

OPERATION MANUAL

MINI-CRAWLER CRANE

MK1033C-1

Serial No. MK0003 and up

WARNING

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

NOTICE

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

M A E D A

CONTENTS

ITEM	Page
INTRODUCTION	1- 1
1. INTRODUCTION	1- 2
2. FOR SAFE USE OF MACHINE	1- 3
3. MACHINE OVERVIEW	1- 4
3.1 SPECIFIED OPERATIONS	1- 4
3.2 MACHINE STRUCTURE	1- 4
3.3 MACHINE FUNCTIONS	1- 5
4. QUALIFICATION FOR OPERATING THE MACHINE	1- 5
4.1 QUALIFICATION REQUIRE FOR OPERATING CRANES	1- 5
5. TERMINOLOGY	1- 6
5.1 TERMS AND DEFINITIONS	1- 6
5.2 DIAGRAM OF WORKING RADIUS AND LIFTING HEIGHT	1- 8
5.3 RATED TOTAL LOAD CHART	1-10
5.4 ANGLE INDICATOR	1-19
SAFETY	2- 1
1. BASIC PRECAUTIONS	2- 2
2. OPERATION RELATED PRECAUTIONS	2- 7
2.1 BEFORE STARTING ENGINE	2- 7
2.2 AFTER STARTING ENGINE	2- 8
2.3 DURING CRANE WORK	2-12
3. TRANSPORT PRECAUTIONS	2-21
4. BATTERY HANDLING PRECAUTIONS	2-23
5. MAINTENANCE PRECAUTIONS	2-25
5.1 PRECAUTIONS BEFORE MAINTENANCE	2-25
5.2 PRECAUTIONS DURING MAINTENANCE	2-27
6. SAFETY LABEL LOCATIONS	2-32
OPERATION	3- 1
1. NAME OF EACH SECTION	3- 2
1.1 MACHINE UNITS	3- 2
1.1.1 EXPLANATION OF MACHINE UNITS	3- 3
1.2 TRAVELLING AND CRANE OPERATION UNITS	3- 6
1.2.1 LEVERS	3- 7
1.2.2 SWITCHES	3- 8
1.2.3 METERS AND LAMPS	3-10
1.3 CRANE OPERATION UNITS	3-11
1.3.1 LEVERS	3-12
1.3.2 SWITCHES	3-13
1.4 OUTRIGGER SAFETY DEVICES	3-14
1.4.1 FUNCTIONS OF OUTRIGGER SAFETY DEVICES	3-14
1.4.2 NAMES AND DESCRIPTIONS OF OUTRIGGER DISPLAY	3-16
1.4.3 OUTRIGGER NOT INSTALLED WARNING	3-18

ITEM	Page
1.5 MONITOR	3-19
1.5.1 MONITOR DISPLAY PARTS	3-19
1.5.2 EMERGENCY STOP CANCEL SWITCH	3-39
1.6 MOMENT LIMITER (OVERLOAD PREVENTIVE DEVICE)	3-40
1.6.1 CONFIGURATION OF MOMENT LIMITER	3-40
1.6.2 FUNCTIONS OF MOMENT LIMITER	3-41
1.6.3 MOMENT LIMITER OPERATION	3-42
1.6.4 MONITOR COMPONENTS	3-44
1.6.5 MOMENT LIMITER FUNCTIONS	3-47
1.7 MACHINERY COVER	3-48
2. OPERATION	3-49
2.1 PRE-OPERATION INSPECTION	3-49
2.1.1 VISIBLE CHECKS	3-49
2.1.2 CHECKING BEFORE STARTING ENGINE	3-52
2.1.3 CHECKING AFTER STARTING ENGINE	3-63
2.2 STARTING ENGINE	3-71
2.2.1 NORMAL ENGINE START WITH MAIN STARTER SWITCH	3-71
2.2.2 NORMAL ENGINE START WITH MAIN STARTER SWITCH IN COLD WEATHER	3-72
2.2.3 ENGINE START WITH AUXILIARY STARTER BUTTON	3-73
2.3 OPERATIONS AND CHECKS AFTER STARTING ENGINE	3-74
2.4 BREAK-IN OPERATION	3-77
2.5 MACHINE TRAVELLING POSTURE	3-77
2.6 START MOVING MACHINE	3-78
2.7 CHANGING DIRECTION OF THE MACHINE	3-79
2.8 STOPPING/PARKING THE MACHINE	3-80
2.9 STOPPING ENGINE	3-81
2.10 INSPECTION AFTER STOPPING ENGINE	3-81
2.11 CAUTIONS IN DRIVING	3-82
2.12 OUTRIGGER SETUP OPERATION	3-83
2.13 PRECAUTIONS BEFORE CRANE WORK	3-91
2.14 CRANE OPERATION POSTURE	3-93
2.15 MAIN BOOM/JIB DERRICKING OPERATION	3-94
2.16 MAIN BOOM/JIB TELESCOPING OPERATION	3-95
2.17 SLEWING OPERATION	3-96
2.18 CRANE ACCELERATOR OPERATION	3-97
2.19 RECOMMENDED OPERATION PROCEDURE	3-97
2.20 CRANE STOWAGE OPERATION (FIXED HOOK SPECIFICATION)	3-99
2.21 OUTRIGGER STOWING OPERATION	3-100
2.22 PROHIBITED OPERATIONS DURING CRANE WORK	3-105
3. HANDLING RUBBER TRACKS	3-107
3.1 GOOD USE	3-107
3.2 WARRANTY	3-107
3.3 PROHIBITED OPERATIONS	3-108
3.4 CAUTIONS IN USING RUBBER TRACKS	3-109
4. HANDLING WIRE ROPES	3-111
4.1 CRITERIA FOR WIRE ROPE REPLACEMENT	3-111

ITEM	Page
5. TRANSPORTATION	3-111
5.1 HOISTING MACHINE	3-111
5.2 LOADING/UNLOADING	3-114
5.3 CAUTIONS WHEN LOADING MACHINE	3-115
5.4 CAUTIONS DURING TRANSPORTATION	3-115
6. HANDLING IN COLD WEATHER	3-116
6.1 PREPARING FOR LOW TEMPERATURE	3-116
7. LONG-TERM STORAGE	3-118
7.1 BEFORE STORING MACHINE	3-118
7.2 DURING STORAGE	3-118
7.3 AFTER STORAGE	3-118
8. HANDLING BATTERY	3-119
8.1 CAUTIONS IN HANDLING BATTERY	3-119
8.2 REMOVING/INSTALLING BATTERY	3-120
8.3 CAUTIONS IN CHARGING BATTERY	3-120
8.4 STARTING ENGINE WITH BOOSTER CABLE	3-121
9. TROUBLESHOOTING	3-123
9.1 ELECTRICAL COMPONENTS	3-123
9.2 MACHINE BODY	3-123
9.3 ENGINE	3-124
10. HOW TO REMOVE AND MOUNT A COUNTERWEIGHT	3-125
10.1 REMOVING THE COUNTERWEIGHT	3-126
10.2 MOUNTING THE COUNTERWEIGHT	3-128
INSPECTION AND MAINTENANCE	4- 1
1. PRECAUTIONS FOR MAINTENANCE	4- 2
2. BASIC MAINTENANCE	4- 4
3. LEGAL INSPECTION	4- 7
4. CONSUMABLES	4- 7
5. LUBRICATING OIL	4- 8
5.1 USE OF LUBRICATING OIL ACCORDING TO TEMPERATURES	4- 8
6. ACCESSORY TOOLS AND STANDARD TIGHTENING TORQUE	4- 9
6.1 ACCESSORY TOOLS	4- 9
6.2 STANDARD TIGHTENING TORQUE LIST	4- 9
7. INSPECTION AND MAINTENANCE LIST	4-11
8. MAINTENANCE PROCEDURES	4-14
8.1 INITIAL 10 HOUR MAINTENANCE	4-14
8.2 INITIAL 50 HOUR MAINTENANCE	4-14
8.3 INITIAL 250 HOUR MAINTENANCE	4-14
8.4 PRE-OPERATION INSPECTION	4-15
8.5 IRREGULAR MAINTENANCE	4-15
8.6 MAINTENANCE EVERY 30 HOURS	4-24
8.7 MAINTENANCE EVERY 50 HOURS	4-26
8.8 MAINTENANCE EVERY 250 HOURS	4-30
8.9 MAINTENANCE EVERY 500 HOURS	4-32
8.10 MAINTENANCE EVERY 1000 HOURS	4-37
8.11 MAINTENANCE EVERY 2000 HOURS	4-46

ITEM	Page
SPECIFICATIONS	5- 1
1. PRINCIPLE SPECIFICATION LIST	5- 2
2. SPECIFICATION DIMENSIONAL DRAWING	5- 4
3. DIMENSIONAL DRAWING OF OUTRIGGER WIDTH	5- 5
4. RATED TOTAL LOAD CHART	5- 6
5. WORKING RADIUS/LIFTING HEIGHT	5- 7
REMOTE CONTROL	6- 1
1. OUTLINE OF REMOTE CONTROLLER	6- 2
1.1 FEATURE	6- 2
1.2 CONFIGURATION	6- 2
1.2.1 CONFIGURATION OF REMOTE CONTROLLER	6- 2
1.3 FUNCTIONS	6- 3
1.3.1 FUNCTIONS OF REMOTE CONTROLLER	6- 3
2. SAFETY PRECAUTIONS	6- 4
2.1 PRECAUTIONS ON HANDLING	6- 4
2.2 OPERATION RELATED PRECAUTIONS	6- 8
2.2.1 BEFORE STARTING ENGINE	6- 8
2.2.2 AFTER STARTING ENGINE	6- 9
2.2.3 DURING OPERATION	6- 9
2.2.4 AT THE END OF OPERATION	6- 9
3. SAFETY LABEL LOCATIONS	6-10
4. COMPONENTS OF THE TRANSMITTER	6-11
4.1 UPPER PART COMPONENTS OF THE TRANSMITTER	6-11
4.2 LOWER PART COMPONENTS OF THE TRANSMITTER	6-12
4.3 DESCRIPTION OF COMPONENTS OF THE TRANSMITTER	6-13
5. COMPONENTS OF THE RECEIVER	6-19
5.1 COMPONENTS OF THE RECEIVER	6-19
6. PRE-OPERATION INSPECTION	6-21
6.1 CHECKING BEFORE STARTING ENGINE	6-21
6.1.1 CHECKING BEFORE TURNING ON THE TRANSMITTER	6-21
6.1.2 CHECKING AFTER TURNING ON THE TRANSMITTER	6-22
6.1.3 INSPECTION OF THE RECEIVER	6-23
6.2 CHECKING AFTER STARTING ENGINE	6-24
6.2.1 VERIFICATION FOR THE ENGINE START AND STOP	6-24
6.2.2 OUTRIGGER MODE OPERATION CHECK	6-25
6.2.3 CRANE MODE OPERATION CHECK	6-26
7. OPERATION	6-29
7.1 CAUTIONS BEFORE OPERATION	6-29
7.2 OPERATION IN OUTRIGGER MODE	6-30
7.2.1 OUTRIGGER SETTING	6-31
7.2.2 OUTRIGGER STOWING	6-31

ITEM	Page
7.3 OPERATION IN CRANE MODE	6-32
7.3.1 SLEWING OPERATION	6-33
7.3.2 MAINBOOM TELESCOPING	6-33
7.3.3 HOOK RAISING AND LOWERING (WINCH SPECIFICATION)	6-34
7.3.4 MAIN BOOM DERRICKING	6-34
7.3.5 JIB DERRICKING	6-35
7.3.6 JIB TELESCOPING	6-35
7.3.7 SPEED SELECTOR ROTARY SWITCH: (S10)	6-36
7.3.8 ACCELERATION DIAL: R1	6-36
7.3.9 EMERGENCYSTOP SWITCH OPERATION	6-37
7.3.10 ENGINE START AND STOP OPERATION	6-37
7.4 CHECKING AFTER CRANE OPERATION	6-38
8. HANDLING BATTERY	6-39
8.1 REPLACEMENT TIMING OF BATTERY	6-39
8.2 REPLACEMENT METHOD OF BATTERY	6-39
8.3 CHARGING METHOD OF BATTERY	6-40
9. TROUBLESHOOTING	6-41
9.1 BEFORE TROUBLESHOOTING	6-41
9.2 ERRORS IN THE REMOTE CONTROL DEVICES	6-42
10. PRINCIPLE SPECIFICATION LIST	6-44
ELECTRIC MOTOR	7- 1
1. PRECAUTIONS FOR USE OF ELECTRIC MOTOR	7- 2
2. SAFETY LABEL LOCATIONS	7- 3
3. NAME OF EACH SECTION	7- 5
3.1 TRAVELLING UNIT	7- 5
3.2 POWER UNIT	7- 8
3.3 POWER SUPPLY BOX	7- 8
3.4 INVERTER UNIT	7- 9
4. OPERATION	7-12
4.1 PRE-OPERATION INSPECTION	7-12
4.1.1 INSPECTION BEFORE STARTING ELECTRIC MOTOR (VISIBLE CHECKS)	7-12
4.1.2 INSPECTION BEFORE STARTING ELECTRIC MOTOR	7-12
4.1.3 INSPECTION AFTER STARTING ELECTRIC MOTOR	7-12
4.2 POWER SUPPLY CONNECTION	7-13
4.3 OPERATION AND CHECKING AFTER POWER CONNECTION	7-16
4.4 MACHINE OPERATION	7-18
4.5 MACHINE STOP AND CHECKS AFTER STOPPING MACHINE	7-18
4.6 POWER SUPPLY SEPARATION	7-19
5. LONG-TERM STORAGE	7-20
6. ELECTRIC MOTOR TROUBLESHOOTING	7-21
7. METHOD OF REMOVING AND INSTALLING POWER UNIT	7-22
7.1 REMOVAL OF POWER UNIT	7-23
7.2 INSTALLATION OF POWER UNIT	7-26
8. PRINCIPLE SPECIFICATION LIST	7-27
9. SPECIFICATION DIMENSIONAL DRAWING	7-29

ITEM	Page
WINCH	8- 1
1. SAFETY LABEL LOCATIONS	8- 2
2. WINCH PARTS	8- 5
2.1 WINCH MACHINE PARTS	8- 5
2.2 WINCH OPERATION PARTS	8- 6
2.3 MONITOR	8- 7
2.3.1 MONITOR DISPLAY PARTS	8- 7
2.4 OVER HOIST DETECTOR	8-10
2.5 EXCESSIVE UNWIND DETECTOR	8-10
3. OPERATION	8-11
3.1 PRE-OPERATION INSPECTION	8-11
3.1.1 VISIBLE CHECKS	8-11
3.1.2 CHECKING BEFORE STARTING ENGINE	8-12
3.1.3 CHECKING AFTER STARTING ENGINE	8-12
3.2 OPERATIONS BEFORE CRANE WORK	8-14
3.3 HOOK RAISING/LOWERING OPERATION	8-16
3.4 CRANE STOWAGE OPERATION	8-17
3.5 WHEN CHANGING TO HOOK BLOCK (SINGLE FALL HOOK)	8-20
3.6 WHEN CHANGING TO FIXED HOOK	8-24
4. SPECIFICATIONS	8-26
4.1 SPECIFICATIONS	8-26
4.2 MAIN DIMENSIONAL DRAWING	8-27
4.3 WORKING RADIUS AND RATED TOTAL LOAD	8-27
4.3.1 RATED TOTAL LOAD CHART	8-28
4.3.2 WORKING RANGE/LIFTING HEIGHT OF SINGLE FALL WINCH	8-29

INTRODUCTION

1. INTRODUCTION	1- 2
2. FOR SAFE USE OF THE MACHINE	1- 3
3. MACHINE OVERVIEW	1- 4
4. QUALIFICATION FOR OPERATING THE MACHINE	1- 5
5. TERMINOLOGY	1- 6

1. INTRODUCTION

Thank you for purchasing the Maeda Knuckle Crane MK1033C-1.

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

This manual describes the procedures and precautions to follow for proper operation, inspection and maintenance of the machine.

Many accidents are caused due to failure to observe safety precautions for operation, inspection, and maintenance.

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

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

⚠ WARNING

Improper operation of this machine can lead to serious injuries or death.

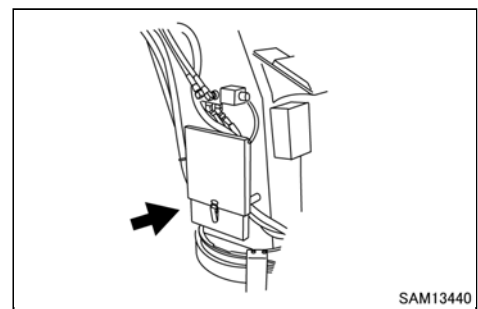
Operators and maintenance personnel must always read this manual prior to operation or maintenance of this machine.

Keep this manual in a designated place so that all personnel that work on this machine will read it for reference periodically.

- **Avoid operating this machine before understanding this manual thoroughly.**
- **Keep this manual at hand so that you can read it when necessary.**
- **If you lose or damage this manual, contact Maeda or our sales service agency immediately to order a new one.**
- **This manual should always accompany this machine upon transfer of the machine to the next owner or user.**
- **This manual is based on the data that was available at the time of the creation of the manual.**
The information of this manual, including maintenance specifications, tightening torque, pressure, measuring method, adjustment value, and illustrations, are subject to change without prior notice due to continuous machine improvement.
These changes may affect the machine maintenance procedure. Always obtain the latest information from Maeda or our sales service agency before performing maintenance of this machine.

For safety instructions, see “2. FOR SAFE USE OF THE MACHINE” on page 1-3 and “SAFETY” on page 2-1.

Storage place of the operation manual



2. FOR SAFE USE OF THE MACHINE

This manual classifies the risks into the following three categories for easy understanding of the safety information.

DANGER

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

It also provides information on how to avoid such hazard.

WARNING

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

It also provides information on how to avoid such hazard.

CAUTION

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

It also provides information on how to avoid such hazard.

This manual also uses the following indications to provide other precautions for handling the machine and helpful information.

CAUTION

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

NOTES

This denotes helpful information.

The operations, inspections, maintenance and safety precautions for this machine that are outlined in this manual are relevant to specified tasks.

It is impossible to anticipate all situations where the machine is used.

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

When performing the machine operation, inspection or maintenance in a situation that is not covered by this manual, be sure to take necessary measures and actions for safety on your own.

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

Encircled numbers used in the illustrations are expressed in parentheses in the text. (Example: ① → (1))

3. MACHINE OVERVIEW

3.1 SPECIFIED OPERATIONS

This machine is to be used for the following operation(s):

- Crane operation

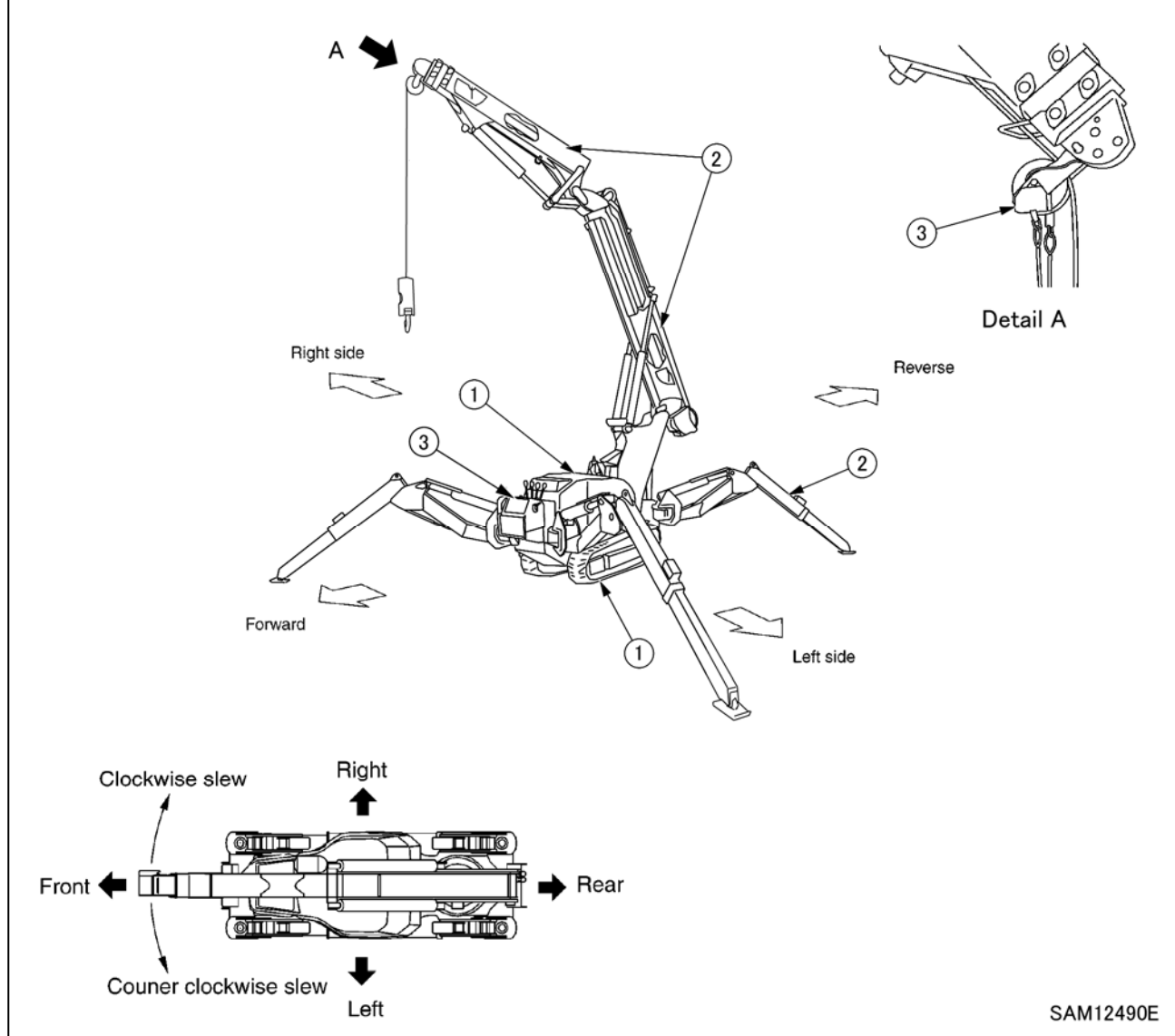
This machine is a mobile crane mounted on the rubber track dolly (carrier) with a knuckle boom.

This self-propelled crane is capable of moving (travelling) in the worksite and craning an object weighing up to the rated total load.

This crane is also equipped with the remote control system.

3.2 MACHINE STRUCTURE

EXTERNAL VIEW



- (1) Carrier
- (2) Crane
- (3) Safety device

In this manual, the front, rear, right and left of the machine are determined as viewed from the carrier in the travelling direction (forward) of the machine.

The boom slewing directions (clockwise [right] and counterclockwise [left]) are determined as viewed from above the machine.

This machine is composed of the following units and systems:

[1] CARRIER

The carrier consists of the travelling gear, engine, travelling operation unit, and crane operation unit.

[2] CRANE

The crane consists of the telescopic main boom, main boom derrick system, telescopic jib, jib derrick system, slewing system, hook block, winch system, and outrigger system.

[3] SAFETY DEVICE

This machine is equipped with the following safety devices: Over-hoist detector/automatic stop device, emergency stop switch, angle indicator, hydraulic safety valve, hydraulic automatic locking device, slinging rope detachment protector, tri-colour lights, alarm buzzer (audio alarm), levelling instrument, crane tip-over alarm (issued when operating the crane over 3 degrees of inclination and travelling over 10 degrees inclination), outrigger safety device (outrigger extension detection and crane interlock), and boom displacement detector.

3.3 MACHINE FUNCTIONS

[1] CARRIER

- This machine is designed to have a compact overall width when the crane and outriggers are retracted, which facilitates running in confined areas.
- Operating the two travelling levers enables direction changes of forward, backward, right and left travelling.

[2] CRANE

- The crane unit has the flexible outriggers that allow the machine to work in rough terrains or confined areas. The outriggers can be extended in various ways according to the worksite terrain and conditions.
- Through the combination use of the telescopic boom, derrick and slewing systems besides the winch system (winch spec), the crane can raise and lower the hook to move the lifted object to the desired position within the rated total load and the specified working envelope.
- The outrigger setup and the crane operations can be performed with the remote control system.
- Changing the angle and length of the main boom and jib can make diverse positions.

4. QUALIFICATION FOR OPERATING THE MACHINE

WARNING

- Workmen's accidents in connection with cranes occur frequently. What we would like our users to recognize is the fact that even an experienced person can incur accidents.
- For operation of this machine, be sure to observe safety rules shown in this manual.

4.1 QUALIFICATION REQUIRE FOR OPERATING CRANES

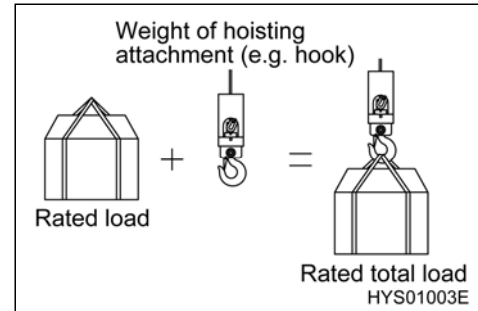
Qualification for operation of this type machine is provided in local laws and regulations. Check with the competent authority or your Maeda dealer for detail.

5. TERMINOLOGY

5.1 TERMS AND DEFINITIONS

[1] RATED TOTAL LOAD

The maximum load that can be applied according to the boom length and angle. The load includes the mass (weight) (winch spec) of hoisting accessories (hooks) and slinging tackle.

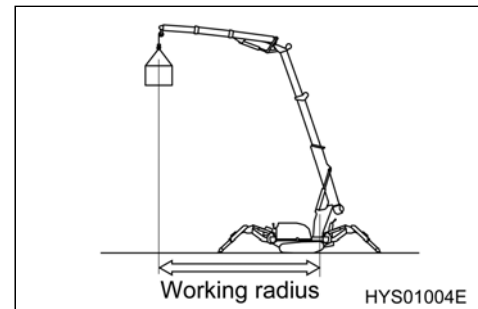


[2] RATED LOAD

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

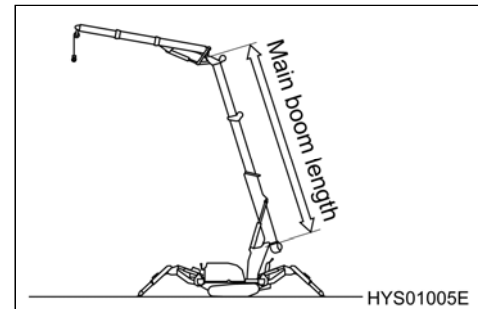
[3] WORKING RADIUS

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



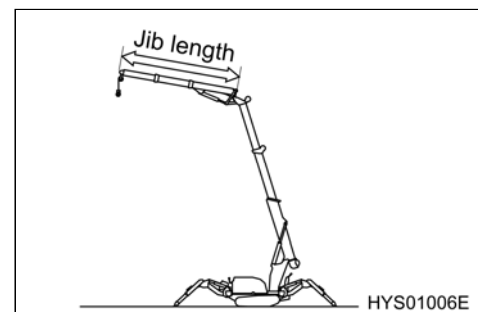
[4] MAIN BOOM LENGTH

A distance between the main boom primary pin and the top pin of the main boom end.



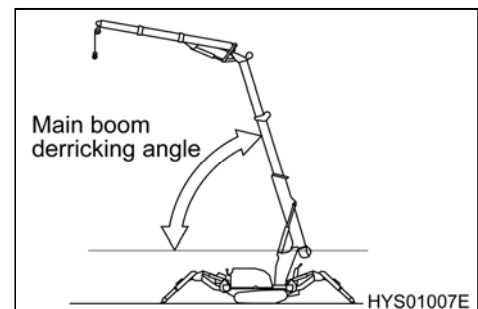
[5] JIB LENGTH

A distance between the jib primary pin (main boom top pin) and the boom head shackle.



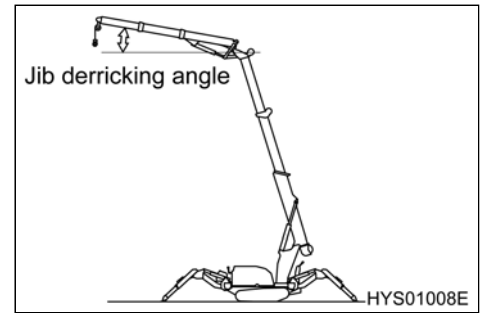
[6] MAIN BOOM DERRICKING ANGLE

An angle which the main boom forms with the horizon.



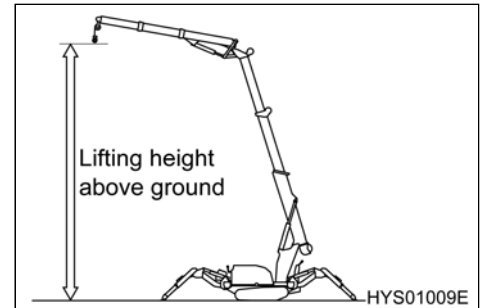
[7] JIB DERRICKING ANGLE

An angle which the jib forms with the horizon.





[8] LIFTING HEIGHT ABOVE GROUND

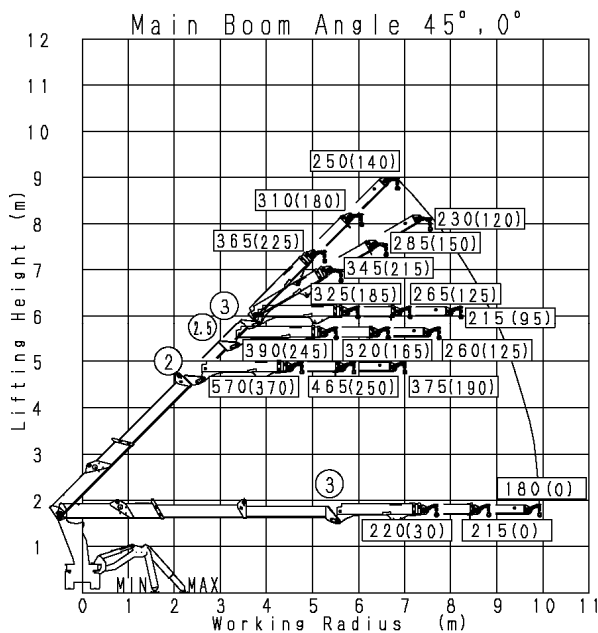
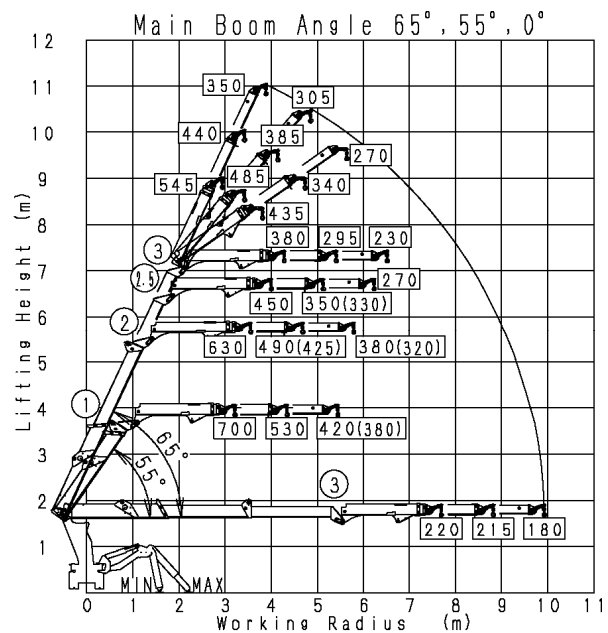
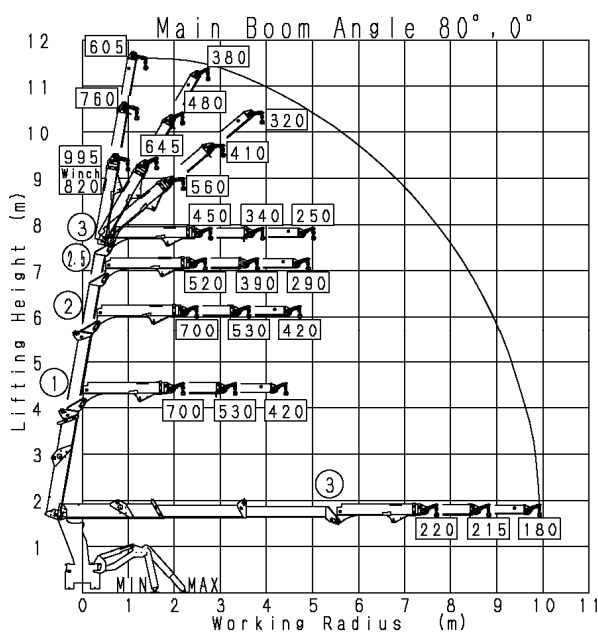
A vertical distance between the hook bottom end and the ground with the hook raised to the upper limit.



5.2 DIAGRAM OF WORKING RADIUS AND LIFTING HEIGHT

⚠ WARNING

- The numerical figure in a box represents the rated total load (kg). When outriggers are set to "MIN", work should be performed within a load inside parentheses. A numerical value without parentheses is common to outriggers set to "MAX" and "MIN".
- The numerical values (rated total load) in in the figure show values including the mass of a hoisting attachment when the crane is set horizontally using the outrigger. (Fixed hook 2 kg, winch single rope hook 20 kg)
- If 2nd stage boom is extended to some extent, work should be performed within the rated total load of the main boom (2).
- If one half of the 1st mark  on the main boom side is exposed from the 1st stage boom, work should be performed within the rated total load of the main boom (2.5).
- If one half of the 2nd mark  on the main boom side is exposed from the 1st stage boom, work should be performed within the rated total load of the main boom (3).
- For rated total load other than that in the figure below, see "5.3 RATED TOTAL LOAD CHART".
- The maximum rated total load in the case of the winch specification is 820 kg.



SAM12480

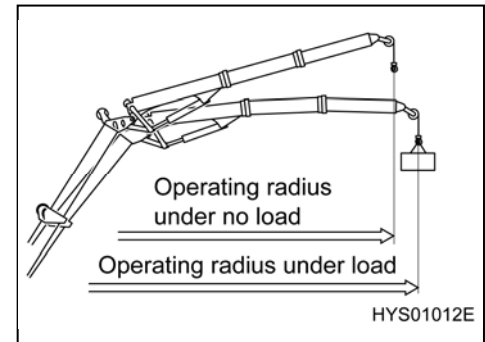
1. The diagram of working radius and lifting height above ground shows the relationships between the working radius, boom angle and lifting height at no load, allowing for no deflection in the boom.

A deflection occurs in the boom when an object is hoisted, which causes the working radius to widen slightly.

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.



2. For rated total load other than that in the safety plate, check the following figure and chart.

To check the chart, see “5.3 RATED TOTAL LOAD CHART”.



5.3 RATED TOTAL LOAD CHART

⚠ CAUTION

- Rated total load chart is based on level, hard ground. Perform work on level, hard ground. Depending on the outrigger setting or bad ground conditions the machine may tip over. Be very careful during the work.
- The chart below show values including the mass of a hoisting attachment when the crane is set horizontally using the outrigger. (Fixed hook 2 kg, winch single rope hook 20 kg)
- If 2nd stage boom is extended to some extent, work should be performed within the rated total load of the main boom (2).
- If one half of the 1st mark  on the main boom side is exposed from the 1st stage boom, work should be performed within the rated total load of the main boom (2.5).
- If one half of the 2nd mark  on the main boom side is exposed from the 1st stage boom, work should be performed within the rated total load of the main boom (3).
- If main boom angle exceeds the value of Main Boom Angle column in the chart by any extent, work should be performed within the rated total load in the next column of Main Boom Angle.
- If jib angle falls below the value of Jib Angle column in the chart by any extent, work should be performed within the rated total load in the next column of Main Boom Angle.
- Unless outriggers are extended to maximum, work should be performed in accordance with values in "Rated Total Load Chart with outriggers extended to minimum".
However some conditions are exceptional and work can be performed with values in "Rated Total Load Chart with outriggers extended to Maximum". See "5.3 [5] EXAMPLE OF RATED TOTAL LOAD CHART" for the exceptional conditions.
- The maximum rated total load in the case of the winch specification is 820 kg.

Outrigger Position : MAX

Main Boom (1)				(kg)		
				Jib Stage		
				First	Second	Third
Main Boom Angle	80°	Jib Angle	90°	995		
			80°	995	995	850
			60°	995	675	535
			40°	795	600	475
			0°	700	530	420
	55°		90°	965		
			55°	965	665	525
			40°	795	600	475
			0°	700	530	420
		0°	700	530	420	

Main Boom (2.5)				(kg)		
				Jib Stage		
				First	Second	Third
Main Boom Angle	80°	Jib Angle	90°	995		
			80°	995	880	700
			60°	745	555	440
			40°	645	475	370
			0°	520	390	290
	65°		90°	645		
			65°	645	520	415
			50°	575	455	360
			35°	515	400	320
			0°	450	350	270
	45°		90°	440		
			45°	440	375	300
			30°	415	340	275
			0°	390	320	260
			0°	335	280	225

Main Boom (2)				(kg)		
				Jib Stage		
				First	Second	Third
Main Boom Angle	80°	Jib Angle	90°	995		
			80°	995	995	850
			60°	995	675	535
			40°	795	600	475
			0°	700	530	420
	65°		90°	910		
			65°	910	680	540
			50°	805	620	460
			35°	725	565	450
			0°	630	490	380
	45°		90°	640		
			45°	640	545	440
			30°	605	500	400
			0°	570	465	375
	0°	0°	545	395	320	

Main Boom (3)				(kg)		
				Jib Stage		
				First	Second	Third
Main Boom Angle	80°	Jib Angle	90°	995		
			80°	995	760	605
			60°	645	480	380
			40°	560	410	320
			0°	450	340	250
	65°		90°	545		
			65°	545	440	350
			50°	485	385	305
			35°	435	340	270
			0°	380	295	230
	45°		90°	365		
			45°	365	310	250
			30°	345	285	230
			0°	325	265	215
	0°	0°	220	215	180	

The rated total load chart provides the maximum loads (including hook weight) that the crane is capable of hoisting objects depending on main boom and jib length and angle and outrigger extension condition, by working radius.

[1] MAIN BOOM LENGTH

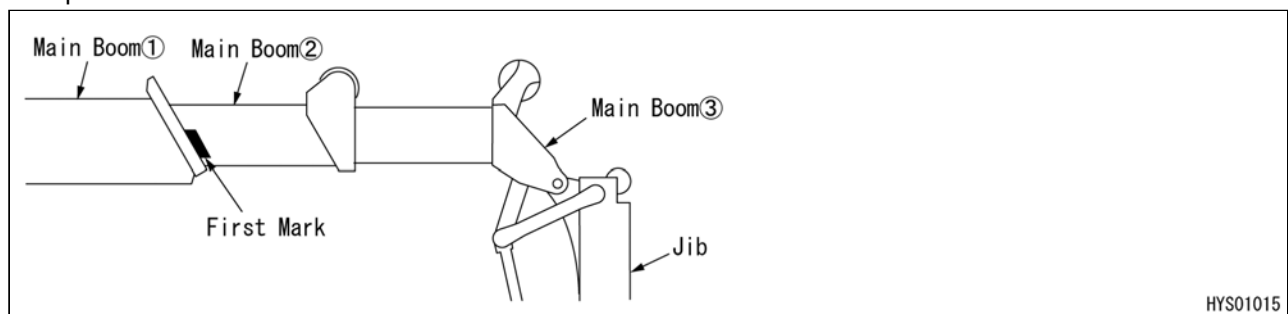
"Main Boom (1)", "Main Boom (2)", "Main Boom (2.5)" and "Main Boom (3)" as shown on the top horizontal column of the Rated Total Load Chart represent the condition of the following figures.

1. "Main Boom (1)": All the main booms retracted.



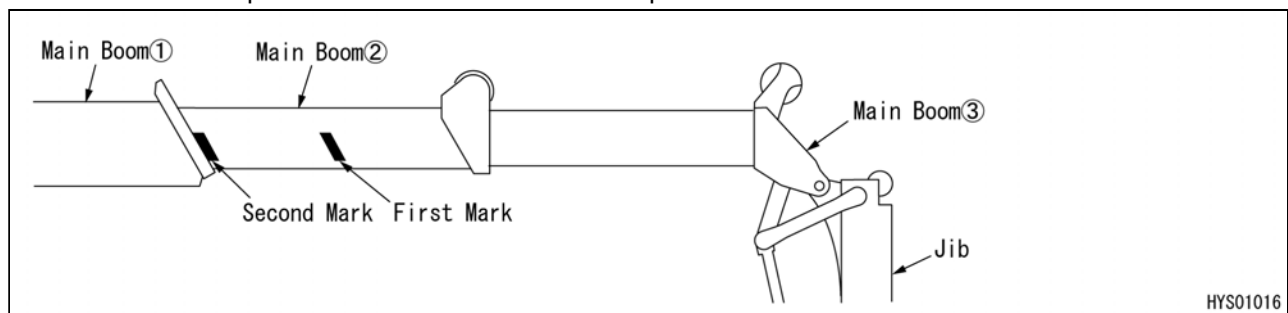
2. Main Boom (2): With main boom extended to such extent that the 1st "▀" mark of main boom (2) is exposed.

If main boom (2) is extended to some extent, work should be performed in accordance with the performance of this column.



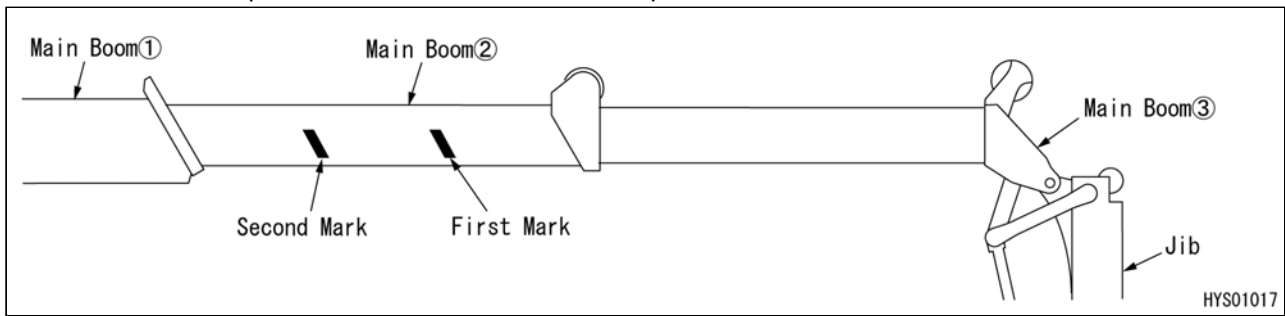
3. "Main Boom (2.5)": With main boom extended to such extent that the 2nd "▀" mark of main boom (2) is exposed.

When more than one-half of the first "▀" mark of the main boom (2) is exposed from the main boom (1), work should be performed in accordance with the performance of this column.



4. "Main Boom (3)": All the main booms extended fully.

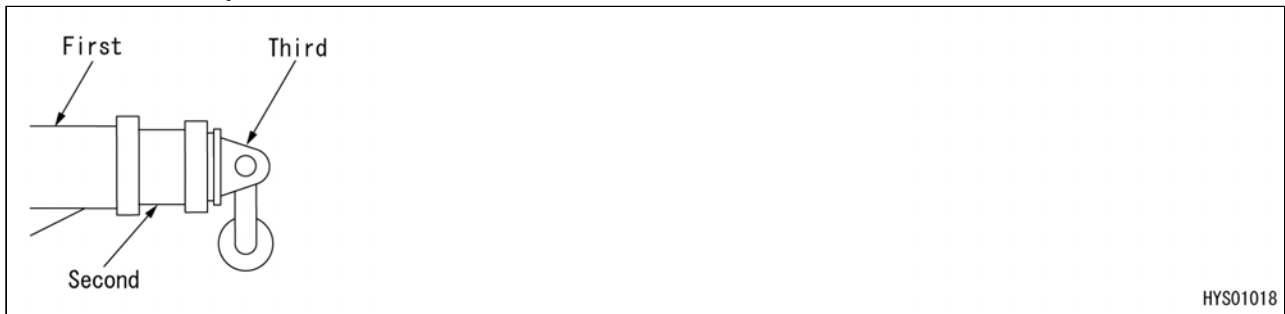
When more than one-half of the 2nd "▀" mark of the main boom (2) is exposed from the main boom (1), work should be performed in accordance with the performance of this column.



[2] JIB LENGTH

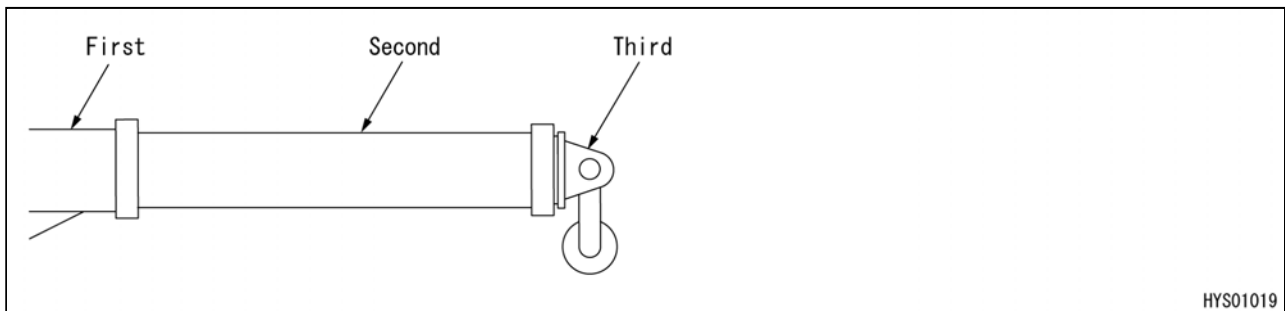
"First", "Second" and "Third" of "Jib Stage" as shown in the Rated Total Load Chart represent the condition of the following figures.

1. "First": All the jibs retracted.



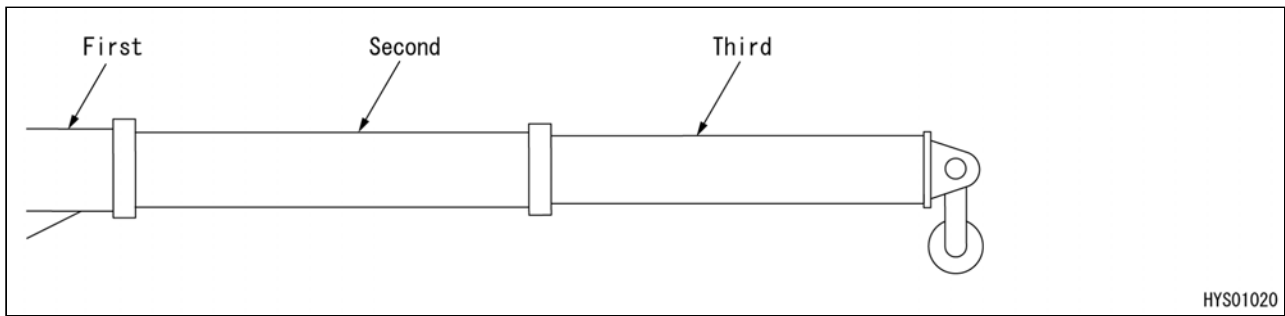
2. "Second": With the second-stage jib extended fully.

If 2nd jib is extended to some extent, work should be performed in accordance with the performance of this column.



3. "Third": All the jibs extended fully.

If 3rd jib is extended to some extent, work should be performed in accordance with the performance of this column.

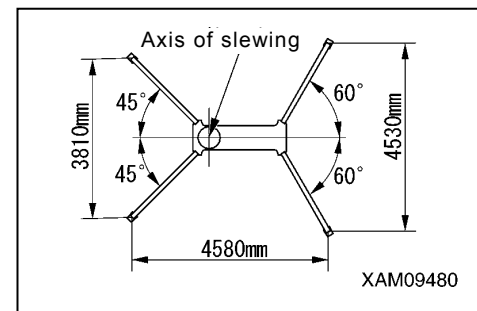


[3] OUTRIGGER MAXIMUM EXTENSION

⚠ WARNING

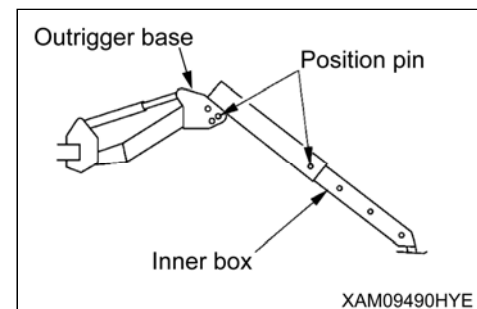
- When operating the crane, be sure to extend all the outriggers. Never perform any crane operation without setting up the outriggers. Otherwise the machine may tip over causing serious personal injury.
- Outriggers should be extended while watching levelling instrument so that the machine is set horizontally.
Tilting the machine more than 3° activates alarm buzzer. To stop the buzzer, place the machine horizontally.
- If outriggers are extended to minimum, work should be performed in accordance with values in "Rated Total Load Chart with outriggers extended to minimum".
Working under improper values may cause the machine to tip over. Be very careful.
- If you have retracted any positioning pin of outrigger inner box or outrigger base by even 1 hole, your work should be performed in accordance with the value of "Rated Total Load Chart with Outrigger Extended to Minimum".
- There are positions where stability of the machine becomes poor depending on set conditions of the outrigger. Reduce the working radius and use sufficient care.

"Outriggers extended to maximum" in the top column of the Rated Total Load Chart represents the condition in the figure on the right. If you have retracted even one inner box and outrigger base, the status is defined as "Outrigger Extended to Minimum". See "OPERATION 2.12 OUTRIGGER SETUP OPERATION" for proper placement of the outriggers.

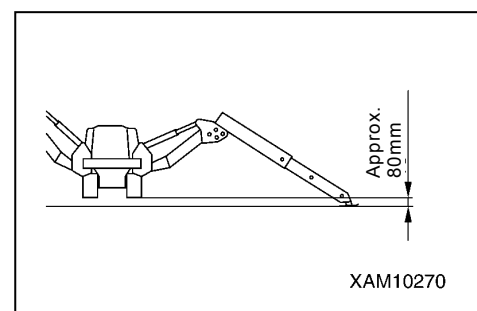


NOTES

- "With outriggers extended to maximum" means that,
- (1) The outrigger set up angle is set to the position pin position (60° front and 45° rear).
 - (2) Inner boxes of all the outriggers are pulled out fully.
 - (3) All outrigger base positioning pins are set to the maximum position.
 - (4) All the outriggers are placed on level ground.
 - (5) The dimension (distance between bottom of the outrigger and bottom of the track) in the figure on the right is approximately 80 mm.
- The above represents "Outriggers extended to maximum".

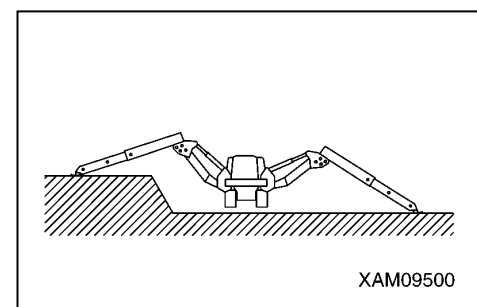


Any status other than that in the illustration to the right represents "Outrigger Extended to Minimum".



NOTES

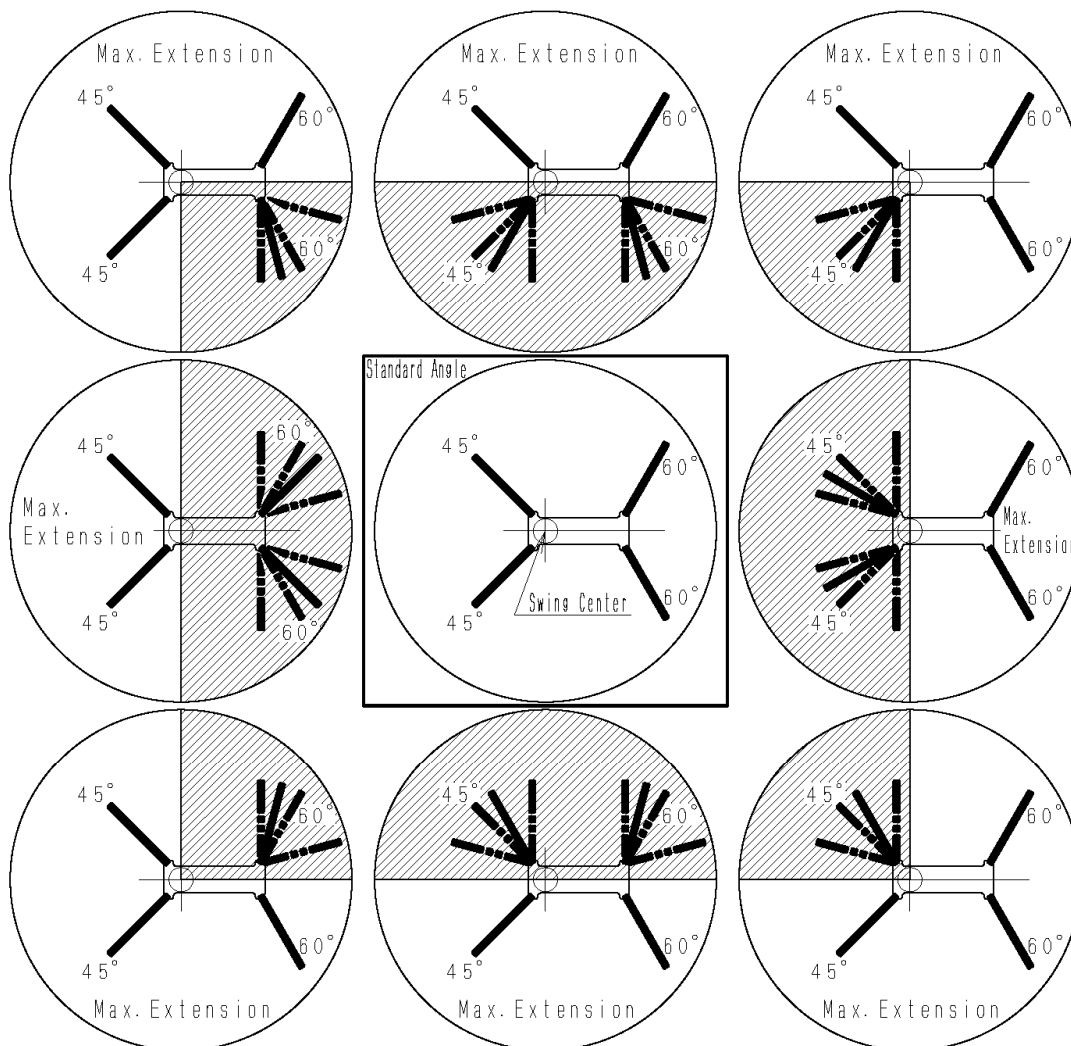
Even with all the outriggers extended to maximum, so long as the ground surface of any one of them is not flush with bottom surface of track due to uneven terrain etc., the status will have to be defined as "Outrigger Extended to Minimum".



[4] CRANE OPERATION PROHIBITED AREAS DUE TO OUTRIGGER EXTENSION POSITION

⚠ WARNING

- The illustration below shows crane operation prohibited areas (diagonally shaded areas in the illustration below) due to the outrigger set up condition.
Crane operation in the crane operation prohibited areas (diagonally shaded areas in the illustration below) causes the machine to tip over, leading to serious personal injury.
Never perform crane operation in the shaded areas below.
- Of 4 outriggers, 2 outriggers either in front and rear or on the right and left must always be set to the maximum extension position (inner MAX, base MAX, front 60°, rear 45°).
At this time, even if 2 outriggers are set to standard extension, work should be performed in accordance with the value of "Rated Total Load Chart with outriggers extended to minimum".
- The outrigger extension position that enables crane work on the entire circumference is only in "Standard extension status" shown in the centre of the illustration below.
- If you have retracted any positioning pin of outrigger inner box or outrigger base by even 1 hole, your work should be performed in accordance with the value of "Rated Total Load Chart with Outrigger Extended to Minimum".
- There are positions where stability of the machine becomes poor depending on set conditions of the outrigger. Reduce the working radius and use sufficient care.



SAM15910

[5] EXAMPLE OF RATED TOTAL LOAD CHART

Read and understand fully precautions of the rated total load chart before selecting the load value in the chart that matches the main boom, jib and outrigger conditions.

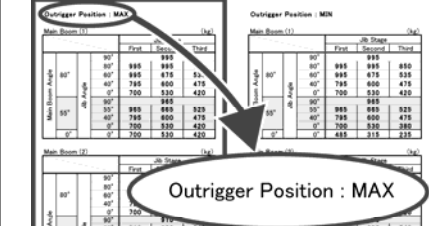
1. Select the extension status of outriggers.

- Maximum extension
- Other than maximum extension

For details of outrigger extension status, see "OPERATION 2.12 OUTRIGGER SETUP OPERATION".

Example:

- Outriggers are extended to maximum
→ Select outrigger maximum extension
- One or more outriggers are extended to other than maximum
→ Select outrigger other than maximum extension



Outrigger Position : MAX

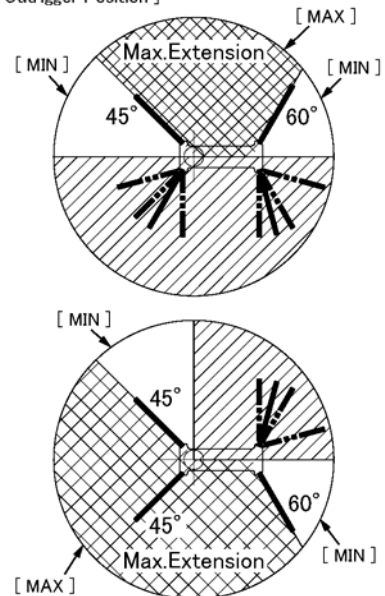
Main Boom (1)		Jib Stage		First		Second		Third	
Main Boom Angle	80°	90°	995	995	995	995	995	995	995
	60°	90°	995	995	995	995	995	995	995
	45°	90°	995	995	995	995	995	995	995
	0°	90°	995	995	995	995	995	995	995
Main Boom Angle	80°	60°	995	995	995	995	995	995	995
	60°	60°	995	995	995	995	995	995	995
	45°	60°	995	995	995	995	995	995	995
	0°	60°	995	995	995	995	995	995	995
Main Boom Angle	80°	45°	995	995	995	995	995	995	995
	60°	45°	995	995	995	995	995	995	995
	45°	45°	995	995	995	995	995	995	995
	0°	45°	995	995	995	995	995	995	995
Main Boom Angle	80°	0°	995	995	995	995	995	995	995
	60°	0°	995	995	995	995	995	995	995
	45°	0°	995	995	995	995	995	995	995
	0°	0°	995	995	995	995	995	995	995

SAM13550

NOTES

Even one or more outriggers are extended to other than maximum, works can be done with values of "Rated Total Load Chart with outriggers extended to Maximum" only for area between two adjacent maximum extended outriggers.

Rated Total Load (For Multi Outrigger Position)
[Outrigger Position]

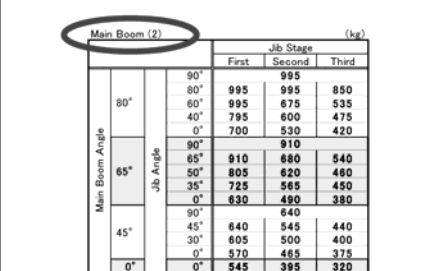


2. Select the stage of the main boom.

For details of the number of stages of the main boom, see "INTRODUCTION 5.3 [1] MAIN BOOM LENGTH".

Example: The stage of the main boom is the second

→ Select the second stage of the main boom



Main Boom (2)

Main Boom (2)		Jib Stage		First		Second		Third	
Main Boom Angle	80°	90°	995	995	995	995	995	995	995
	60°	90°	995	995	995	995	995	995	995
	45°	90°	995	995	995	995	995	995	995
	0°	90°	995	995	995	995	995	995	995
Main Boom Angle	80°	60°	995	995	995	995	995	995	995
	60°	60°	995	995	995	995	995	995	995
	45°	60°	995	995	995	995	995	995	995
	0°	60°	995	995	995	995	995	995	995
Main Boom Angle	80°	45°	995	995	995	995	995	995	995
	60°	45°	995	995	995	995	995	995	995
	45°	45°	995	995	995	995	995	995	995
	0°	45°	995	995	995	995	995	995	995
Main Boom Angle	80°	0°	995	995	995	995	995	995	995
	60°	0°	995	995	995	995	995	995	995
	45°	0°	995	995	995	995	995	995	995
	0°	0°	995	995	995	995	995	995	995

SAM13560

3. Select the angle of the main boom and jib.

NOTES

If there is no matching angle in the chart, select the next lower angle.

Jib angle denotes both plus angle and minus angle other than 0° and 90°.

90° denotes -90°.

The + side of the jib is up to 80° at the maximum.

Main Boom (2)		Jib Stage (kg)		
Main Boom Angle	Jib Angle	First Second Third		
		First	Second	Third
90°	90°	995	995	850
80°	80°	995	995	850
60°	60°	995	875	535
40°	40°	795	600	475
0°	0°	700	530	420
90°	90°	910		
85°	85°	910	680	540
50°	50°	805	620	480
35°	35°	725	565	450
0°	0°	630	490	380
90°	90°	640		
45°	45°	640	545	440
30°	30°	605	500	400
0°	0°	570	465	375
0°	0°	545	395	320

SAM13570

Example: Main boom angle is 80° → Select main boom angle of 80°

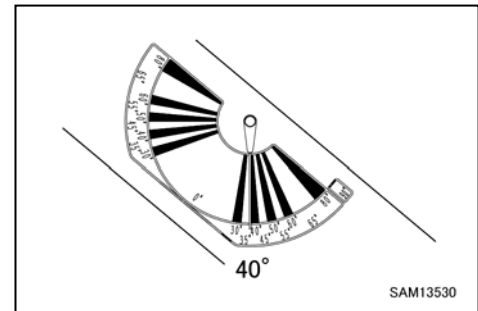
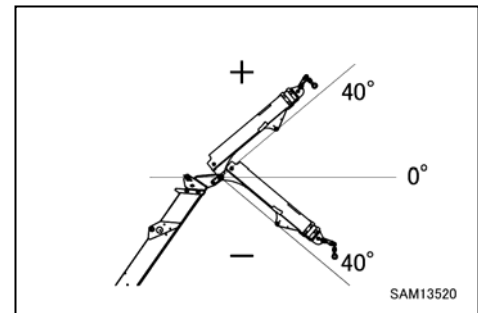
Jib angle is 70° → Select jib angle of 60°

Jib angle is -70° → Select jib angle of 60°

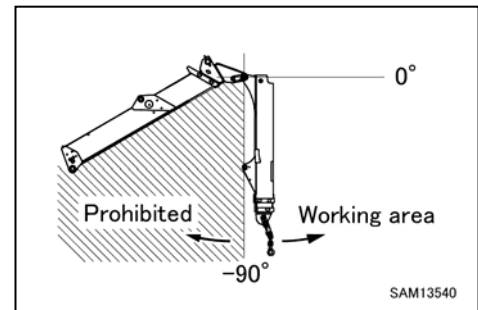
If the jib is derricked down to the - side, read rated total load of the same angle on the + side.

Example: If jib angle is -40° , read rated total load at $+40^{\circ}$.

The angle indicator has no indication of “-”. Read $+40^{\circ}$ as it is.



Work when jib angle exceeds -90° is prohibited. (Jib derrick down operation stops automatically.)



4. Select the stage of the jib.

For details of the stage of the jib, see “INTRODUCTION 5.3 [2] JIB LENGTH”.

Example: The stage of the jib is the third

→ Select the third stage of the jib

Main Boom (2)		Jib Stage (kg)		
Main Boom Angle	Jib Angle	Jib Stage		
		First	Second	Third
90°	90°	995	995	995
	80°	995	675	535
	60°	795	600	475
	40°	700	530	420
	0°	630	490	390
65°	90°	910	680	540
	85°	805	620	480
	50°	725	565	450
	35°	630	490	390
	0°	545	395	320
45°	90°	640	545	440
	45°	605	500	400
	30°	570	465	375
	0°	545	395	320
	0°	545	395	320

Rated total load can be selected in the above procedure.

5.4 ANGLE INDICATOR

WARNING

- Use the angle indicator to check the angle of the main boom and jib in operation when the crane is operated from a distance, using a remote-controller.
- Before hoisting a load, always refer to the Rated Total Load Chart to determine the correct main boom or jib length (i.e. number of booms sections used) and main boom angle and jib angle, then check the actual weight of the load with the applicable rated total load and ensure that weight of both of the load itself and sling etc. never exceeds the rated total load.

The boom angle indicators are attached to left and right sides of both 1st stage main boom and 1st stage jib, and consist of a “Pointer” and a “Scale plate” as shown in the figure on the right.

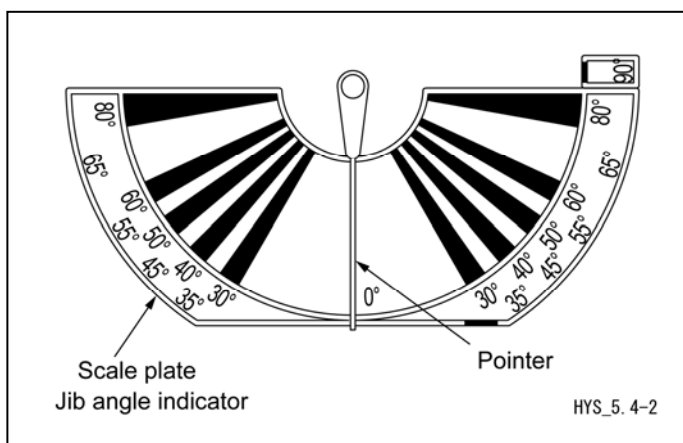
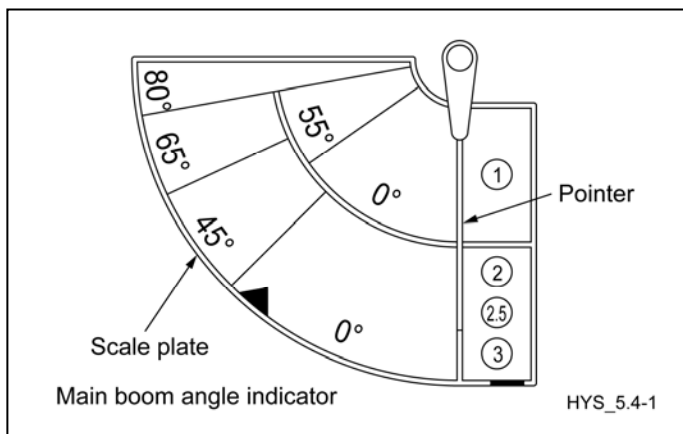
Use boom angle indicators as follows:

[Main boom angle indicator]

- Read the figure which the pointer indicates.
The figure shows the “Boom angle” of the moment.

[Jib angle indicator]

- Read the figure which the pointer indicates.
The figure shows the “Jib angle” of the moment.



NOTES

The angle indicator has no indication of “-”.
When the jib is derricked down more than 0°, read the figure of the angle indicator as it is.

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SAFETY

1. BASIC PRECAUTIONS	2- 2
2. OPERATION RELATED PRECAUTIONS	2- 7
3. TRANSPORT PRECAUTIONS	2-21
4. BATTERY HANDLING PRECAUTIONS	2-23
5. MAINTENANCE PRECAUTIONS	2-25
6. SAFETY LABEL LOCATIONS	2-32

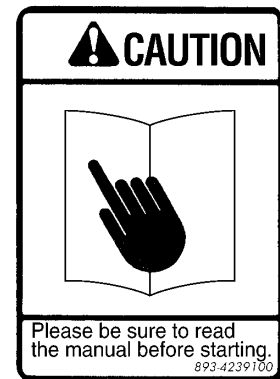
WARNING

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

1. BASIC PRECAUTIONS

OBSERVE THE MANUAL AND SAFETY LABELS

- Read fully and understand this manual as well as the safety labels attached to various parts of this Machine. Attempting to drive/operate without understanding fully may result in wrong operation that may cause personal or equipment accidents.
- Fully understand the proper use and inspection/maintenance procedures, and perform the work safely.
- Make sure this manual and the safety labels attached to various parts of this Machine are legible all the time.
Whenever illegibility or loss occurs, order a replacement from our sales service agency and put the safety label back to the original location.

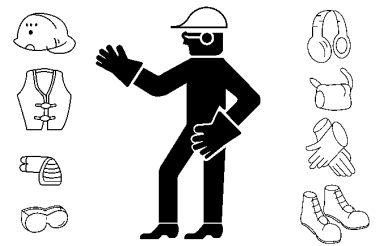


QUALIFICATION FOR OPERATION

- To operate this Machine, the operator must attend special training.
Be sure to attend before operating.
★ See "INTRODUCTION 4. QUALIFICATION FOR OPERATION THE MACHINE" for details.
- When performing work using this Machine, always carry copies of your qualifications and training certificates.

WEAR PROTECTIVE EQUIPMENT AND CLOTHES SUITABLE FOR WORK

- Always put on a helmet, safety shoes and safety vest. However, make sure that the safety vest does not interfere with an operation lever, starter switch, emergency stop switch, etc.
- Make sure to wear the necessary protective equipment suitable for the relevant working condition.
- Do not wear loose garments or accessories as these may get caught on an operation lever or any protrusions which could lead to unexpected movement of the Machine.



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COMMIT TO SAFE OPERATION

- Follow the instructions and signs given by the manager and work supervisor, and observe safety first during work.
- Follow the crane work basics during work.
- Always make sure to carry out inspections before using this machine.
- Do not work under bad weather such as heavy rain, strong wind, thunder or heavy fog.
- Do not drive under any condition when you are tired, under the influence of alcohol or after taking soporific drugs.
- Follow all of the workplace rules, safety regulations and operation method sequences during operations and inspection/maintenance.
- Pay attention to surrounding conditions and pedestrians all the time during operation.
Whenever pedestrian approach, abort the operation at once, and take action such as issuing a warning.
- When operating, be mentally prepared for unexpected situations so that you can take action immediately.
- Never attempt any use outside of the capabilities and purposes described in this manual under any circumstances.
- Observe the designated rated total load and work range when operating.
- Never attempt inattentive driving, harsh driving or awkward operation under any circumstances.
- Pull out the key when leaving the operator's station.

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

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

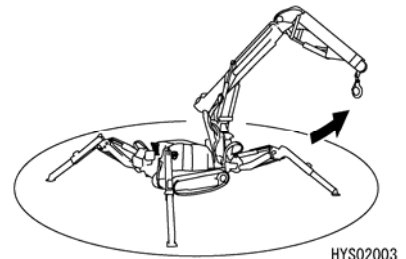
- (1) Crane capacity
- (2) Crane maintenance conditions
- (3) Behaviors and disadvantages unique to the crane
- (4) Other subjects that require attention while operating
 - (a) Operating condition of the brakes and safety devices etc.
 - (b) Check condition of lights on rotating lamps
 - (c) Operating condition of hook, boom and outriggers etc.

PROVIDE SAFETY DEVICES FOR SURE

- Check that all guards and covers are attached properly. Repair immediately if damaged.
- Understand how to use the safety devices correctly and use properly.
- Do not detach the safety devices under any circumstances. Keep control to achieve proper function at all times.
- Improper use of the safety devices may lead to serious accidents.
- Do not rely only on the safety devices whilst operating.

FOLLOW INSTRUCTIONS AND SIGNS WHEN WORKING

- When operating the crane, appoint a work supervisor and agree mutual signs beforehand, and follow the work supervisor and signs during operation.
- When operating in a driver's blind spot, especially follow the instructions and signs of the work supervisor and operate with caution.
- When working jointly with 2 or more cranes, decide "certain signals" to use and proceed while giving those signals to confirm each other's operation.
- When operating the crane, the clearance between the boom and the carrier and also the gaps between the movable parts of the derrick cylinder may catch body parts such as your arm or finger. The operator is requested to make sure no one is within the working radius of the crane before operating.



PREPARE FOR ABNORMALITY

- Make sure to carry out inspections and maintenances, and make an effort to prevent accidents before they happen.
- Whenever you feel an abnormality in the Machine, abort the operation immediately, ensure safety and report to the manager.
- Decide in advance who will take the responsibility to prevent a secondary accident.
- Never operate the Machine when fuel or hydraulic oil is leaking from the Machine. Report the abnormality to the manager, and repair the leaking point of the fuel/hydraulic oil completely before use. The fuel for this Machine is light oil. Be especially careful for the presence of a fuel leak.
- Before leaving the Machine, lower the hoisted load to the ground, stop the engine and pull out the engine key.



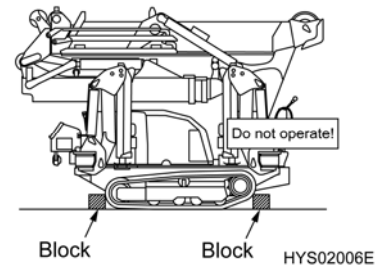
TEMPORARY STORAGE WHEN ABNORMALITY IS FOUND WITHIN MACHINE

In case the Machine is found with an abnormality and is therefore stored temporarily waiting for service, apply following measures to notify all persons in the office that "the use is prohibited due to failure".

- Put on warning tags on the crane operation lever and other applicable parts.

Write clearly the information such as abnormality contents, name and contact of the storage manager, and the term of storage.

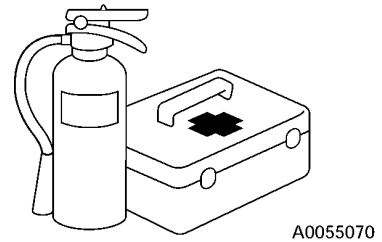
- Keep it immovable when parking by, for instance, putting the blocks on the rubber tracks as pawls.
- Pull out the engine key and keep it with you.



PROVISION OF FIRE EXTINGUISHER AND FIRST AID BOX

Always observe the following to prepare for injuries and fires.

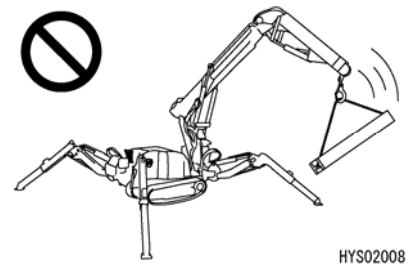
- To prepare in case of fire, decide on a location and install a fire extinguisher, and make sure to read the label for terms of usage.
- Decide the location to store the first aid box. In addition, inspect the first aid box periodically and replenish the contents as necessary.
- Decide the measures to take upon an injury or fire accident.
- Decide how to contact the emergency address (for instance the emergency physician, ambulance or fire department), and put up the contact address at designated position so that anyone can make the contact.



DO NOT RUSH AND BE CAREFUL WHEN OPERATING

- Do not attempt sudden lever operation or harsh driving.
- When 2 or more cranes are within close proximity to each other, drive with care while paying attention to tip-over accident due to mutual contact. If in doubt, appoint a guide to prevent machine contact.
- When any abnormality or danger occurs during the operation, abort the operation immediately to avoid hazard.
- Abort the work under bad weather (heavy rain, strong wind, thunder, thick fog).

Decide whether to abort working by referring to the "work abort decision standard" in the work schedule and by discretion of the work supervisor of the site.



DO NOT MODIFY

Do not modify the Machine without our written consent under any circumstances.

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

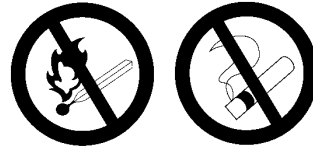
We cannot be held responsible for any personal injury or failure caused by modification that was performed without consulting us.

SAFETY WHEN REFILLING FUEL

- Light oil is used as the fuel of this Machine.
Do not use the wrong kind of fuel.
Refilling with the wrong kind of fuel may damage the engine.
- Always stop the engine before refilling.
Refilling the fuel when engine is running may cause leaked fuel to ignite from a hot silencer or another source.
- Overfilling the fuel results in spillage and is dangerous. Refill slightly lower than the specified level.
Always wipe away cleanly whenever the fuel spills.
- Close the tank cap securely after replenishing the fuel.



A0055020



A0055040

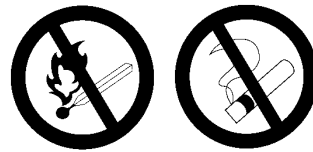
KEEP FIRE AWAY FROM OIL

Letting fire approach the fuel, hydraulic oil or engine oil may result in it catching fire. Strictly observe the following.

- Do not allow any burning items such as cigarettes or matches near flammable components.
- Securely close all of the fuel and oil container caps.
- Keep the fuel and oil in a well-ventilated location.
- Store the fuel and oil in a specified location and prohibit public access.
- Do not leave the site when replenishing the fuel or oil.
Be especially careful to observe "Safety when refilling fuel" (described earlier in this manual), when replenishing fuel.
- Cleanly wipe away fuel or oil that is spilled during replenishment.



A0055020



A0055040

HANDLING AT HIGH TEMPERATURE

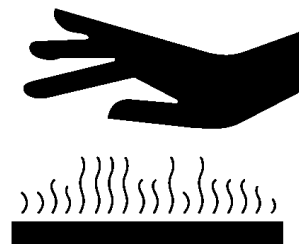
After stopping machine operations, the engine and engine oil, cooling water and hydraulic oil are hot for a short duration. There can also be a small accumulation of pressure within the hydraulic oil tank.

Attempts to inspect the engine, remove the radiator cap, drain oil, drain water or replace the filter at this time will result in burns.

Wait until the temperature drops, then follow the sequences below.

- To prevent emission of the high temperature oil, stop the engine and wait until the oil temperature drops. To detach the cap, loosen the bolt and lift up the cap a bit to let the pressure out, then remove the bolt.

(To gauge the drop in oil temperature, place a hand near the surface of the hydraulic oil tank or similar location (making sure of no contact) and check by ambient temperature.)

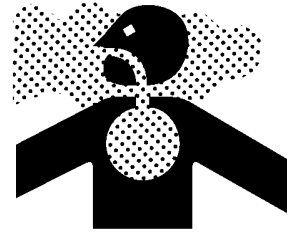


A0055050

BEWARE OF ASBESTOS DUST

Inhalation of asbestos dust may result in lung cancer. This Machine does not contain asbestos, but asbestos may be found in the wall, ceiling or other construction locations within the worksite of this Machine. In addition, be careful of the following when working with a material that may contain asbestos.

- Put on designated dust free mask and/or other protection equipment where necessary.
- Do not use compressed air for cleaning.
- Spray water when cleaning to prevent airborne asbestos dust.
- Always work at windward location when operating the Machine at a site that may contain asbestos dust.
- Strictly observe the assigned rules related to the worksite and environmental standard.



A0055060

CRANE INJURY PREVENTION

To prevent serious accidents, do not allow any part of your body to be caught:

- Between the main boom and the carrier.
- Between the outrigger support and the ground contact surface.
- Between the main boom/post and the derrick cylinder.
- Between the tracks and the ground.
- Between the main boom and the jib.



A0055130

BEWARE OF EXHAUST GAS

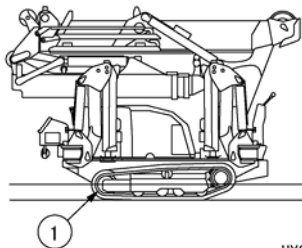

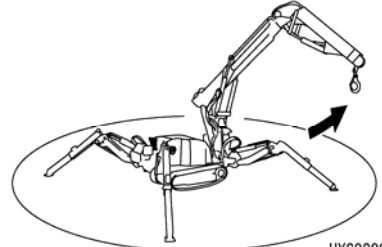
To prevent the risk of petrol poisoning from starting the engine/handling fuel and cleaning oil/painting indoors or at a location with bad ventilation, open the windows and exit doors. If the ventilation is insufficient even after opening the windows and exit doors, set up a ventilation fan.



A0055060

2. OPERATION RELATED PRECAUTIONS

2.1 BEFORE STARTING ENGINE

ESTABLISH SAFETY OF WORKSITE	
<ul style="list-style-type: none"> • Confirm that no danger is present at the worksite before starting work. • Investigate the ground and road surface condition of the worksite and decide the best working method. • Level any inclination of the worksite as much as possible before starting work. Also, if sand and gravel are excessive, spray water before work. • When working over the roadway, enforce “keep out” by, for instance, assigning guides or surrounding the site by barriers, and ensure the safety of the traffic vehicles and pedestrians. • Enforce “keep out” to prevent people from entering the worksite and apply measures to prevent people from approaching. Attempt to approach the moving Machine may result in pinching or hard collision by contact, and may result in serious 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)). 	 <p>HYS02017</p>
INSPECTION BEFORE STARTING ENGINE	
<p>Execute the following inspections before the first engine start-up of the day.</p> <p>Omitting these inspections may result in serious bodily accidents.</p> <ul style="list-style-type: none"> • Inspect for fuel/oil leaks, accumulation of combustibles around the engine and battery systems, and similar potential problems. ★See “OPERATION 2.1.1 VISIBLE CHECKS” for details. • Inspect the quantity of fuel, cooling water, and hydraulic oil tank, air cleaner blockage, electrical wiring damage, and check operations of safety devices and instruments. ★See “OPERATION 2.1.2 CHECKING BEFORE STARTING ENGINE” for details. • Make sure the operation levers are at neutral position. Check that the operation linkages operate adequately. <p>Always repair if any of the above is faulty.</p>	 <p>A0055020</p>
CAUTIONS WHEN STARTING ENGINE	
<ul style="list-style-type: none"> • Make sure no person or object is within the boom slewing radius area before starting the engine. • Honk the horn for warning before starting the engine. • Do not start the engine by short-circuiting the starter circuit. This may cause a fire. 	 <p>HYS02003</p>

2.2 AFTER STARTING ENGINE

INSPECTION AFTER STARTING ENGINE

Omitting the inspections after starting the engine results in a delay to discover any machine abnormalities, and may result in accidents and Machine damage.

Inspection should be carried out in a clear area. No unauthorized persons should be able to approach the machine.

- Inspect the equipment operation conditions, machine travelling conditions, outrigger operation conditions, and crane operation conditions such as derricking, extension, retraction and slewing of the main boom and derricking, extension and retraction of the jib.

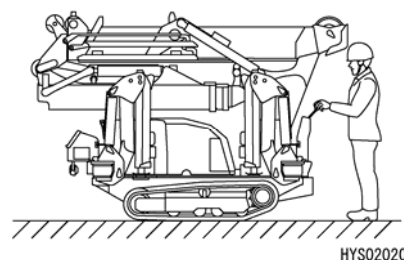
★ See “OPERATION 2.1.3 CHECKING AFTER STARTING ENGINE” for details.

- Inspect the sound, vibration, heat and odor of the machine, and check for instrument errors, air leaks, oil leaks, fuel leaks, water leaks and other bad factors. Be especially careful for the fuel leak.
 - Always repair the broken part whenever an abnormality is found.
- Attempt to use without servicing may result in unexpected accidents and/or Machine failures.

CAUTIONS WHEN STARTING TO MOVE MACHINE

To prevent serious injuries and accidental deaths, implement the following actions before moving the machine.

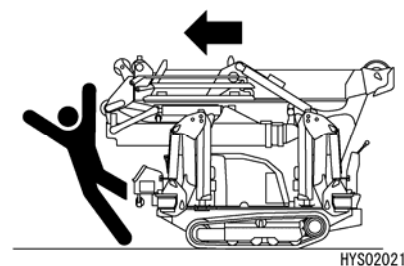
- Set the machine to the travelling posture as shown in the right figure.
 - Make sure the boom is fully lowered and retracted.
 - Retract the outrigger.
- ★ See “OPERATION 2.5 MACHINE TRAVELLING POSTURE” for details.
- Make sure to check around again so that no one or no object is in the vicinity before starting to move.
- Remove the hook (winch specification), retract the outriggers and check the safety in the surroundings before travelling.
- Honk the horn for warning before starting to move.
- Always stand in front of the travelling lever on the travelling operation panel during travelling operation of this Machine. When the Machine has started to move, walk in line with the travelling speed of the Machine.
- The Machine is prohibited to travel when a person or load is on the carrier or the boom.
- When stowing outriggers, insert each position pin completely to lock. Use a snap pin as a safety lock.



CAUTIONS WHEN MOVING FORWARD/BACKWARD OR CHANGING DIRECTION

Always observe the following to prevent serious injuries and accidental death when moving the machine.

- Lower the speed early and wait until the machine stops before changing from forward to backward, or backward to forward.
 - Honk the horn to alert 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 a certain part of vision is blocked, so stop the Machine as necessary and make sure no one is in front or around.
- Assign a guide if the location is hazardous or with bad view.
 - Make sure to prevent people from encroaching on the machine pathway.

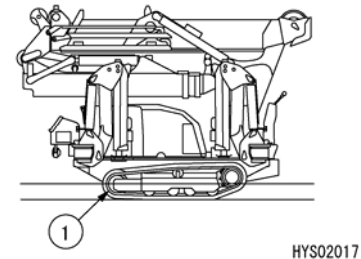
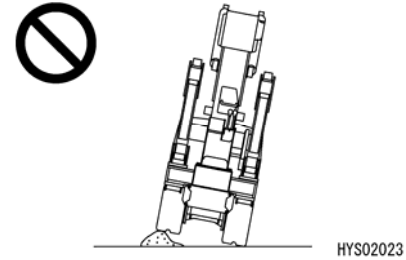
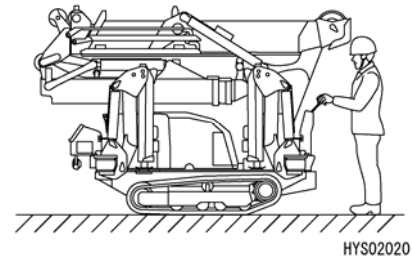


CAUTIONS WHEN TRAVELLING

Always observe the following to prevent serious injuries and accidental death when moving the Machine.

- Concentrate on the direction you are driving.
- Be sure to observe the travelling posture.
Travelling with the work equipment raised or extended is essentially prohibited. This will overturn the machine, causing serious injury and accidents.
- Be careful not to bump your head against the winch during travelling. (Winch specification)
- Do not over speed or start moving/stopping/slewing suddenly.
Keep the travelling speed of the Machine in line with walking speed.
- When travelling backward, the driver is requested to pay extra attention to their step.
Slow down the Machine and move it carefully so that it does not stumble over obstacles and irregularities of the ground.
- Whenever you find a machine abnormality (sound, vibration, odor, instrument error, fuel/water/oil leak, etc.), immediately park the Machine in a safe location and investigate the cause.
- Do not change the direction suddenly. This may cause the Machine to lose balance, damage the Machine or nearby objects.
- When travelling over uneven terrain, travel as slow as possible to prevent tripping, and avoid acute operation when changing the direction.
- Avoid moving over obstacles as much as possible.
Travel as slowly as possible when moving over an obstacle for unavoidable reason. Also, do not move diagonally over obstacles that cause the Machine to tilt excessively (10° or more).
- When travelling, ensure extra clearance to prevent accidents by contacting other machinery or objects.
- 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)).
- Check the loading ability against the Machine mass before crossing over a bridge or construction that is a private property. In case of a public road, ask the applicable road management administration and follow the given advice.

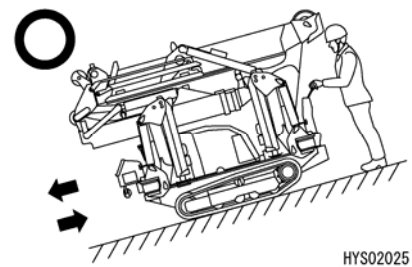
Travelling posture



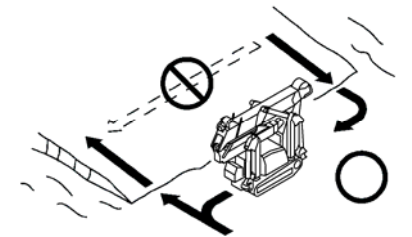
BE CAREFUL WHEN TRAVELLING OVER SLOPE

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

- When travelling over a slope, the operator is requested to operate from the high side position of the Machine.
- Be careful of tripping and skids when travelling over slope.
- Do not travel horizontally or change direction when travelling over a slope. Practice safe travelling by for instance moving to level ground.
★ See "OPERATION 2.11 [3] CAUTIONS ON UPWARD/DOWNWARD SLOPE" for details.
- Beware of skidding on grass, fallen leaves, and on wet steel plates even if the slope is gentle.
Avoid the Machine being horizontal over the slope as much as possible, and decrease the speed sufficiently.
- Travel slowly at low speeds when going downhill. In addition, brake (by setting the travel lever to neutral) when necessary.
- Do not operate the lever abruptly.
- The center of gravity position changes suddenly on the boundary where the angle changes, slowly operate and travel.
- If the machine tilts more than "10 degrees" forward or backward, or from side to side while travelling, the overturn warning buzzer sounds. If the overturn warning buzzer sounds, do not travel on a slope with more inclination. The machine may overturn.



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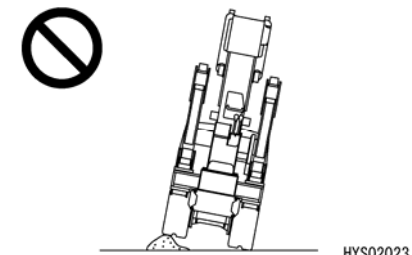


HYS02026

BE CAREFUL OF TRIPPING ON UNSTABLE GROUND

Always observe the following to prevent serious injuries or death when travelling over unstable ground for unavoidable reasons.

- Do not enter soft ground area. The machine may get stuck.
- The ground near a cliff, roadside or deep gully is unstable, so avoid going near such ground as much as possible.
The Machine may trip or fall when the ground loosens due to mass and/or vibration of the Machine. Be especially careful after rain, use of dynamite, or earthquakes, as the ground will be unstable.
- Avoid going near the earth fills or vicinity of dug gutter that are instable.
Crumbles caused by mass and/or vibration of the Machine may cause the Machine to tilt.

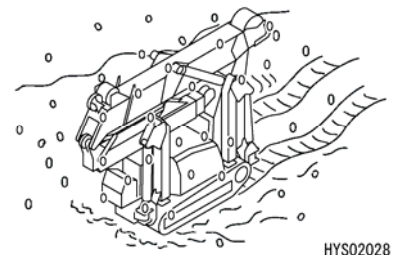


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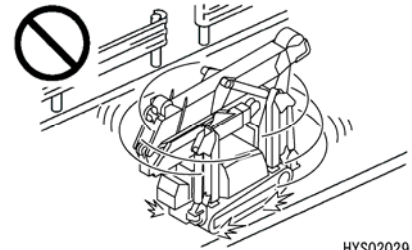
CAUTIONS WHEN TRAVELLING SNOW COVERED OR FROZEN GROUND

ALWAYS observe the following to prevent serious injuries or death when travelling over snow covered ground or frozen roads for unavoidable reasons.

- The snow covered grounds and frozen roads cause slips even when the inclination is small, so decrease the speed when travelling and avoid sudden starting/stopping/slewing. 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 travel and other operations to be unstable. Be very careful.
- In cold weather conditions, check that the load before being hoisted is not frozen to the ground or other substance. Attempt to hoist without knowing the load is frozen and stuck to the ground or other substance is dangerous.
- Refrain from directly touching metal surface with your hands or fingers in cold and harsh weather conditions. Touching metal surface may result in skin freezing 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.



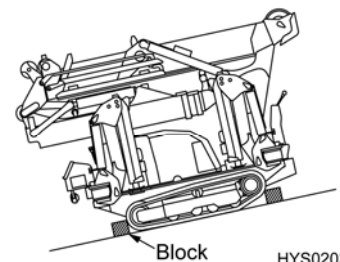
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CAUTIONS WHEN PARKING

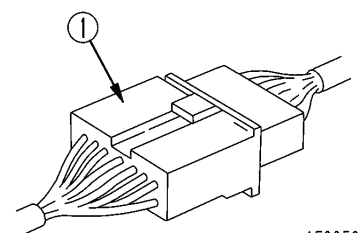
- Park at a location where the ground is level; rock falls, landslides, and flooding does not occur.
- To park on a slope for unavoidable reason, use blocks as pawls to immobilize the Machine.
- When parking on the street, place the flags, protection barriers, lighting and similar objects, and caution notices without interfering with the traffic, so that other travelling machines can notice clearly.
- Stop the engine before leaving the Machine.
Always bring back the starter key with you and store in a designated location.



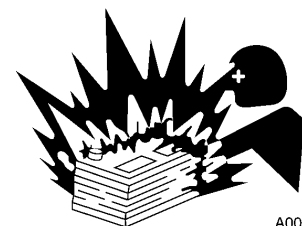
HYS02030E

CAUTIONS UNDER COLD WEATHER

- After end of the work, wipe off and put on a cover 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 freeze, the Machine may operate improperly upon the next use and cause unexpected accidents.
- Remove snow and defrost the slewing gear and boom, and check the movements before starting work.
- Warm up the engine.
Operating levers and switches with a cold engine causes the machine to be lethargic, and may result in unexpected accidents.
- Avoid sudden acceleration of the engine immediately after engine start.
- Increase the oil temperature of the hydraulic circuit by using the operation lever. Doing so improves the Machine reactions and prevents improper operations.
- If the battery fluid is frozen, do not charge the battery or start the engine using other power source.
Such act may cause the battery to catch fire.
Defreeze the battery fluid and check for battery fluid leak before re-charging or starting the engine.



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2.3 DURING CRANE WORK

INSPECTION BEFORE STARTING WORK

Check that the safety devices and crane operate properly.

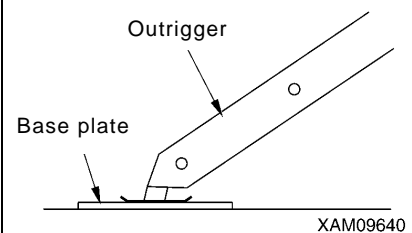
- Operate each of the operation levers and switches under no load, and check that operations take place without abnormality.
Repair immediately if any abnormality exists.
- Check that the safety devices operate properly.
- Check that the moment limiter operates properly.

CAUTIONS WHEN HANDLING MONITOR

- Use/store the monitor under the following ranges of ambient temperature.
★ Operating temperature: -10 to 55°C Storage temperature: -20 to 60°C
- Avoid direct sunlight so that the temperature of the monitor body does not exceed the above range.
- Avoid locations with strong acid or alkaline atmosphere as much as possible. Otherwise, unexpected failures may occur.
- Do not apply impact to the monitor body for instance by colliding with an object.
Such attempt may damage the case and may result in failures and improper operations.
- Do not push the panel sheet of the monitor body using excessive force, or push with a sharp object such as a tip of a screwdriver. Such actions can damage the panel sheet and may result in failures and improper operations.
- Do not remove the case cover or panel sheet from the monitor body or disassemble them. Such act may damage the case and/or panel sheet and may result in failures and improper operations.

PLACE CRANE ON LEVEL AND HARD SOIL

- Always place the outriggers on level, stable and solid ground.
Attempting to operate the crane without outriggers firmly contacting the ground may cause the Machine to tip.
- Always place all outriggers before operating the crane.
- Do not set any outrigger near an unsteady location such as soft ground, verge or drilled hole.
In case the outriggers need to be placed on soft ground for an unavoidable reason, always reinforce the ground by laying a sufficiently large and strong base plate below each outrigger supports.

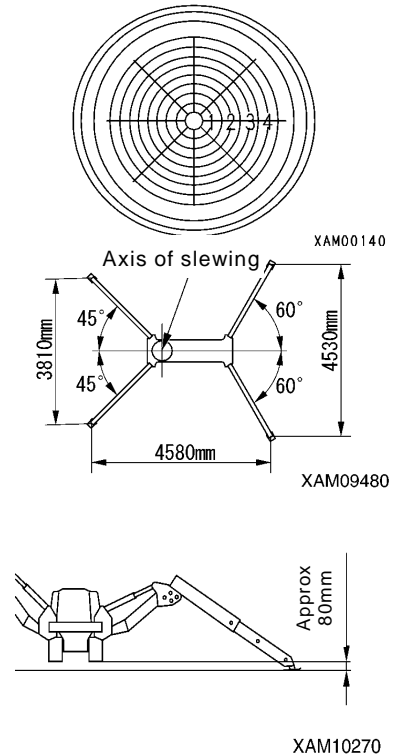


CHECK OUTRIGGER PLACEMENT CONDITION

For outrigger setup, see "OPERATION 2.12 OUTRIGGER SETUP OPERATION". Always observe the following to prevent serious injuries and accidental death when placing the outriggers.

- When placing the outriggers, always keep the Machine level while looking at the level gauge. Occasionally check the level gauge and make sure to keep the Machine level during the crane operation as well.
- Always place the outriggers at its "maximum extension".
In case of placing in a non-maximum extension condition for an unavoidable reason, work should always be performed in accordance with the "Rated Total Load Chart with outrigger extended to minimum".
- The level of the monitor does not indicate properly unless zero adjustment is made. Be sure to make zero adjustment when replacing the inclination sensor.

- Place the outriggers so that the rubber tracks are approximately 80 mm above the ground.
- Make sure all of the outrigger position pins are securely fixed.
- When setting up the outriggers other than "Outriggers extended to maximum", set adjacent 2 or more outriggers to "Extension to maximum".



CAUTIONS WHEN PLACING OUTRIGGER

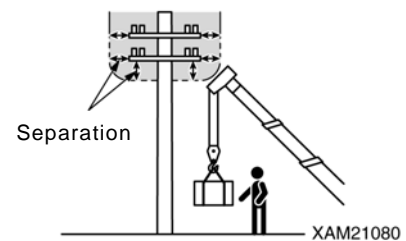
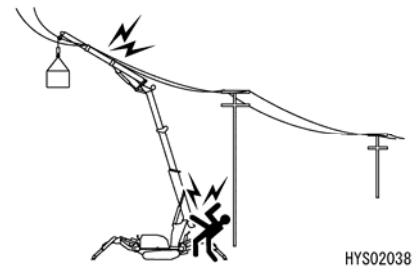
- Do not let people approach the machine when placing the outriggers.
Otherwise, serious accidents such as feet being trapped may occur.



BEWARE OF ELECTRICAL CABLE ABOVE

- Do not let the Machine touch any overhead electrical cables. High voltage cables may also inflict an electrical shock if in close proximity.
- Sliding operators are likely to suffer electrical shocks. Always observe the following 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 correct measures are taken (for instance power turned off or guards put in place before starting work).
 - Put on rubber soled shoes and rubber gloves, and be careful that the body parts unprotected by rubber or other insulation do not contact the wire rope or the Machine frame.
 - Place a guide and let him/her watch so that the boom, wire rope or Machine frame does not go too near to the electrical cable. Before doing so, decide the emergency signs and other necessities.
 - Ask the electricity company for the voltage in the electrical cables at the worksite.
 - Ensure the separation (safe distance) shown in the following table between the boom/Machine frame and electrical cables.

	Voltage of Electrical Cable	Minimum Safe Distance
Low voltage	100/200V	2 m
High voltage	6,600V	2 m
Special high voltage	22,000V	3 m
	66,000V	4 m
	154,000V	5 m
	187,000V	6 m
	275,000V	7 m
	500,000V	11 m



MEASURES WHEN ELECTRIC SHOCK ACCIDENT OCCURS

If an electric shock accident occurs, react calmly and take measures in the following procedure.

1. Report

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

2. Evacuation of related personnel from vicinity of Machine

Evacuate all personnel, including workers, from the 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 personnel affected by electric shock. Otherwise, secondary electrical shock accident will occur.

3. Emergency procedure

In the case of personnel receiving an electric shock due to the machine being electrically charged, do the following:

- (1) If the machine is operational, immediately move it to a safe location away from the cause of the electrical charge. Take care not to break or disrupt the distribution power cable.
- (2) Move the machine to a safe location, and after making sure the machine is not electrically charged, take the affected personnel to the hospital.

4. Measure after accident

After the 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 OPERATING CRANE IN LOCATION WITH HIGH OUTPUT MICROWAVE EMISSION

Operating the crane near 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, slinging operators 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

- A risk of lightning exists in case of a thunderstorm, so immediately lower the load and retract the boom, then stop any further operation.
- Wind can cause the hoisted load to move back and forth, which could cause the machine to become unstable. If the hoisted load is affected, immediately lower the load and retract the boom.
- If the maximum instantaneous wind speed is 10 m/s or greater, immediately lower the load and retract the boom, then stop any further operation.
- Even when the maximum instantaneous wind speed is below 10 m/s, the bigger the hoisted load, the higher the hoisted load position, or the longer the boom is, this can increase the effect from the wind. Be very careful during the 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 tip or damage the boom. Be very careful during the work.
- When an earthquake occurs, abort the operation and wait until it 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.

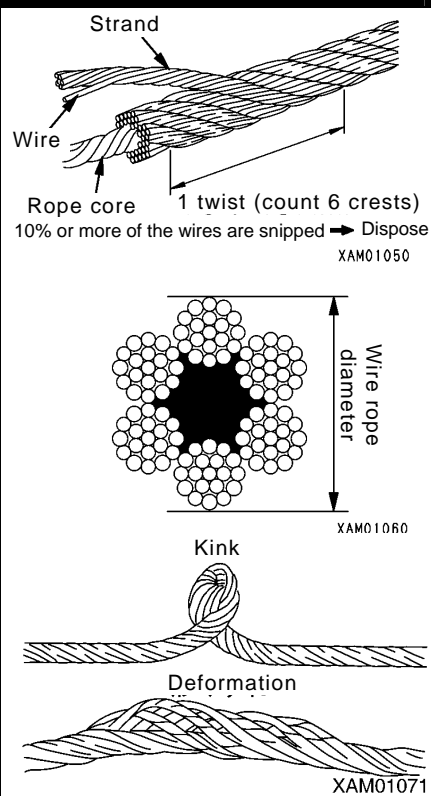
Force	Wind Speed (m/s)	Effect On Land
0	Less than 0.3	Smoke rises vertically.
1	0.3 - below 1.6	Wind motion visible in smoke.
2	1.6 - below 3.4	Wind felt on exposed skin.
3	3.4 - below 5.5	Leaves and small twigs move in constant motion.
4	5.5 - below 8.0	Dust and loose paper blow up. Small branches begin to move.
5	8.0 - below 10.8	Bushes with leaves start to sway. Waves form on the face of pond/swamp.
6	10.8 - below 13.9	Large branches begin to move. Whistling heard in electrical wires. Use of umbrella becomes difficult.
7	13.9 - below 17.2	Whole trees start to shake. Effort needed to walk against the wind.
8	17.2 - below 20.8	Twigs broke from trees. Progress impeded.
9	20.8 - below 24.5	Light structure damage. Slates blown off.
10	24.5 - below 28.5	Trees uprooted. Considerable structural damage.
11	28.5 - below 32.7	Widespread structural damage.

CAUTIONS WHEN SLINGING

- Check the following before hoisting a load.
Attempts to hoist the load without checking may result in serious accidents by dropping 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 rope of the hook block is vertical.
 - When the load leaves the ground, stop raising the load 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 located correctly. If the “retainer device” is not located, the wire rope may leave the hook block and cause the load to fall resulting in a serious accident.
- The larger the wire rope angle is when hoisting the load increases the force that is applied to the wire rope even when the load weight is unchanged, and thus may cause the wire rope to snap. Give due consideration to slinging operations so that excessive force is not applied to the wire rope.
- Hoist only 1 load at a time.
Do not attempt to hoist more than one load at a time. Doing so may cause the hoisted loads to bump into each other causing damage to the loads, or the loads may move and lose balance, causing serious accidents such as tipping.
Do not hoist more than 1 load at a time even if the total combined weight is within the rated total load.
- Hoisting of lengthy loads can cause the load to lose balance and could be dangerous.
In the case of such loads, hoist vertically if possible, or achieve balance of the hoisted load by applying a rope to both ends of the load.

CAUTIONS WHEN HANDLING WIRE ROPE

- Wire ropes can wear out from constant use or old age, so be sure to inspect every time before work, and replace immediately if at or beyond the replacement standard.
At the same time, inspect the sheave at the tip of the boom and the sheave of the hook block. Damaged sheaves accelerate the damage of the wire ropes.
- Use wire ropes specified by us.
- Always wear leather gloves when handling the wire rope.
- Do not use a wire rope of which any of the following applies:
 - 10% or more of strands (except a filler wire) in 1 twist of a wire rope are snapped.
 - The wire rope diameter abrasion is beyond 7% of the nominal diameter.
 - Kinked wire rope.
 - Excessively deformed or corroded wire rope.
 - Affected by heat or sparks.



CAUTIONS WHEN OPERATING CRANE

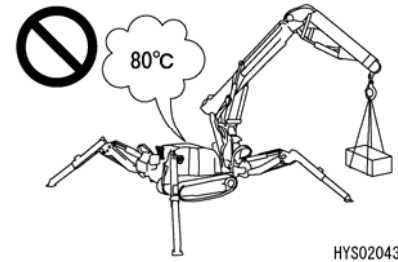
- Be sure to check that the emergency stop cancel switch is at the "OFF" (auto) position before operating the crane.
Do not attempt to operate the crane when the emergency stop cancel switch is at the "ON" (cancel) position.
The emergency stop cancel switch is permitted to be at the "ON" (cancel) position only during inspection or maintenance works.
- Perform work while paying attention to the display and warning of the monitor.
- There is a crane work prohibited area depending on the placement condition of outriggers.
To slew up to a crane work area from the boom containment condition beyond the crane work prohibited area, slew to the crane work area with the main boom raised at or more than 40° and fully contracted and the jib fully lowered and fully contracted, and perform the work.
- Crane operations are not possible unless the outriggers are placed in "extension" condition and enter the crane mode. Also, the crane operation is halted by the outrigger interlock when an outrigger support leaves the ground during the operation. Securely place the crane in the extension condition, and avoid operations and works that may cause the machine to vibrate when operating the crane.
- The outrigger interlock is a supplemental device in the case of an emergency. Do not perform work in a crane work prohibited area or work beyond the rated total load. If the Machine inclines due to load sway, contacting the ground on rough terrain or bad ground, it could fall down.
- Do not rely too much on the safety devices whilst operating.
- Attempt to work beyond the capacity of the Machine may cause serious accidents and failures caused by for instance tipping or fluctuation. Observe the rated total load chart when operating the crane.
- Do not travel with a load being hoisted under any circumstances.
This may cause the crane to fall over resulting in serious accidents.
- Perform the crane operation slowly.
Sudden use of lever or accelerator may cause risks such as shaking, dropping of the load or collision with the surroundings. Be especially careful to be slow during the slewing operations.
- Do not allow unauthorized personnel to approach the working radius or under the load because of risks of falling load and contact with load. This could cause a serious accident. Also consider that the working radius increases when the load is hoisted and the boom is deflected.
- It is dangerous to operate the crane under bad weather or at places where the view is not clear.
Work lamps or other lighting devices should be used in dark places.
When the view is bad because of bad weather (heavy rain, strong wind, thunder or heavy fog), stop the operation and wait until the weather recovers.
- Do not use for any other purpose than that of a crane, for instance do not use for raising a person.
- Do not raise or lower the boom acutely. Such attempt may cause serious accidents by tipping.
- The volume of the hydraulic oil in each of the cylinders changes depending on the temperature.
By leaving idle with a load 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 driving operation position when a load is hoisted.
Lower the load before leaving the Machine.
- If the alarm buzzer of the over-hoist detector sounds, immediately release your hand from the winch lever. Winding-up of the hook block then stops automatically. Then, operate the winch lever "downward" (push it forward) to wind down the hook block. The hook block also winds up when the boom is being extended or raised. Therefore, provide sufficient clearance between the boom and hook block when performing work.
- When the main boom and jib are extending, the hook block is wound up.
Operate the winch lever "downward" (push it forward) and extend the main boom and jib while lowering the hook block.
- If an overload is caused during work, operate the winch lever "downward" (push it forward) and wind down the winch to unload.
- When the hook block is not used, wind up the winch.
The hook block of an empty load may hit operators near the load.

CAUTIONS ABOUT HIGH TEMPERATURE OIL WHEN OPERATING CRANE

When hydraulic oil temperature exceeds 80°C, high pressure hoses and seals can be damaged by heat, and it may cause burning to skin from oil spray.

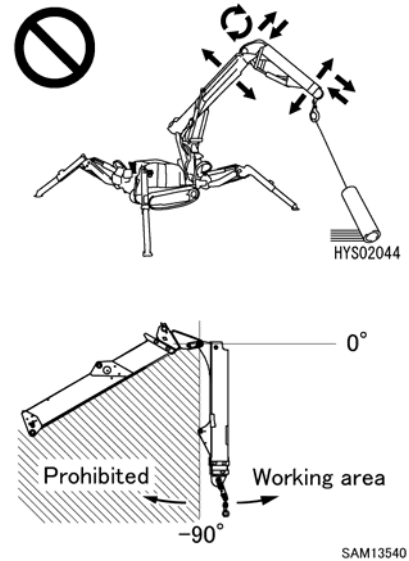
If temperature of hydraulic oil exceeds 80°C, set the engine to idle, stop all operations and wait until the oil cools down.

Continuous crane operation with the accelerator pedal depressed will increase the hydraulic oil temperature. Take special care during this operation.



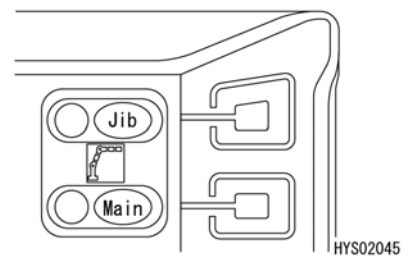
CAUTIONS DURING MAIN BOOM AND JIB OPERATION

- Perform boom operation lever operation as slowly as possible. Especially avoid sudden lever operations when the load is hoisted, which may cause the load to waggle and give a large impact to the Machine, and thus may damage the crane or tip the Machine.
- When the boom is lowered, the working radius increases, and the rated total load that can be hoisted decreases. When working while raising/lowering the boom, pay extra attention so that the mass (weight) of the load at the time the boom is most lowered does not cause overloading.
- When the jib is brought close to a horizontal direction, the working radius increases, and the rated total load that can be hoisted decreases. When working while raising/lowering the jib, pay extra attention so that rated total load at the time the jib is horizontal does not cause overloading.
- Use the jib in an area raised (upper side) from the vertical direction (lower side).
- Pulling of the load laterally by raising/lowering, and/or extracting/retracting the boom is prohibited. Do not attempt to do the above under any circumstances.
- When the boom is extended, the working radius increases, and the rated total load that can be hoisted decreases. When working while extending/retracting the boom, pay extra attention so that rated total load at the time the boom is most extended does not cause overloading.



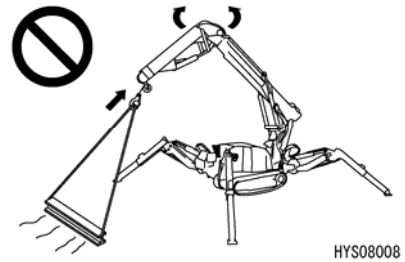
CAUTIONS DURING SWITCHING OPERATION BETWEEN MAIN BOOM AND JIB

- When operating the main boom and the jib with the manual operation lever, switch between "Jib" and "Main" with the selector switch before performing the work.
- To avoid pushing the selector switch of "Jib" and "Main" mistakenly, be sure to check the switching status of the selector switch before operating the lever.
- Since a common circuit is used for raising/lowering operation and extending/retracting operation of the main boom and the jib, combined operation of the main boom and the jib cannot be performed.
- When "Jib" and "Main" are switched with the jib retracted, the jib extends slightly.
- The switching operation in Monitor 1 is not necessary when operations are performed with radio control.

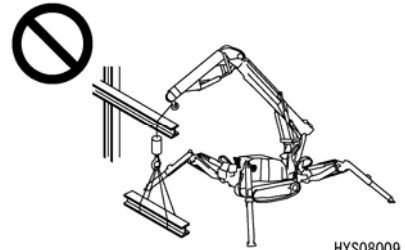


CAUTIONS WHEN OPERATING WINCH

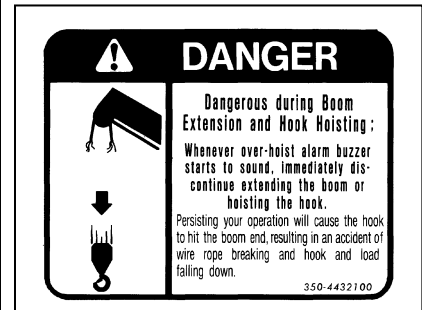
- Do not allow persons to enter the area below the hoisted load.
- When hoisting a load, always stop once at the “takeoff” position where the hoisted load leaves the ground. Check subjects such as load stability and load force, then hoist up the load.
- Do not pull laterally, pull toward you or hoist diagonally. Such attempt may cause the crane to tip or become damaged.
- Overwinding of the hook block may result in a collision with the boom, snapping the wire ropes and causing the hook block and load to fall and may lead to a serious accidents. Take care not to overwind the hook block.
- Be careful to prevent the wire rope and/or hoisted load from contacting an obstacle such as a tree or steelwork when hoisting a load.
If caught by an obstacle, do not forcibly hoist the load, but untangle the caught part before winding up.
- Do not use a winch drum wire that is wound up irregularly. If wound up irregularly, not only does the wire rope get damaged and shortens its lifespan, but it may snap and causes serious accidents.
Observe the following precautions to avoid wire rope from winding up irregularly.
- Do not allow the hook block to contact the ground except when the hook block is removed.



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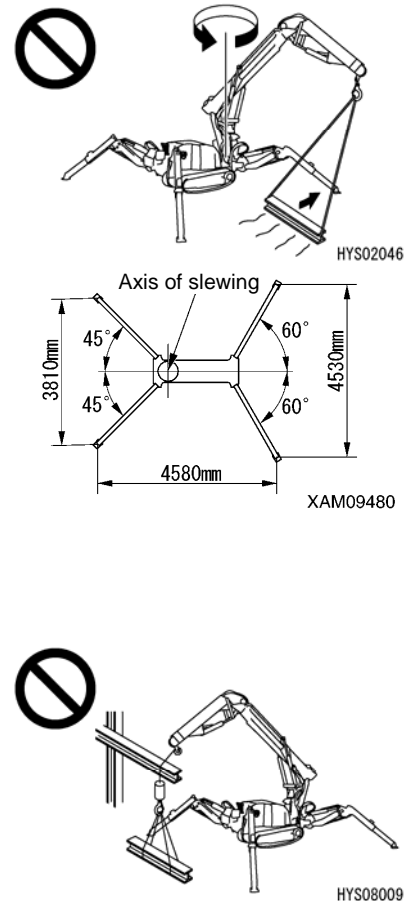


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CAUTIONS DURING SLEWING OPERATION

- Check safety in the vicinity and honk the horn before slewing.
 - If the boom derrick angle is small, be careful to prevent the main boom and the jib from hitting the operator or the Machine.
 - Perform the slewing lever operation as slowly as possible. Make sure to start smoothly, slew at low speed, and stop gently. Especially avoid sudden lever operations when the load is hoisted, which may cause the load to waggle and cause the Machine to lose balance, and thus may damage the crane or tip the Machine.
 - Attempts to pull the load towards the machine or let the load stand up by slewing operation are strictly prohibited. Do not attempt to do the above under any circumstances.
 - When slewing 360° while hoisting a load, always set up outriggers in the standard extension direction as shown in the figure on the right. The Machine cannot slew 360° while hoisting a load other than in the above extension.
- Even if outriggers are extended to maximum, use sufficient care because stability in the lateral direction is limited.
- For details of slewing control due to extension, see "INTRODUCTION 5.3 [4] CRANE OPERATION PROHIBITED AREAS DUE TO OUTRIGGER EXTENSION POSITION".
 - Certain outrigger extension condition may cause the boom to hit an outrigger during slewing operation and cause the crane to be damaged or the Machine to tip.
- Be careful to prevent the boom from hitting outriggers during slew operation.
- Be careful to prevent the wire rope and/or hoisted load from contacting an obstacle such as a tree or steelwork when hoisting a load or slewing.
- If caught by an obstacle, do not forcibly wind up the hoisted load, but untangle the caught part before winding up.



COOPERATION HOISTING IS PROHIBITED AS A GENERAL RULE

- Duel hoisting, where 2 or more cranes are used to hoist a single load, is strictly prohibited. Duel hoisting is very hazardous and may cause the machine to tip due to an uneven centre of gravity, unexpected fall of the hoisted load or boom damage.
- If duel hoisting is required for unavoidable reasons, discuss and establish a work scheme under the responsibility of the user, let the worker fully acknowledge the work method and procedures, and only proceed under the direct leadership of the work supervisor.
- Also, observe the following cautions:
- Use cranes of the same model.
 - Choose the Machine model that can handle a sufficiently larger load than the load to be hoisted.
 - Make sure only 1 person gives signals.
 - Limit the crane operations to single operations as a rule, and do not attempt any slewing operation.
 - Appoint 1 responsible sling operator who is most experienced.

WORK AT WORKPLACE WHERE LIFT BELOW GROUND LEVEL IS PERFORMED

- When lowering a wire rope in work underground, leave at least 3 loops of wire rope on the winch drum.
- Make sure to give signals.
- Perform crane operation with extra care.

3. TRANSPORT PRECAUTIONS

CAUTIONS WHEN LOADING/UNLOADING WITH CRANE

Load and unload the Machine by hoisting with a crane where possible because the Machine has a high center of gravity.

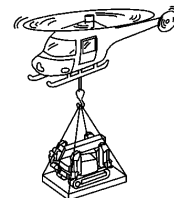
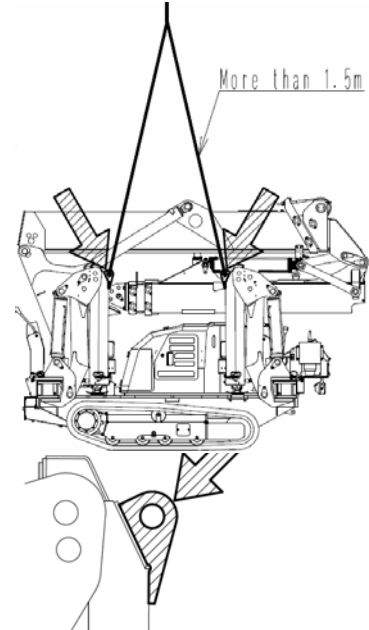
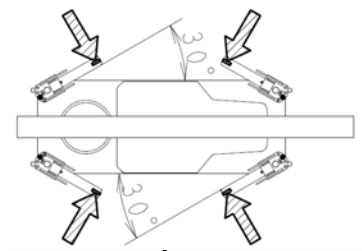
Be careful of the following when loading or unloading the Machine by hoisting with a crane.

- When lifting the Machine body, be sure to set the crane to stowage position, extend the rotary by 1 position with outriggers retracted, and securely insert position pins. Sling the Machine at 4 points at the position shown in the figure on the right and do not sling it in any other manner.

- Only use a crane and a slings (e.g. wire rope and shackles) which are approved and capable of lifting the mass (weight) of the machine.

★See “OPERATION 2.5 MACHINE TRAVELLING POSTURE” for details.

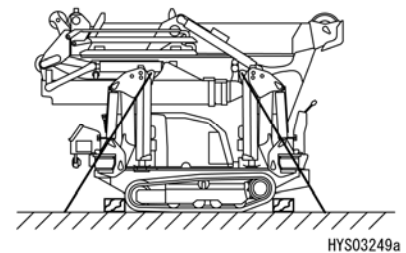
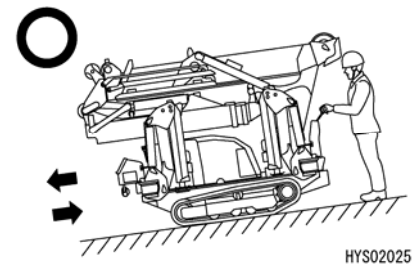
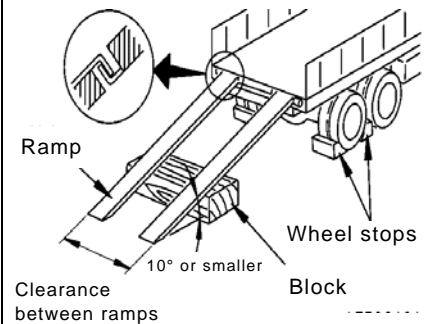
- Where it is required to hoist the machine for a longer time (10 minutes or longer), or when it is carried by a helicopter, use a proper carriage deck as shown in the figure on the right, for safe transportation.



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CAUTIONS WHEN LOADING/UNLOADING BY SELF PROPELLING

- Be especially careful when loading or unloading the Machine by self propelling because the risks of tipping and dropping are possible.
- Select a location that is level and has a firm road surface when loading or unloading the Machine. In addition, keep enough distance from the roadside.
- Use ramps under 10° or a lesser angle. In addition, decide the clearance between ramps to meet the centre of the rubber tracks.
- 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.
- ★ See “OPERATION 2.5 MACHINE TRAVELLING POSTURE” for details.
- Always move backward when loading the Machine. Moving forward may cause the machine to fall. A driver is requested always to be positioned on the load-carrying platform of a truck.
- When loading or unloading, set the engine rotation to low idling (low speed rotation) and operate slowly by low speed travels.
- Use ramps that are strong and of good width, length and thickness, and that enable safe loading/unloading. Reinforce with blocks or other packing if the ramps deflect.
- Remove mud and other substances from the footing to prevent the Machine from skidding over the ramps. Remove substances stuck on the ramps such as grease, oil or ice, and keep clean. Be especially careful on the rainy days where slips easily occur.
- Never change direction over the ramp. Temporarily leave the ramp before correcting the direction.
- As the center of gravity position moves suddenly on the boundary where the angle changes, slowly operate and travel.
- 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.
- ★ See “OPERATION 5.2 LOADING/UNLOADING” for details.
- ★ See “OPERATION 5.3 CAUTIONS WHEN LOADING MACHINE” for details.



CAUTIONS DURING TRANSPORT

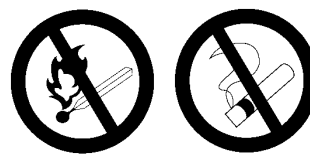
Observe the related regulations and transport safely.

4. BATTERY HANDLING PRECAUTIONS

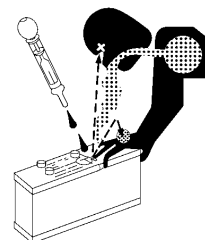
CAUTIONS WHEN HANDLING BATTERY

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

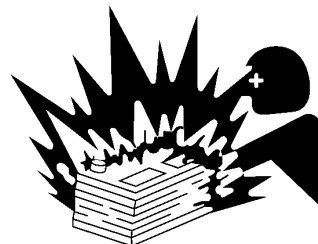
- Do not let a cigarette or any fire source approach the battery.
- Always wear protective glasses and rubber gloves before handling the battery.
- If the battery fluid contacts clothing or skin, immediately wash away using a large quantity of water.
- If the battery fluid enters your eyes, wash immediately with plenty of water and see a doctor as soon as possible.
- If you have accidentally swallowed the battery fluid, immediately drink a huge quantity of water, and see a doctor as soon as possible.
- Wipe with a wet clean cloth when cleaning the battery upper surface or related part. Do not use organic solvent or detergent such as petrol or paint thinner.
- Fully tighten the battery cap.
- If the battery fluid is frozen, do not charge battery or start the engine using another power source. Such act may cause the battery to catch fire.
- Unfreeze the battery fluid and check for battery fluid leak before charging or starting the engine.
- Always detach the battery from the Machine frame before charging the battery.



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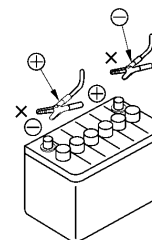


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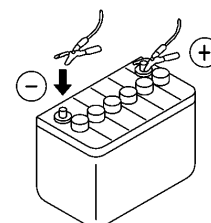
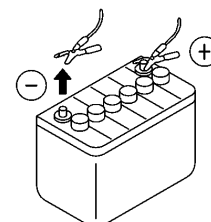
CAUTIONS WHEN STARTING UP USING BOOSTER CABLE

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

- Start the engine with two persons, with 1 standing on the driving operation position in the travel operation panel side.
- When starting the engine using another Machine, be careful to prevent contact between the normal Machine and broken Machine.
- Keep the starter switch key of both the normal Machine and the broken Machine in "OFF" position when the booster cable is connected.
- Do not connect to wrong side [connecting (+) to (-), (-) to (+)] when connecting the booster cable.
- Start connecting from (+) terminal first, but start disconnecting from (-) terminal (ground) first.
- Connect the ground to the frame of the broken Machine when connecting the ground as the last procedure.
- ★ See "OPERATION 8.4 STARTING ENGINE WITH BOOSTER CABLE" for details.
- Avoid contact between clips of the booster cable, and contact between a clip and the Machine when disconnecting the booster cable.



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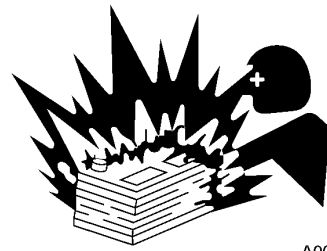
XAM04590

CAUTIONS WHEN CHARGING BATTERY

Improper handling when charging the battery may cause the battery to explode. Follow the manuals attached to the Machine and the charger, and always observe the following.

★ See "OPERATION 8.3 CAUTIONS WHEN CHARGING BATTERY" for details.

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



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5. MAINTENANCE PRECAUTIONS

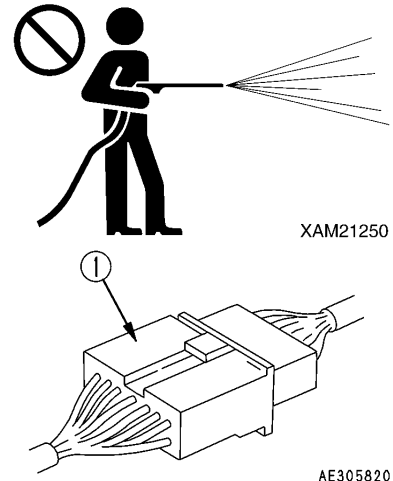
5.1 PRECAUTIONS BEFORE MAINTENANCE

FAILURE REPORT

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

CLEAN BEFORE INSPECTION OR MAINTENANCE

- Before starting an inspection or maintenance, clean the Machine and prevent rubbish from entering the Machine and make sure safety will be ensured during maintenance.
- Attempting to inspect or maintain the Machine whilst still dirty not only lessens chance of locating faults, but may cause rubbish to enter your eye, or slipping and tripping that result in injury.
- Always observe the following when washing the vehicle.
 - Use antislip shoes to prevent slips and trips caused by wet foothold.
 - Put on protective equipment when using a high pressure steam car washer. Avoid an accident from high pressure water which causes skin laceration or mud or other substance to fly into eyes.
 - Do not directly spray water onto the electrical system (sensors, connector, receiving box etc.) (1). Water entering the electrical system is dangerous and will cause faulty or improper operations.



TIDY UP WORKPLACE

Always tidy away tools, hammers and other things that obstruct the working area; grease and oil should be wiped off immediately after use.
An untidy workplace may cause safety hazards and result in injuries to personnel.

FOLLOW SUPERVISOR'S INSTRUCTION DURING TEAMWORK

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

USE APPROPRIATE TOOLS

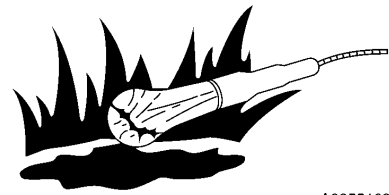
Do not use damaged or deteriorated tool, or use a tool for a purpose other than its intended purpose. Use tools suitable for the maintenance work.
Entrance of a broken piece of a tool such as a drift with a crushed head or a hammer may destroy eyesight.



HANDLING ILLUMINATION DEVICES

- Use explosion proof illumination device when inspecting the fuel, oil, battery fluid or similar substance. Failure to use an explosion proof illumination device may cause a serious fire and/or explosion.
- Attempting to work without using an illumination device in a dark place may cause injury or other issues. Always use illumination device.

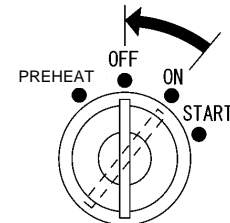
Do not use a lighter or other burning objects instead of the illumination device even if it is dark. Such use may cause fire, and furthermore the battery gas may catch fire and explode.



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STOP ENGINE BEFORE INSPECTION OR MAINTENANCE

- Before inspection or maintenance, always park the Machine at a location where the ground is level and firm, and rock-falls, landslides and flooding do not occur, fully retract and lower the boom, and stop the engine.
- Operate each of the crane operation levers back and forth 2 - 3 times to relieve the pressure remaining in the hydraulic circuits.
- Apply pawls to prevent rubber tracks from moving.
- Persons in charge of the maintenance should pay attention to prevent parts of the body and clothes from contacting any moving parts.



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FIRE RISK PREVENTION

Always observe the following during maintenance where the fuel, oil, battery or other substance that may catch fire are handled.

- Keep the fuel, oil and any other easily combustible oil and fats away from fire during storage.
- Do not leave the site when replenishing the fuel or oil.
- Use incombustible cleaning oil for cleaning components, and do not use light oil, petrol or anything else that may catch fire.
- Do not smoke during inspection and maintenance. Only smoke at a designated location.
- When inspecting fuel, oil, battery fluid or similar, use explosion proof illumination devices but do not use fire of a lighter or a match for illumination.
- Loosened or damaged electrical connections may short the circuit and result in fire. Inspect accordingly before starting the work.
- Check to make sure a fire extinguisher is near the inspection/maintenance site.



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5.2 PRECAUTIONS DURING MAINTENANCE

NO ENTRY OF UNAUTHORIZED PERSONNEL

Do not allow anyone, other than the necessary personnel, to enter the site during maintenance. Post a guard, if necessary.
Take special care in case of polishing, welding work, or digging work.

MEASURES UPON FINDING ABNORMALITY DURING INSPECTION

- Always repair whenever any abnormality is found during inspection.
Attempt to use without repairing the defect may cause accidents.
- Ask us or our sales service agency for repair depending on the failure type.

DO NOT DROP TOOLS OR PARTS INSIDE MACHINE

- Be careful not to drop any bolts, nuts or tools' inside the Machine when inspecting while opening the inspection port or tank replenishment port. Dropping object may damage the Machine or cause the Machine to operate improperly and thus may cause accidents.
If anything drops, always retrieve it.
- Do not keep anything unnecessary for the inspection in your pocket.

NOISE CAUTION

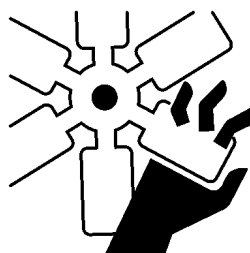
Loud noise in the surroundings may cause hearing difficulty or deafness. Use ear protection or ear plugs during long-term noise exposure, such as engine maintenance.

WORK BY AT LEAST TWO PERSONS DURING MAINTENANCE WITH ENGINE RUNNING

To prevent accidents, do not attempt maintenance when the engine is running.

Always observe the following in case of maintaining with the engine running for unavoidable reason.

- 1 person should stand at the driving operation position on the travel operation panel side, and keep checking each other while ensuring that the engine can be stopped at any time.
- Be especially careful when working near a rotating part because you may get entangled.
- Do not touch operation levers. If it is unavoidable to use the operation levers, always give a sign to the other person and let him/her evacuate to a safe place.
- Do not touch the alternator belt or other parts, as this may break tools or sever limbs.



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CAUTIONS WHEN WORKING UNDER MACHINE

- Park the Machine on a level and firm place, and fully retract and lower the boom.
- Before maintenance under the Machine, extend the outriggers to maximum so the Machine lifts. If the Machine is unstable and sways, insert support platforms (height increasers) below the front and rear parts of the Machine frame to stabilize the Machine.
- See "OPERATION 2.12 OUTRIGGER SETUP OPERATION" for extension of the outriggers.



A0055140

CAUTIONS WHEN WORKING AT HIGH ELEVATION

- Secure scaffolding by using a workstation with the stairs when working at high elevation.
- Tidy the footing to avoid falling and always observe the following precautions.
 - Do not spill oil or grease.
 - Always tidy away tools.
 - Beware of the footing when walking.
- Do not jump from the scaffolding under any circumstances. Use a handrail or platform, and secure your body in three locations (both feet and one hand, or both hands and one foot) when climbing up or down the scaffolding.
- Use protective equipment that suit the work.
- Never step on the boom, outrigger or machinery cover to prevent accidents such as falling or tripping due to slippage.
- Do not put a load on the Machine such as on the cover.



AD305870

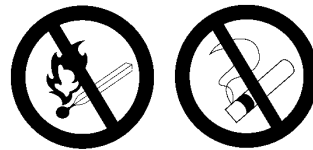
CAUTIONS WHEN REPLENISHING FUEL OR OIL

Letting fire approach the fuel or oil may result in catching fire. Light oil is used as the fuel and thus requires extra effort to observe the following.

- Stop the engine when refilling.
- Do not smoke when refilling.
- Immediately wipe away spilt fuel or oil.
- Securely tighten the fuel and oil caps.
- Supply fuel/oil at a location with good ventilation.
- Do not leave the site when replenishing the fuel or oil.



A0055020

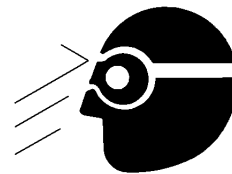


A0055040

BEWARE OF CHIPS WHEN WORKING WITH HAMMER

When using a hammer, always wear protective equipment such as safety goggles and a helmet. Also, insert a brass bar or similar object between the hammer and target object.

Hitting hard metal parts such as a pin or bearing may cause splintering or chipping, which in turn could cause eye injuries if safety precautions are not met.



AE305880

CAUTIONS DURING WELDING REPAIR

Weld in a location with good facilities, and only authorized personnel are permitted to weld. Unauthorized personnel are strictly prohibited since risks such as gas generation, fire and electrical shock are present when welding.

The personnel authorized to weld are requested to always observe the following.

- Disconnect the battery terminals to prevent battery explosions.
- Peel off the paint from the welding section to prevent gas generation.
- Attempting to heat up hydraulic machinery, piping or a section near such parts may cause combustible vapour or mist to be generated and catch fire. Avoid heating such areas.
- Directly heating a pressurized piping or rubber hose may cause a sudden snap. Apply a fire protection cover.
- Wear protective equipment.
- Always ventilate the area.
- Keep combustibles away from the area and prepare a fire extinguisher.
- Do not ground to a location near electrical parts. Such may cause the electrical part to malfunction.
- To avoid sparks in the cylinder caused by welding, ground to a location close to the weld to prevent an electric current from passing through the cylinder.

DISCONNECT BATTERY TERMINAL

Disconnect (-) terminal of the battery and stop the electrical flow before repairing the electrical system or starting an electrical weld.

★See "OPERATION 8. HANDLING BATTERY" for details.



A0055170

CAUTIONS WHEN ADJUSTING RUBBER TRACK TENSION

- Grease is sealed inside the rubber track tension adjuster. The grease is at a high pressure because of the tension of the rubber track. Attempting to release the grease without observing the following precautions may cause the grease valve to pop out and result in serious accident.
- Do not loosen the tension adjustment grease valve more than one full turn. Doing so may cause the grease valve to pop out. To avoid the risk during tension adjustment, do not place your body in front of the grease valve.

★See "OPERATION 2.1.3 [1] CHECKING/ADJUSTING RUBBER TRACK TENSION" for details.



A0055200

CAUTIONS WHEN HANDLING HIGH PRESSURE HOSE

Oil leaking from a high pressure hose may cause fire or accident due to faulty operation.

Whenever a damaged hose or loosened bolt is found, abort working and ask us or our sales service agency for a repair.

- Replacement of a high pressure hose requires experienced skill. In addition, the tightening torque is decided by the hose types and size.
Customers are prohibited to repair.
- If any of the following conditions are found, replace the applicable parts:
 - Hose sleeve damage or leak.
 - Scratch or truncation of the coat, or exposure of reinforcing layer of a wire.
 - Coat is partially swollen.
 - Indication of twist or collapse on a movable part of hose.
 - Foreign object buried in coating.
 - Hose sleeve deformation.

HIGH PRESSURE OIL CAUTIONS

Failure to check to make sure the pneumatic circuit pressure is relieved before inspection or replacement of a high pressure piping or hose may result in accidents.

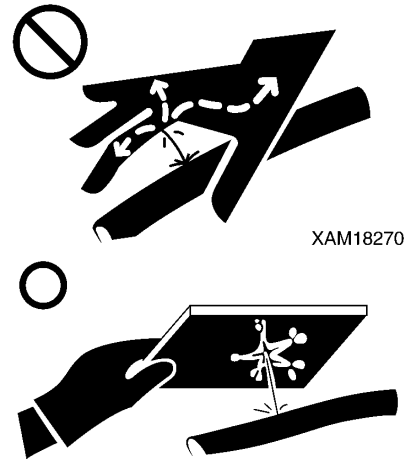
Strictly observe the following.

- Do not start any inspection or replacement before the pressure dissipates.
- Put on safety goggles and leather gloves.
- When a piping or hose leak exists, the piping/hose itself or the vicinity of the ground is wet. Check for a piping crack and hose crack or inflation.

If detection is difficult, ask us or our sales service agency for repair.

- High pressure oil leaking through a small hole may puncture the skin or destroy eyesight upon contact.

If this happens, wash away with flowing water and see the doctor as soon as possible.



XAM18270

A0055190

CAUTIONS WHEN TEMPERATURE IS HIGH

Parts such as the engine, oil in various parts, exhaust system manifold and muffler are at high temperature immediately after stopping the engine.

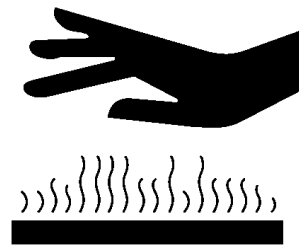
Attempts to remove the cap or execute maintenance such as oil draining, water draining or filter replacement in this condition may result in burns.

Wait until the temperature lowers, then execute the inspection/maintenance following the procedure described in this manual.

★ "OPERATION 2.1.2 INSPECTION BEFORE STARTING ENGINE":
Checking Cooling Water Level, Checking Oil Level in Engine Oil Pan, Checking Oil Level in Hydraulic Oil Tank

★ "MAINTENANCE 8.9 500 HOURS MAINTENANCE": Replacement of Engine Lubricating Oil and Filter Cartridge, Replacement of Hydraulic Oil Return Filter

★ "MAINTENANCE 8.10 1000 HOURS MAINTENANCE": Replacement of Oil in Hydraulic Oil Tank, Cleaning inside Cooling System



A0055050

CHECKS AFTER INSPECTION/MAINTENANCE

Failure to execute an inspection/maintenance item or failure to check the function and operation of the maintained part may cause an unexpected fault which may result in accidents.

Strictly observe the following.

- Checks while engine is stopped
 - Check for unexecuted inspection/maintenance.
 - Check that inspection/maintenance was completed without errors.
 - Check for any dropped tools or parts. Ones caught in the inside or lever related link mechanism in particular pose danger.
 - Check for any fuel leak, water leak, oil leak, bolt loose and similar issues.
- Checks while engine is running

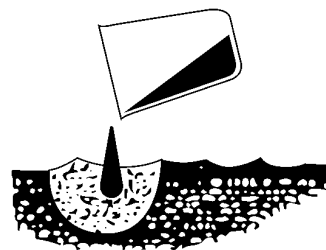
Take special care when checking while the engine is running, referring to "Work by at least two persons during maintenance while engine is running" section.

 - Check that the inspected/maintained parts operate normally.
 - Check that issues such as an oil leak do not occur when load is applied to the oil pressure by increasing the engine rotation.

CAUTIONS WHEN TREATING WASTE

To prevent environmental pollution, strictly observe the following:

- Never allow waste oil to flow into water systems, such as river or sewage system.
- Always drain into a container when draining the oil from the Machine. Do not directly drain to the ground under any circumstances.
- Observe the applicable legal regulations and rules when disposing of harmful substance such as the oil, fuel, solvent, filter or battery.



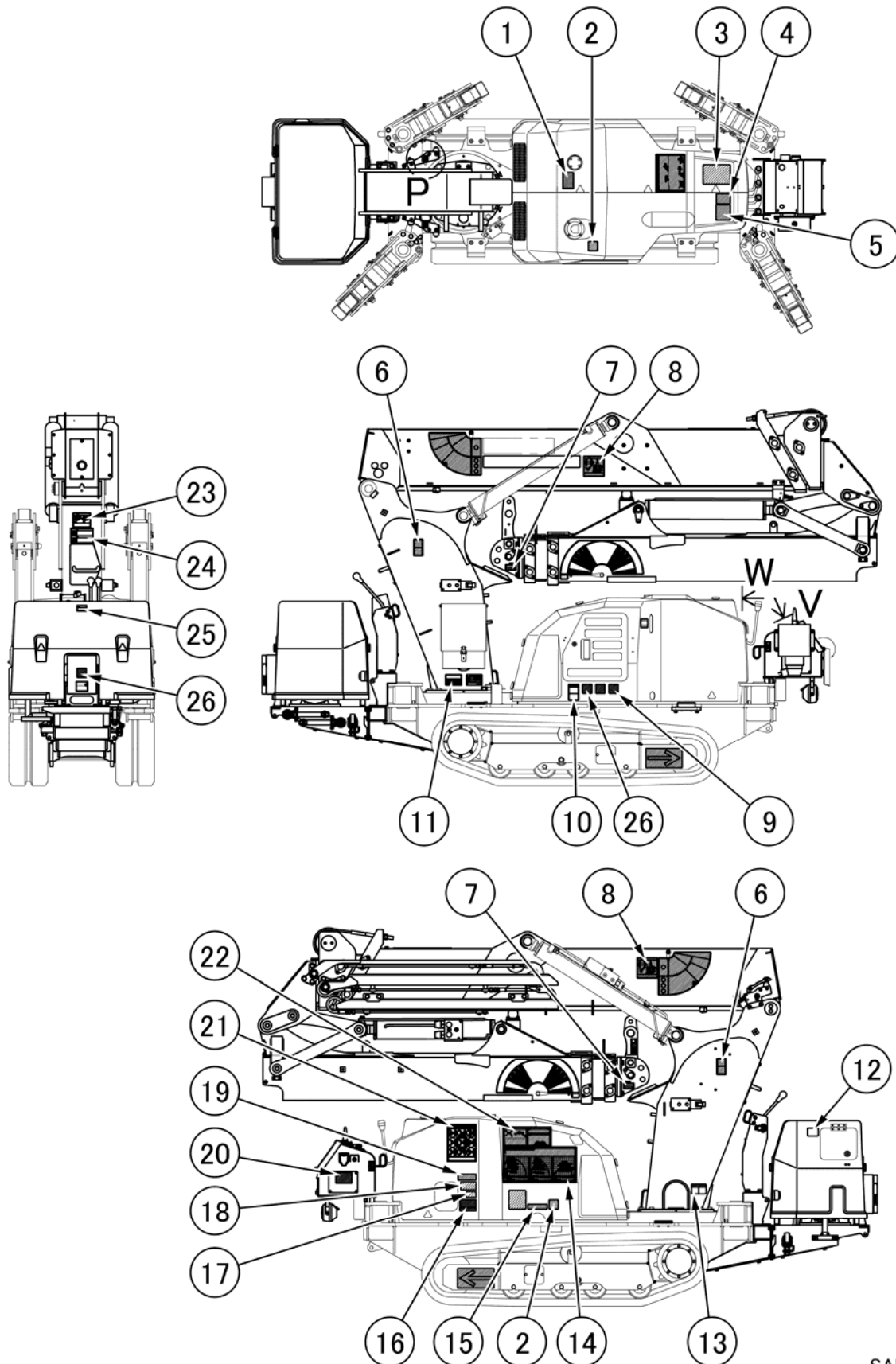
A0055220

6. SAFETY LABEL LOCATIONS

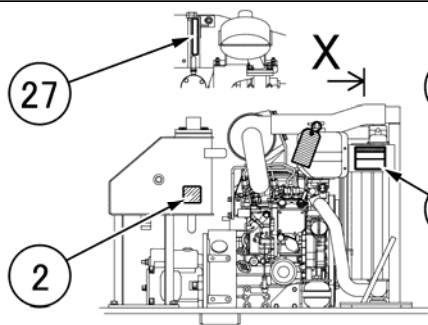
Keep safety labels clean and visible at all times.

If lost, replace immediately or apply for a new one.

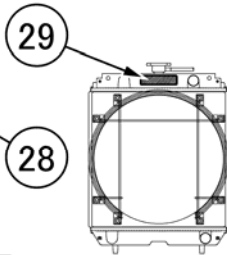
There are also labels other than safety labels shown below, treat them in the same manner.



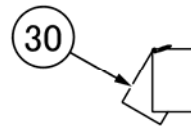
SAM12501



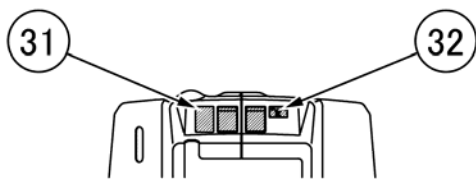
Inside the
Machinery Cover



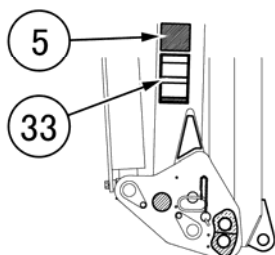
View X
(radiator)



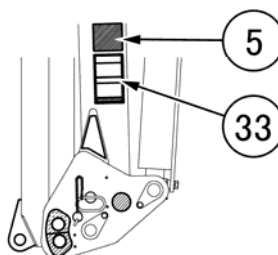
Precautions for use N.P.



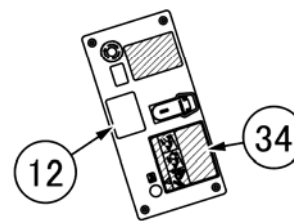
View W



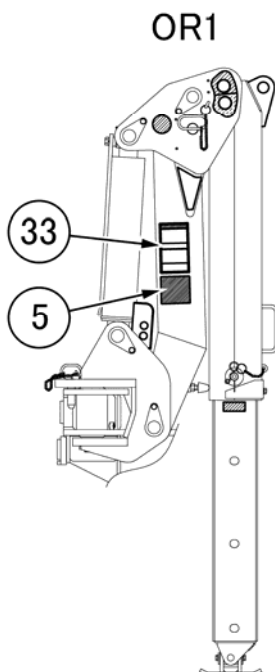
OR4



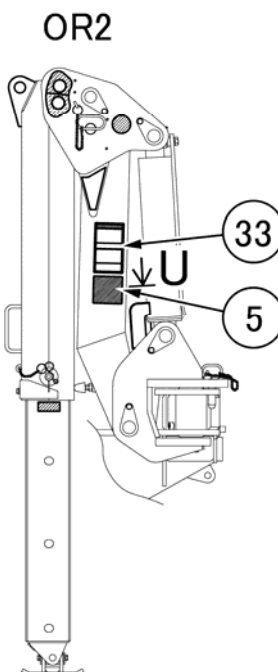
OR3



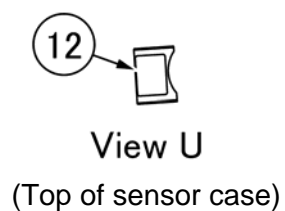
View V
(Top lid of case)



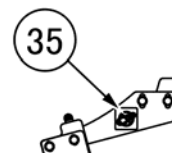
OR1



OR2



View U
(Top of sensor case)

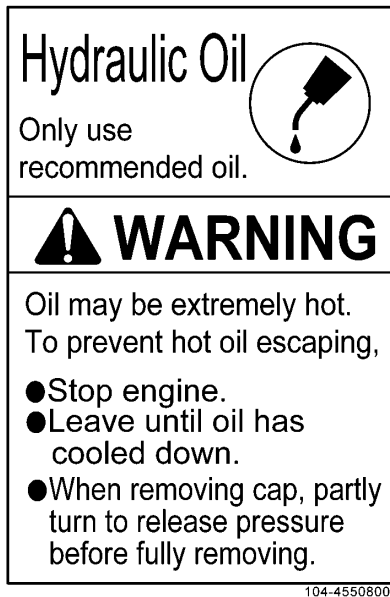


View P
(DR storage detection BKT)

Outriggers

SAM12511

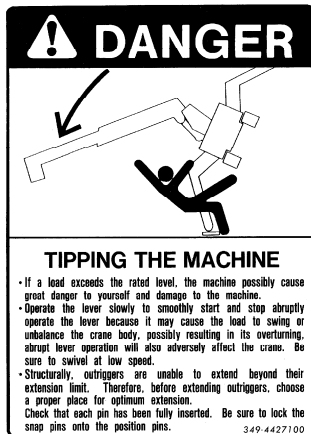
(1) Hydraulic oil caution (104-4550800)



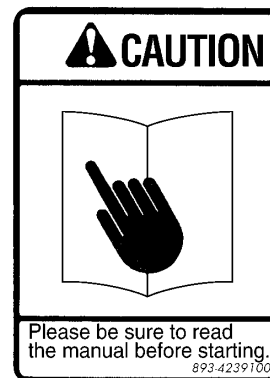
(2) High temperature caution (553-4267700)



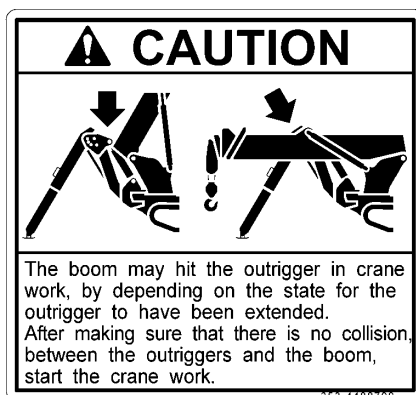
(3) Caution for crane handling (349-4427100)



(4) Caution when driving, inspecting or maintaining (893-4239100)



(5) Caution when outrigger setting (353-4488700)



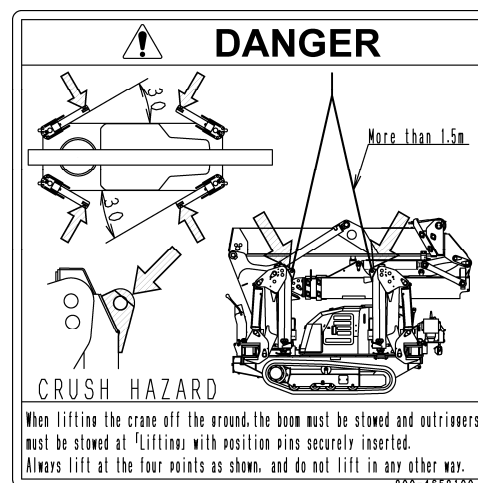
(6) No access to crane (349-4422000)



(7) Warning about pin position (200-4651500)



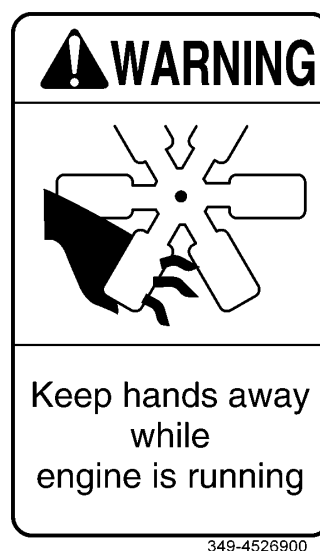
(8) Caution when hoisting machine (200-4652100)



(9) Pinch caution (553-4267600)



(10) Rotating fan caution (349-4526900)

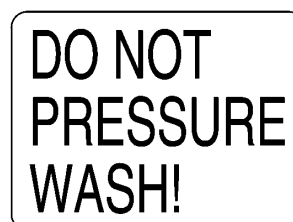


(11) Machine total weight (200-4680800)

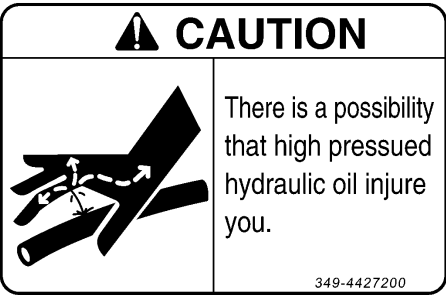
MK1033CW—1 MACHINE WEIGHT	
Model	Weight
MK1033CW-1	2290 kg
MK1033CW-1 with winch	2390 kg
MK1033CWE-1	2270 kg
MK1033CWE-1 with winch	2370 kg

200-4680800

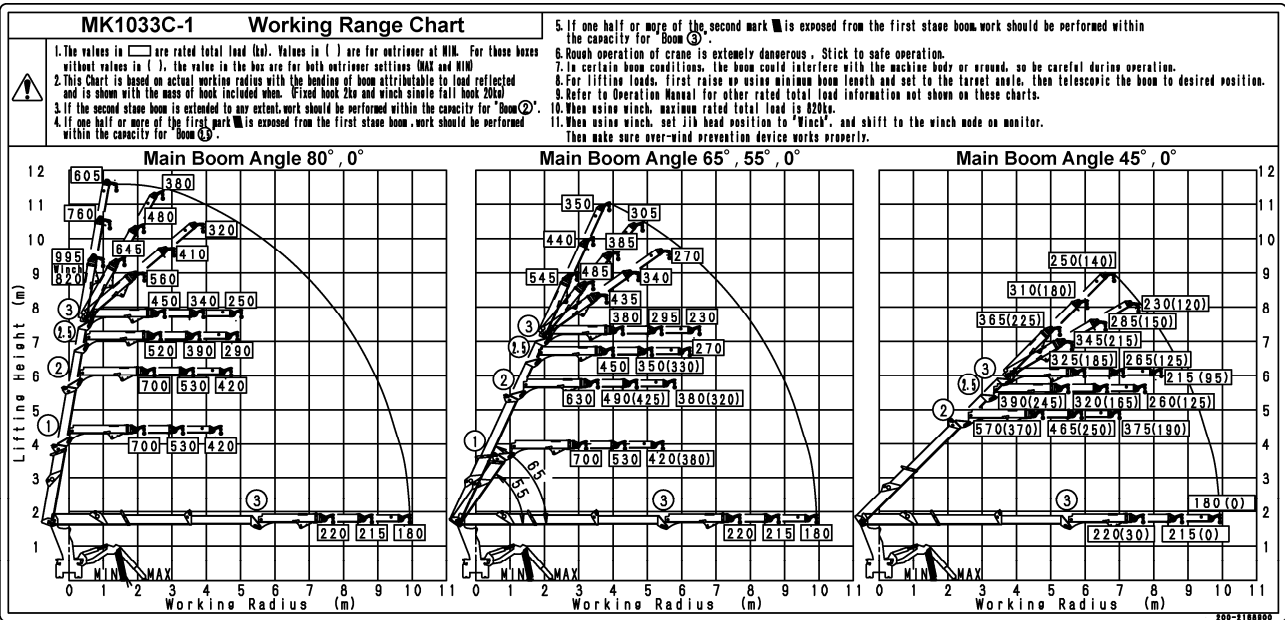
(12) Washing caution (350-4539700)



(13) High pressure oil caution (349-4427200)



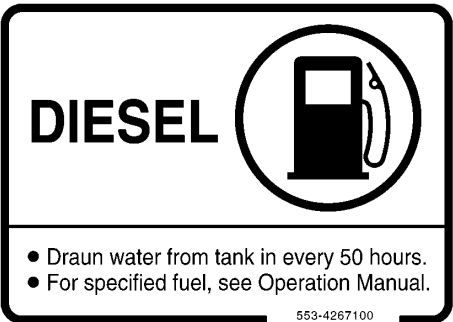
(14) Working range chart (200-2168900)



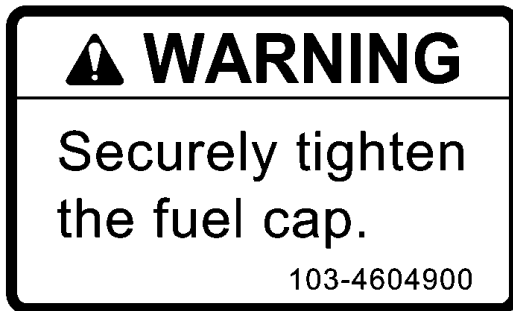
(15) Exhaust gas caution (349-4427400)



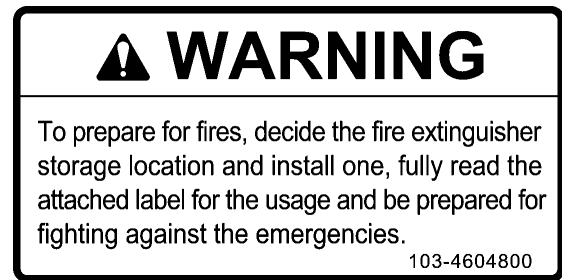
(16) Diesel fuel caution (553-4267100)



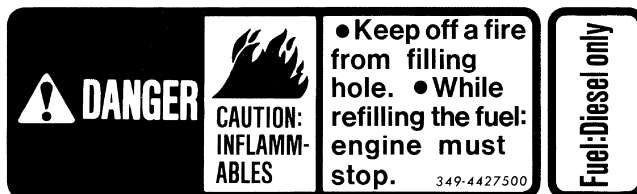
(17) Fuel tank cap caution (103-4604900)



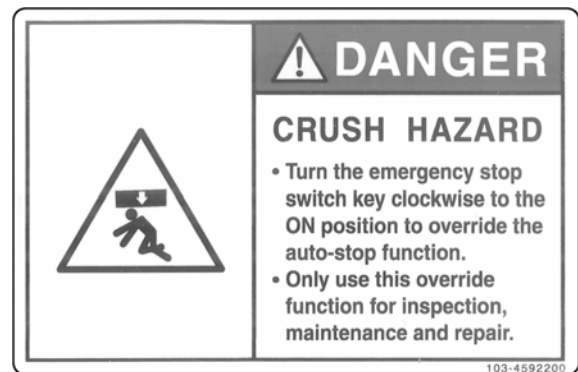
(18) Fire extinguisher caution (103-4604800)



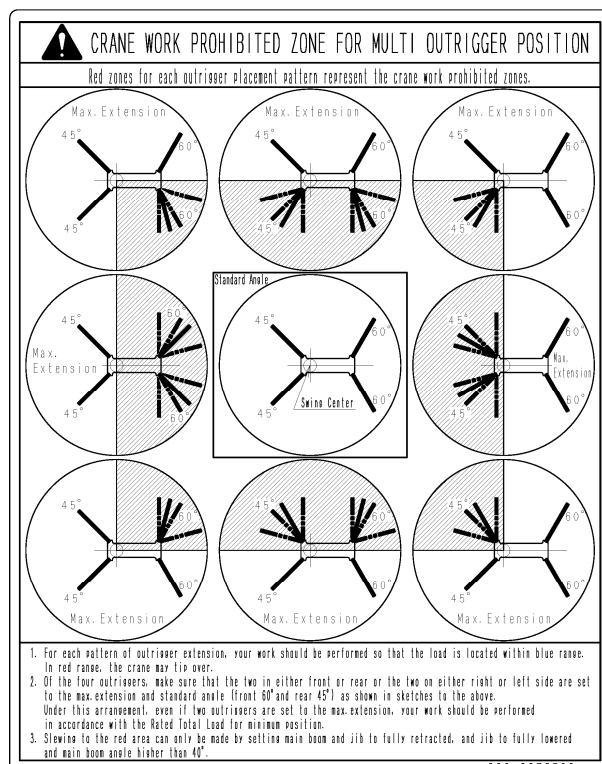
(19) Fire ban (349-4427500)



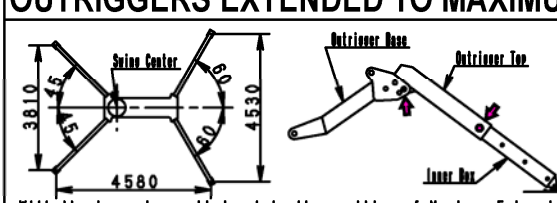
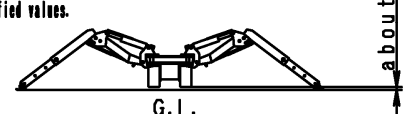
(20) Emergency stop caution (103-4592200)



(21) Warning about outrigger work range (200-3379500)



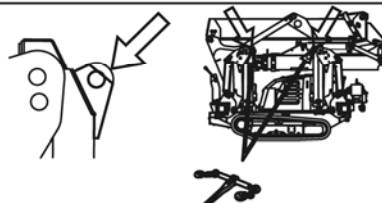
(22) Warning about outrigger operation (200-3357100)

OUTRIGGERS EXTENDED TO MAXIMUM	
 <p>With the inner box pulled out to the position of Maximum Extension, positioning pin for outrigger base is set Maximum Position.</p> <p>1. If the position of inner box or outrigger base positioning pin is retracted by even one step, your work should be performed in accordance with the value for minimum extension.</p> <p>2. When swiveling with a load suspended, stability may vary between the front and rear or right and left side of the machine. Perform your work with the working radius reduced to as short as possible and pay attention to a possibility of tipping over.</p> <p>3. For any crane work, use outriggers to maintain the machine body horizontally.</p>	<p>WARNING</p> <p>1. Use a leveling instrument to position your machine horizontally on level and hard ground.</p> <p>2. Use outriggers extended to the maximum in principle.</p> <p>3. For setting insert retainer pins for positioning pins.</p> <p>4. For traveling, be sure to stow outriggers.</p> <p>CAUTION</p> <p>1. For crane work, extend four outriggers so that load is uniformly applied and tracks are lifted off the ground by about 80mm.</p> <p>2. Do not perform crane work with tracks rounded, because it may cause damage to undercarriage. Do not lift your machine excessively for increasing the lifting height over the ground level, which will cause the stability to be reduced. Work within the specified values.</p>  <p>about 80mm</p> <p>G.L.</p>

200-3357100

(23) Machine hoisting position (200-4660200)

WARNING




CRUSH HAZARD

Only use these brackets on the outriggers to connect tie-down binders and fasteners.

200-4660200


(24) Caution when traveling on slopes (200-4651800)

WARNING



Travelling on a slope is only allowed if slope angle is less than **10 degrees**. Stand on the up-side of the slope and operate slowly. The machine may slip and it could cause an accident.

CAUTION



Do not traverse on slope. It could cause the machine to tip over. When close to tipping the caution buzzer will sound, stop traveling to avoid tipping over.

200-4651800

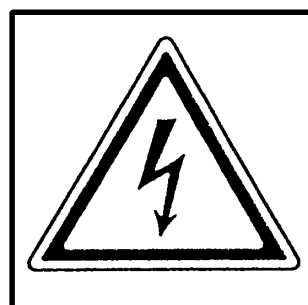
(25) Method of division (200-4652200)

CAUTION

Refer to Operation Manual for procedure to attach/remove the unit.

200-4652200

(26) Electric shock caution (553-4267300)

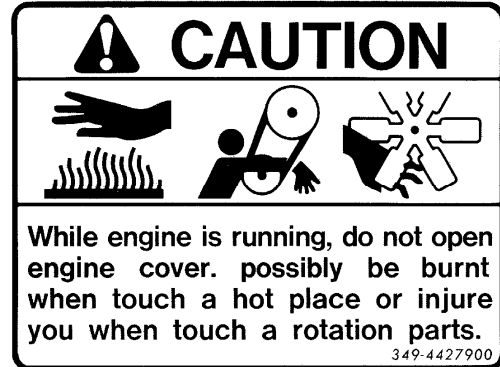


553-4267300

(27) High temperature caution (349-4427800)



(28) Engine cover caution (349-4427900)

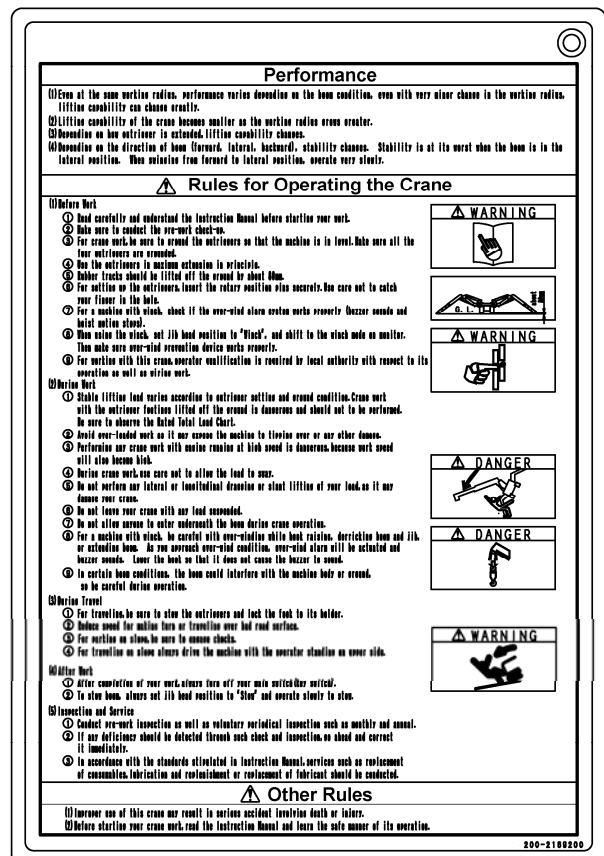
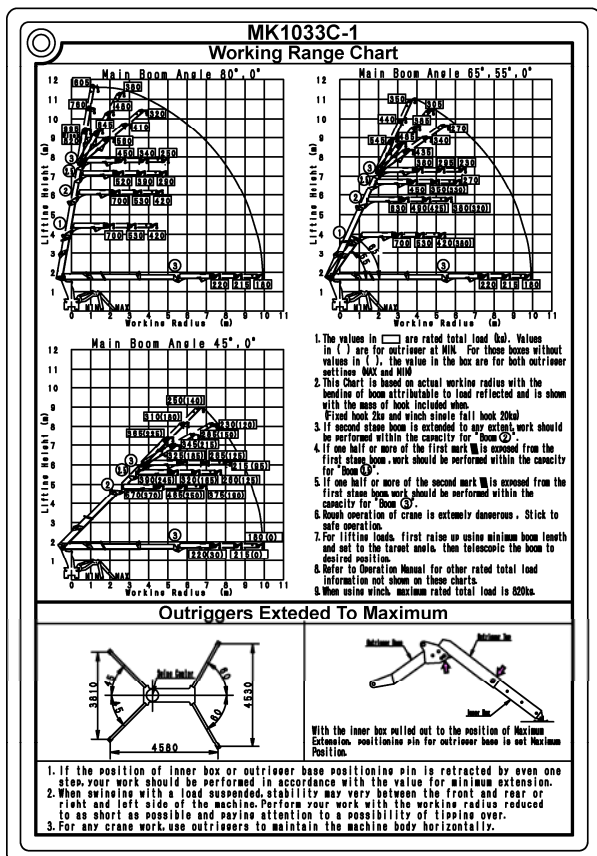


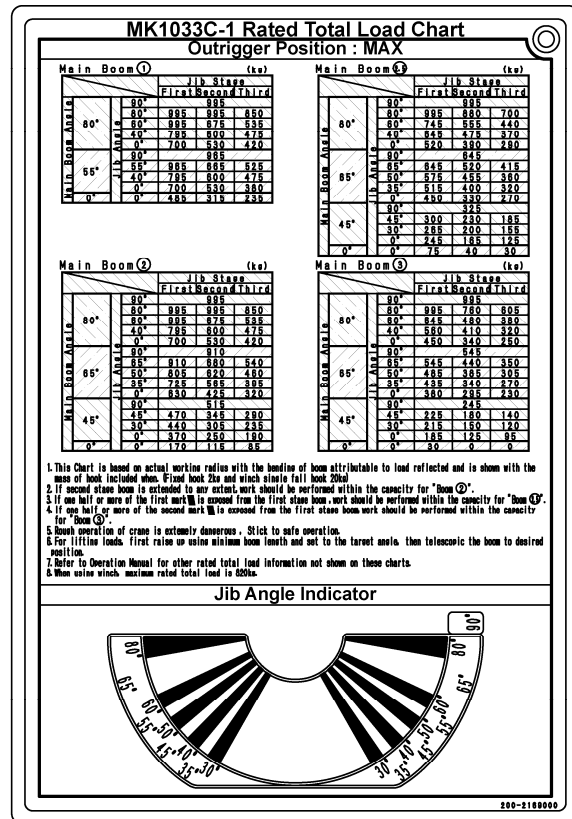
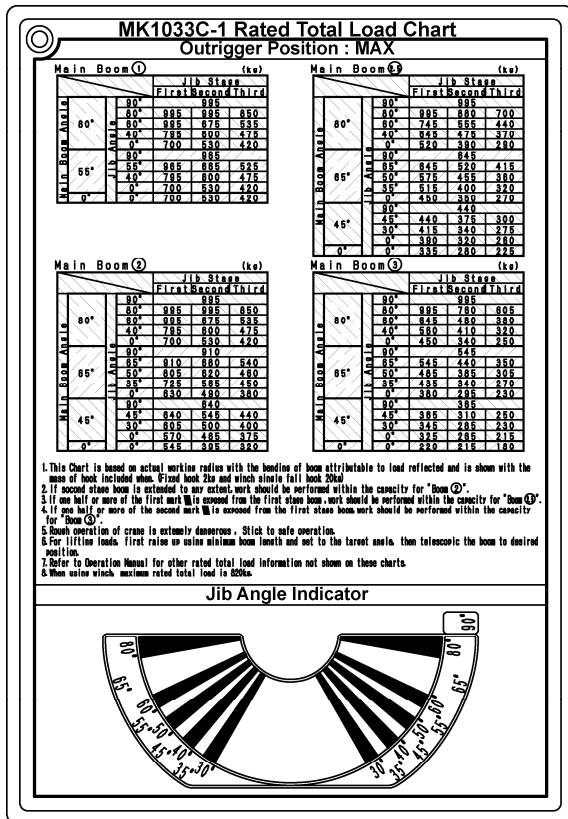
(29) Radiator caution (349-4427300)



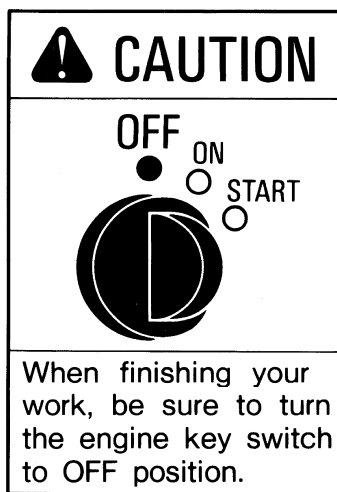
(30) Precautions for use (200-4652800)

(30-1) Precautions for use (1/2) (200-2169200)





(31) Main switch caution (349-4421400)



349-4421400

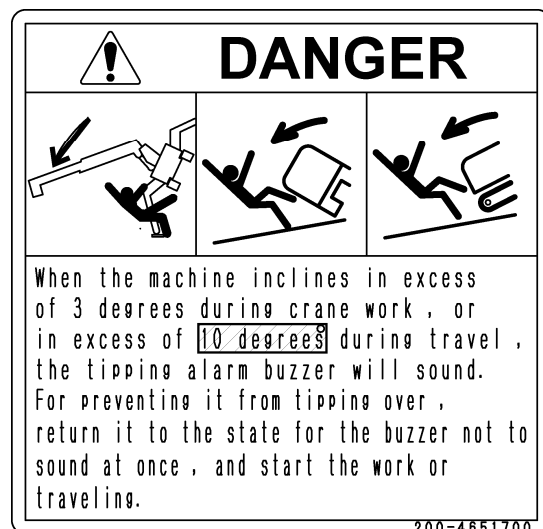
(32) Overhead hazard (200-4651200)



(33) Outrigger pin hole caution and footing check
(101-4593300)



(34) Slope caution (200-4651700)



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



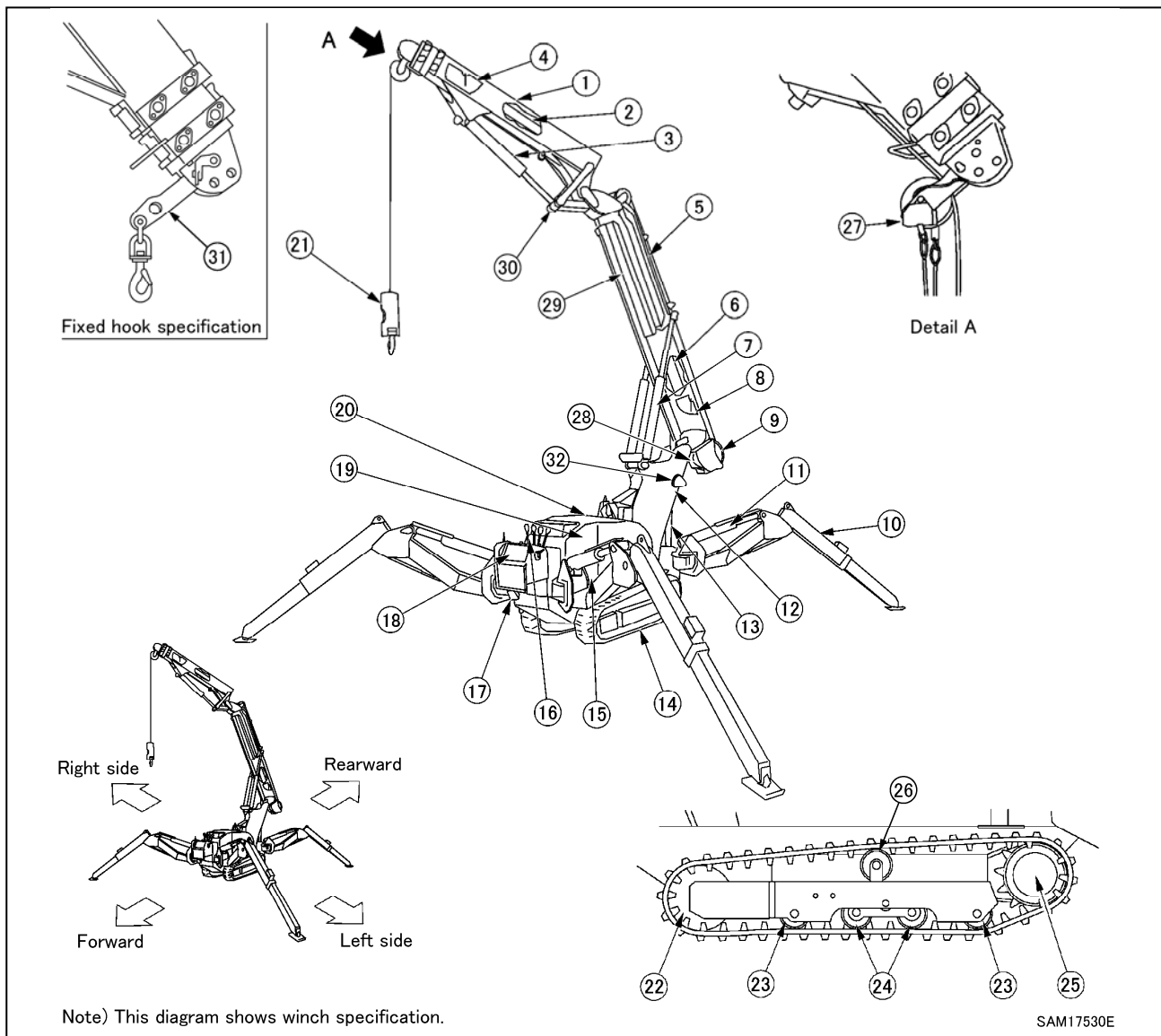
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OPERATION

1. NAME OF EACH SECTION	3- 2
2. OPERATION	3- 49
3. HANDLING RUBBER TRACKS	3-107
4. HANDLING WIRE ROPES	3-111
5. TRANSPORTATION	3-112
6. HANDLING IN COLD WEATHER	3-116
7. LONG-TERM STORAGE	3-118
8. HANDLING BATTERY	3-119
9. TROUBLESHOOTING	3-123
10.HOW TO REMOVE AND MOUNT A COUNTERWEIGHT	3-125

1. NAME OF EACH SECTION

1.1 MACHINE UNITS



- | | |
|--|--|
| (1) Jib | (17) Headlight |
| (2) Jib telescoping cylinder (inside the jib) | (18) Monitor |
| (3) Jib derricking cylinder | (19) Machinery cover |
| (4) Angle indicator (jib) | (20) Hydraulic oil tank (inside the machinery cover) |
| (5) Main boom | (21) Hook block (winch specification) |
| (6) Main boom telescoping cylinder (inside the boom) | (22) Front idler |
| (7) Main boom derricking cylinder | (23) Track roller |
| (8) Angle indicator (main boom) | (24) Tandem track roller |
| (9) Winch (winch specification) | (25) Travelling motor and sprocket |
| (10) Outrigger | (26) Carrier roller |
| (11) Outrigger cylinder | (27) Over-hoisting prevention device |
| (12) Post | (28) Over-unwinding prevention device |
| (13) Travel control | (29) Hose guide |
| (14) Rubber tracks | (30) Link |
| (15) Fuel tank (under the engine) | (31) Fixed hook |
| (16) Crane control | (32) Tri-colour lights |

1.1.1 EXPLANATION OF MACHINE UNITS

[1] Jib (1)

A jib with a 3-stage telescoping mechanism.

[2] Jib telescoping cylinder (2)

A telescoping cylinder built into the jib.

[3] Jib derricking cylinder (3)

A cylinder for derricking the jib.

[4] Angle indicator (jib) (4)

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

See “INTRODUCTION 5.4 ANGLE INDICATOR” on how to read the angle indicator.

[5] Main boom (5)

A boom with a 3-stage telescoping mechanism.

[6] Main boom telescoping cylinder (6)

A telescoping cylinder built into the boom.

[7] Main boom derricking cylinder (7)

A cylinder for derricking the main boom.

[8] Angle indicator (main boom) (8)

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

See “INTRODUCTION 5.4 ANGLE INDICATOR” on how to read the angle indicator.

[9] Winch (9)

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

For operational methods for the winch, see “WINCH 3.3 HOOK RAISING/LOWERING OPERATION”.

[10] Outrigger (10)

A device for stabilising the vehicle body horizontally, composed of 4 units.

For outrigger setup, see “OPERATION 2.12 OUTRIGGER SETUP OPERATION”; for stowage see “OPERATION 2.21 OUTRIGGER STOWING OPERATION”.

[11] Outrigger cylinder (11)

A cylinder for extending the outrigger.

[12] Post (12)

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

[13] Travel control (13)

A part for travel control of the machine.

For operation method of travelling, see “OPERATION 2.5 MACHINE TRAVELLING POSTURE” and “OPERATION 2.6 START MOVING MACHINE”.

[14] Rubber tracks (14)

Rubber tracks for travelling.

For adjusting rubber track tension, see “OPERATION 2.1.3 [1] CHECKING/ADJUSTING RUBBER TRACK TENSION”.

[15] Fuel tank (15)

A tank for putting fuel in to operate the engine.

[16] Crane control (16)

A part for controlling the crane.

[17] Headlight (17)

A working light to illuminate the front.

[18] Monitor (18)

A display device to display the status of the vehicle.

[19] Machinery cover (19)

A left-right splitting machinery cover.

[20] Hydraulic oil tank (20)

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

[21] Hook block (single fall hook) (21)

Single fall hook for the the winch.

For the installation method, see “WINCH 3.5 WHEN CHANGING TO HOOK BLOCK (SINGLE FALL HOOK)”.

[22] Front idler (22), track roller (23), tandem track roller (24), travel motor sprocket (25), carrier roller (26)

Travel device for travelling.

For operation method of travelling, see “OPERATION 2.5 MACHINE TRAVELLING POSTURE” and “OPERATION 2.6 START MOVING MACHINE”.

[23] Over-hoisting prevention device (27)

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

For details of the device, see “WINCH 2.4 OVER HOIST DETECTOR”.

[24] Over-unwinding prevention device (28)

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

For details of the device, see “WINCH 2.5 EXCESSIVE UNWIND DETECTOR”.

[25] Hose guide (29)

A guide for the hose supplying hydraulic pressure to the jib.

[26] Link (30)

A device for making the derricking of the jib smooth.

[27] Fixed hook (31)

A hanging hook without winding/unwinding operations, fixed to the end of the jib.

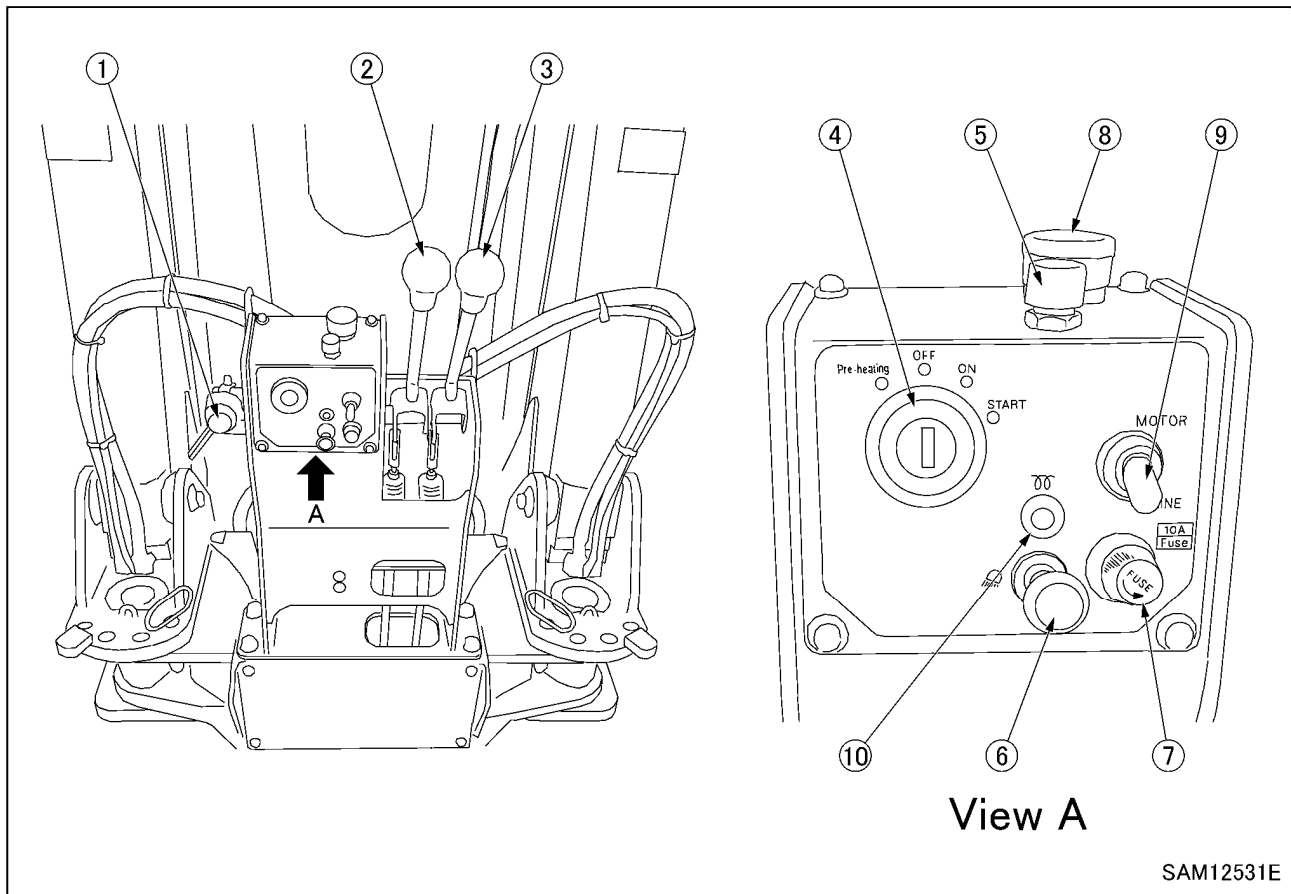
Cannot be used together with the hook block (single fall hook).

For the installation method, see “WINCH 3.6 WHEN CHANGING TO FIXED HOOK”.

[28] Tri-colour lights (32)

Red, yellow and green lights blink according to the operational status of the machine.

1.2 TRAVELLING AND CRANE OPERATION UNITS



- (1) Accelerator lever
- (2) Left travelling lever
- (3) Right travelling lever
- (4) Main starter switch
- (5) Horn switch
- (6) Headlight switch
- (7) Fuse (10A)
- (8) Emergency stop switch
- (9) Engine/Electric motor select switch (valid only for electric motor spec)
- (10) Preheat lamp

1.2.1 LEVERS

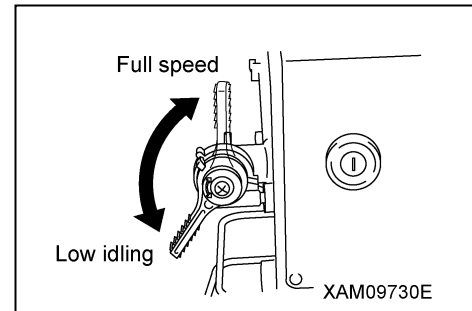
[1] ACCELERATOR LEVER (1)

Use this lever to adjust the engine speed or output.

- Low idling : Push the lever downward.
- Full speed : Pull the lever upward.

NOTES

- At the desired engine speed for your work, release the lever. It will stop at that position.
- Accelerator lever is also provided on the crane operation unit.



[2] LEFT/RIGHT TRAVELLING LEVERS (2), (3)

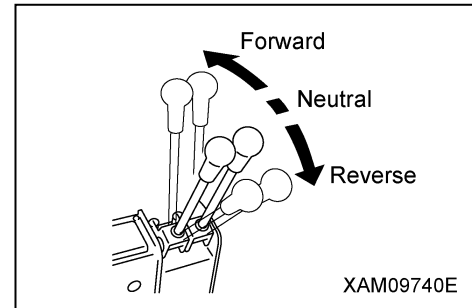
Use this lever to move the machine forward/backward, stop, slew, and to adjust the travelling speed.

- 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.

- Reverse : 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.



1.2.2 SWITCHES

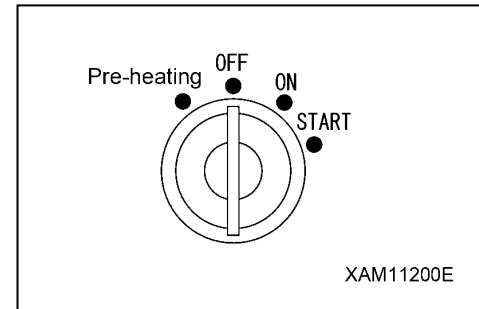
[1] MAIN STARTER SWITCH (4)

CAUTION

Always turn the main starter switch to the “OFF” position at the end of work.

Use this switch to start and stop the engine.

- **PRE-HEAT** : Turn the key to this position when starting the engine in cold weather.
When the preheat lamp turns off, release your hand from the key. The key automatically returns to the “OFF” position.
- **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** : Position where the engine starts.
When the engine has started, release your hand from the key. The key automatically returns to the “ON” position.



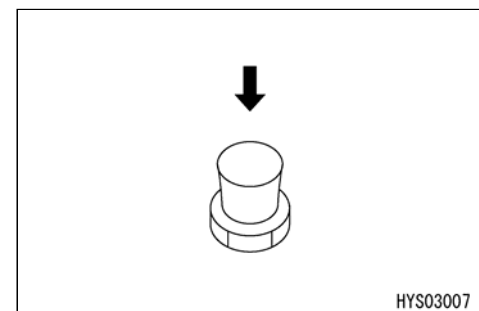
[2] HORN SWITCH (5)

Use this switch to honk the horn.

- **Honking the horn** : Press the switch.

NOTES

- The horn will stop when you release your finger from the switch.
- The horn switch is provided on the crane operation side as well.



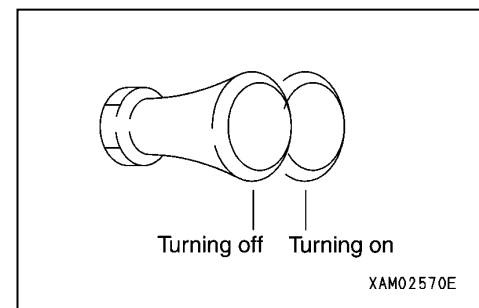
[3] HEADLIGHT SWITCH (6)

Use this switch to turn on the headlights.

- **ON** : Pull the switch out.
- **OFF** : Push the switch in.

NOTES

The headlights do not light up even if the headlight switch is operated when the starter switch is at the “OFF” position.



[4] EMERGENCY STOP SWITCH (8)

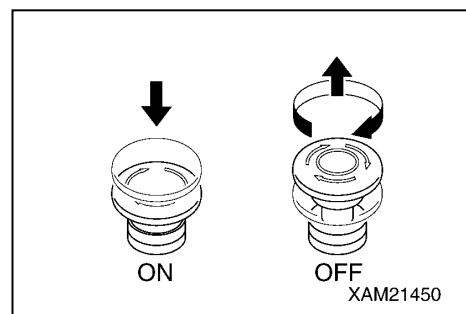
Use this switch to stop the machine immediately in case of an error in the machine.

- ON : Press the switch. The engine stops.
- OFF : Turn the switch clockwise (direction of the arrow in the right figure), or pull the switch toward you.

The switch returns to the original position.

NOTES

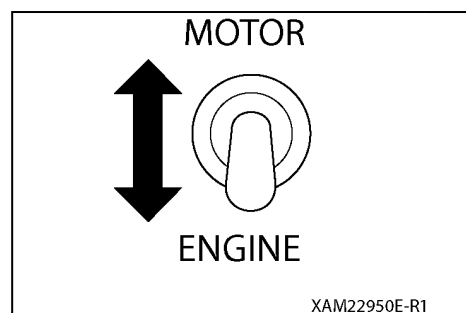
When restarting the engine after an emergency stop, be sure to turn the emergency stop switch to the "OFF" position before starting the engine.



[5] ENGINE/ELECTRIC MOTOR SELECT SWITCH (9)

Available only for the electric motor specification.

Refer to "ELECTRIC MOTOR 3.1 TRAVELLING UNIT".



1.2.3 METERS AND LAMPS

[1] FUSE (7)

CAUTION

Be sure to turn the main starter switch to the "OFF" position when checking or replacing a fuse.

CAUTION

Fuses protect electrical components and wires from being burnt out.

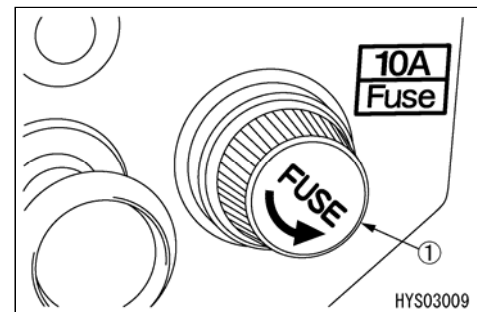
- Fuses used here are tubular fuses. If a fuse is corroded and shows white powder, be sure to change the fuse.
- If a fuse has melted, always check the cause in the circuit and fix the problem before changing the fuse.
- Always make sure the replacement fuse is of the same capacity.

Systems and capacities of fuses are as follows:

- Fuse (1) (10A): For meter panel, horn.

Inspect and replace fuses in the following procedure.

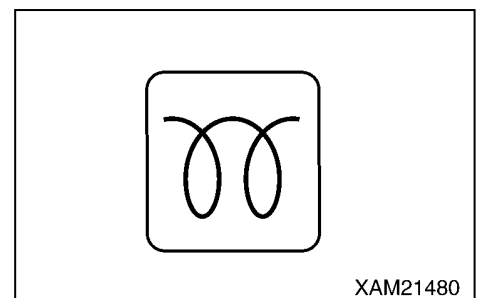
1. Turn the fuse holder on control panel counterclockwise and take it out.
2. Check and replace fuses contained in the removed fuse holder.
3. Install new or checked fuse to the holder and turn it clockwise to tighten.



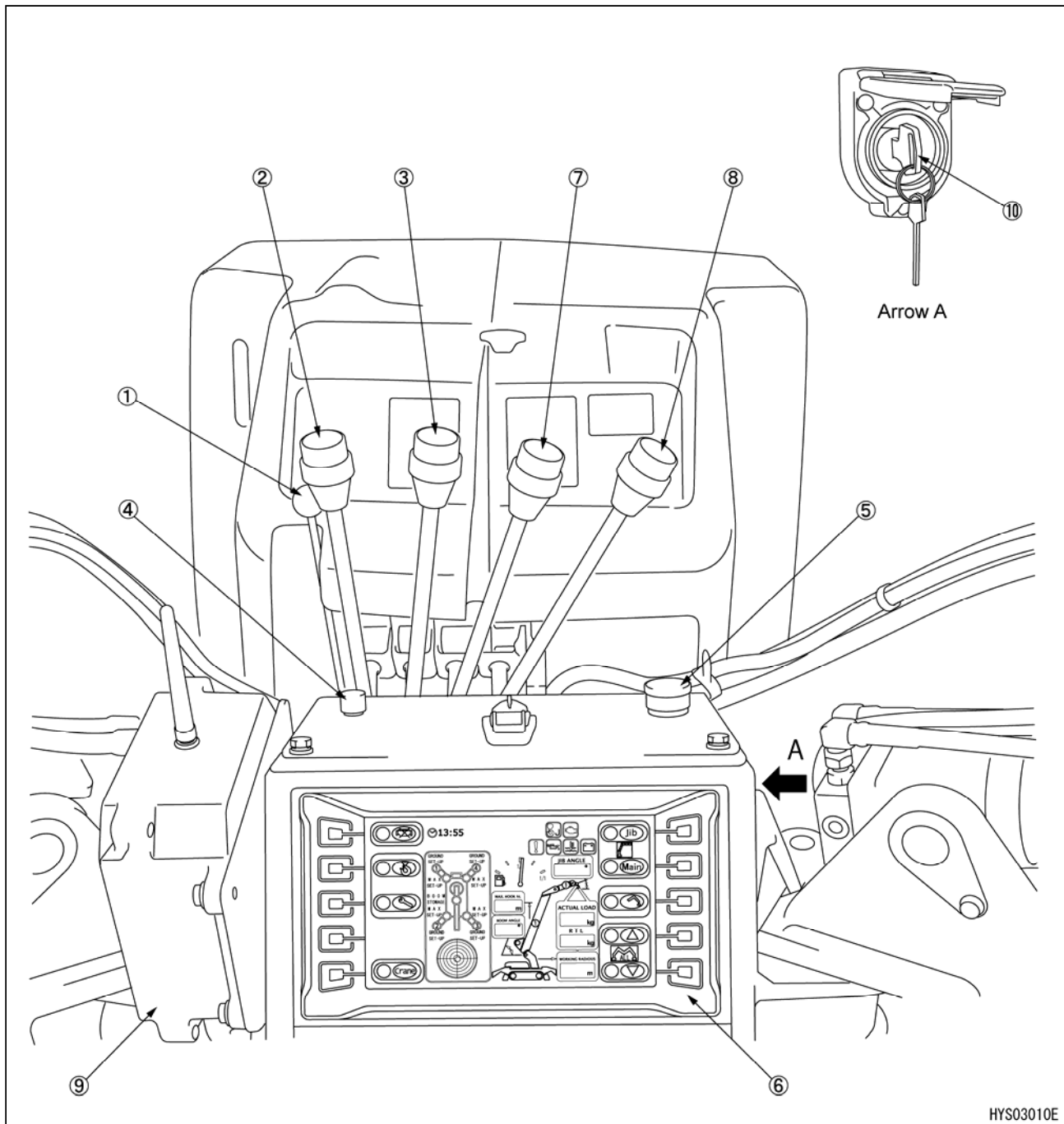
[2] PREHEAT LAMP (10)

This lamp lights up during preheat operation engine start time.

This lamp lights up when the starter switch is placed in the "Pre-heating" position and, after several seconds, turns off to indicate that the preheat is complete.



1.3 CRANE OPERATION UNITS



- | | |
|-------------------------------------|------------------------------------|
| (1) Accelerator lever | (7) Winch lever |
| (2) Slewing lever | (8) Main boom/jib Derricking lever |
| (3) Main boom/jib Telescoping lever | (9) Remote-control receiver |
| (4) Horn switch | (10) Emergency stop cancel switch |
| (5) Emergency stop switch | |
| (6) Monitor | |

1.3.1 LEVERS

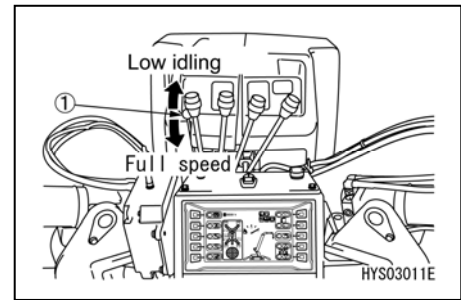
[1] ACCELERATOR LEVER (1)

Use this lever to adjust the engine speed or output.

- Low idling : Push the lever forward.
- Full speed : Pull the lever toward you.

NOTES

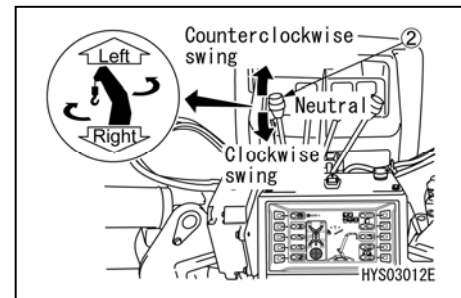
- At the desired engine speed for your work, release the lever. It will stop at that position.
- Accelerator lever is also provided on the travelling control unit.



[2] SLEWING LEVER (2)

Use the lever to slew the crane boom and post.

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



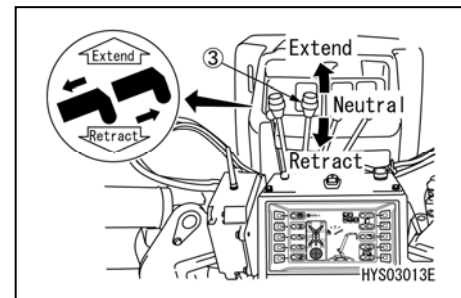
[3] MAIN BOOM/JIB TELESCOPING LEVER (3)

Use this lever for telescoping the crane main boom and jib.

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

NOTES

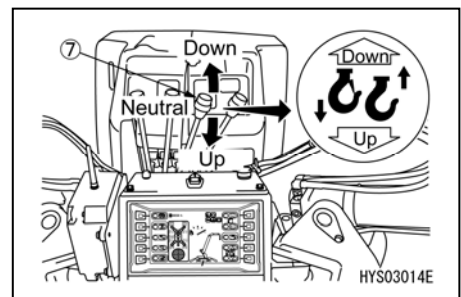
For details about change between the main boom and jib, refer to "OPERATION 1.5 MONITOR".



[4] WINCH LEVER (7) (Winch specification)

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

- Down : Push the lever forward (downward).
- Neutral : Release your hand from the lever.
The lever returns to the "Neutral" position and the brake is automatically applied. Thus, raising and lowering of the hook block is stopped.
- Up : Pull the lever toward you (upward).



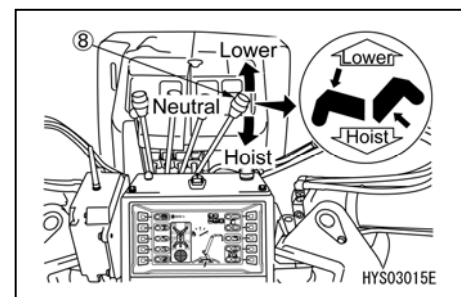
[5] MAIN BOOM/JIB DERRICKING LEVER (8)

Use this lever for derricking the crane main boom and jib.

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

NOTES

For details about change between the main boom and jib, refer to "OPERATION 1.5 MONITOR".



1.3.2 SWITCHES

[1] EMERGENCY STOP CANCEL SWITCH (10)

DANGER

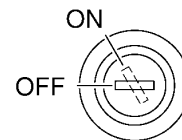
- Do not turn the emergency stop cancel switch to the “ON” (cancel) position except in a machine failure condition or when conducting a load test. When turning the emergency stop cancel switch to the “ON” (cancel) position, the safety device stops.
Any crane operation in such conditions will result in dropping of hoisted load, breakage of the crane boom, wire breakage caused by over-hoisting, and/or crane tipping due to over load, and may cause a serious accident resulting in death or serious injury.
If the emergency stop cancel switch is turned to the “ON” (cancel) position, the red light of the tri-colour lights blinks and a warning buzzer sounds intermittently.
Key for the switch must be detached during normal operations.

NOTES

Use the emergency stop cancel switch only in the case of an emergency or for inspection/maintenance (e.g. load test).

Open the cover when using the switch.

- ON (Cancel) : Insert the key into the switch. Turn the key clockwise and retain the key at that position. The activation stop function is canceled while the key is maintained at the ON position.
- OFF (Auto) : Insert the key into the switch and turn the key counterclockwise.
The activation stop functions.
The key can be removed or inserted at this position.



XAM19641

[2] HORN SWITCH (4)

Use this switch to honk the horn.

- Honking the horn: Press the switch.

NOTES

- The horn will stop when you release your finger from the switch.
- The horn switch is also provided on the travelling control unit.



HYS03007

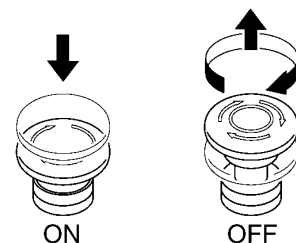
[3] EMERGENCY STOP SWITCH (5)

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

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

NOTES

When restarting the engine after an emergency stop, be sure to turn the emergency stop switch to the “OFF” position before starting the engine.



XAM21450

1.4 OUTRIGGER SAFETY DEVICES

1.4.1 FUNCTIONS OF OUTRIGGER SAFETY DEVICES

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

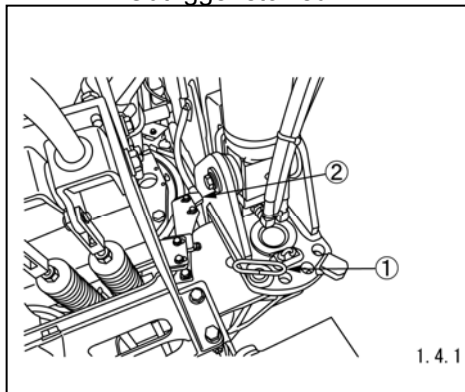
For the names of each outrigger component, refer to “OPERATION 2.12 [1] OUTRIGGER COMPONENTS”.

	Interlock Function	Description
1	Outrigger Interlock	<p>The outriggers cannot be operated unless the outrigger rotary is rotated to the extension side (outward) with the main boom and jib stowed (lowered and contracted to the maximum, and slewed and stowed).</p> <p>Being stowed is as follows:</p> <ul style="list-style-type: none">• Lowered to the maximum : The main boom and jib are lowered to the maximum.• Retracted to the maximum : The main boom and jib retract to the maximum.• Slew and stowed : The main boom and jib are placed at the slew and stowing position. <p>The rotary extension side is detected for each outrigger by using the detection switch of the frame.</p>
2	Crane Interlock	<p>Set up the outriggers so that the following conditions will be satisfied regarding the maximum outrigger extension lamps: two or more adjacent lamps do not turn on in green or red; and all the outrigger ground lamps (3) turn on in green. In addition, keep the vehicle body placed horizontally. No crane operations can be performed unless the crane mode button on the monitor is pressed in this state.</p> <p>If the above conditions are not satisfied, the crane mode button does not work. For the maximum outrigger extension lamps, refer to “OPERATION 1.4.2. [2] OUTRIGGER EXTENSION AND SLEWING CONTROL LAMPS”.</p>

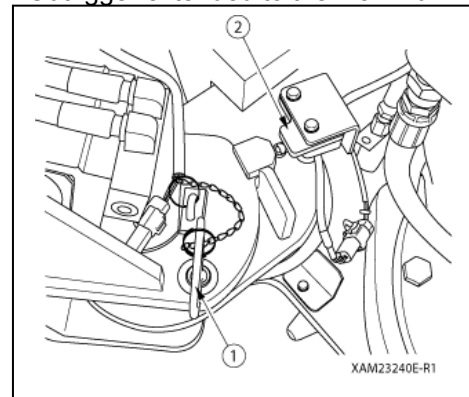
CAUTION

- During crane operation, if, of the 4 outriggers, the ground detection conditions of the outriggers adjacent to each other are not met, the buzzer sounds continuously, the yellow and red lights of the tri-colour lights blink, the crane interlock function is activated and crane work cannot be performed.
- If the crane is stowed, the setting operation and stowage operation of the outriggers are enabled.
- If the crane operation is not enabled even after the outriggers are extended and set, there may be faulty adjustment or failure in the outrigger safety devices.
Ask us or our sales service agency for repair.
- If the setting operation and stowage operation of the outriggers are not enabled even after the crane is stowed, there may be faulty adjustment or failure in the outrigger safety devices. Ask us or our sales service agency for repair.
- Insert the outrigger position pins securely.

Outrigger stowed

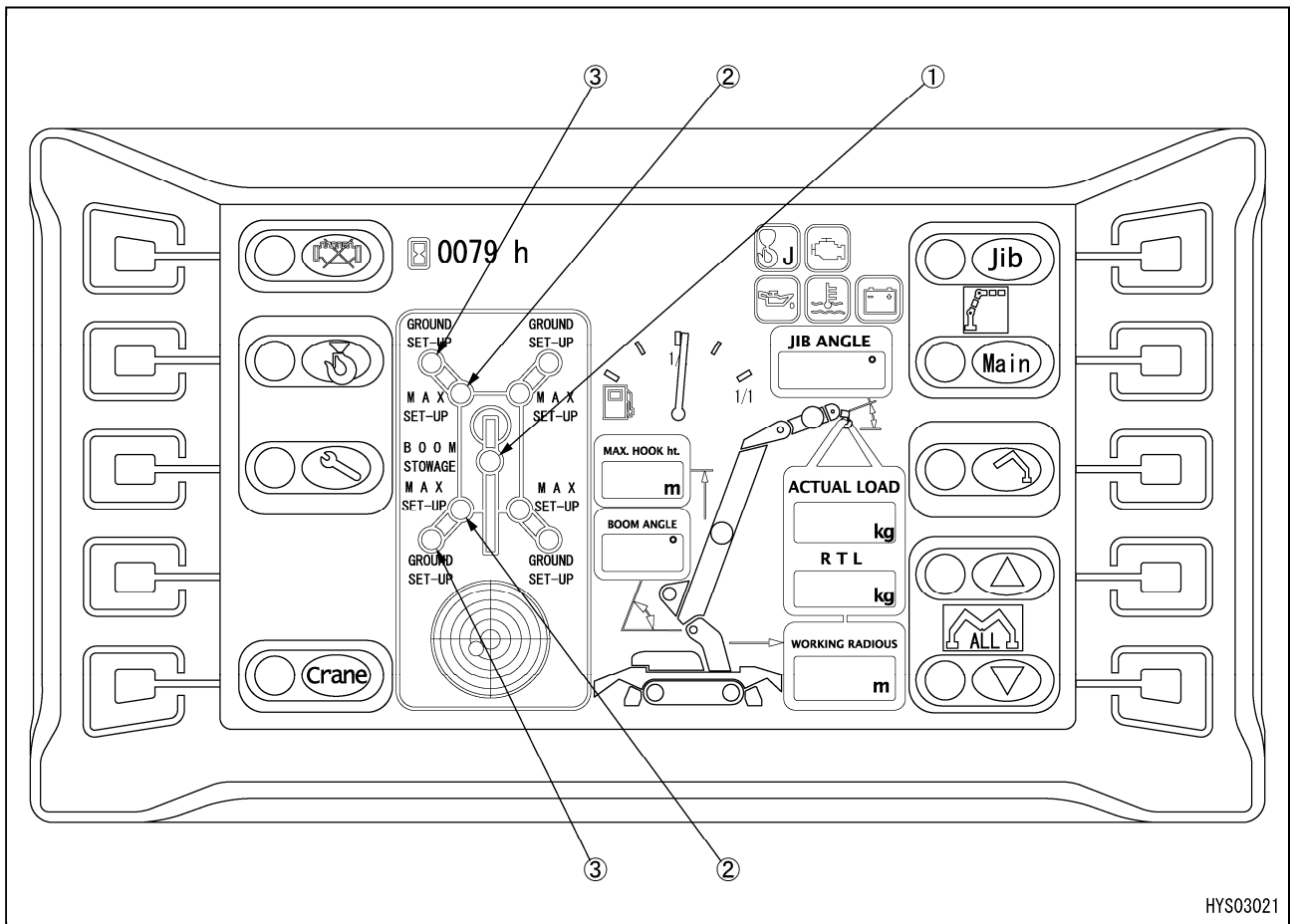


Outrigger extended to the maximum



- (1) Positioning pin
(2) Detection switch

1.4.2 NAMES AND DESCRIPTIONS OF OUTRIGGER DISPLAY



HYS03021

- (1) Main boom/jib stowing lamp
- (2) Maximum outrigger extension lamp
- (3) Outrigger grounding lamp

⚠ WARNING

- Do not remove, disassemble, or repair detection switches. Do not move the detection switches from the original location to another.
- If you hit detection switches or find damage to the detection switches, be sure to check the ON/OFF operation of the lamps on the outrigger display and operation of the crane interlock function and outrigger interlock function. If you find any error, ask us or our sales service agency for repair.
- When setting the outriggers, check that position pins are properly inserted before use.

[1] MAIN BOOM/JIB STOWING LAMP

This lamp turns on to indicate that the main boom/jib are stowed. The main boom/jib stowing lamp turns on and off in accordance with the following two types of detection switches. (When both of the detection switches detect simultaneously.)

(1) [Detection of stowing in the main boom slewing direction]

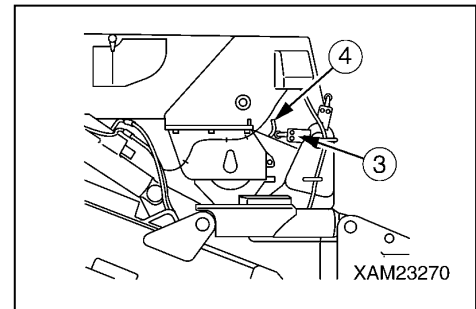
The lamp blinks when the main boom stops at the slew and stowing position and turns off when it leaves there.

Main boom movements are detected by the potentiometer on upper part of rotary joint.

(2) [Detection of stowing in the main boom horizontal direction]

The lamp turns on in green when the main boom stops at the horizontal stowing position and blinks in green when it leaves there.

Main 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.

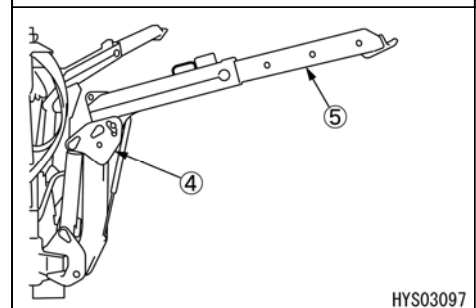
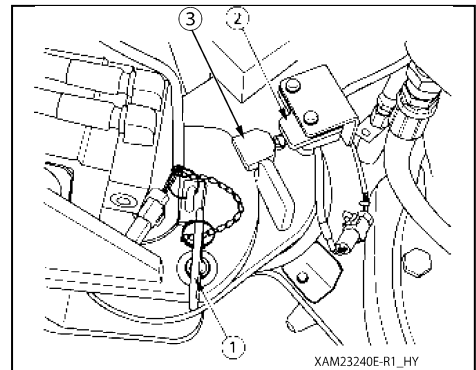


[2] OUTRIGGER EXTENSION AND SLEWING CONTROL LAMPS (CHANGE TO GREEN/YELLOW/RED)

This lamp turns on to indicate that the rotary of the outrigger rotary is at the maximum extended position.

Slew the rotary outward so that the outrigger can be extended out. Insert the position pin (1) securely in the position where the rotary projection (3) presses the detection switch (2).

In addition, open the outrigger base (4) up to the maximum position, and stretch the inner box (5) up to the maximum position.



In the position where all these conditions are satisfied, the lamp turns on in green with the outrigger placed at the maximum extended position.

In addition, the outrigger extended and slewing control states are indicated by the lamp on pattern.

On, green : Indicates that the outrigger is at the maximum extended position. Slewing is possible in the 90-degree range including the outrigger.

On, yellow : Indicates that the outrigger rotary is at the standard extended angle and the length of the inner box is not the maximum. Slewing is possible in the 90-degree range including the outrigger. However if No.1 and 2 outriggers or No. 3 and 4 outriggers lamps are on red and yellow combination, slewing is impossible in the 90-degree range including the yellow lamp outrigger. If even one outrigger is indicated as this condition, work should be performed in accordance with the values in “Rated Total Load Table for Outrigger Minimum Extension”.

Blink, yellow : Indicates that the outrigger stands still due to slewing control in the direction of the outrigger whose lamp is blinkin in yellow. Avoid it by slewing to the opposite direction.

On, red : Indicates that the outrigger rotary is of multi type, except standard extension angle. Slewing is impossible in the 90-degree range including the outrigger.

Blink, red : Indicates that the outrigger stands still due to slewing control in the direction of the outrigger whose lamp is blinking in red. Avoid it by slewing to the opposite direction.

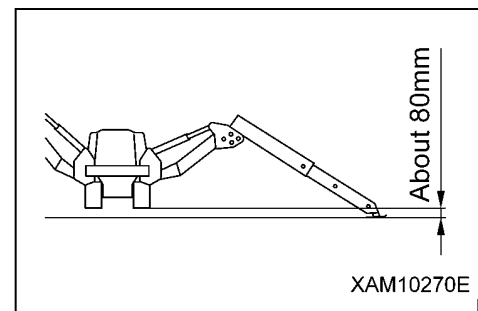
[3] OUTRIGGER GROUNDING LAMP (CHANGES TO GREEN/RED)

This lamp turns on and indicates that the outriggers are set.

The lamp lights up in green when the outrigger tray is set and blinks in red when the tray floats (stowed).

The conditions of the outrigger trays are detected by the detection switch at the base of the outrigger cylinder.

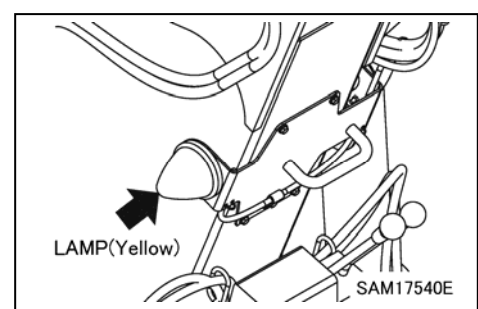
The crane mode cannot be entered unless all the outriggers are indicated by a lamp that is on in green. If the lamps of two or more adjacent outriggers turn on in red during the crane mode, the crane operation is disabled, except the main boom telescoping and winch winding-down operations. Even if a lamp has turned on in green, the outrigger may be left lifted a little. Thus, by swinging the outrigger by hand, check that it has set up securely on the ground, before entering the crane mode.



1.4.3 OUTRIGGER NOT INSTALLED WARNING

When not in travelling mode, the yellow light of the tri-colour lights blinks unless one or more of the outriggers are installed.

NOTES
The outrigger not installed warning is linked with the outrigger ground detection of the moment limiter, so if two or more adjacent outriggers are not installed, the red light also flashes at the same time.

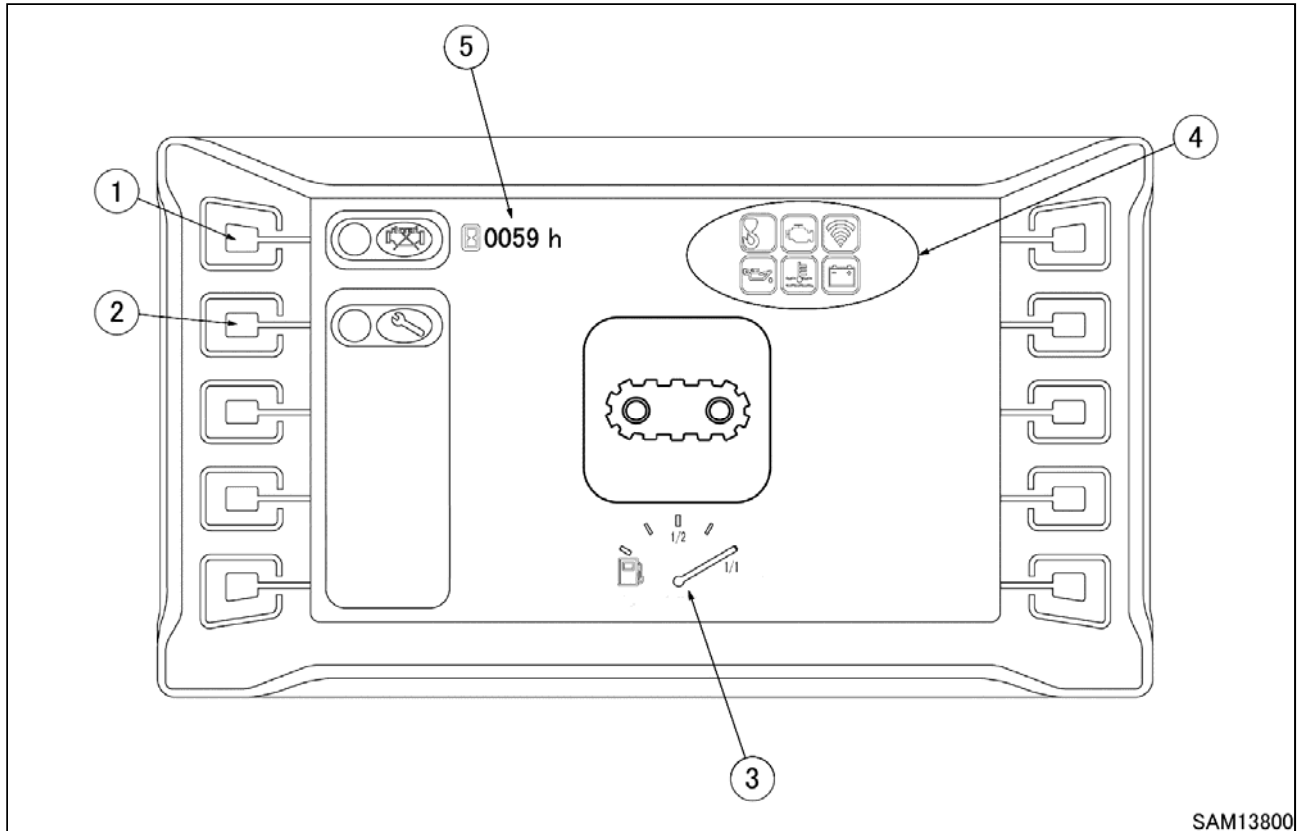


1.5 MONITOR

The display can be changed to the travelling mode screen by turning ON the main starter switch when the outrigger has been stowed.

Before operating the monitor, place them in a state other than stowing.

[Travelling mode display]



- (1) Auxiliary starter button
- (2) Service screen selector button
- (3) Fuel gauge

- (4) Engine/crane monitor display
- (5) Hour meter/clock display

1.5.1 MONITOR DISPLAY PARTS

The monitor has five modes:

Monitor 1 : Home screen (page 3-20)

Monitor 2 : Outrigger individual operation screen (page 3-28)

Monitor 3 : Hook selection screen (page 3-30)

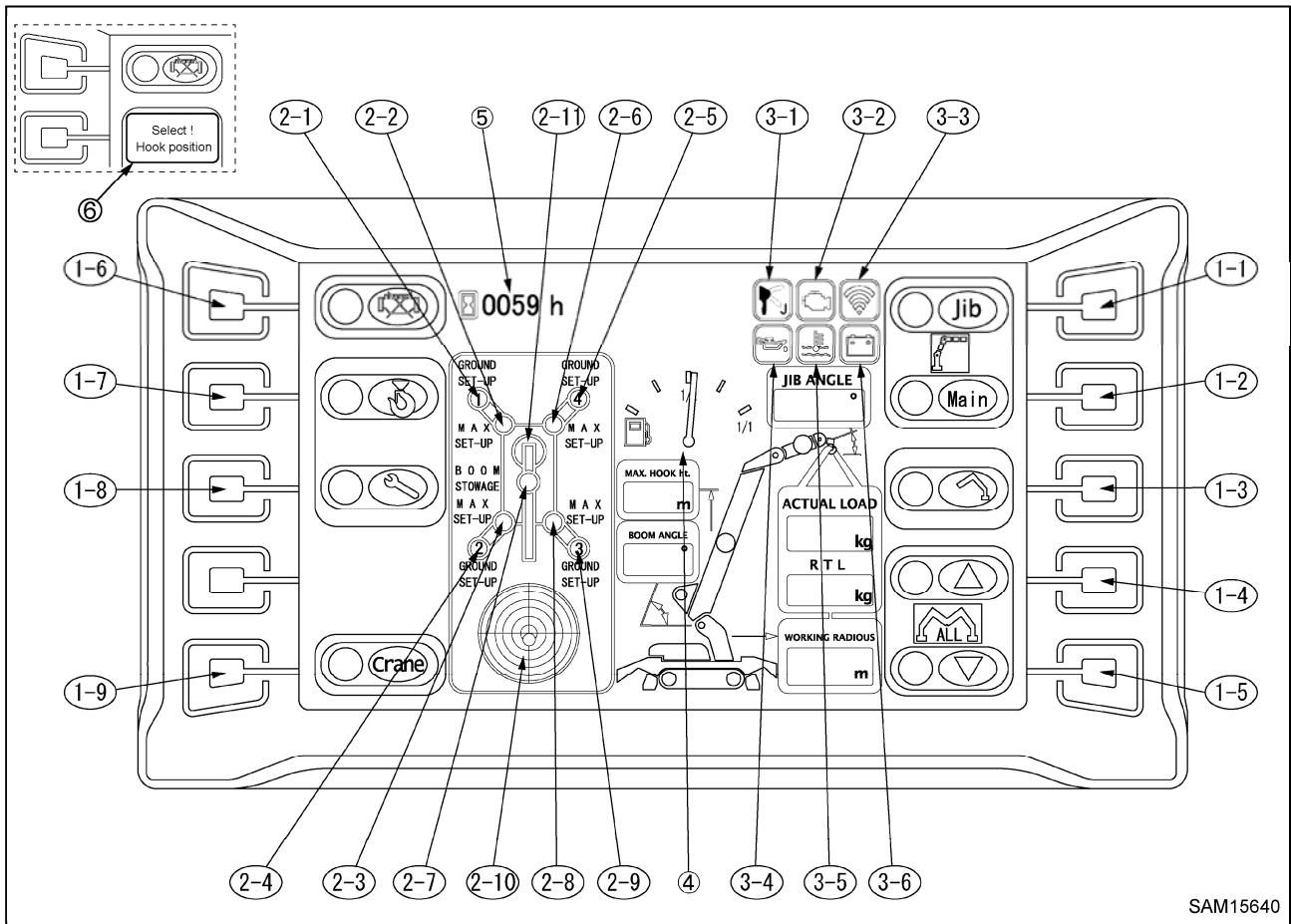
Monitor 4 : Service screen (page 3-32)

Display setting screen (page 3-34)

Monitor 5 : Service screen 2 (page 3-38)

[1] MONITOR 1: HOME SCREEN

When the main starter switch is turned "ON" to extend the outrigger, the monitor displays the following screen:



(1) Selector button

- (1-1) Jib selector button
- (1-2) Main boom selector button
- (1-3) Individual outrigger operation selector button
- (1-4) Collective outrigger (ON) button
- (1-5) Collective outrigger (OFF) button
- (1-6) Auxiliary starter button
- (1-7) Winch setting screen selector button
- (1-8) Service screen selector button
- (1-9) Crane mode button

(2) Outrigger setting/Levelling instrument display

- (2-1) No. 1 outrigger setting lamp
- (2-2) No. 1 outrigger extension lamp (MAX)
- (2-3) No. 2 outrigger extension lamp (MAX)
- (2-4) No. 2 outrigger setting lamp
- (2-5) No. 4 outrigger setting lamp
- (2-6) No. 4 outrigger extension lamp (MAX)
- (2-7) Jib and main boom stowage lamp
- (2-8) No. 3 outrigger extension lamp (MAX)
- (2-9) No. 3 outrigger setting lamp
- (2-10) Levelling instrument
- (2-11) Main boom slewing position lamp

(3) Engine/crane monitor display

- (3-1) Hook mode display
- (3-2) Engine/electric motor mode display
- (3-3) Remote control mode display
- (3-4) Engine oil pressure abnormality display
- (3-5) Engine water temperature abnormality display
- (3-6) Charge abnormality display

(4) Fuel gauge

(5) Hour meter/clock display

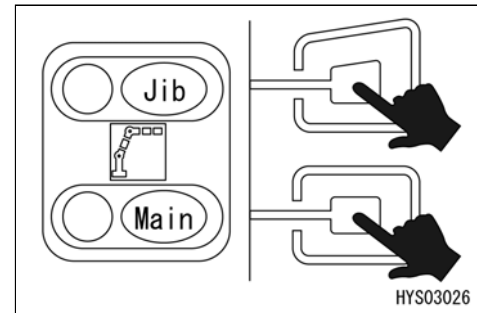
(6) Fixed hook caution display

(1) Selector button

(1-1) Jib selector button

Use this switch to change between the jib and main boom.

When “Jib selector button” is pressed, the display on the left turns from blue to green and the jib is selected.



(1-2) Main boom selector button

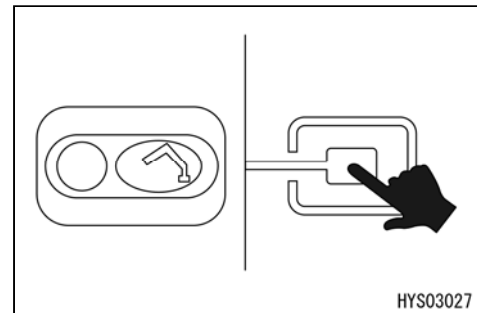
Use this switch to change between the main boom and jib.

When “Main boom selector button” is pressed, the display on the left turns from blue to green and the main boom is selected.

(1-3) Individual outrigger operation selector button

Use this button to change to the outrigger individual operation mode.

When “Individual outrigger operation selector switch” is pressed, the display changes to the individual outrigger operation screen of Monitor 2 (page 3-28).

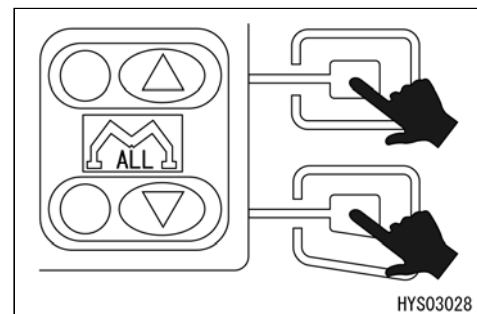


(1-4) Collective outrigger (ON) button

Use this switch to operate the 4 outriggers simultaneously.

When “Collective outrigger (ON) button” is pressed, the four outrigger cylinders contract simultaneously and the outriggers can be stowed.

When you release your finger from the button, the outrigger cylinders stop.



(1-5) Collective outrigger (OUT) button

Use this switch to operate the 4 outriggers simultaneously.

When “Collective outrigger (OUT) switch” is pressed, the four outrigger cylinders extend simultaneously and the outriggers can be set.

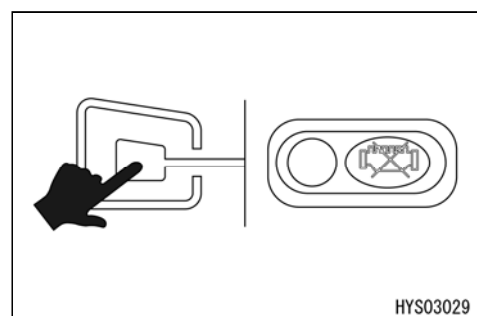
When you release your finger from the button, the outrigger cylinders stop.

(1-6) Auxiliary starter button

Use this switch to start and stop the engine.

- Start: When the auxiliary starter switch is pressed with the engine stopped while the circle on the left is green, the engine starts. After starting, release your finger from the button.
- The circle on the left to the auxiliary button of the monitor panel changes to red.
- Stop: When the auxiliary starter switch is pressed during operation of the engine while the circle on the left is red, the engine stops.

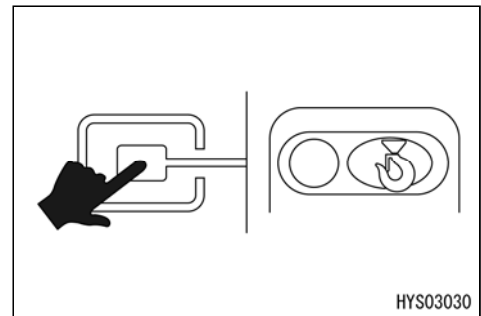
Do not release your finger from the button until the engine stops.



(1-7) Winch setting screen selector button

Use this button to change the display to the screen with which to set the winch condition (fixed or single fall hook).

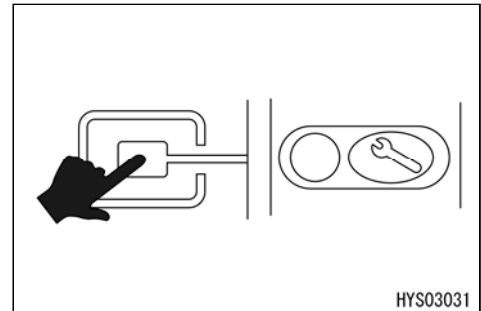
Refer to “OPERATOIN 1.5.1 [3] MONITOR 3:HOOK SELECTOR SCREEN ” for setting contents.



(1-8) Service screen selector button

Use this switch to display the service content.

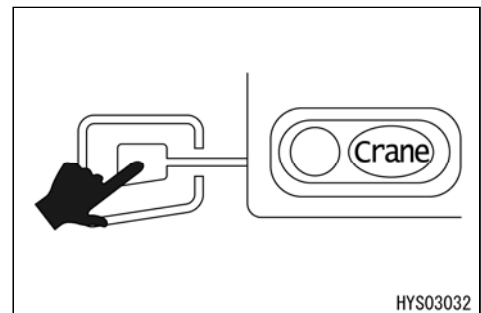
When “Service screen selector button” is pressed, the screen is changed to the service screen of Monitor 4 (page 3-32).



(1-9) Crane mode button

Use this button to change to the crane mode.

Set up the outrigger securely by referring to “OPERATION 2.12 OUTRIGGER SETUP OPERATION”. Then, press the “crane mode” button. After the circle on the left turns from red to green and the mode changes to crane, the crane comes ready for operation.



(2) Outrigger setting/Levelling instrument display

⚠ WARNING

- Do not remove, disassemble, or repair detection switches. Do not move the detection switches from the original location to another.
- If you hit detection switches or find damage to the detection switches, be sure to check the ON/OFF operation of the lamps on the outrigger display and operation of the crane interlock function and outrigger interlock function. If you find any error, ask us or our sales service agency for repair.
- When setting the outriggers, check that position pins are properly inserted before use.

(2-1), (2-4), (2-9), and (2-5) outrigger setting lamps

This lamp turns on and indicates that the outriggers are set.

The lamp lights up in green when the outrigger tray sets, and blinks in red when the tray floats (stowed).

The conditions of the outrigger trays are detected by the detection switch at the base of the outrigger cylinder.

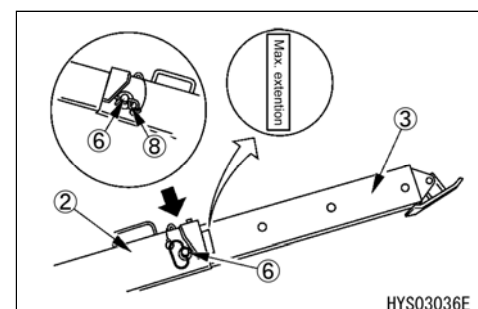
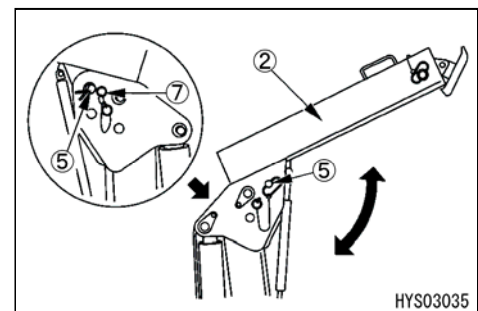
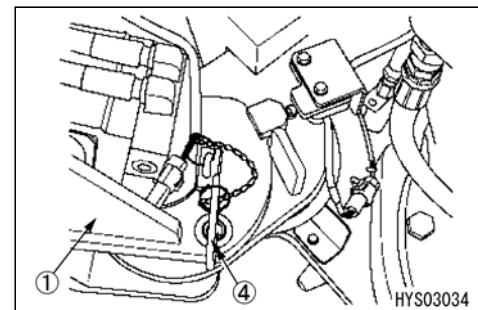
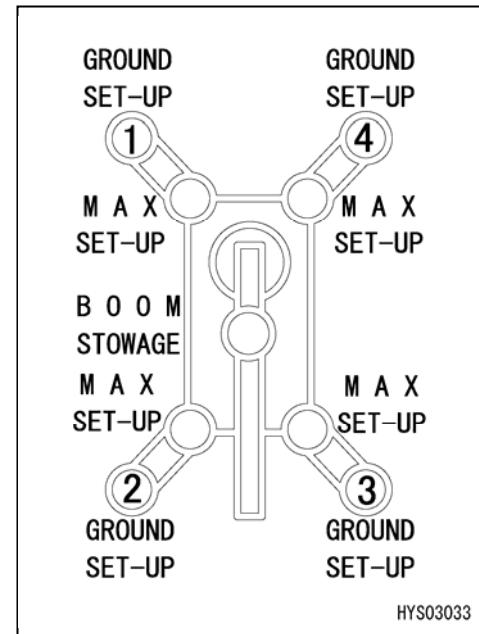
(2-2), (2-3), (2-8), and (2-6) outrigger extension lamps (max)

This lamp turns on to indicate that No. 1 outrigger rotary (1), top box (2) and inner box (3) are at the maximum position.

The extension lamp lights up in green when the No. 1 outrigger is set to the maximum and lights up in red when it is set to other position.

The conditions of the outrigger maximum extension are detected by respective detection buttons.

Be sure to insert set position pins (4), (5) and (6) and use snap pins (7) and (8) as a retainer.



(2-7) Main boom/jib stowing lamp

This lamp turns on to indicate that the main boom/jib are stowed.

The main boom/jib stowing lamp turns on and off in accordance with the following two types of detection switches. (When both of the detection switches detect simultaneously.)

(1) [Detection of stowing in the main boom slewing direction]

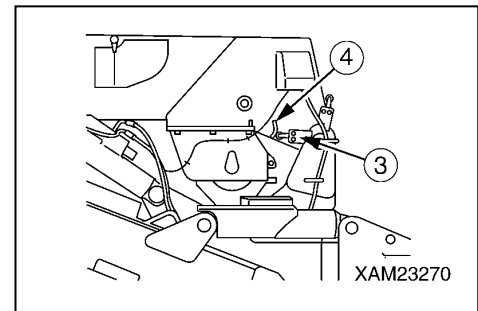
The lamp blinks when the main boom stops at the slew and stowing position and turns off when it leaves there.

Main boom movements are detected by the potentiometer on upper part of rotary joint.

(2) [Detection of stowing in the main boom horizontal direction]

The lamp turns on in green when the main boom stops at the horizontal stowing position and blinks in green when it leaves there.

Main 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.



(2-10) Levelling instrument

WARNING

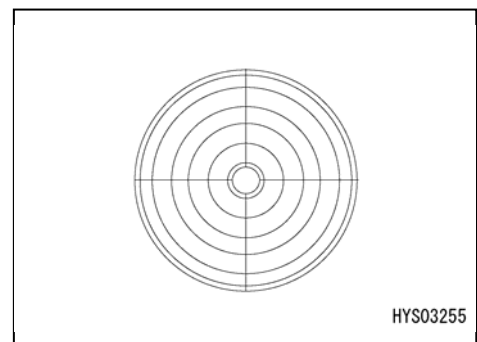
When setting the outriggers, make adjustments while watching the levelling instrument so that the machine is in a horizontal condition.

If crane operation is performed with the machine tilted, tripping may be caused.

This displays an inclination status of the machine.

The inclination and direction of the machine can be determined from the position of the yellow circle.

Use this to check whether the machine is in a horizontal condition when setting the outriggers.



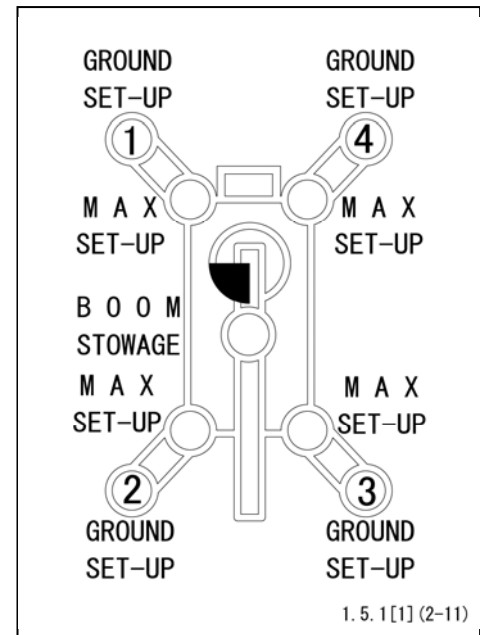
(2-11) Main boom slewing position lamp

This lamp turns on to indicate the position where the main boom is slewing.

Upon slewing of the main boom, out of the four divided lamps, the one in the slewing direction turns blue.

The main boom slewing position is detected by the potentiometer on upper part of rotary joint.

NOTES
When the main boom is in the stowing direction, the entire main boom slewing position lamp turns off.



(3) Engine/crane monitor display

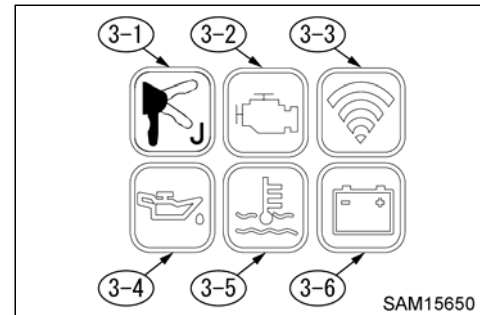
(3-1) Hook mode display

The hook condition (fixed or single fall hook) is displayed.

J : The condition is set to the fixed hook specification.

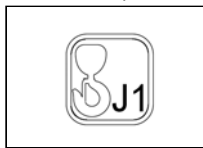
Display changes in 3 patterns depending on fixed hook position.

To change the setting, use the hook selector button on the monitor 3 (hook screen) screen.



J1 : The condition is set to the wire single fall specification.

To change the setting, use the hook selector button on Monitor 3 (hook screen).



(3-2) Engine/electric motor mode display

Engine symbol: Displayed when the engine is available.

Electric operation symbol: Displayed when electric operation is available.

(3-3) Remote control mode display

The remote control symbol is displayed when remote control operations are enabled.

(3-4) Engine oil pressure abnormality display

Indicates a drop in engine oil pressure.

It is normal if the monitor lights up when the main starter switch is turned "ON" and comes off as engine speed increases after engine start.

If the monitor lights up during operation, engine oil pressure is dropping.

Stop the operation immediately, and check the engine oil filter for clogging and the engine lubricant quantity.

(3-5) Engine water temperature abnormality display

Indicates an abnormality of engine coolant temperature.

It is normal if the monitor remains OFF during operation.

Engine coolant temperature is exceeding the normal value if the monitor lights up during operation.

Set the engine speed to low idle immediately and wait until the monitor goes OFF (engine coolant temperature drops).

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

(3-6) Charge abnormality display

Indicates an abnormality of the charging system.

It is normal if the monitor lights up when the main starter button is turned "ON" and comes off as engine speed increases after engine start.

The charging system has an error if the monitor lights up during operation.

Stop the operation immediately. Then, check the tension of the alternator belt, the battery and alternator output voltages, and others.

(4) Fuel gauge

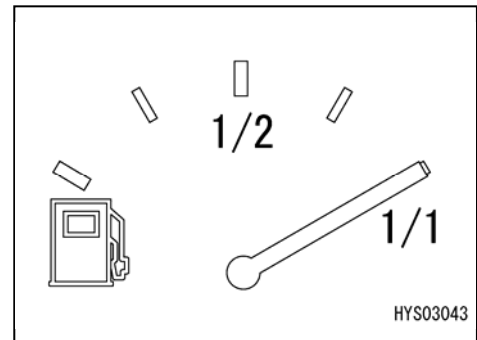
Displays the remaining amount of fuel in the tank.

The gauge displays the remaining amount of fuel when the main starter switch is turned "ON".

If the amount of fuel has decreased on the gauge during operation, stop the operation immediately and replenish fuel.

NOTES

- Fill the fuel tank to full at the end of work for the day.
- Even if the starter switch is turned "ON", a regular remaining amount is not displayed for a while in some cases, but this is not an error.



(5) Hour meter/clock display

Displays total operation hours of the machine.

Use this value as a reference for periodical check intervals.

When the engine is running, the meter indication advances even if the machine is not operated.

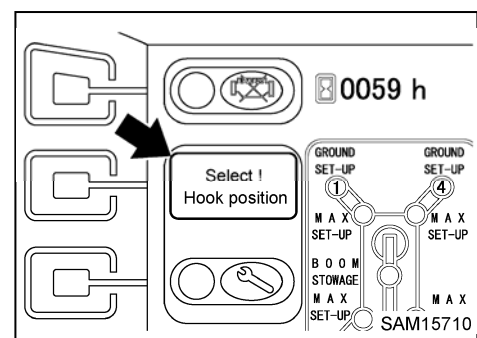
The meter indication advances "1" when the machine has been running for 1 hour regardless of the engine rotation speed.

For details about change between the hour meter and clock, see "(7) Display setting screen button (page 3-34)".



(6) Fixed hook caution display

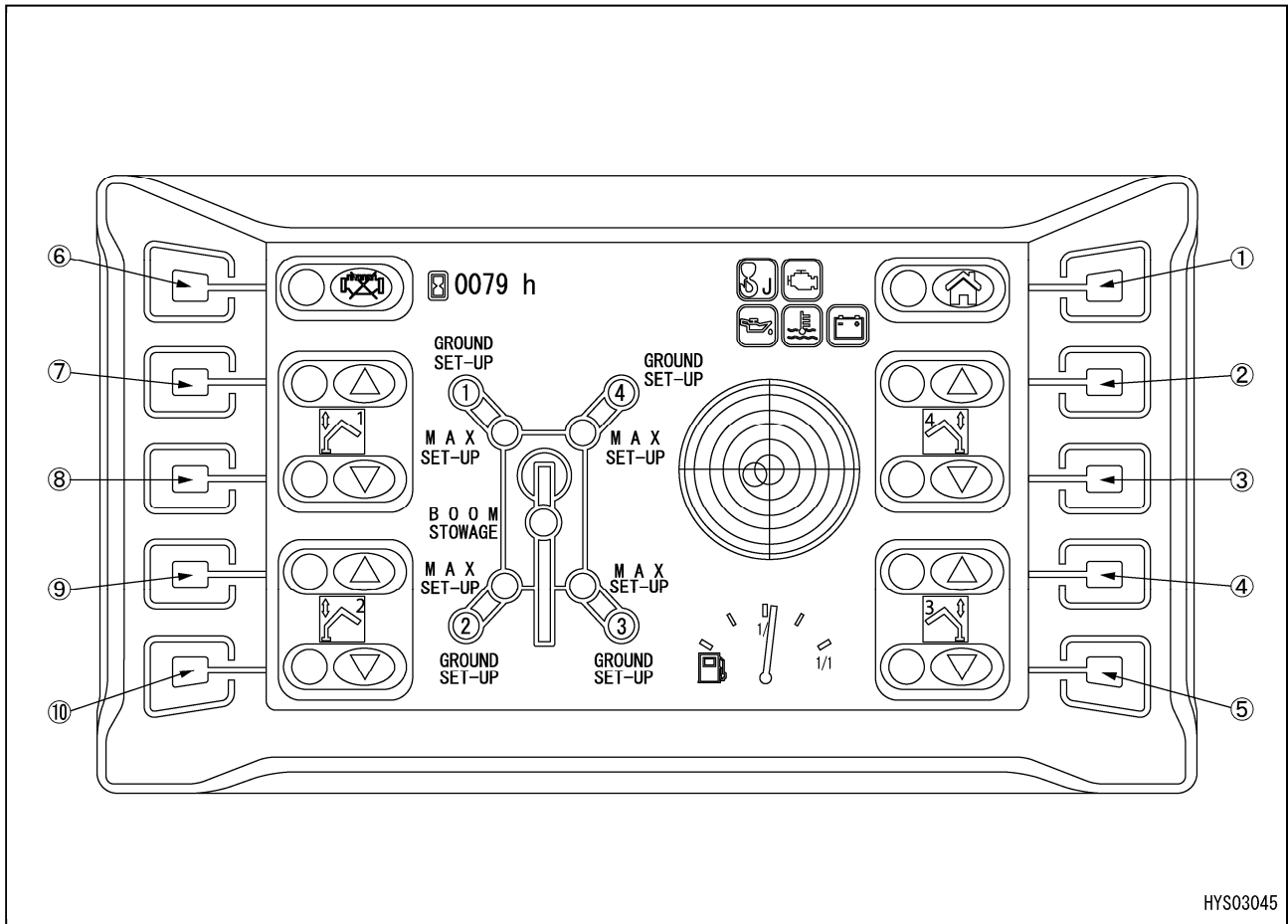
When fixed hook is selected and then return to home, message of "Select! Hook position" appears in blinking all times. If actual position of fixed hook matches, crane can be used safely even the message is shown.



[2] MONITOR 2: OUTRIGGER INDIVIDUAL OPERATION SCREEN

When “Individual outrigger operation selector switch” on the Monitor 1 screen is pressed, the outrigger individual operation screen (figure below) is displayed.

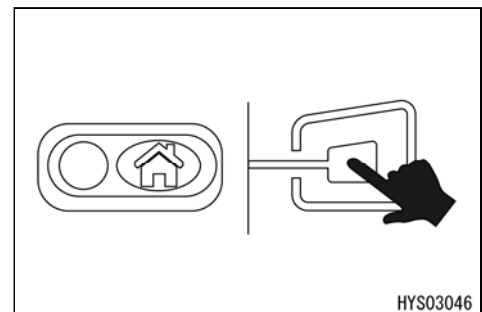
When the home button on the upper right is pressed, the screen returns to Monitor 1 (home screen (page 3-20)).



- | | |
|----------------------------------|-----------------------------------|
| (1) Home button | (6) Auxiliary starter button |
| (2) No. 4 outrigger (IN) button | (7) No. 1 outrigger (IN) button |
| (3) No. 4 outrigger (OUT) button | (8) No. 1 outrigger (OUT) button |
| (4) No. 3 outrigger (IN) button | (9) No. 2 outrigger (IN) button |
| (5) No. 3 outrigger (OUT) button | (10) No. 2 outrigger (OUT) button |

- (1) Home button

When “Home button” is pressed, the screen returns to the Monitor 1 screen (home screen).

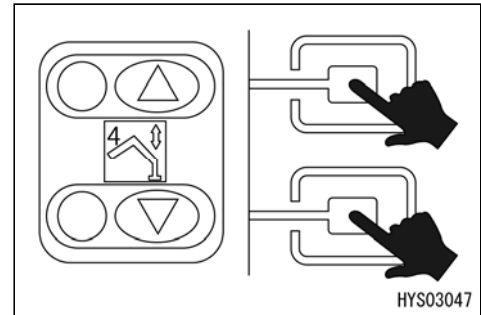


(2), (4), (7), and (9) outrigger (IN) buttons

Use these buttons to stow the outriggers.

When the outrigger (IN) button is pressed, the outrigger cylinders contract and the outriggers can be stowed.

When you release your finger from the button, the outrigger cylinders stop.



(3), (5), (8), and (10) outrigger (OUT) buttons

Use these buttons to set up the outriggers.

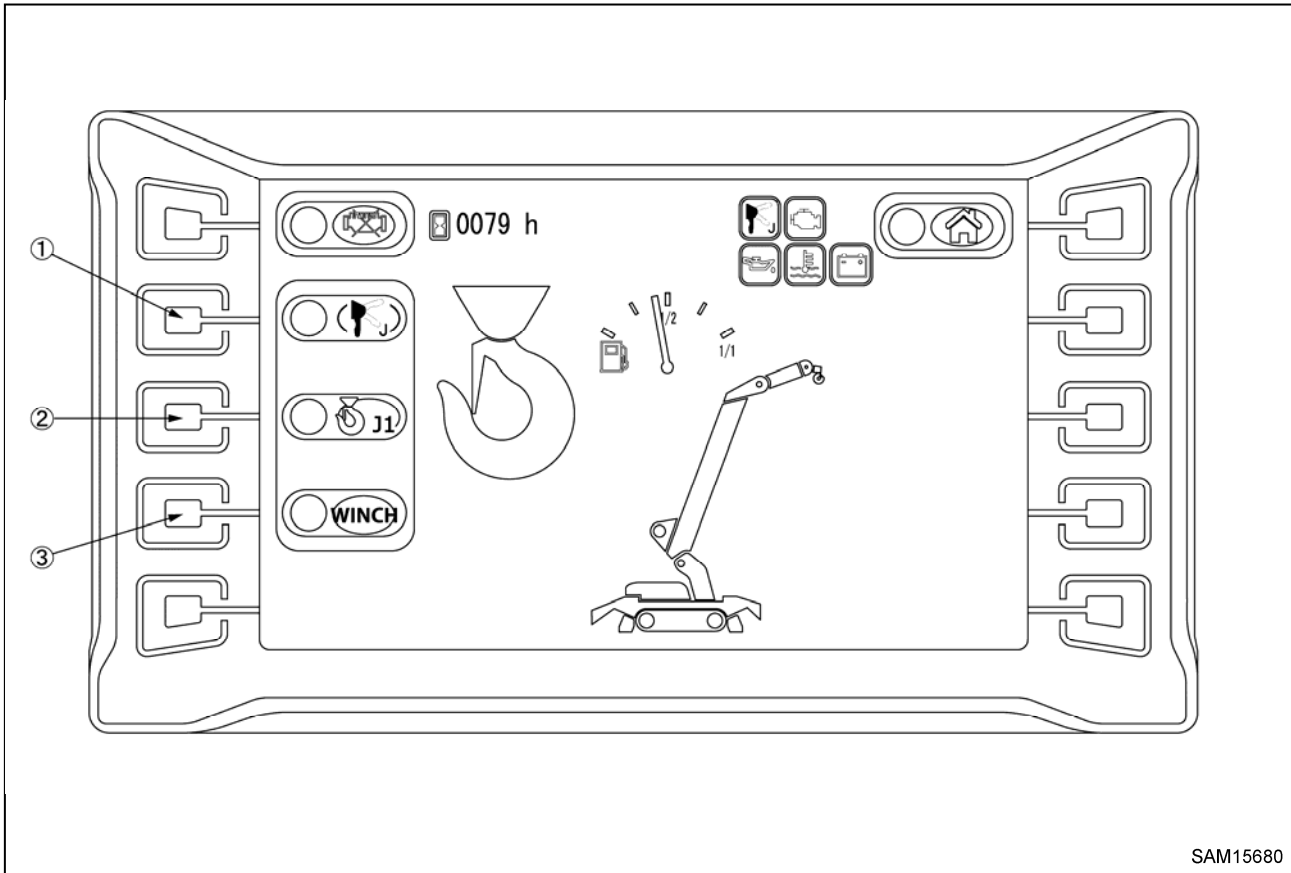
When the “outrigger (OUT) button” is pressed, the outrigger cylinders extend and the outriggers can be stowed.

When you release your finger from the button, the outrigger cylinders stop.

[3] MONITOR 3: HOOK SELECTOR SCREEN

When “Winch setting screen selector button” on the Monitor 1 screen is pressed, the winch selector screen (the figure below) is displayed.

When the home button on the upper right is pressed, the screen returns to the Monitor 1 screen (home screen).

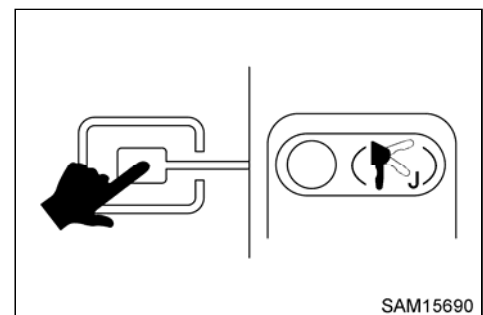
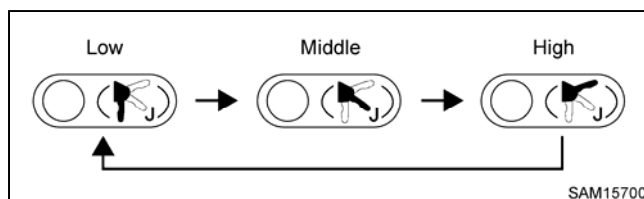


- (1) Fixed hook selector button
- (2) Wire single fall selector button
- (3) Winch installation selector button

(1) Fixed hook selector button

When “Fixed hook selector button” is pressed, the condition is set to the fixed hook specification.

Set position of fixed hook. Display of position changes by pressing select button (1).



No winch operation can be performed.

Even if the condition is set to the fixed hook specification, select “Winch” with the winch installation selector button of (3) when the winch unit is installed on the boom.

When the setting is completed, press the home button to return to the monitor 1 (home screen) screen.

When fixed hook is selected and then return to home, message of “Select! Hook position” appears in blinking all times. If actual position of fixed hook matches, crane can be used safely even the message is shown.

! WARNING

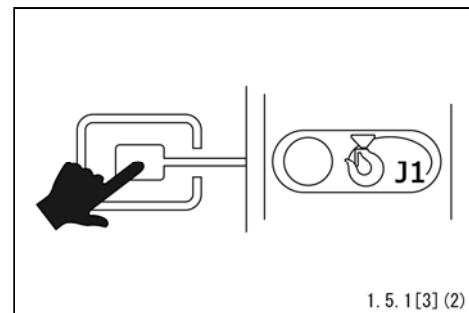
If crane is operated with setting of fixed hook position not matched to actual position, crane may tip.

(2) Wire single fall selector button

When the “Wire single fall selector button” is pressed, the mode is set to the wire single fall specification.

“Winch installation selector button” is also automatically selected and winch operation becomes possible.

When the setting is completed, press the home button to return to the monitor 1 (home screen) screen.

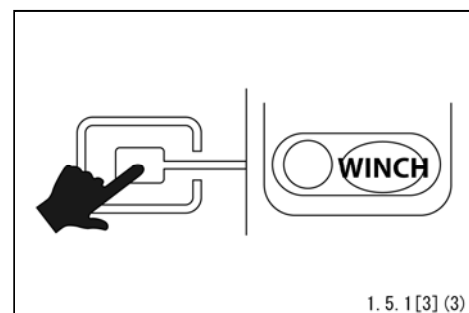


(3) Winch installation selector button

Pressing the “Winch installation selector button” turns the blue circle on the left to green and the moment limiter considers the weight of the winch unit.

Even if the winch is not used with the fixed hook specification selected, always select this mode when the winch unit is installed on the boom. (Green)

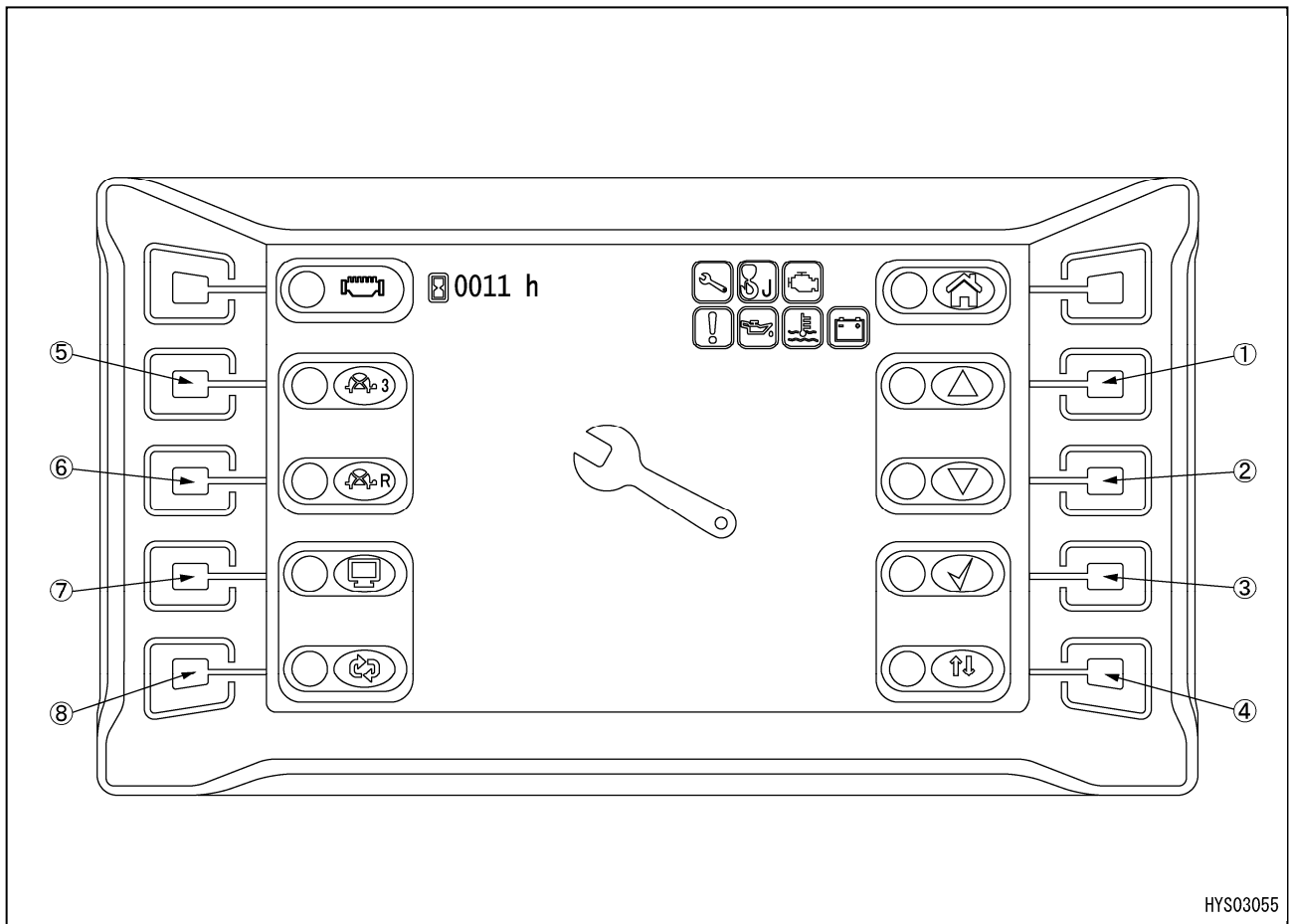
When the winch has not been installed to the boom, be sure to leave this button unselected. (Blue)



[4] MONITOR 4: SERVICE SCREEN

When the “Service screen selector button” is pressed on the Monitor 1 screen, the service screen is displayed as shown below.

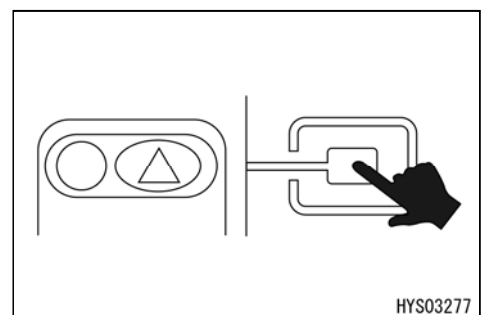
When the home button on the upper right is pressed, the screen returns to the Monitor 1 screen (home screen).



- | | |
|----------------------------|-------------------------------------|
| (1) Cursor move button (▲) | (5) Micro speed 3 setting button |
| (2) Cursor move button (▼) | (6) Micro speed 3 reset button |
| (3) Set/OK button | (7) Display setting screen button |
| (4) Page change button | (8) Replacement part confirm button |

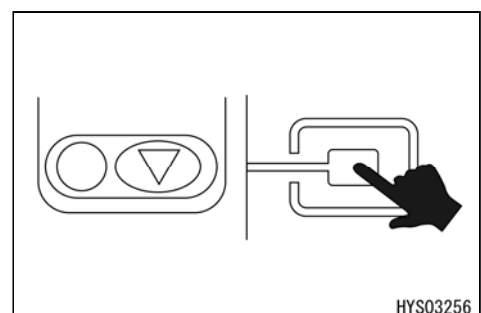
(1) Cursor move button (▲)

When cursor move button (▲) is pressed, the cursor moves one step up or to the left.



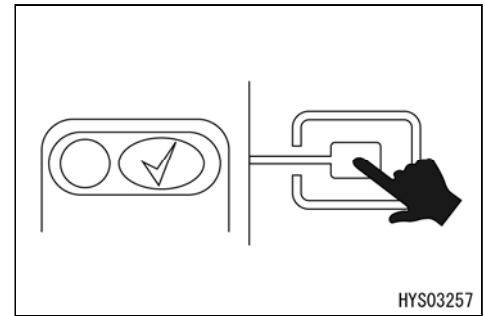
(2) Cursor move button (▼)

When cursor move button (▼) is pressed, the cursor moves one step down or to the right.



(3) Set/OK button

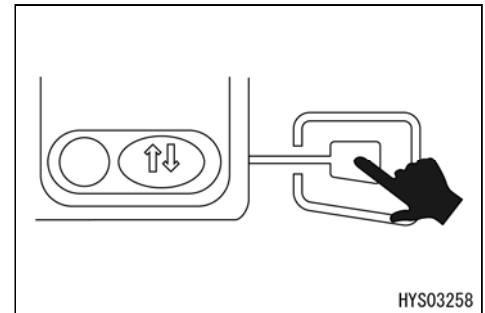
By pressing the Set/OK button, the item indicated by the cursor can be set and determined.



(4) Page change button

When the Page change button is pressed, the display changes to the next page if any.

When this button is pressed on the last page, the display changes to the first page.

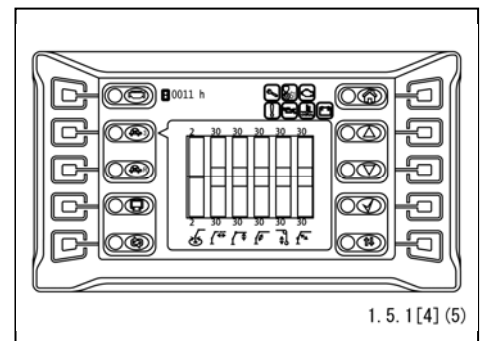
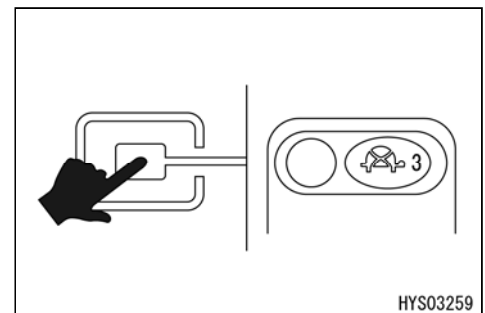


(5) Micro speed 3 setting button

When this button is pressed, the micro speed 3 setting screen is displayed.

Move the cursor (▲ or ▼) to the desired item to set, and press the Set/OK button. The speed for that item can be set.

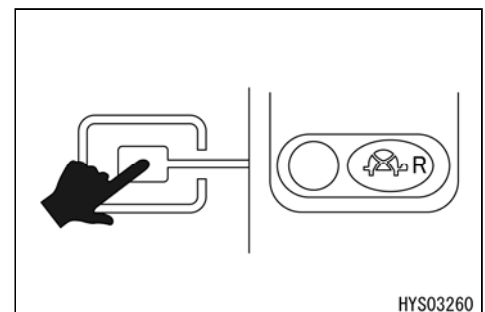
Adjust the speed optionally by referring to "REMOTE CONTROL 4.3 DESCRIPTION OF COMPONENTS OF THE TRANSMITTER [9] ACCELERATION DIAL (R1)". By pressing the Set/OK button again, the adjusted speed can be determined.



(6) Micro speed 3 reset button

By pressing this button, the setting of micro speed 3 can be reset.

Move the cursor (▲ or ▼) to the desired item to set, and press the Set/OK button. That item can be determined.

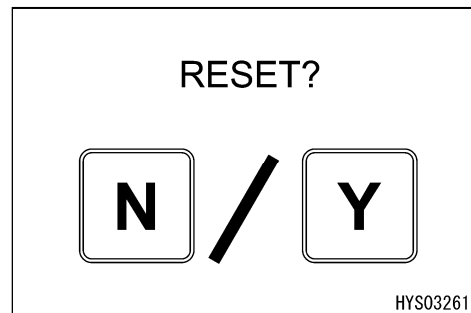


Press the micro speed 3 reset button to access the screen on the right. Using a cursor move button, place the cursor in one of the following:

N: Does not perform the reset.

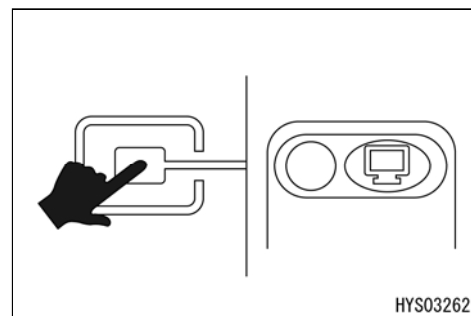
Y: Performs the reset.

Then, press the Set/OK button to determine the selection.

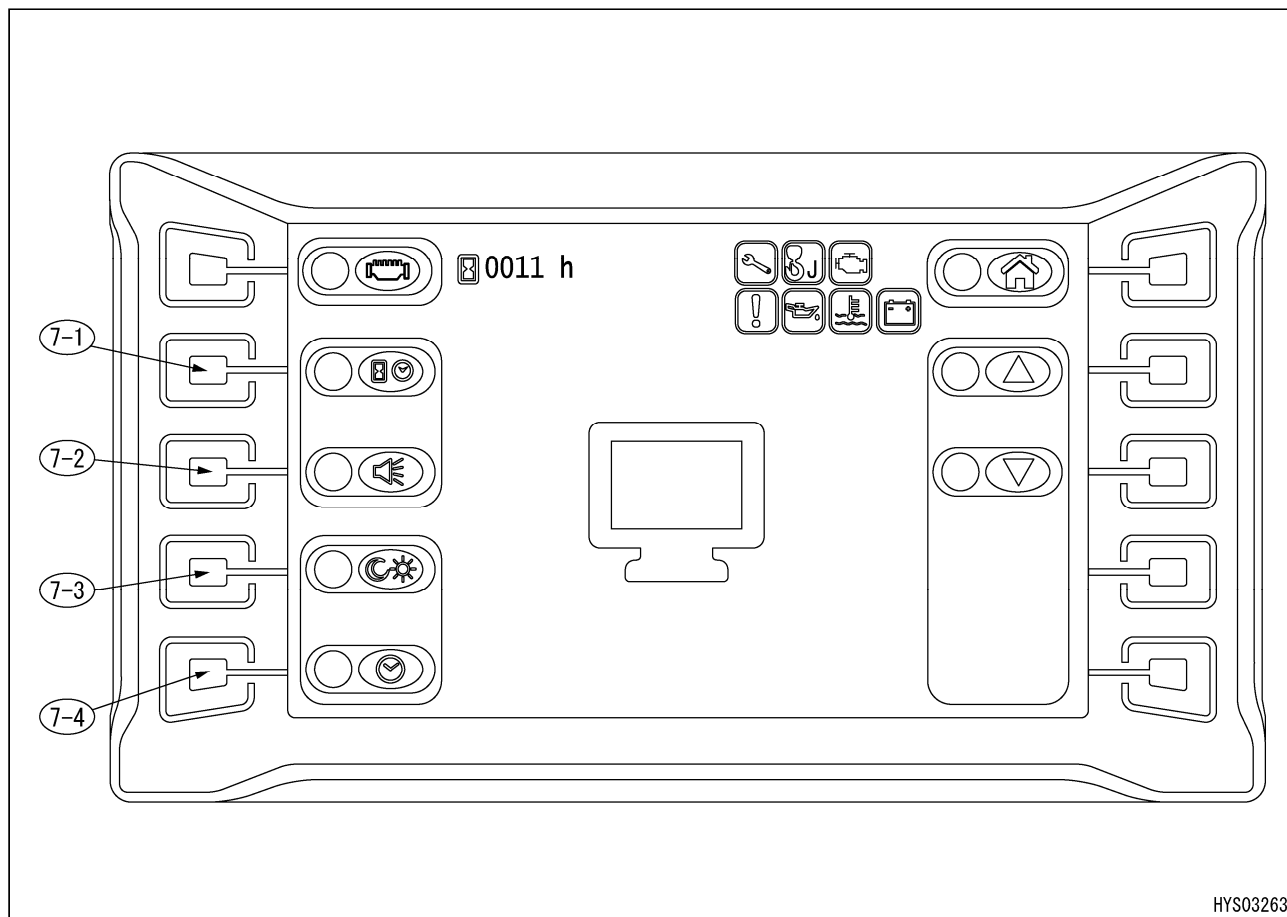


(7) Display setting screen button

When this button is pressed, the display changes to the Display Setting screen.



[Display Setting screen]

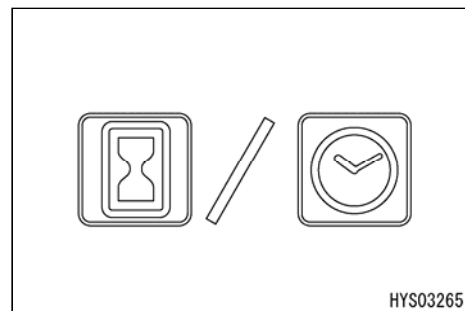
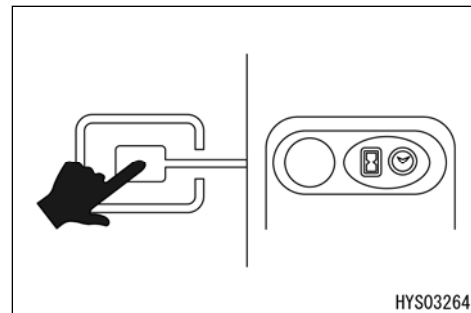


(7-1) Hour meter/Clock change button
(7-2) Mute button

(7-3) Screen brightness setting button
(7-4) Clock setting button

(7-1) Hour meter/Clock change button

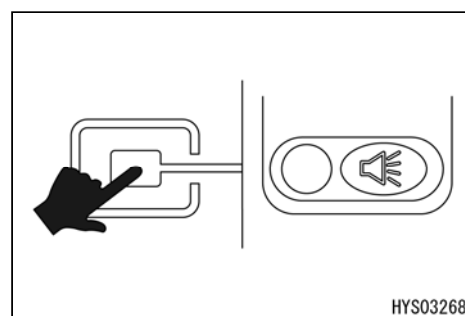
By pressing this button, the hour meter or clock display can be set.
Press the Hour meter/Clock change button, then move the cursor (▲ or ▼) to the desired item to set. That item can be determined.

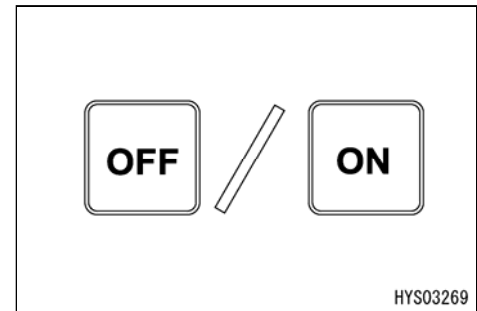


(7-2) Mute button

By pressing this button, the button tone can be set to the mute mode.

Press the Mute button, then move the cursor (▲ or ▼) to the desired item to set (ON or OFF). That item can be determined.

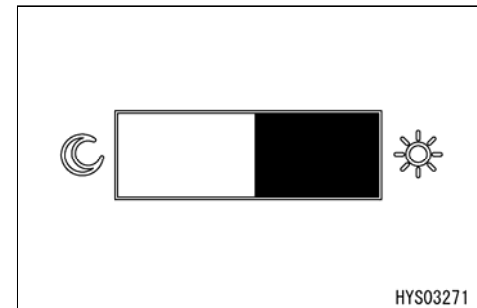
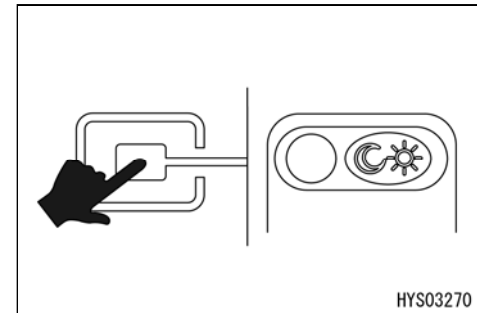




(7-3) Screen brightness setting button

By pressing this button, the screen brightness can be set.

Press the screen brightness setting button, then move the cursor (▲ or ▼). The screen brightness can be adjusted and determined.



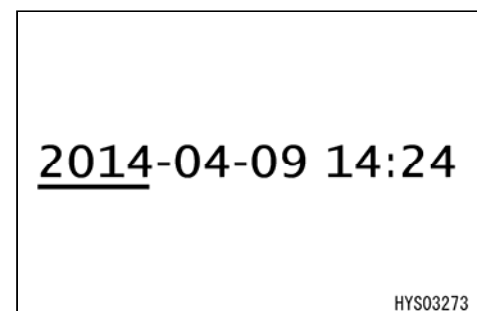
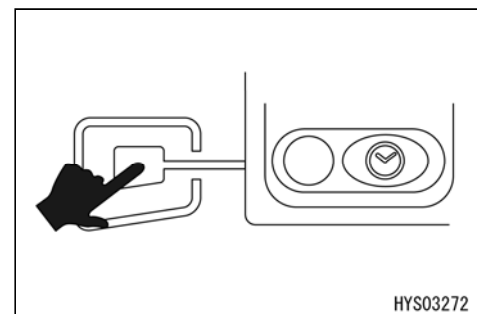
(7-4) Clock setting button

By pressing this button, the clock can be set.

Press the clock setting button, then move the cursor (▲ or ▼) to the desired item to set.

By pressing the Set/OK button, the item indicated by the cursor can be set. The time can be adjusted by moving the cursor (▲ or ▼).

By pressing the Set/OK button again, the adjusted time can be determined.

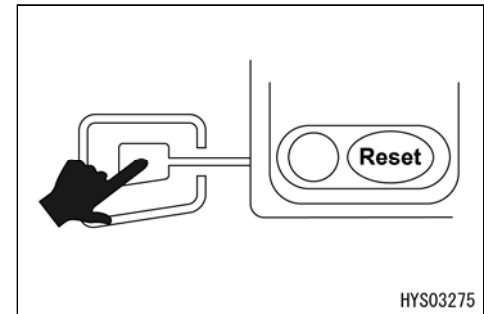
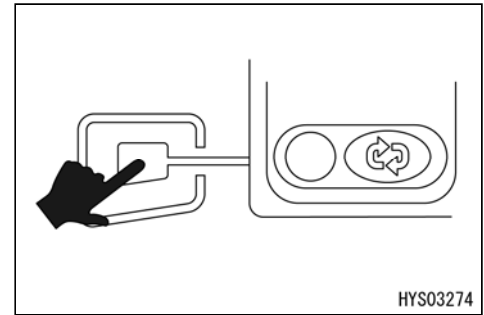


(8) Replacement part confirm button

By pressing this button, the remaining time of life of the replacement part and its expire time can be viewed and set.

Replace the part within the expire time by referring to “INSPECTION AND MAINTENANCE”.

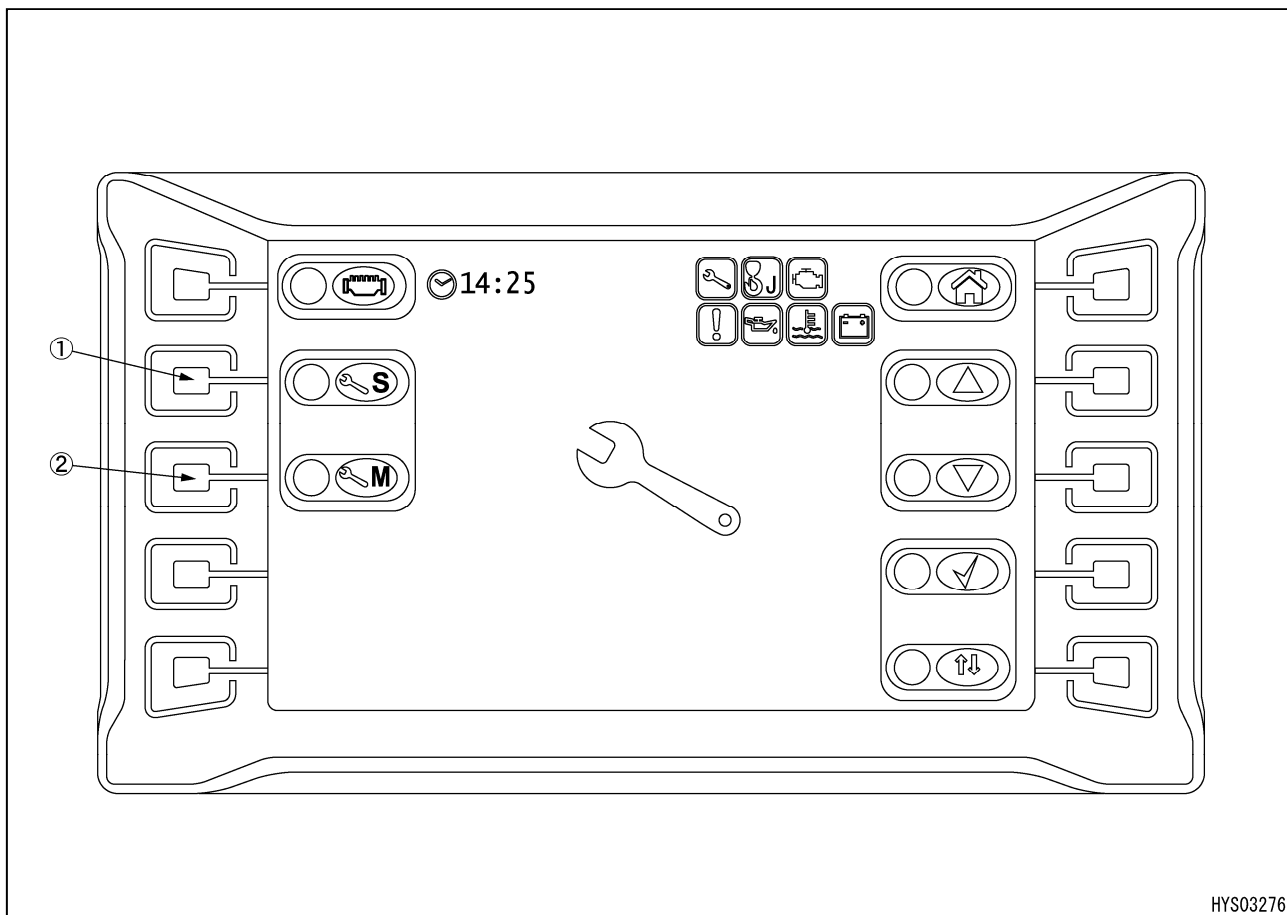
After completion of replacement, press the Reset button to reset the remaining time.



[5] MONITOR 5: SERVICE SCREEN 2

When the Page change button is pressed on the Monitor 4 screen, the Service screen 2 is displayed as shown below.

When the Page change button is pressed again, the display returns to Monitor 4 (Service screen).



HYS03276

(1) Service mode button

(2) Manufacturer mode button

(1) Service mode button

This button calls the mode designed for service plants.

It must not be operated by the customer.

(2) Manufacturer mode button

This button calls the mode designed for the manufacturer.

It must not be operated by the customer.

1.5.2 EMERGENCY STOP CANCEL SWITCH

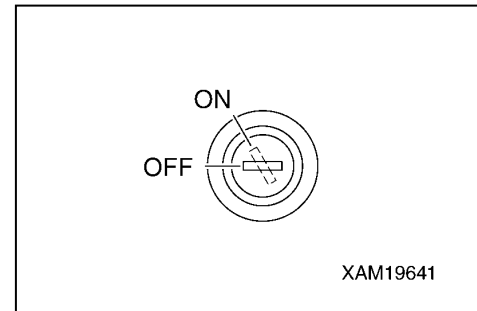
DANGER

- Do not turn the emergency stop cancel button to the “ON” (cancel) position except in a machine failure condition or when conducting a load test. When turning the emergency stop cancel switch to the “ON” (cancel) position, the safety device functions are no more available. Any crane operation in such conditions will result in dropping of hoisted load, breakage of crane boom, and/or crane tipping due to over load, and may cause a serious accident resulting in death or serious injury. If the emergency stop cancel button is turned to the “ON” (cancel) position, a warning buzzer sounds intermittently.
- The switch key must be kept removed during normal operations of the crane.

Use the emergency stop cancel switch when the stop of activation is to be canceled when an abnormality has occurred or the load test is to be conducted.

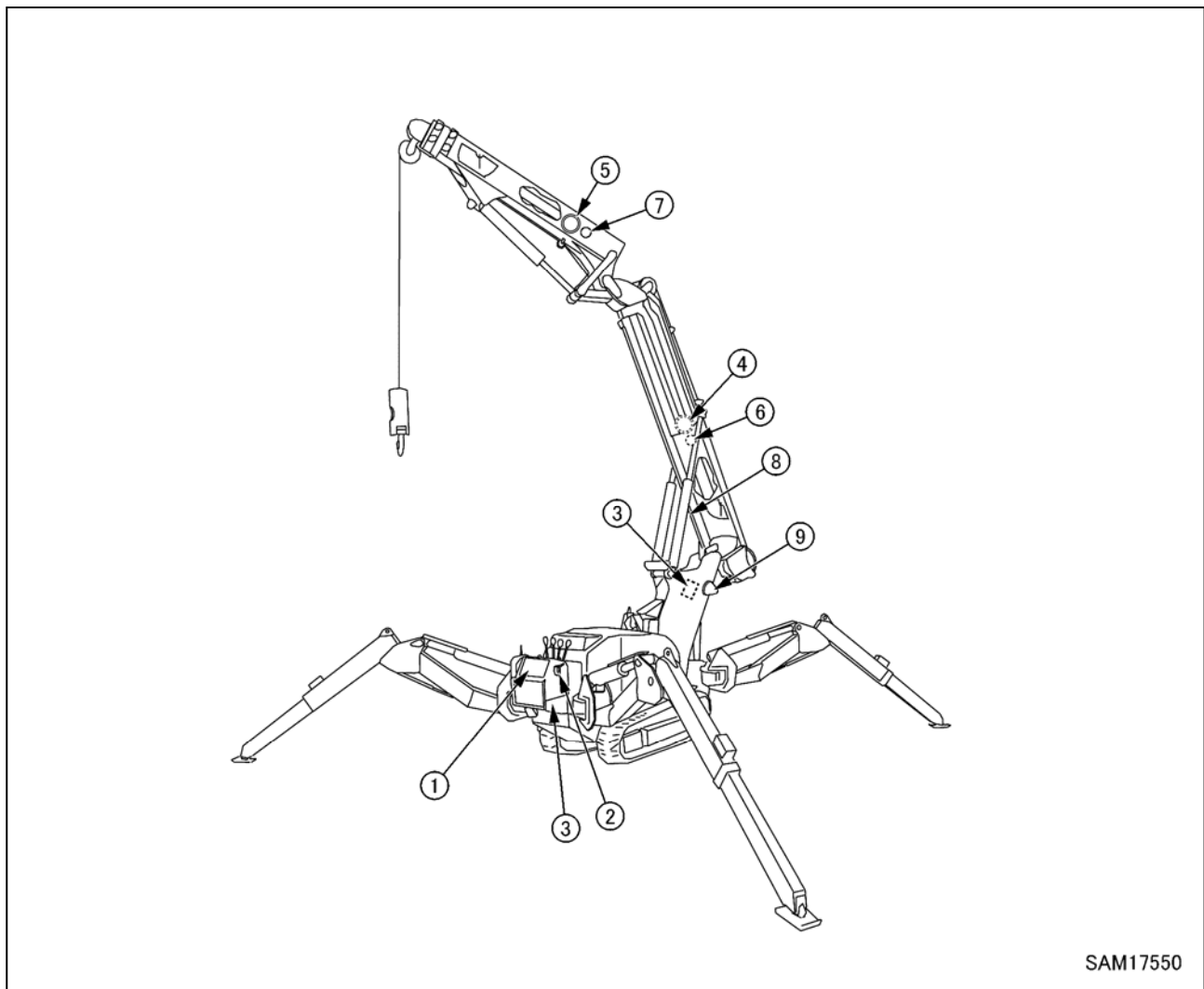
Open the cover when using the button.

- OFF (automatic): Turn the key counterclockwise.
The activation stop functions.
The key can be removed or inserted at this position.
- ON (cancel) : Turn the key clockwise and hold the position.
The activation stop function is canceled while the key is maintained at the ON position.



1.6 MOMENT LIMITER (OVERLOAD PREVENTIVE DEVICE)

1.6.1 CONFIGURATION OF MOMENT LIMITER



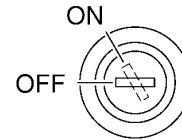
SAM17550

- | | |
|--|--|
| (1) Monitor | (6) Main boom angle meter (side of main boom) |
| (2) Emergency stop cancel switch | (7) Jib angle meter (side of jib) |
| (3) Controller [2 pieces at the bottom of monitor,
1 piece inside post] | (8) Pressure sensor (main boom derricking cylinder
section, 2 pieces) |
| (4) Total length of main boom (side of main boom) | (9) Tri-colour light (Left side of post: yellow light
right side of post: red and green lights) [3 units] |
| (5) Total length of jib (side of jib) | |

1.6.2 FUNCTIONS OF MOMENT LIMITER

DANGER

- Do not remove or disassemble, or repair the detector of a device such as the main boom angle meter, jib angle meter, main boom length meter, or pressure sensor. In addition, do not reposition the detector from the original location to another.
- When an object hits the detector or damage is found on it, be sure to check the operating condition of the automatic stop.
If an abnormality is found in terms of the operating condition of the automatic stop or the stop position is exceeded, be sure to repair the detector.
- This button must not be placed in the “ON” (cancel) position except when an abnormality has occurred or a load test is to be conducted. If it is placed in that position, the functionality of the moment limiter stops. Any crane operation in such conditions will result in dropping of hoisted load, breakage of the machine, and/or crane tipping due to over load, and may cause a serious accident resulting in death or serious injury.
If the emergency stop cancel switch is placed in the “ON” (cancel) position, the warning buzzer sounds intermittently.
- The crane slewing operation does not stop automatically when the crane is overloaded. When overloaded, the crane must not be slewed. Otherwise, the machine may tip over causing severe personal injury, which could lead to death or serious injury.
- When the crane is approximating the stop position while in operation, be sure to lower the crane operation speed.
If the crane is at a high operation speed, it may exceed the predetermined stop position and the machine may tip over causing severe personal injury, which could lead to death or serious injury.



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The moment limiter is a safety device that is installed to prevent dropping of the suspended load or breakage or tipping of the machine, which may occur due to overload.

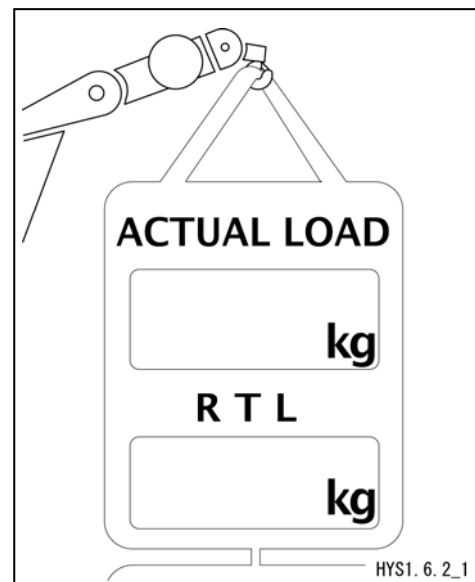
Before starting crane operations, be sure to inspect operation of the moment limiter to make sure that there is no abnormality.

[1] MECHANISM OF MOMENT LIMITER

The moment limiter calculates the Rated Total Load in the current condition by (1) detecting the current figure from the main boom angle meter, jib angle meter, main boom length meter, and jib length meter, (2) detecting the outrigger extension state with the outrigger position detection switch, and further (3) inputting (by the operator) whether the hook and winch to use are present.

When the load is hoisted actually at this time, the pressure sensor of the main boom derricking cylinder section causes the Actual Load (i.e. hoisting load) to be output to the moment limiter.

The moment limiter makes comparison and calculation on the Rated Total Load and Actual Load (hoisting load) that were calculated regarding the current figure. Then, it issues an alarm and automatically stops the operation of the dangerous side of the crane if the result is as follows: Actual Load / Rated Total Load \geq 100%.



HYS1. 6. 2_1

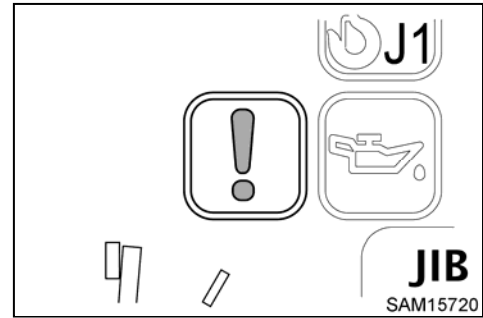
[2] MOMENT LIMITER ABNORMALITY DISPLAY

The moment limiter performs self diagnosis by using the controller, for example, when an abnormality occurs on the main boom angle meter, jib angle meter, main boom length meter, jib length meter, or pressure sensor or when wiring breakage or removal of a connector occurs.

The moment limiter notifies the operator of the result via the abnormality display on the motor.

If the display is blinking, this indicates that an abnormality has currently occurred; if it is on continuously, this indicates that an abnormality occurred in the past.

When an abnormality is displayed, immediately stop the crane and contact us or our sales service agency to make request for repair.



1.6.3 MOMENT LIMITER OPERATION

The moment limiter is a safety device that is provided for measures available for an emergency case. In actuality, any operations relying on the safety device will incur danger.

Keep in mind to perform operations in the safety area, and pay sufficient attention during operations so that the crane will not stop automatically.

[1] PROHIBITED OPERATIONS AFTER AUTOMATIC STOP

DANGER

If the crane has stopped automatically due to overload, all crane operations in the black arrow direction in the figure on the next page are prohibited.

Disobeying this rule may cause critical danger due to tipping of the machine or breakage of the crane, for example.

[2] RECOVERY OPERATION FROM AUTOMATIC STOP

⚠ DANGER

- When performing recovery operation from an automatic stop of the moment limiter, be sure to lower the engine rotation speed so that operations can be performed slowly. Performing crane operations at a high speed of engine rotation could cause critical danger; in this case, the hoisted load will waggle resulting in overload, which could lead to tipping of the machine or breakage of the crane, for example.
- When an automatic stop works, immediately stop the operations. Otherwise, the stop may delay resulting in danger.
- When an automatic stop occurs during manual operations due to overload, a reaction occurs. In this case, immediately return the lever to Stop.

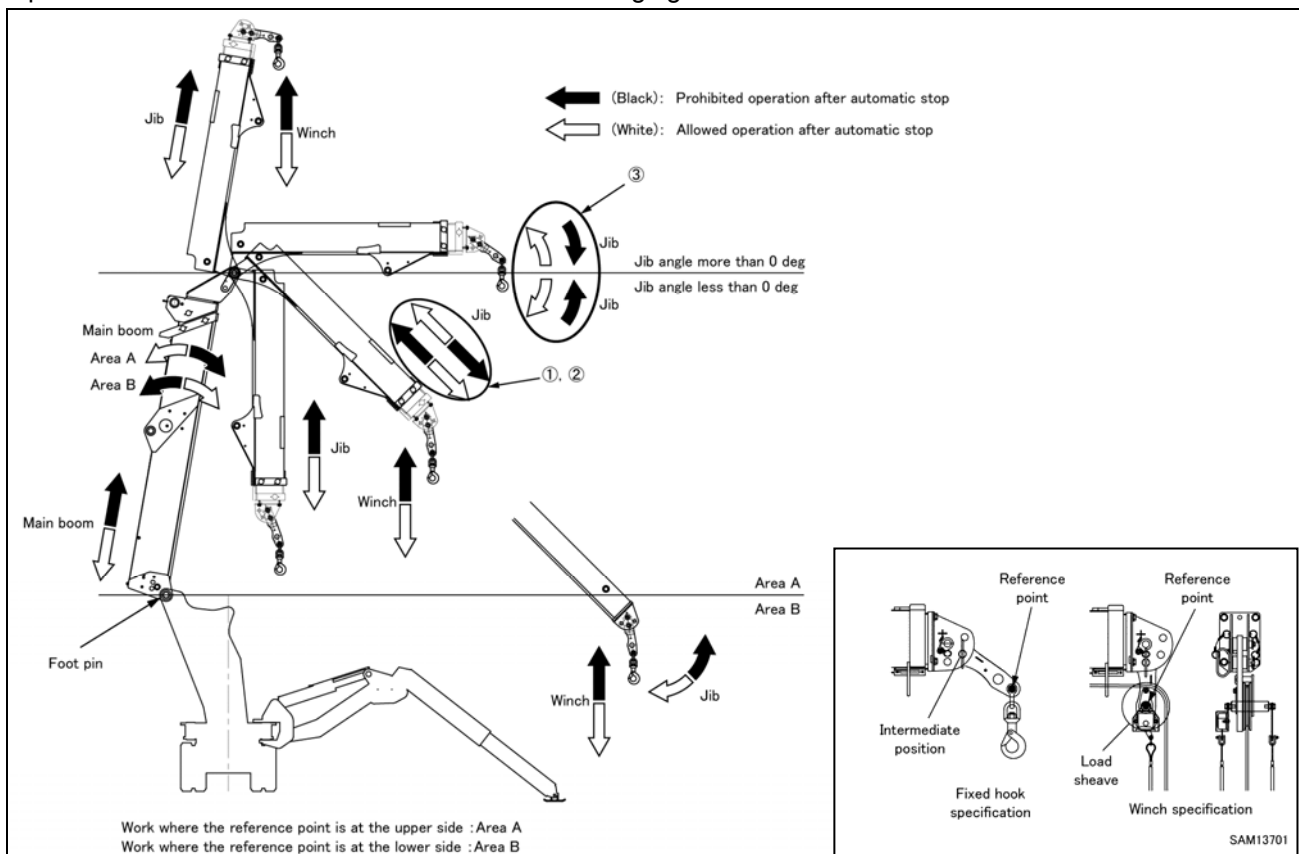
When overload is detected and crane is automatically stopped during slewing operation, recover this situation by slewing to the opposite direction of which caused the stop.

Possible operation after crane is stopped by overload detection: Slew (only to the opposite direction of which caused stop), boom raise, boom retract, jib retract, jib raise, jib lower (when jib angle is in minus).

When overload is detected and crane is automatically stopped, recover this situation by telescope or derrick main boom or jib to the direction to shorten working radius, or hoist down by winch.

If such operations are impractical, avoid damage by performing operations on the safe side according to the worksite condition.

Operations in the white arrow direction in the following figure are available:



NOTES

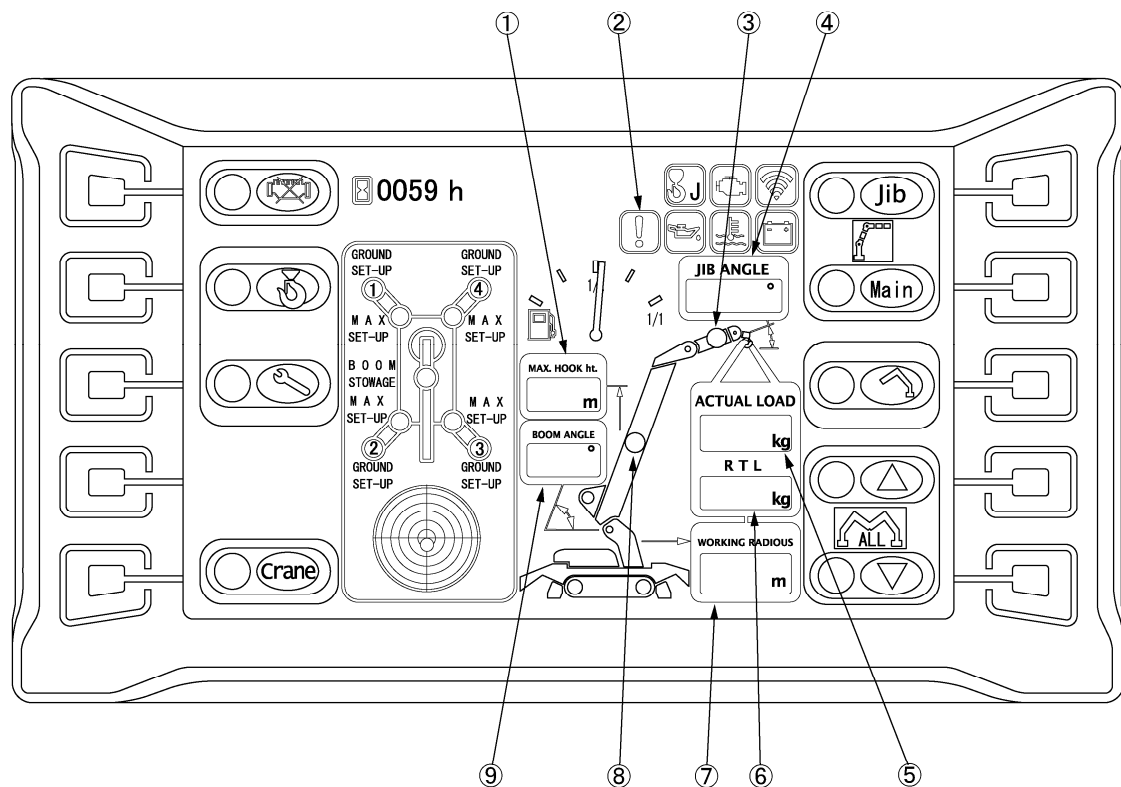
Recovery operation from auto-stop caused by jib telescopic operation

- If overload is detected during jib telescopic operation, reverse operation can be performed.
- (1) When overloading condition is detected by hoisting load from the ground in "jib retracting operation", "jib retracting operation" will be stopped. Hoist down the load by operating "jib extending operation".
- (2) When overloading condition is detected by hoisting load in "jib extending operation", "jib extending operation" will be stopped. Reduce working radius by operating "jib retracting operation".

Recovery operation from auto-stop caused by jib derricking operation.

- (3) If the jib angle is 0 degree or more, raise the jib. Lower it otherwise.
- For the fixed hook, the reference point refers to the shackle installed point for intermediate positioning. For the winch specification, it refers to the centre of the load sheave.

1.6.4 MONITOR COMPONENTS



HYS1.6.4

- | | |
|----------------------------|------------------------------|
| (1) Lifting height display | (6) Rated total load display |
| (2) Abnormality display | (7) Working radius display |
| (3) Jib stage display | (8) Main boom stage display |
| (4) Jib angle display | (9) Main boom angle display |
| (5) Actual load display | |

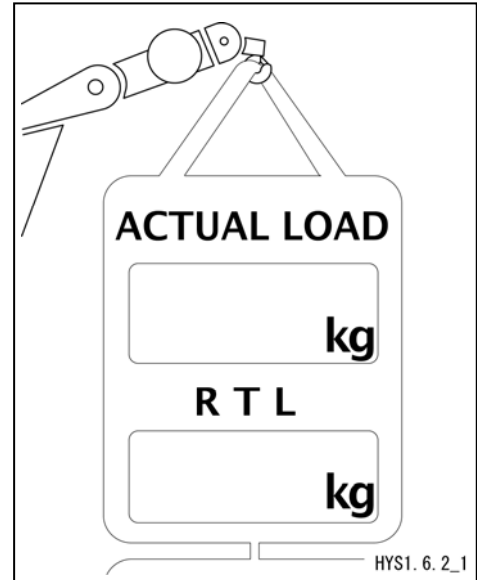
[1] MOTOR DISPLAY DESCRIPTION

1. Rated total load display

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

This actual load equals the total weight of the hook, sling, and hoisted weight.

If the percent load is 100% or more, the display blinks in red.



2. Rated total load display

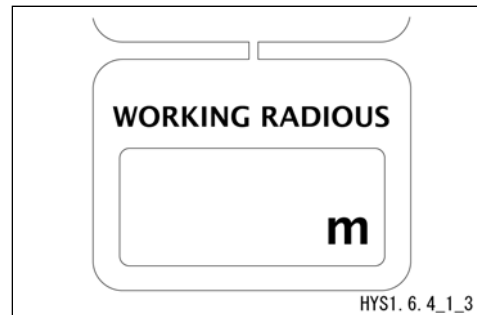
Displays the rated total load (i.e. total weight of hook, sling, and hoisted weight) up to which the crane can currently hoist the load. It is calculated depending on the conditions including the hook selection, the state of the main boom/jib, and the outrigger extension state.

3. Working radius display

Continually displays the current working radius during crane operations.

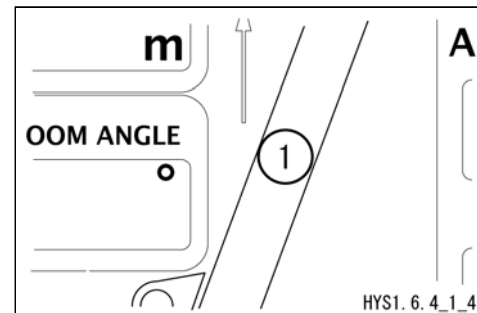
The working radius refers to the horizontal distance from the centre of slewing of the crane to the centre of the hook.

For the fixed hook, this field displays the radius at the intermediate position.



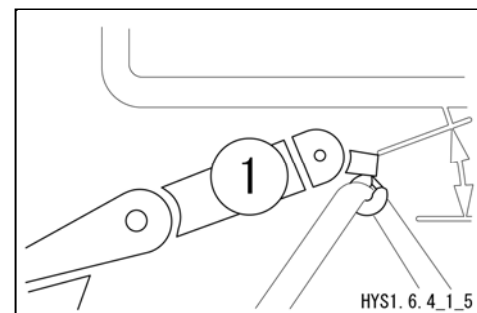
4. Main boom stage display

Continually displays the current main boom stage during crane operations.



5. Jib stage number display

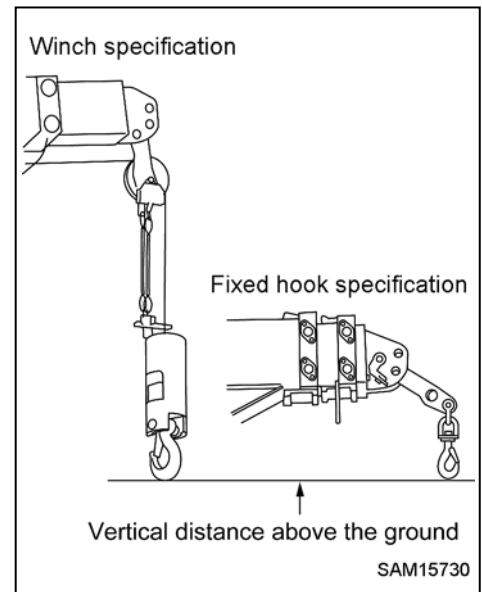
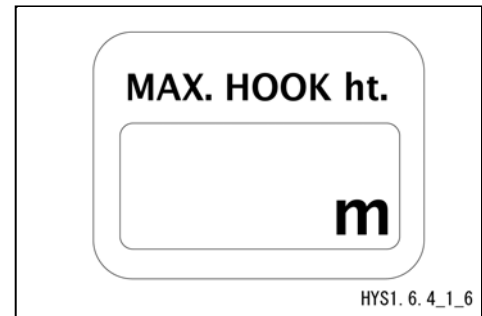
Continually displays the current jib stage number during crane operations.



6. Lifting height display

Continually displays the maximum lifting height of the current hook during crane operations.

The lifting height refers to the perpendicular distance from the bottom of the hook to the ground. For the winch specification, it refers to the distance to the bottom of the hook block resulting when this block is wound up to the maximum (higher limit) point.

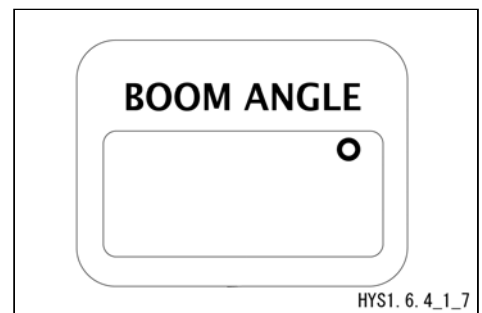


7. Main boom angle display

Continually displays the current main boom angle during crane operations.

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

When the main boom derricking stops in response to operation of the main boom upper or lower limit switch, the digits blink in red.

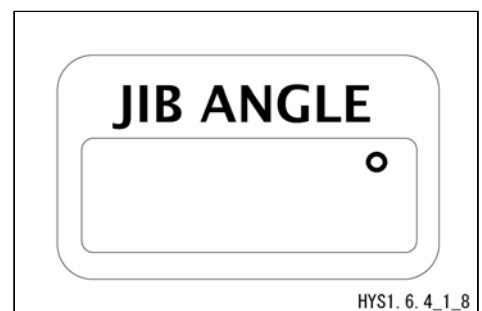


8. Jib angle display

Continually displays the current jib angle during crane operations.

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

When the jib angle becomes smaller than -90 degrees, the digits blink in red.



1.6.5 MOMENT LIMITER FUNCTIONS

[1] OVERLOAD ALARM

1. Safety area (the Actual Load is smaller than 100% of the Rated Total Load)

- Green light of tri-colour lights blinks.
- The actual load display of the monitor panel turns on in green.

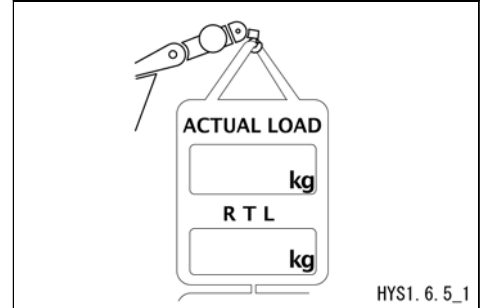
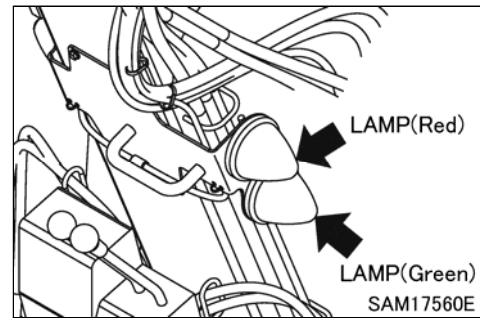
2. Limit alarm (the Actual Load is greater than or equal to 100% of the Rated Total Load)

- Red light of tri-colour lights blinks.
- The actual load display of the monitor panel blinks in red.
- The alarm generates continuous sound “peep”.
- Operation of the crane’s danger side stops automatically.

3. Recovering from a limit alarm automatic stop

When an automatic stop occurs, immediately recover from the overload.

For recovery operations, refer to “OPERATIONS 1.6.3 [2] RECOVERY FROM AUTOMATIC STOP”.

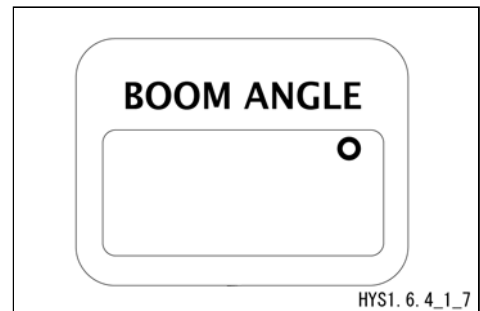


[2] MAIN BOOM UPPER LIMIT DETECTION

When the main boom is raised up to a main boom angle of 79 to 80 degrees, the main boom derricking operation stops automatically and the main boom angle display blinks in red.

NOTES

The stopping angle somewhat varies with the derricking speed of the main boom.



[3] MAIN BOOM LOWER LIMIT DETECTION

When the main boom is lowered down to a main boom angle of 0 to 1 degree, the main boom lowering operation stops automatically and the main boom angle display blinks in red.

NOTES

The stopping angle somewhat varies with the lowering speed of the main boom.

1.7 MACHINERY COVER

WARNING

- Before removing the machinery cover, be sure to stop the engine and remove the main starter switch key.
- Do not remove the machinery cover immediately after the operation while the engine is still hot.

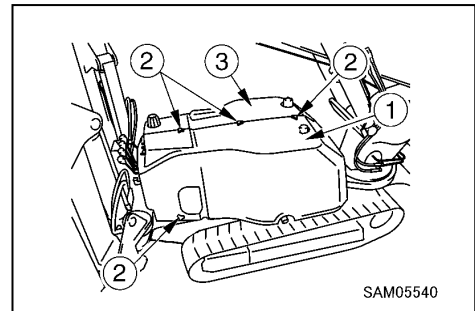
[1] REMOVING MACHINERY COVER

Remove the machinery cover with the following procedure when performing inspection/maintenance inside the machinery cover.

1. Remove fixing bolts (2) (7 bolts) of the left-side machinery cover (1).

NOTES

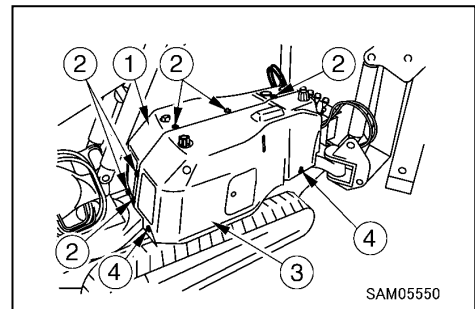
The fixing bolts (2) are positioned with 3 at the top, 3 at the rear and 1 at the lower side.



2. Remove fixing bolts (4) (2 bolts) of the right-side machinery cover (3).

NOTES

The fixing bolts (4) are positioned with 1 at the lower rear, and 1 at the lower side.



3. Remove the left-side machinery cover (1).
4. Remove the right-side machinery cover (3).

[2] INSTALLING MACHINERY COVER

When you have finished inspection/maintenance inside the machinery cover, install the machinery cover in the reverse order of removal.

2. OPERATION

2.1 PRE-OPERATION INSPECTION

2.1.1 VISIBLE CHECKS

WARNING

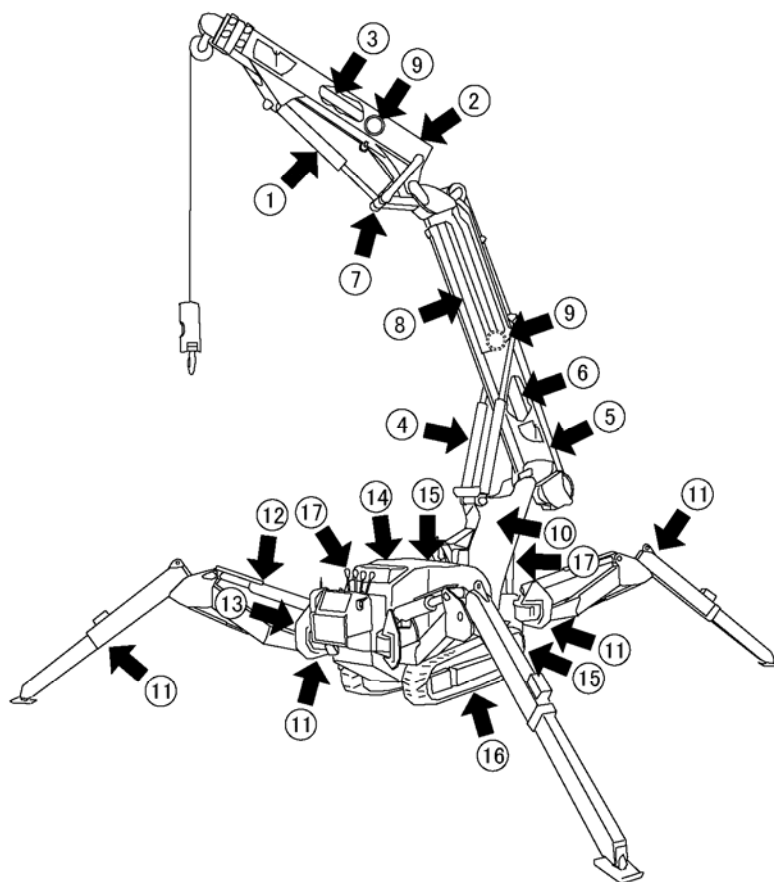
- This machine is equipped with a diesel engine.
If you smell fuel around the engine, it may be leaking. Carefully check for cracks on the fuel hose or fuel hose connections.
- Build up of combustibles and oil leakage around the hot engine section such as engine and muffler and around the battery can cause fire in the machine.
Carefully check around these areas. If there is any abnormality, be sure to fix it or contact us or our sales service agency.

Before starting the engine, check around the engine for smell of fuel.

Inspect external areas and the bottom of the machine for any loose bolts and oil leakage, in addition to checking the crane and hydraulic systems.

Check for looseness or play in electric wiring and any deposits of trash in places where it is exposed to high temperatures.

Inspections described in this section should be conducted before the first engine start-up of the day.



SAM12541-01

[1] INSPECTION OF JIB DERRICK CYLINDER

Check for loose pipe connections, oil leakage, wear or damage of support pins etc, and repair as necessary.

[2] INSPECTION OF JIB

Check for cracks and bent or damaged parts. Check wear of support pins etc, and repair as necessary.

Check for loose mounting bolts of the support pin lock plate portion and tighten it as necessary.

[3] INSPECTION OF JIB TELESCOPE CYLINDER

Check for loose pipe connections or oil leakage and repair any abnormality.

[4] INSPECTION OF MAIN BOOM DERRICK CYLINDER

Check for loose pipe connections, oil leakage, wear or damage of support pins etc, and repair as necessary.

[5] INSPECTION OF MAIN BOOM

Check for cracks and bent or damaged parts. Check wear of support pins etc, and repair as necessary.

Check for loose mounting bolts of the support pin lock plate portion and tighten it as necessary.

[6] INSPECTION OF MAIN BOOM TELESCOPE CYLINDER

Check for loose pipe connections or oil leakage and repair any abnormality.

[7] INSPECTION OF LINK

Check for cracks and bent or damaged parts. Check wear of support pins etc, and repair as necessary.

[8] INSPECTION OF HOSE GUIDE

Check for cracks, bent or damaged parts, looseness of piping joints, oil leak, etc., and repair as necessary.

[9] INSPECTION OF MEASURING CORD REEL

Check for operation failures due to damage, deformation, dirt, ice, etc. and repair as necessary.

[10] INSPECTION OF POST

Check for cracks, bent or damaged parts. Also check for loose post and slew ring mounting bolts, loose swing system speed reducer mounting bolts, loose pipe connections or oil leakage. Repair any abnormality detected.

[11] INSPECTION OF OUTRIGGER

Check for cracks and bent or damaged parts. Check wear of support pins etc, and repair as necessary.

[12] INSPECTION OF OUTRIGGER CYLINDER

Check for loose pipe connections, oil leakage, wear or damage of support pins etc, and repair as necessary.

[13] INSPECTION OF GROUND CONTACT DETECTOR

Check for operation failures due to damage, dirt, adhesion of ice, etc. and repair as necessary.

[14] INSPECTION AROUND ENGINE

Check for and remove any accumulation or deposits of inflammable items including fallen leaves, wastepaper, dust, oil or grease in high temperature areas such as engine and muffler.

Check for fuel or oil leakage from the engine and repair if necessary.

Check for slack wiring or loose connections. Also check for any trace of burning around the starter, alternator or battery and repair any abnormality that may be found.

[15] INSPECTION OF HYDRAULIC SYSTEM OF UNDERCARRIAGE (Travel motor, control valve, hydraulic oil tank, hose and joint)

Check for loose pipe connections or oil leakage and repair any abnormality.

[16] INSPECTION OF UNDERCARRIAGE (Rubber track, track roller, sprocket and idler)

Check for damage, wear and loose track rollers. Repair any abnormality.

Check for loose or missing bolts and retighten as necessary.

★ See "OPERATION 3. HANDLING RUBBER TRACKS" for details.

[17] INSPECTION OF EACH OPERATION LEVER

Operate each lever and check if they move smoothly, return to the neutral position, and if there is difference of operational feeling among levers. If any abnormality is found, repair.

2.1.2 CHECKING BEFORE STARTING ENGINE

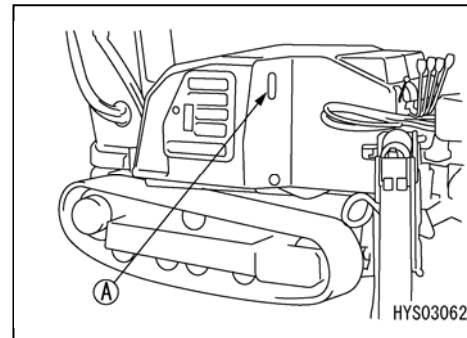
Inspections described in this section should be conducted before the first engine start-up of the day.

[1] CHECKING/REFILLING ENGINE COOLANT

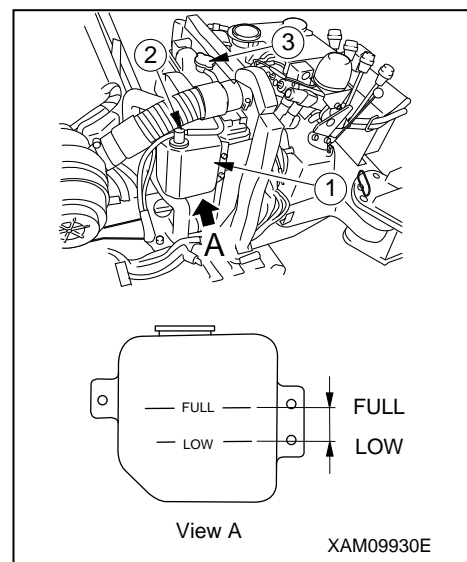
WARNING

**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. Place the machine on a level surface.
2. Check the coolant level in the reserve tank (1) through the inspection window (A) located at the front side of the right machinery cover. It must be between “LOW” and “FULL”.



3. If the coolant level is lower than the “LOW” level, use the following procedure to refill coolant.
 - (1) See “OPERATION 1.7 MACHINERY COVER” and remove the machinery cover.
 - (2) Remove the cap (2) of the reserve tank (1) and fill coolant from the filler opening to the level “FULL”.
 - (3) After refilling coolant, securely install the cap (2) of the reserve tank (1).
 - (4) See “OPERATION 1.7 MACHINERY COVER” and install the machinery cover.
4. If the reserve tank is empty, follow the steps below.
 - (1) See “OPERATION 1.7 MACHINERY COVER” and remove the machinery cover.
 - (2) Remove the radiator cap (3) and check the coolant level in the radiator.
 - (3) If the coolant level in the radiator was low, check the radiator, radiator hose, and engine for water leakage.
 - (4) Fill coolant from the radiator filler opening and securely install the radiator cap (3).
 - (5) Remove the cap (2) of the reserve tank (1) and fill coolant from the filler opening to the level “FULL”.
 - (6) After refilling coolant, securely install the cap (2) of the reserve tank (1).
 - (7) See “OPERATION 1.7 MACHINERY COVER” and install the machinery cover.



[2] CHECKING/CLEANING RADIATOR FINS

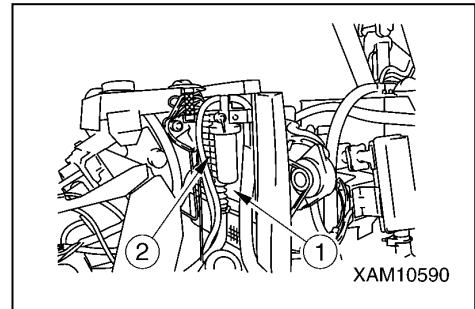
WARNING

Dust may blow in all directions when compressed air is used. Always wear goggles and mask.

CAUTION

- To prevent damage on the fins during the use of the compressed air, keep the pressure of the compressed air to 0.20 to 0.29 MPa (2 to 3 kg/cm²) and apply it away from the fins. Damage on the fins will cause water leakage or overheating.
- At a dusty worksite, check the fins every day and clean as needed.

1. See “OPERATION 1.7 MACHINERY COVER” and remove the machinery cover.
2. Apply the compressed air (0.20 to 0.29 MPa {2 to 3 kg/cm²}) to the oil cooler (2) and radiator (1) to remove the mud and dust clogged in the fins.
3. See “OPERATION 1.7 MACHINERY COVER” and install the machinery cover.



[3] CHECKING OIL LEVEL AND REFILLING OIL IN ENGINE OIL PAN

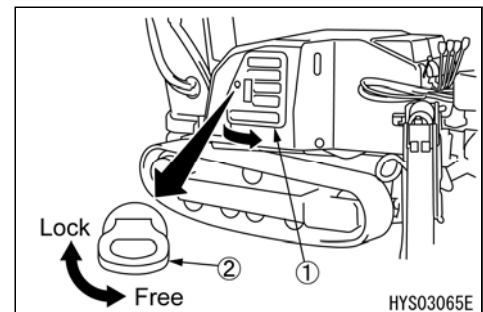
CAUTION

Securely install the oil level gauge and filler cap after checking the oil level and refilling the oil. If the oil level gauge falls during the operation, the hot oil may spout out of the pan, causing burns.

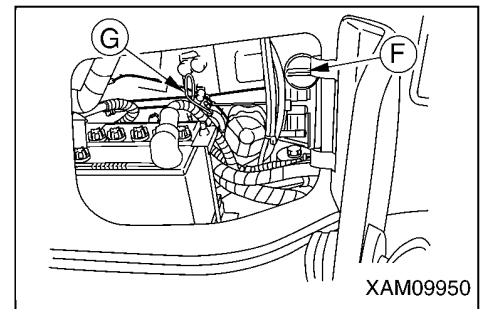
CAUTION

- See “INSPECTION AND MAINTENANCE 5.1 USE OF LUBRICATING OIL ACCORDING TO TEMPERATURE” for the oil to be used.
Using oil other than those specified may shorten the life of the engine.
Be sure to refill the specified oil.
- Keep the engine oil at an 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 the oil.

1. Place the machine on a level surface.
2. Open the inspection cover (1) on the side surface of right hand machinery cover.
To unlock the inspection cover (1), insert the key (2) into the key hole and turn it counterclockwise, and then pull the cover toward you.



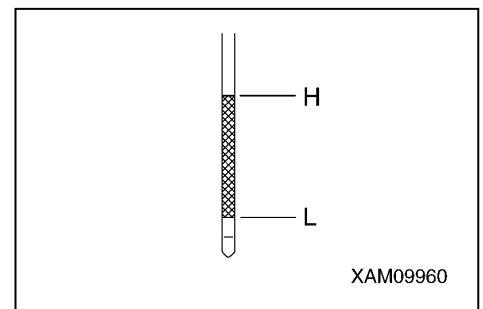
3. Pull the oil level gauge (G) out and wipe the oil with a disposable cloth.
4. Insert the oil level gauge (G) into the oil filler and pull it out.
5. If the oil level is between the “H” mark and “L” mark on the oil level gauge (G), the oil level is normal.
6. If the oil level is lower than the “L” mark, remove the oil filler cap (F) and refill the engine oil from the filler opening.



NOTES

Refill the engine oil up to the midpoint between “H” and “L” on the oil level gauge (G).

7. Securely install the oil level gauge (G) and filler cap (F) after refilling the oil.
8. Close the inspection cover (1) and turn the key (2) clockwise.
Pull the inspection cover (1) lightly to check that it is locked, and pull out the key (2).

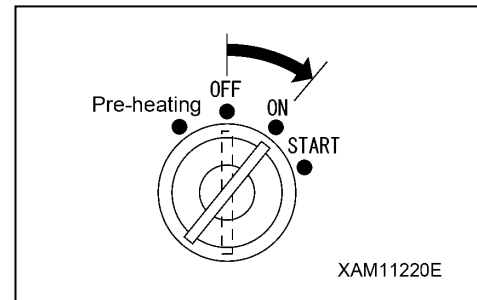


[4] CHECKING FUEL LEVEL AND REFILLING FUEL IN FUEL TANK

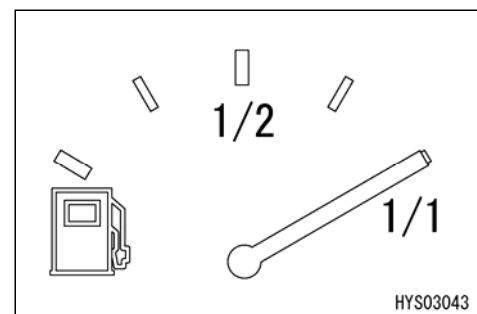
⚠ DANGER

- See “INSPECTION AND MAINTENANCE 5.1 USE OF LUBRICATING OIL ACCORDING TO TEMPERATURE” for the fuel to be used.
 - Be extremely careful with fire such as cigarettes.
 - Always stop the engine before refilling fuel. Refilling the oil when engine is running may cause leaked fuel to draw fire from hot muffler or other substance.
 - Overfilling the fuel results in spillage and is dangerous. Refuel to the level slightly lower than the specified upper limit level.
- Always wipe away cleanly whenever the fuel spills.
- Be careful not to let any foreign substance go into the filler opening when refuelling.
 - Securely close the tank cap after refuelling.

1. Turn “ON” the starter switch.



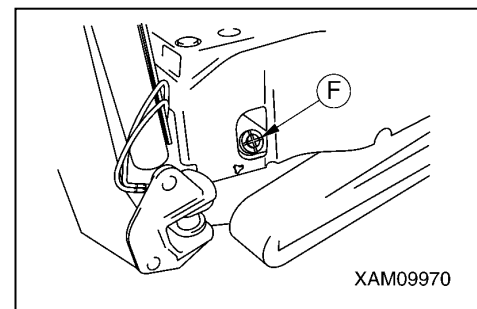
2. Looking at the fuel gauge on the monitor panel, check if the fuel is filled to almost full (around “1/1”).



3. If the fuel level is low, remove the tank cap (F) located at the front lower part of the left-hand machinery cover and refuel from the filler opening while watching the fuel gauge.
4. Securely turn and close the tank cap (F) after refuelling.

NOTES

Fill the fuel tank to full at the end of the work for the day.



[5] CHECKING/CLEANING WATER SEPARATOR

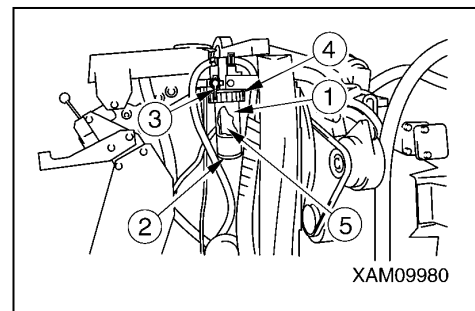
WARNING

- The water separator pot has fuel (light oil) inside. Be extremely careful of fire such as cigarettes when cleaning the water separator pot.
- If the fuel spills when the water separator pot is removed, thoroughly wipe it off.

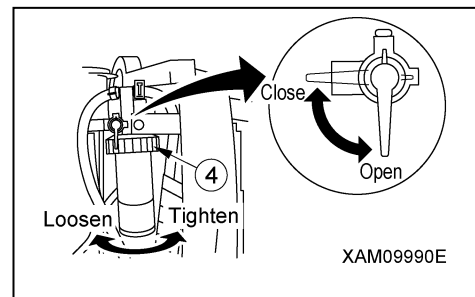
CAUTION

- 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 accumulates in the water separator pot, it is assumed that water is also mixed in the fuel tank.
See “INSPECTION AND MAINTENANCE 8.7 MAINTENANCE EVERY 50 HOURS” and remove water and dust mixed into the fuel tank.

1. See “OPERATION 1.7 MACHINERY COVER” and remove the machinery cover.
2. Check the water separator pot (1) at the front part of the radiator 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.



3. If there are water or dust accumulated in the water separator pot (1), clean the inside of the water separator pot (1) using the following procedure.
 - (1) Turn the fuel lever (3) to horizontal position (close) to shut off the fuel.
 - (2) Turn the retainer ring (4) counterclockwise to loosen, then remove the water separator pot (1).
 - (3) Pull out the element (5) from the water separator pot (1).
 - (4) Clean the water separator pot (1) and the element (5) with light oil, and spray compressed air (0.20 to 0.29 MPa {2 to 3 kg/cm²}) inside to scrape off dust from the surface.
 - (5) Insert the element (5) into the water separator pot (1).
 - (6) Replace the water separator pot (1) then turn the retainer ring (4) clockwise to tighten.
 - (7) Turn the fuel lever (3) to the vertical position (open).
4. See “OPERATION 1.7 MACHINERY COVER” and install the machinery cover.



[6] CHECKING FUEL FILTER

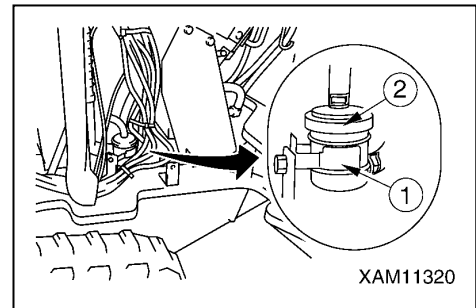
WARNING

- The fuel filter pot has fuel (light oil) inside. Be extremely careful of fire such as cigarettes when replacing the fuel filter.
- If the fuel spills when the fuel filter is removed, thoroughly wipe it off.

CAUTION

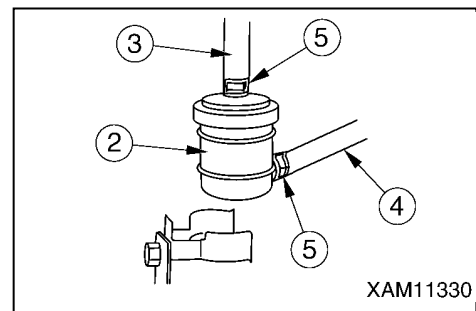
Water or dust accumulated inside the fuel filter will cause engine failure.
Check inside the case and remove any water or dust accumulated inside.

1. See "OPERATION 1.7 MACHINERY COVER" and remove the machinery cover.
2. Inspect the fuel filter and check for dust accumulated inside the fuel filter case (2).



3. If there is water or dust accumulated in the fuel filter case (2), clean the inside using the following procedure.

- (1) Remove the fuel filter (2) from the holder (1).
- (2) Loosen the clamps (5) of the fuel hoses (3) and (4) connected to the fuel filter (2) and remove the fuel hoses (3) and (4).
- (3) Connect the fuel hoses (3) and (4) to the new fuel filter (2) to prevent them from falling with the clamps (5).
- (4) Insert the fuel filter (2) into the holder (1) to secure it.



NOTES

After inserting the fuel filter into the holder, lightly shake the fuel filter to check that it is firmly secured.

- (5) After replacing the fuel filter (2), bleed the fuel system.

NOTES

Turn the key switch to ON to operate fuel pump and wait up to 5 minutes for the air to be released.

4. See "OPERATION 1.7 MACHINERY COVER" and install the machinery cover.

[7] CHECKING OIL LEVEL AND REFILLING OIL IN HYDRAULIC OIL TANK

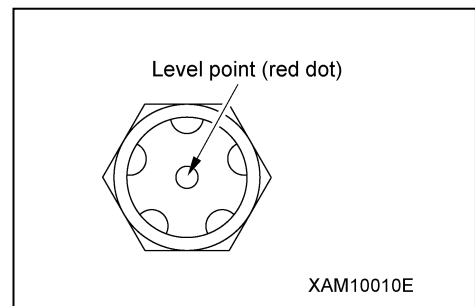
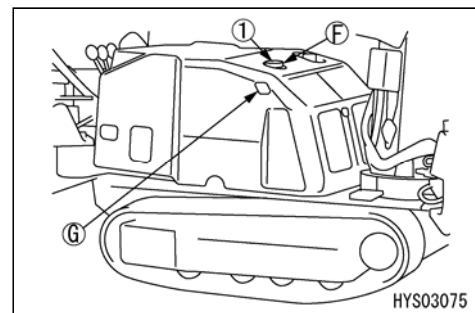
WARNING

- The oil may spout out when the filler cap of the hydraulic oil tank is removed. Loosen the filler cap mounting bolts so that the filler cap is raised a little to allow the release of inner pressure, then remove the mounting bolts and the filler cap.
- Securely tighten mounting bolts of the oil filler cap after refilling the oil.
If the mounting bolts are loose the filler cap may come off during the operation, and the hot oil may spout out of the pan, causing burns.

CAUTION

- See “INSPECTION AND MAINTENANCE 5.1 USE OF LUBRICATING OIL ACCORDING TO TEMPERATURE” for the oil to be used.
- Be sure to put the machine in the travelling posture when checking the oil level. Checking the oil level in the working position will cause overfilling since the oil in the cylinders has not returned to the tank.
- Avoid the oil exceeding the level point (red point) of the level gauge. When the oil goes beyond the correct level, it may spout out from the air breather during travelling or crane operation.
- Be careful not to let any foreign substance go into the filler opening when refilling the oil.

1. Check the oil level gauge (G) in the left side of the machinery cover and ensure that oil is sufficient to reach the level point (red point).
2. If there is not sufficient oil, refill the hydraulic oil from the filler opening (F) on the top of the hydraulic oil tank according to the following procedure.
 - (1) Remove the filler cap (F) by taking out the mounting bolts (1) (4 bolts) at the top of the hydraulic oil tank.
 - (2) Refill the hydraulic oil from the filler opening (F) while looking at the oil level gauge (G).
 - (3) After refilling the oil, set the filler cap (F) and tighten mounting bolts (1) (4 bolts) securely.



[8] CHECKING OIL LEVEL AND REFILLING OIL IN SLEWING REDUCTION GEAR CASE

WARNING

Securely tighten the filler plug after refilling the oil. If the filler plug comes off during the operation, the hot oil may spout out of the pan, causing burns.

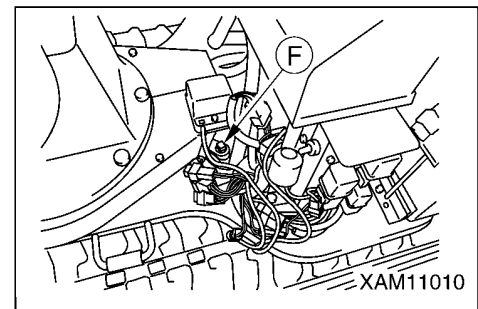
CAUTION

- See “INSPECTION AND MAINTENANCE 5.1 USE OF LUBRICATING OIL ACCORDING TO TEMPERATURE” for the oil to be used.
- Use seal tape, etc. at the thread of the filler plug to stop the oil leak and securely tighten the plug after refilling the oil.

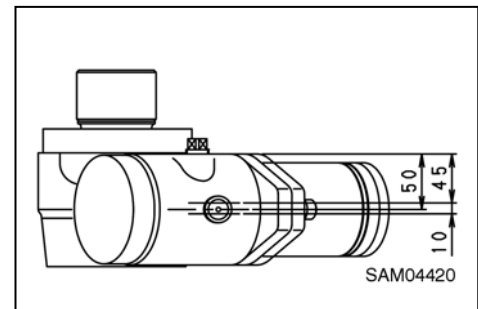
1. Place the machine on a level surface.
2. See “OPERATION 1.7 MACHINERY COVER” and remove the machinery cover.
3. Remove the filler plug (F) on the slewing reduction gear case and check that the oil is filled up to the centre height of the gear case using a ruler etc.

NOTES

- The height at centre of gear case is 50 mm from the top of the filler plug.
- 50 mm (± 5 mm) is the appropriate oil level.
- Do not allow ingress of dust or dirt when measuring or filling oil.



4. If the oil level is low, refill the gear oil from the plug hole of the filler plug (F).
5. Securely tighten the filler plug (F) after checking/refilling the oil.
6. See “OPERATION 1.7 MACHINERY COVER” and install the machinery cover.



[9] CHECKING BATTERY ELECTROLYTE 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 contact with eyes or skin, wash the affected area with plenty of water and consult a physician.
- Do not refill the electrolyte above the “Maximum level line”.
The fluid leakage can cause fire.

CAUTION

- Wipe the top of the battery with a moist cloth to keep it clean.
- Distilled water should be refilled before starting the work next day to avoid freezing.

1. Place the machine on a level surface.
2. See “OPERATION 1.7 MACHINERY COVER” and remove the machinery cover.
3. Verify the electrolyte you can see through the side of the battery case from the inspection hole of the machinery cover.

NOTES

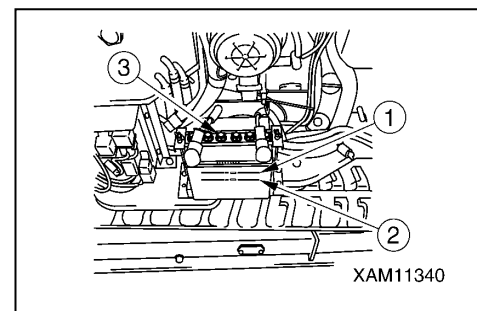
Wipe the battery case clean if it is dirty.

4. Verify that the surface of the electrolyte is at the maximum level line (1).
5. If the surface of the electrolyte is not at the maximum level line (1), remove all the battery caps (3) (6 caps) and replenish up to the maximum level (1).

NOTES

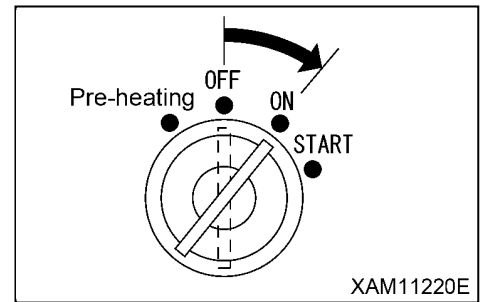
If electrolyte is spilled, refill the electrolyte, and wash immediately with water.

6. Check breather hole of battery cap (3) and clean if necessary before tightening the cap securely.
7. After checking the electrolyte level, see “OPERATION 1.7 MACHINERY COVER” and install the machinery cover.

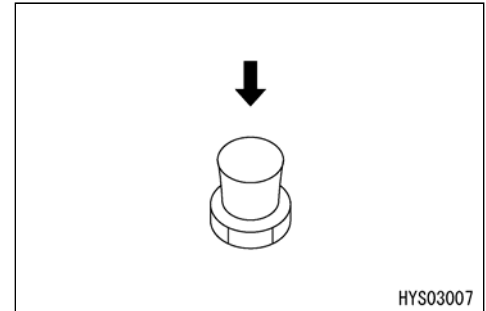


[10] CHECKING HORN FOR OPERATION

1. Insert the key in the starter switch, turn it to the "ON" position and check the following.

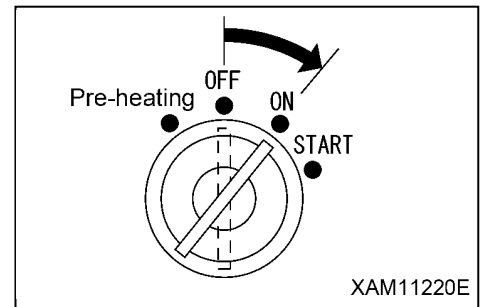


2. Press the horn switch to verify that the horn sounds.
If not, the horn may be faulty or the circuit may be open.
Ask us or our sales service agency for repair.

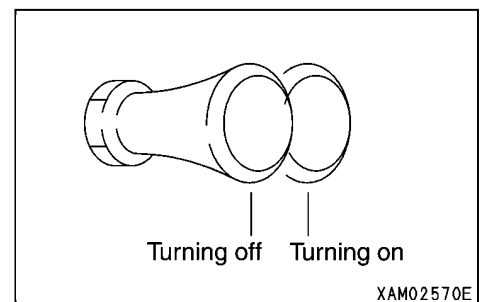


[11] CHECKING HEADLIGHTS FOR OPERATION

1. Insert the key into the main starter switch, turn it to the "ON" position and check the following.



2. Pull the headlight switch to see if the working light at the left tip of the first boom lights up.
If it does not, a blown bulb or wiring failure is likely. Contact us or our sales service agency for repair.

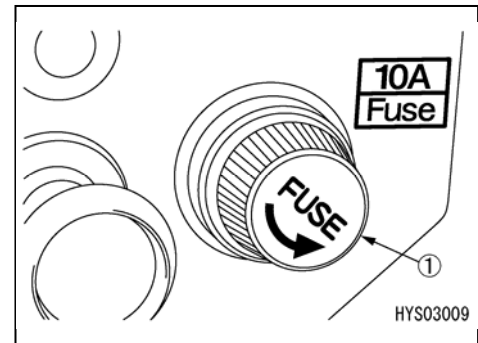


[12] CHECKING FUSE BOX FOR DAMAGE

WARNING

If fuses are blown 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.

1. Turn the fuse holder (1 piece) on the instrument panel counterclockwise and take tubular fuses out.
2. Check the fuse for damage and meltdown and if the fuse of the specified capacity is being used.
3. If the 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.
4. If any trace of an open/short circuit is found in the electrical wiring around the hose guide or link, ask us or our sales service agent for repair.

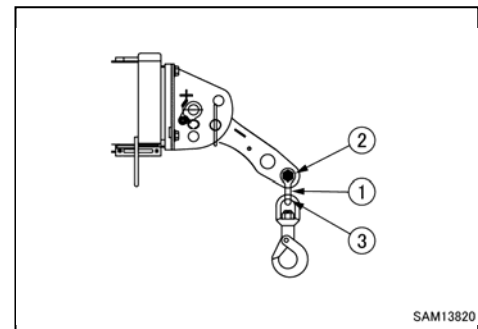


[13] CHECK JIB, MAIN BOOM AND FRAME FOR CRACKS, DEFORMATION OR DAMAGE

Check the jib, main boom and frame for cracks, deformation or any other damage, and repair them as necessary.

[14] GREASING ON SHACKLE

Wipe off and clean old grease from contact point (2) of shackle (1) and the jib head hole, and contact point (3) of fixed hook and shackle (1), then apply new lithium grease.



2.1.3 CHECKING AFTER STARTING ENGINE

Check the following in this section after starting the engine and before starting the work every day.

CAUTION

The checkups described in this section should be carried out after starting the machine. See "Operation 2.2 Starting Engine" and later to execute the engine start up, travelling operations, outrigger operations and crane operations.

[1] CHECKING/ADJUSTING RUBBER TRACK TENSION

CAUTION

- Set the outriggers and raise the rubber track for about 80 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 wheels treads 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 replaced.
Contact us or our sales service agency for the judgement of whether to replace, repair, or keep using the same rubber track.

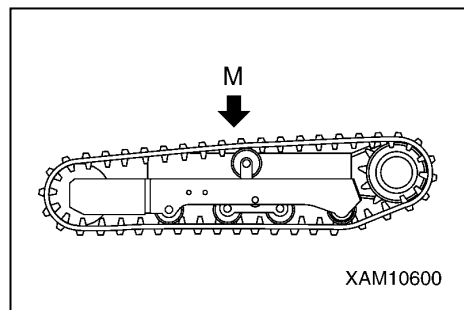
The rubber tracks are worn out differently depending on the working conditions and soil quality. Regularly check the wear and tension of the rubber tracks.

Especially, with the new machine or when a new part was installed, "initial slack" appears with 5 to 30 hours of driving after adjusting the tension to the specified value.

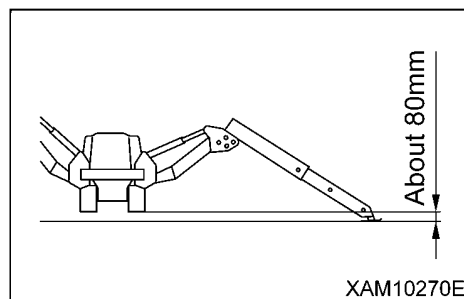
Adjust the tension frequently until the period of "initial slack" passes. This will prevent "rubber track from coming off due to insufficient tension on the rubber track".

[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.



2. See "OPERATION 2.12 OUTRIGGER SETUP OPERATION" to set outriggers and raise the machine about 80 mm above the ground.

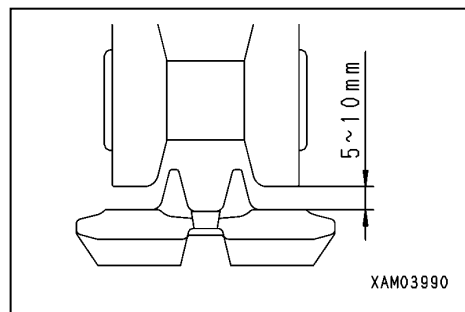


3. Measure the clearance between the wheel tread of the track roller (1) at centre and the shoulder of the rubber track.

NOTES

The clearance of 5 to 10 mm indicates the standard tension.

4. If the tension is out of the standard range, see the following section of "Tension adjustment" to make adjustments.



[TENSION ADJUSTMENT]

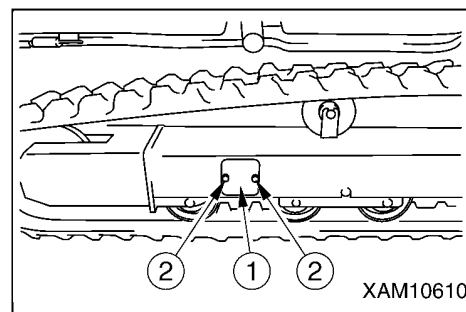
If the "tension check" of the rubber track found the tension lower than standard tension of the rubber track, make adjustments as described below.

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. Remove the mounting bolts (2) (2 bolts) and then remove inspection cover (1).



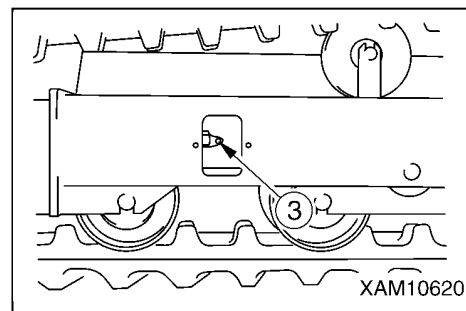
2. Inject the grease from the grease nipple (3) using the grease gun.

3. Perform the following tasks to verify the proper tension.

(1) See "OPERATION 2.21 OUTRIGGER STOWAGE OPERATION" to stow the outriggers and lower the machine on the ground.

(2) Move the machine back and forth.

(3) See "OPERATION 2.12 OUTRIGGER SETUP OPERATION" to set outriggers and raise the machine again about 80 mm above the ground.



4. Perform the "tension check" of the rubber track again.

If the tension is not appropriate, make another adjustment.

5. Install the inspection cover (1) using mounting bolts (2) (2 bolts).

6. See "OPERATION 2.21 OUTRIGGER STOWAGE OPERATION" to stow the outriggers and lower the machine on the ground.

• **TIGHT TENSION (DECREASE TENSION)**

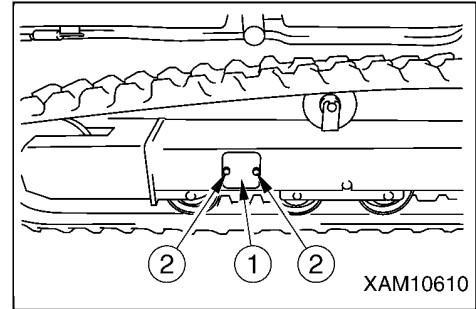
⚠ WARNING

Grease is sealed inside the rubber track tension adjuster. The grease is at a high pressure because of the tension of the rubber track.

Making adjustments without observing the following precautions may cause the grease valve to pop out and result in serious accidents.

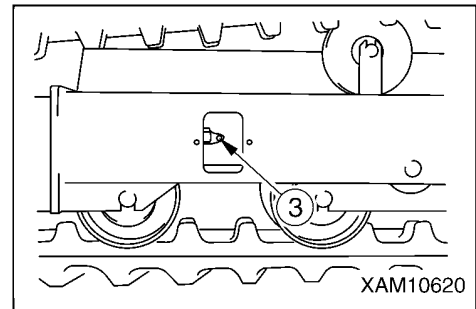
- Do not loosen the tension adjustment grease valve 1 full turn or above. Doing so may cause the grease valve to pop out.
- To avoid the risk during tension adjustment, do not place your body in front of the grease valve.

1. Remove the mounting bolts (2) (2 bolts) and then remove inspection cover (1).



2. Slowly loosen the grease valve (3) to drain the grease.
3. When loosening the grease valve (3), do not loosen by more than 1 turn.
4. If the grease is not drained easily, perform the following to drain the grease.

- (1) See "OPERATION 2.21 OUTRIGGER STOWAGE OPERATION" to stow the outriggers and lower the machine on the ground.
- (2) Move the machine back and forth.
- (3) See "OPERATION 2.12 OUTRIGGER SETUP OPERATION" to set outriggers and raise the machine again about 80 mm above the ground.



5. Tighten the grease valve (3).
6. Perform the "tension check" of the rubber track.
If the tension is not appropriate, make another adjustment.
7. Install the inspection cover (1) using mounting bolts (2) (2 bolts).

8. See "OPERATION 2.21 OUTRIGGER STOWAGE OPERATION" to stow the outriggers and lower the machine on the ground.

[2] CHECKING RUBBER TRACKS FOR DAMAGE AND WEAR

CAUTION

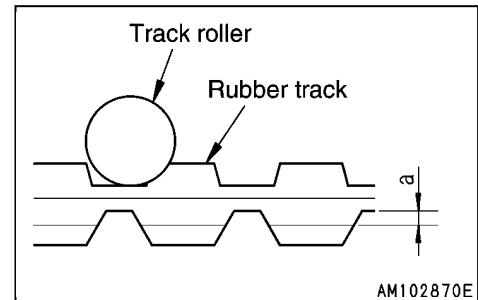
Contact us or our sales service agency for the judgement of whether to replace, repair, or keep using the same rubber track.

The following condition requires repair or replacement of the rubber track. Ask us or our sales service agency for repair/replacement.

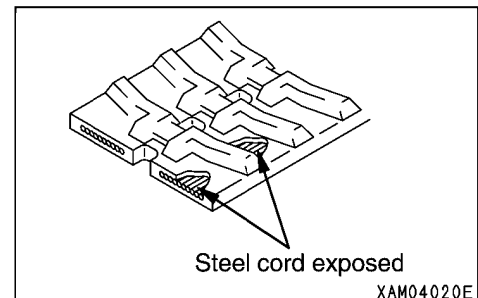
[LUG HEIGHT]

- When the lug height (a) decreases with wear, the traction force drops.

Replace the rubber track with a new one when the lug height (a) decreases to 5 mm or lower.

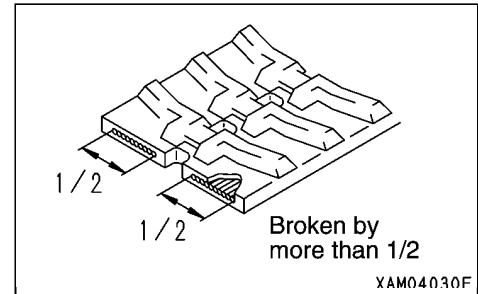


- When the lug is worn out and the steel cord inside the rubber track is exposed for more than 2 links, replace the rubber track with a new one.



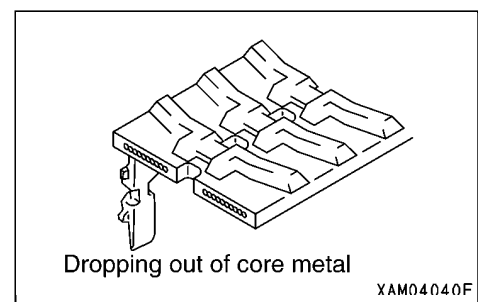
[BROKEN STEEL CORD]

- If more than half of the steel cord layer is broken on one side, replace the rubber track with a new one.



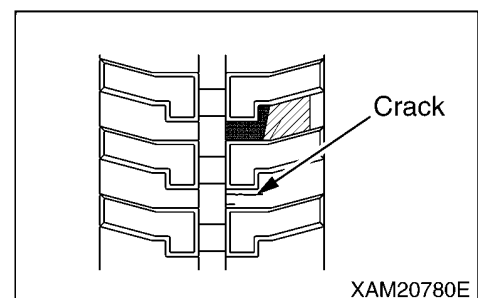
[FALLEN CORE METAL]

- If the core metal of the rubber track is fallen out at more than 1 location, replace the rubber track with a new one.



[CRACKS]

- If there is a crack between rubber track lugs, replace the rubber track with a new one or repair the rubber track.



[3] CHECKING OUTRIGGER OPERATION

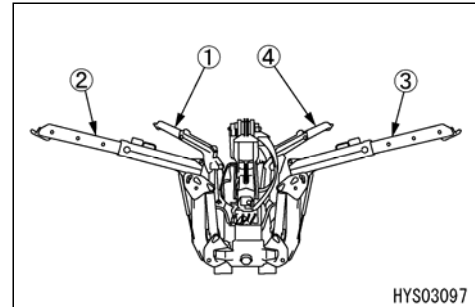
⚠ WARNING

When performing an operation check of the outriggers, be sure to see “OPERATION 2.12 OUTRIGGER SETUP OPERATION” and “OPERATION 2.21 OUTRIGGER STOWAGE OPERATION” and observe the procedure and precautions.

CAUTION

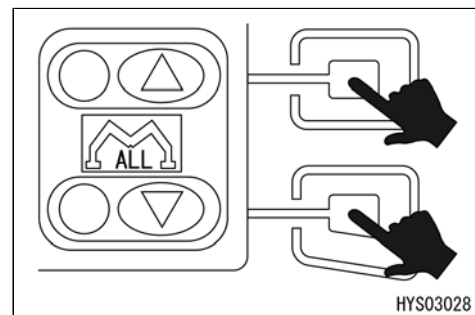
- When performing an operation check of the crane, the outriggers need to be set to the maximum extension. Set the outriggers to the maximum extension in this section.
- Use the monitor to perform outrigger setting operation. See “OPERATION 1.5 MONITOR” for monitor operation.

1. See “OPERATION 2.12 OUTRIGGER SETUP OPERATION [2] TASKS TO BE PERFORMED UPON ENGINE STOP” to rotate the rotary of the 4 outriggers outward, and pull out the inner boxes.



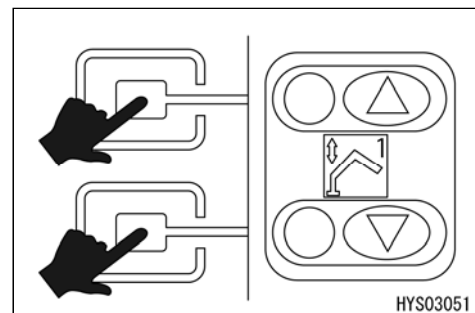
2. See “OPERATION 2.2 STARTING ENGINE” to start the engine.

3. See “OPERATION 2.12 OUTRIGGER SETUP OPERATION” to check whether the four outriggers lower smoothly when the Outrigger collective settings switch “▼” (6) is pressed. Also, check whether the four outriggers rise smoothly when the Outrigger collective setting switch “▲” (5) is pressed. If there is any abnormality such as the four outriggers being incapable of operating, a failure of each switch or valve, or a break is likely.



Ask us or our sales service agency for repair.

4. See “OPERATION 2.12 OUTRIGGER SETUP OPERATION” to check whether the outrigger lowers smoothly when the Outrigger individual settings switch “▼” (8) is pressed. Also, check whether the outrigger rises smoothly when the Outrigger individual setting switch “▲” (7) is pressed. At this time, check if abnormal noise is generated from various parts of the outriggers.



Continue to check all outrigger individual setting buttons in turn.

CAUTION

When setting outriggers on the ground, check if all stroke sensors properly work and there is no adhesion of dirt or ice.

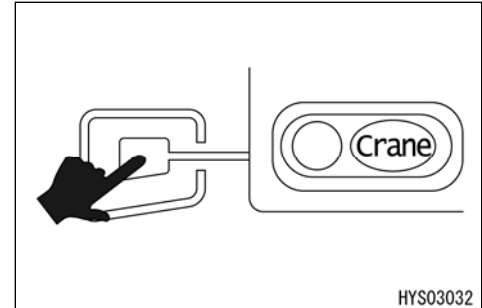
5. Check that the warning buzzer sounds intermittently while the outrigger operation button is operated. If the warning buzzer does not sound, a failure or a break of the buzzer is likely. Ask us or our sales service agency for repair.

[4] CHECKING CRANE OPERATIONS

⚠ WARNING

- When performing an operation check of the crane, see “OPERATION 2.12 OUTRIGGER SETUP OPERATION” to set the outriggers to maximum.
- When performing an operation check of the crane, see from “OPERATION 2.13 PRECAUTIONS BEFORE CRANE WORK” to “OPERATION 2.20 CRANE STOWAGE OPERATION (FIXED HOOK SPECIFICATION)” and observe the procedure and precautions.

1. Set up the outrigger securely. Then, press the “crane mode” button of the monitor panel. After the circle on the left turns from red to green and the mode changes to crane, the crane comes ready for operation.



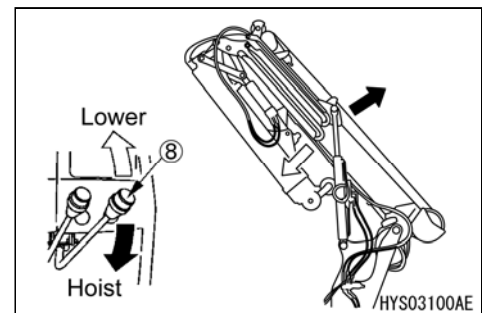
2. Press the main boom selector button of the monitor panel to select the main boom. (The circle on the left of "Main" is displayed in green.)

Verify that the main boom rises smoothly when the main boom/jib derricking lever (8) is operated to “HOIST” side (pulled toward you).

Also, verify that the main boom lowers smoothly when the main boom/jib derricking lever (8) is operated to “LOWER” side (pushed forward).

At this time, check if abnormal noise is generated from various parts of the main boom or main boom derrick cylinder.

Repair if any abnormality is found.



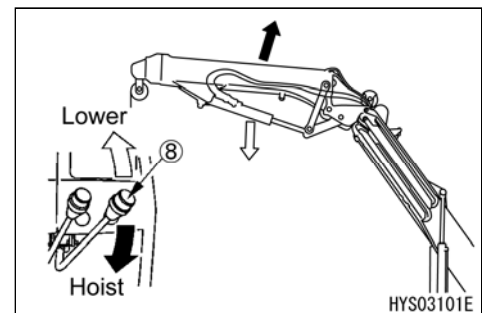
3. Set the main boom angle to 40 degrees or more and then press the main boom selector button of the monitor panel to select the jib. (The circle on the left of “Jib” is displayed in green.)

Verify that the jib rises smoothly when the main boom/jib derricking lever (8) is operated to “HOIST” side (pulled toward you).

Also, verify that the jib lowers smoothly when the main boom/jib derricking lever (8) is operated to “LOWER” side (pushed forward).

At this time, check if abnormal noise is generated from various parts of the jib or jib derrick cylinder.

Repair if any abnormality is found.



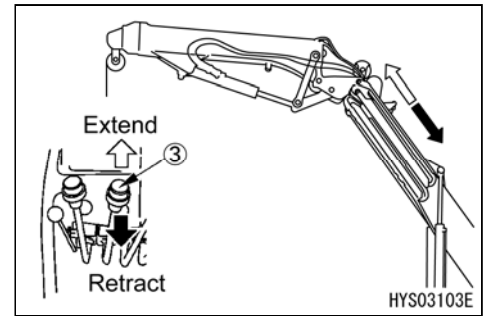
4. Press the main boom selector button of the monitor panel to select the main boom. (The circle on the left of "Main" is displayed in green.)

Verify that the main boom extends smoothly when the main boom/jib telescoping lever (3) is operated to "EXTEND" side (pushed forward).

Also, verify that the main boom retracts smoothly when the main boom/jib telescoping lever (3) is operated to "RETRACT" side (pulled toward you).

At this time, check if abnormal noise is generated from various parts of the main boom or main boom telescoping cylinder.

Repair if any abnormality is found.



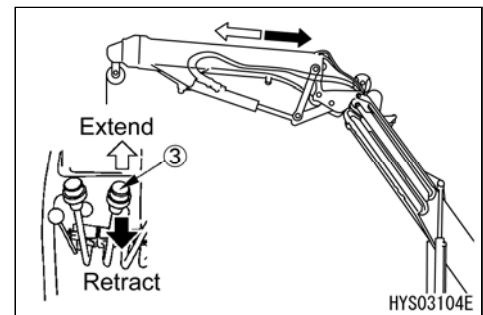
5. Press the jib selector button of the monitor panel to select the jib. (The circle on the left of "Jib" is displayed in green.)

Verify that the jib extends smoothly when the main boom/jib telescoping lever (3) is operated to "EXTEND" side (pushed forward).

Also, verify that the jib retracts smoothly when the main boom/jib telescoping lever (3) is operated to "RETRACT" side (pulled toward you).

At this time, check if abnormal noise is generated from various parts of the jib or jib telescoping cylinder.

Repair if any abnormality is found.

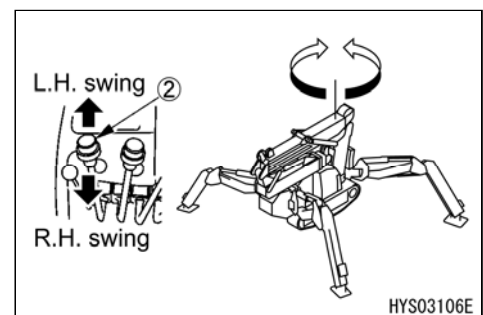


6. Verify that the crane smoothly slews counterclockwise when the slewing lever (2) is operated to "L.H.swing" side (pushed forward).

Also, verify that the crane smoothly slews clockwise when the slewing lever (2) is operated to "R.H.swing" side (pulled toward you).

At this time, check if abnormal noise is generated from around the post.

Repair if any abnormality is found.



[5] INSPECTION OF MOMENT LIMITER

WARNING

When an abnormality occurs in the moment limiter, immediately contact us or our sales service agent.

1. Turn "ON" the starter switch.
2. Check the monitor display.
Check that no occurrence of abnormality is displayed on the monitor.
3. Start the engine and operate the crane as follows. Then, check if the monitor display of the moment limiter is correct.

Crane operation and display item	Monitor display value of moment limiter
Display value of "BOOM ANGLE" when main boom angle is set to "55°" of the angle indicator	55.0°
Display value of "JIB ANGLE" when jib angle is set to "30°" of the angle indicator	30.0°
Display value of "Working Radius" when the main boom length is set to minimum, the main boom angle to "55.0°", jib length to minimum and the jib angle to "0.0°"	3.2±0.2m
Display value of "Actual Load" when a weight whose mass is known is hoisted ★ Must be equal to combined mass of a weight and a lifting component ★ However, some error may be generated depending on the boom condition.	Actual load

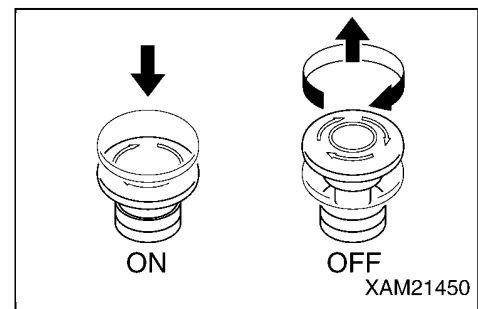
[6] CHECKING EMERGENCY STOP SWITCH FOR OPERATION

Press the emergency stop switch to check if the engine stops.

If the engine does not stop, the switch may be faulty or the circuit may be open. Ask us or our sales service agency for repair.

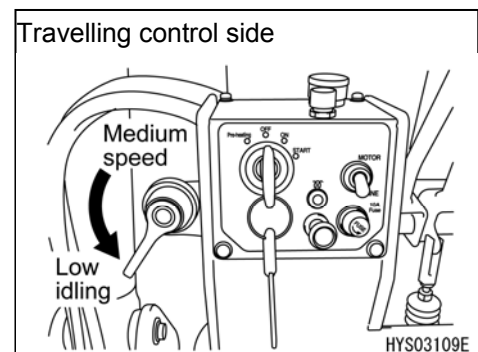
NOTES

When restarting the engine after an emergency stop, be sure to turn the engine emergency stop switch to the "OFF" position before starting the engine. The engine does not start if the engine emergency stop switch is in the "ON" position.



[7] CHECKING ENGINE EXHAUST GAS COLOUR, NOISE AND VIBRATION

1. Set the acceleration lever of either Travel Operation Unit or Crane Operation Unit to low idling position so that the engine is kept in no load operation for 5 minutes.
2. Verify that the engine exhaust gas colour is either transparent or slightly blue. Also, check for abnormal noises and vibrations. Repair if any abnormality is found.



2.2 STARTING ENGINE

⚠ WARNING

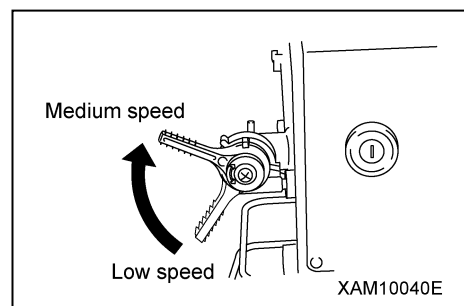
- Before starting the engine, make sure no personnel or impediments are close to the machine and honk the horn.

2.2.1 NORMAL ENGINE START WITH MAIN STARTER SWITCH

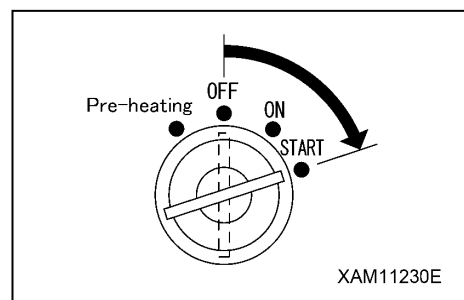
CAUTION

- Do not keep the starter turned for more than 5 seconds. Doing so will accelerate the battery discharge.
If the engine fails to start, wait for 1 minute before retrying.
- Verify that the fuel lever of the water separator pot is in the vertical position (open) before starting the engine.

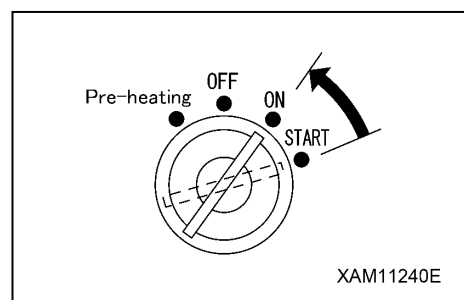
1. Pull the acceleration lever upward to operate the engine at medium speed (lever stroke about midway).



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



3. When the engine has started, release your hand from the key. The key automatically returns to the "ON" position.



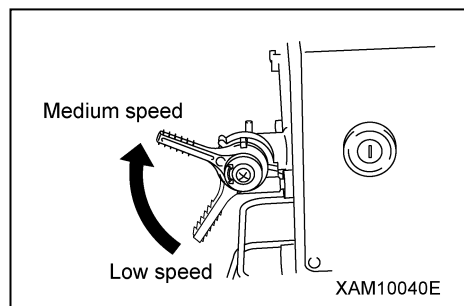
2.2.2 NORMAL ENGINE START WITH MAIN STARTER SWITCH IN COLD WEATHER

CAUTION

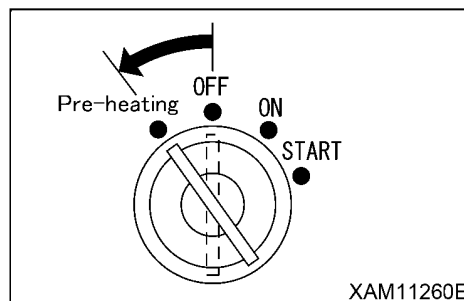
- Do not keep the starter turned for more than 5 seconds. Doing so will accelerate the battery discharge.
If the engine fails to start, wait for 1 minute before retrying.
- Verify that the fuel lever of the water separator pot is in the vertical position (open) before starting the engine.

Start the engine as follows when it is cold.

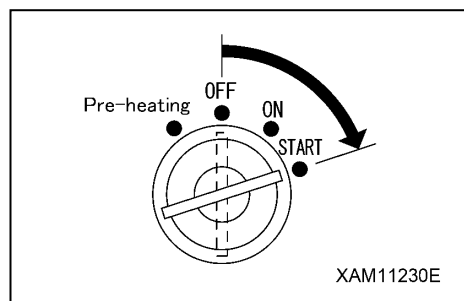
1. Pull the acceleration lever upward to operate the engine at medium speed (lever stroke about midway).



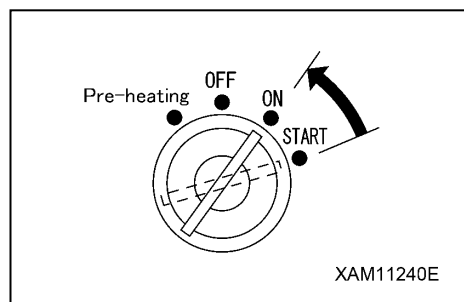
2. Insert the key into the main starter switch, turn the key to "PREHEAT" position and keep the position.
The preheat lamp illuminates.
The key automatically returns to the "ON" position when you release your hand.



3. When the preheat lamp goes OFF, turn the key to the "START" position.



4. When the engine has started, release your hand from the key.
The key automatically returns to the "ON" position.

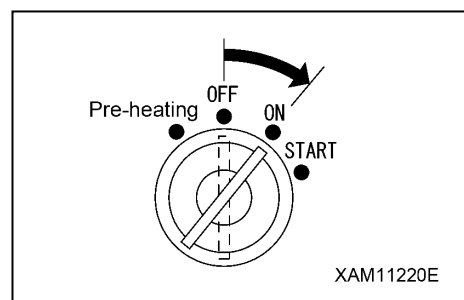


2.2.3 ENGINE START WITH AUXILIARY STARTER BUTTON

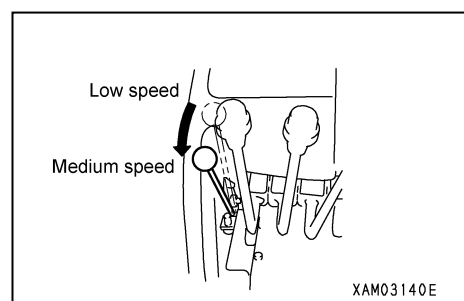
CAUTION

- To start the engine with the auxiliary starter switch, make sure that the main starter switch is in "ON" position.
- Do not keep the starter turned for more than 5 seconds. Doing so will accelerate the battery discharge.
If the engine fails to start, wait for 1 minute before retrying.
- Verify that the fuel lever of the water separator pot is in the vertical position (open) before starting the engine.

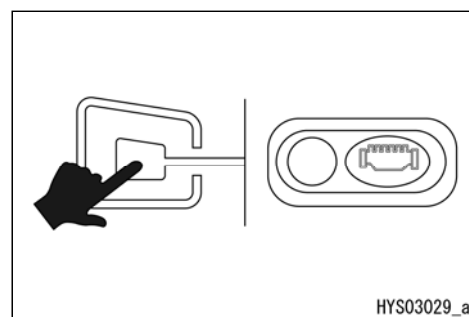
1. Insert the key into the main starter switch and turn the key to the "ON" position.



2. Pull the acceleration lever on the crane control side toward you to operate the engine at medium speed (lever stroke about midway).



3. Press the auxiliary starter button of the monitor panel until the engine started.

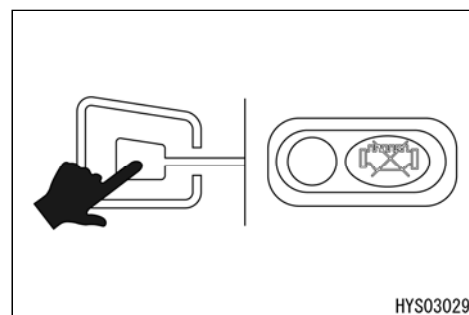


4. When the engine has started, release your hand from the auxiliary starter button.

The auxiliary switch display on the monitor panel changes.

NOTES

If it is difficult to start the engine, see "OPERATION 2.2.1 NORMAL ENGINE START WITH MAIN STARTER SWITCH" and start the engine using the main switch.



2.3 OPERATIONS AND CHECKS AFTER STARTING ENGINE

DANGER

Never refuel (light oil) while the engine is in operation.
Always stop the engine before refilling fuel.

WARNING

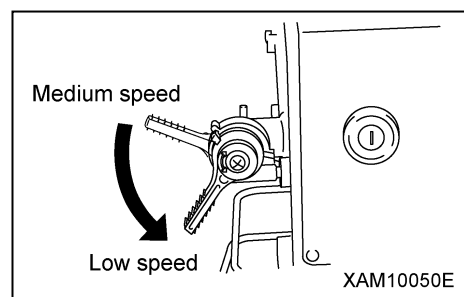
- If any abnormal condition takes place during the warm-up operation, immediately turn the main starter switch to the “OFF” position to make an emergency stop. The engine stops and the power supply of the electric system is turned OFF.
- Always perform the warm-up operation. The motor needs adequate warm-up time especially in cold climates.
Failure to warm the motor may result in a serious accident on account of slow reaction of the travelling gear and crane from the operating lever.
- Crane operational check is necessary after motor warm-up.
Keep the hook block away from the boom to avoid interference or collision.
- If crane operational check detects an abnormal event, make an emergency stop promptly and repair any relevant part.
A potential serious accident may occur if disregarded.
- When performing crane work, see from “OPERATION 2.13 PRECAUTIONS BEFORE CRANE WORK” to “OPERATION 2.20 CRANE STOWAGE OPERATION (FIXED HOOK SPECIFICATION)” and observe the procedure and precautions.

CAUTION

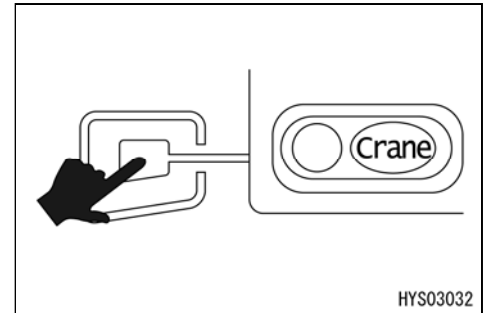
- The appropriate temperature of the hydraulic oil is 45 to 80°C.
Even when operating at low temperature by necessity, increase the temperature of the hydraulic oil to about 20°C.
- Do not idle away suddenly until the warm-up operation is done.
- When the engine has started, check to see that the “battery charge monitor” went off.
Repair if any abnormality is found.
- If the engine is operated at low engine speed for a long time, lubrication of the engine cylinder head may become insufficient, causing a failure.
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.

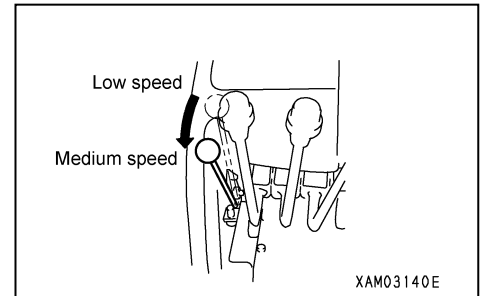
1. Push the acceleration lever downward. Turn the engine to low speed (stroke fully forward) and continue the operation with no load for about 5 minutes.
2. Check if there is any abnormality with the engine exhaust gas colour, noise, and vibration.
Repair if any abnormality is found.
3. See “OPERATION 2.12 OUTRIGGER SETUP OPERATION” to set the outriggers.



4. Set up the outrigger securely. Then, press the “crane mode” button of the monitor panel. After the circle on the left turns from red to green and the mode changes to crane, the crane comes ready for operation.



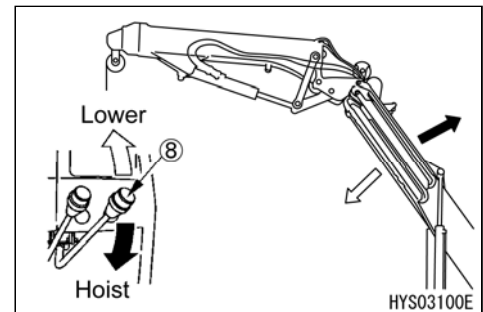
5. Pull the acceleration lever on the crane control side toward you to operate the engine at medium speed (lever stroke about midway).



6. Press the main boom selector button of the monitor panel to select the main boom. (The circle on the left of "Main" is displayed in green.)

Operate the main boom/jib derricking lever (8) slowly back and forth and move the main boom derricking cylinder up/down until it reaches the stroke end. Check if there is any abnormality with the operation.

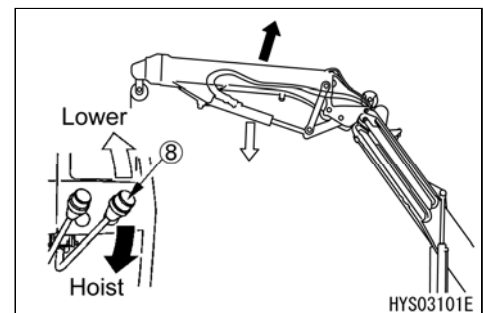
Repair if any abnormality is found.



7. Press the jib selector button of the monitor panel to select the jib. (The circle on the left of “Jib” is displayed in green.)

Operate the main boom/jib derricking lever (8) slowly back and forth and move the jib derricking cylinder up/down until it reaches the stroke end. Check if there is any abnormality with the operation.

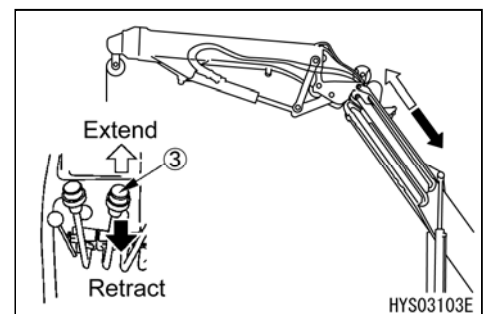
Repair if any abnormality is found.



8. Change the boom selection display of the monitor panel to “Main”.

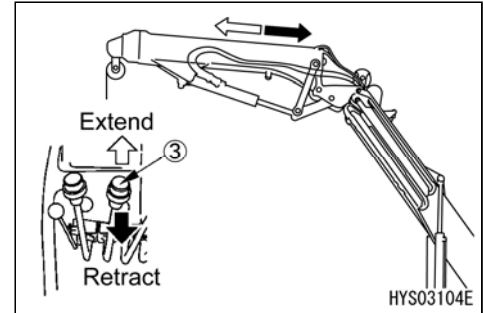
Operate the main boom/jib telescoping lever (3) slowly back and forth to extend/retract the main boom until it reaches the stroke end. Check if there is any abnormality with the operation.

Repair if any abnormality is found.



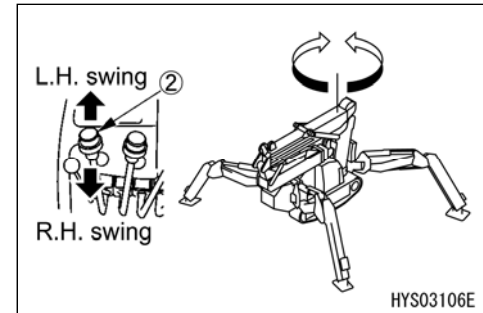
9. Change the boom selection display of the monitor panel to “Jib”.

Operate the main boom/jib telescoping lever (3) slowly back and forth to extend/retract the jib until it reaches the stroke end. Check if there is any abnormality with the operation. Repair if any abnormality is found.



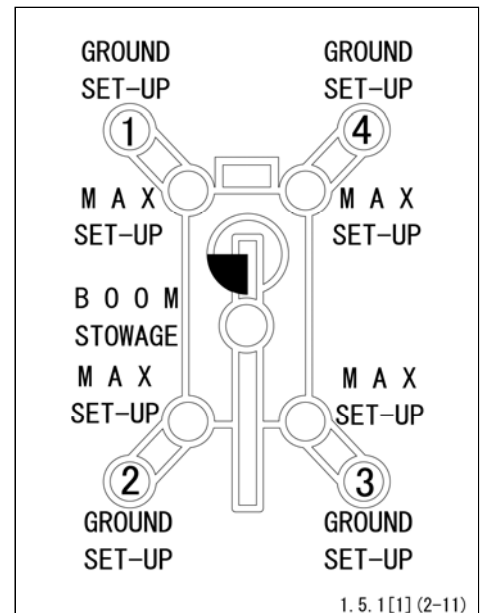
10. Operate the slewing lever (2) slowly back and forth to check if the main boom smoothly slews clockwise and counterclockwise for 360 degrees or more. Also check if the main boom stops immediately when the slewing lever returns to the “NEUTRAL” position.

Repair if any abnormality is found.



Look at the monitor panel and check if the main boom slewing position lamps illuminate in blue at one location in the slewing direction and if the main boom slewing position lamps all go OFF when the main boom is in the stow direction.

Repair if any abnormality is found.



2.4 BREAK-IN OPERATION

CAUTION

Perform break-in for the period of about the first "250 hours" (hours displayed on the service meter). The life of the machine shortens if heavy load operation or high speed operation is performed before fitting of the various sections of the machine.

While this machine is shipped after thorough adjustment and inspection, immediate difficult tasks will quickly degrade the functions and shorten the life of the engine and crane.

Perform break-in for the first "250 hours" (time displayed on the service meter).

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

- Be sure to perform the warm-up operation and avoid idling away after the engine has started. See "OPERATION 2.3 OPERATIONS AND CHECKS AFTER STARTING ENGINE".
- Avoid heavy load operation or high speed operation.
- Avoid sudden starting, sudden acceleration, unnecessary sudden stop or sudden steering.
- When the break-in period reaches "50 hours", do not fail to change the engine oil. See "INSPECTION AND MAINTENANCE 8.2 [1] REPLACEMENT OF ENGINE LUBRICATING OIL AND OIL FILTER CARTRIDGE".

The metal powder produced inside the engine through break-in increases in the engine oil and it deteriorates the oil, shortening the engine life.

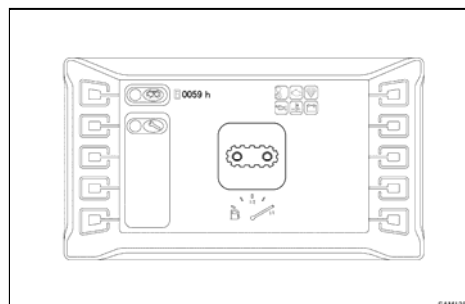
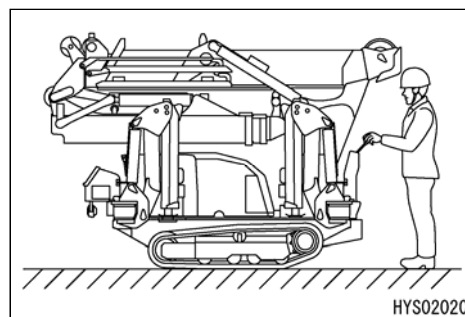
2.5 MACHINE TRAVELLING POSTURE

WARNING

- **When moving this machine self-propelled, take the "travelling posture" with which the boom, hook block, and outriggers are stowed.**
- **Travelling or travelling hoist with the boom extended is essentially prohibited. This will overturn the machine, causing serious injury and accidents.**
- **Do not use this machine for any other purpose except the major purpose such as using it for carrying the load on the machine.**
- **Driving this machine on a public road is prohibited by the Road Traffic Law.**

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

1. See "WINCH 2.4 CRANE STOWAGE OPERATION" and "OPERATION 2.20 CRANE STOWAGE OPERATION (FIXED HOOK SPECIFICATION)" to stow the crane.
2. See "OPERATION 2.21 OUTRIGGER STOWAGE OPERATION" to stow the outriggers.
3. After setting into the travelling posture, check if the monitor looks as shown in the right drawing.



2.6 START MOVING MACHINE

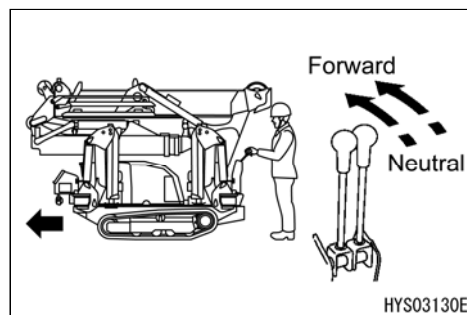
WARNING

- Do not allow anyone around the machine.
- Clear 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 in the vicinity of the machine and honk the horn before starting to move the machine.
- This machine is designed that the person who operates it should move along with it, when the machine starts travelling.
Set 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 a sudden start especially when you are going backward. This could cause a serious accident.
- The front of the machine will be out of view. Be extremely careful when moving forward.
- If you cannot verify the safety because the driving direction is out of view, stop driving and check the safety of the travelling direction.
Assign a guide person if necessary depending on the worksite situation.
- When the winch is installed, be careful not to hit your head against the winch. (Winch specification)

[1] MOVING FORWARD

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

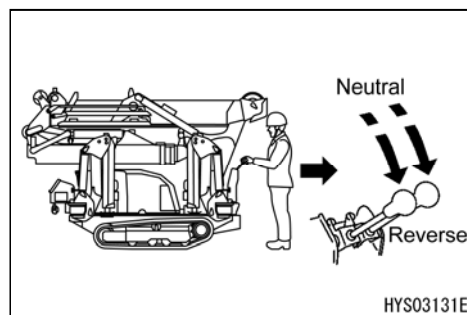
- Push the left and right travelling levers slowly forward to move forward.



[2] MOVING BACKWARD

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

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



2.7 CHANGING DIRECTION OF THE MACHINE

WARNING

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

[1] CHANGING MACHINE DIRECTION WHEN STOPPED

• LEFT TURN

Operate the right travelling lever.

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

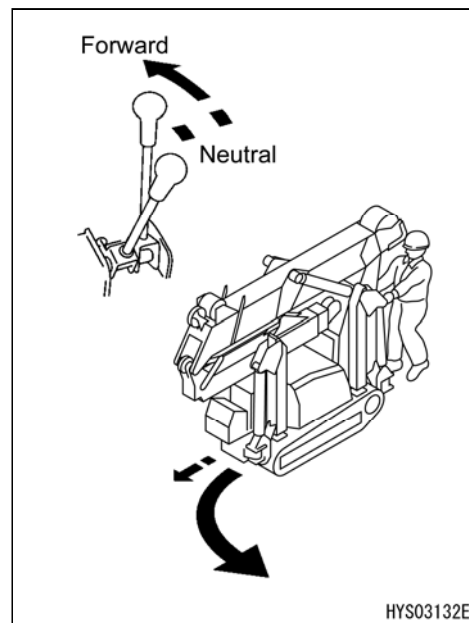
Tilt the travelling lever toward you to turn to the left in the backward direction.

• 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.



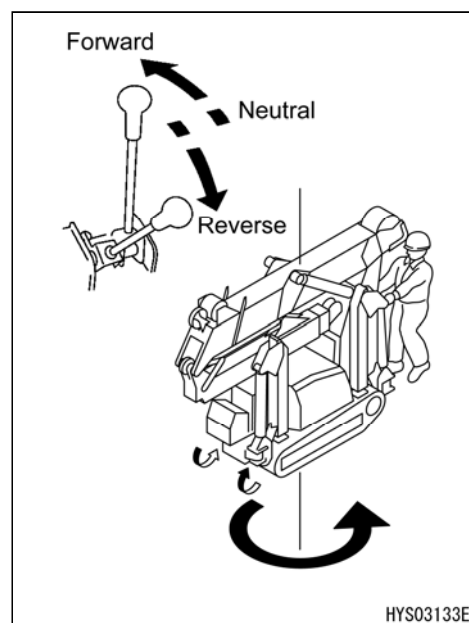
[2] SPIN TURNS

• 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.



[3] CHANGING DIRECTION WHILE MOVING

• LEFT TURN WHILE MOVING FORWARD

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

• LEFT TURN WHILE MOVING BACKWARD

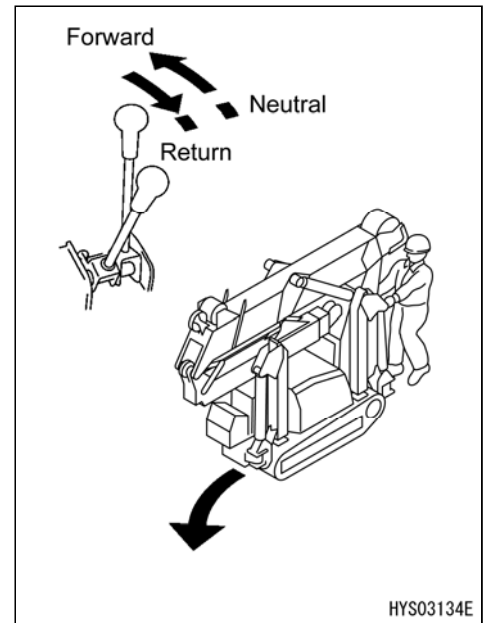
While tilting the right travelling lever toward you, return only the left travelling lever to the NEUTRAL position.

• RIGHT TURN WHILE MOVING FORWARD

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

• RIGHT TURN WHILE MOVING BACKWARD

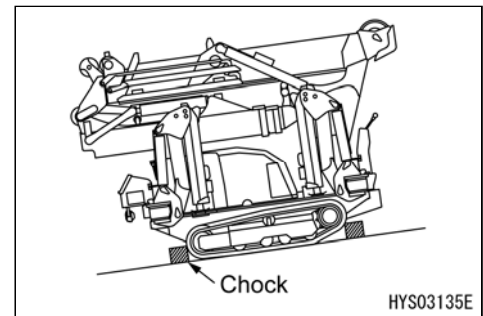
While tilting the left travelling lever toward you, return only the right travelling lever to the NEUTRAL position.



2.8 STOPPING/PARKING THE MACHINE

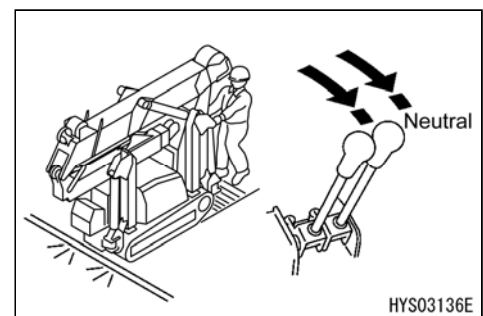
⚠ WARNING

- Avoid sudden stops and try to stop with a safety margin whenever possible.
- Choose a level and solid location for parking the machine. If it is necessary to park on a slope, provide some blocks so that the machine will not move.
- Careless contact with the travelling lever(s) during the engine operation may result in sudden movement of the machine, leading to serious accidents.
- Stop the engine and always remove the key from the main starter switch. Take the key with you when you leave the machine.



Operate the left and right travelling levers to the NEUTRAL position at the same time.

The brake is automatically applied and the machine stops.

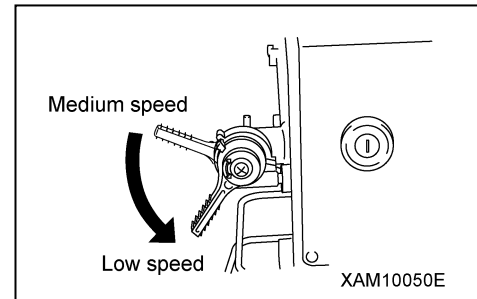


2.9 STOPPING ENGINE

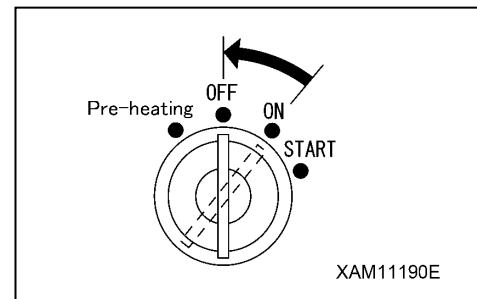
CAUTION

- Stopping the engine before it sufficiently cools down may shorten the life of engine units. Do not stop the engine suddenly except for an emergency.
- When the engine is overheated, do not stop the engine suddenly. Change the engine speed to low, and gradually cool down the engine before stopping.

1. Push the acceleration lever downward. Turn the engine to low speed (stroke fully forward) and continue the operation with no load for about 5 minutes.



2. Turn the main starter switch key to the "OFF" position. The engine stops.
3. Remove the main starter switch key.



2.10 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. Fill up the fuel tank to full. (Replenish after the fuel tank is sufficiently cooled.)
3. Keep the area around the engine free of dead leaves and paper waste. A potential fire could occur if disregarded.
4. Clean off the crawlers and outriggers, removing mud.

2.11 CAUTIONS IN DRIVING

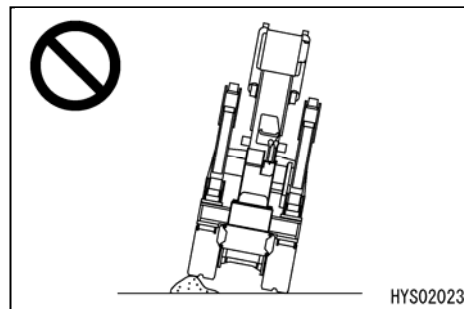
WARNING

Not observing these cautions while driving will result in serious accidents.

[1] CAUTIONS IN DRIVING

Driving 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.

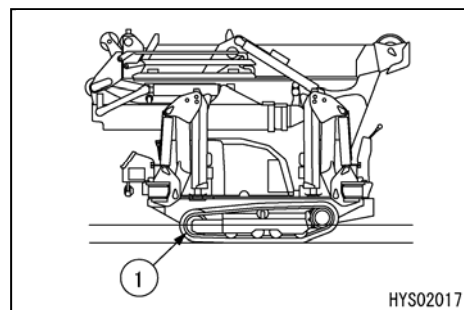


NOTES

See “OPERATION 2.5 MACHINE TRAVELLING POSTURE” for the travelling posture of the machine.

[2] ALLOWABLE WATER DEPTH

In the water, travel promptly in the range up to the center of the idler (1) and pass through the water.



[3] CAUTIONS ON UPWARD/DOWNWARD SLOPE

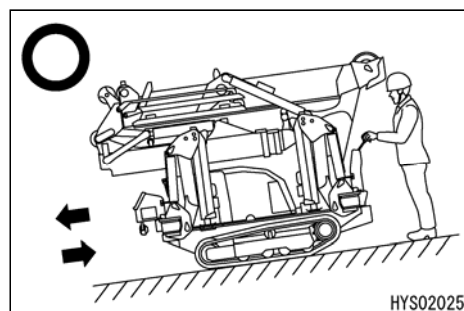
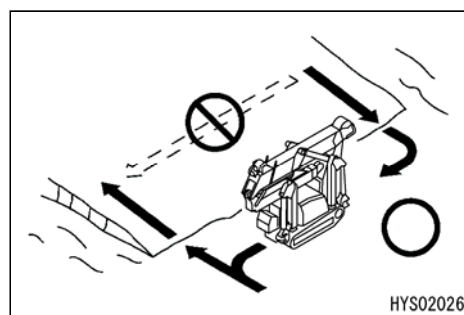
WARNING

- If the machine tilts more than “10 degrees” forward or backward, or from side to side while travelling, the overturn warning buzzer sounds. If the overturn warning buzzer sounds, do not travel on the slope of more inclination. The machine may overturn.
- Even if the machine tilts at 10 degrees or less, there is a risk of overturn when the machine sways considerably due to sudden operation. Always be aware of the machine tilting or swaying and never operate violently.

- Slopes inclined by 10 degrees or more present an overturning hazard. Do not travel on these slopes.
- Never change the direction on the slope or drive parallel to the slope. Travel safely such as by going down to the level ground and taking a detour.
- Operate the acceleration lever 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.

- When travelling over a slope, direct the machine perpendicular to the slope and the driver is requested to operate at the mountain side position of the machine.
- If the engine stops on the slope, return the travelling levers to the “NEUTRAL” position and restart the engine.



2.12 OUTRIGGER SETUP OPERATION

WARNING

- **GROUND FOR SETTING OUTRIGGERS**

Always place the outriggers on a level, stable and solid ground.

Attempt to work with crane without setting the outriggers may cause the machine to overturn.

- **EXTENDING AND SETTING THE OUTRIGGERS**

- Do not let people approach the machine when setting the outriggers.

Close proximity to the machine may cause serious accidents such as getting caught between the outrigger and the machine main unit.

- When setting the outriggers, always keep the machine sternly level while looking at the levelling instrument.

If the machine tilts more than “3 degrees”, the overturn warning buzzer sounds.

- Set the outriggers so that the rubber tracks are approximately 80 mm above the ground.

After setting, verify that all the 4 outriggers are securely set.

- Always set the outriggers to “aximum extension”

If the outriggers are unavoidably set in the state other than the “outrigger extended to maximum”, perform the crane operation with the values given in the “Rated total load chart with the outriggers extended to other than maximum” with all 4 rotaries set to the standard angle or with adjacent 2 or more outriggers extended to maximum.

- If one or more outriggers are not set at the Standard rotary position, set two or more adjacent outriggers to maximum extension. Otherwise the crane cannot enter crane mode to enable crane operation.

- When setting the outriggers, always maintain the outrigger rotary at the extension position, and insert each position pin fully. Do not set the outriggers with the outrigger rotary stowed.

- When setting the outriggers, always extend the outrigger top box.

Do not set the outriggers with the outrigger top box stowed.

- When operating the outrigger button, always keep the engine at lower speed.

When the engine is controlled to high speed, outriggers move too quickly which may result in serious accidents including tipping of the machine.

- Do not perform outrigger collective operation except on a level ground. The 4 outriggers may not contact the ground evenly and the machine may tilt and turn over.

- To lift up the machine by control of the outrigger collective operation button, use the procedure as follows:

- Do not lift up the machine continuously and at a stroke. Doing so may cause the machine to overturn.

Repeat the button “PUSH” position and “RELEASE” position alternately and lift up the machine while checking that the 4 outriggers extend evenly.

- If the 4 outriggers do not extend evenly, operate the individual operation button of the outrigger that does not extend so that all the outriggers extend evenly.

- To lift up the machine by control of the outrigger individual operation buttons, use the procedure as follows:

- There are 4 outriggers. Be careful not to confuse the use of respective 4 outrigger individual setting buttons. Check the number displayed on the monitor at the side of the outrigger individual setting buttons and the arrangement of “Number plate” affixed to each outrigger. A serious accident may occur if the outrigger numbers are confused.

- When you control 2 of the individual operating buttons of the outrigger button section at one time, only 2 in the front (outriggers [(2)] and [(3)]) or only 2 in the rear (outriggers [(1)] and [(4)]) shall be operated at the same time. When 2 buttons in either left or right side are controlled at the same time, 2 outriggers on one side may extend very quickly to cause the machine to overturn.

- Use each of 4 outrigger individual setting buttons properly so that 4 outriggers extend evenly. When 2 outriggers in either left or right side extend very quickly, it may cause the machine to overturn.

- Any outrigger operations other than extending and retracting (e.g. inserting and extracting position pins) must be performed whilst engine is stopped. If any unauthorized person touches the outrigger operation buttons, it may cause the outrigger cylinders to move suddenly, and result in a serious accident.

⚠ WARNING

• SELECTING LOCATION TO SET OUTRIGGERS

- When setting the outriggers on the structural objects such as construction site or concrete floor, verify in advance that the surface where the outriggers will be set has sufficient strength. Insufficient strength in the setting surface will result in machine overturning or falling due to the setting surface collapsing.
- Outriggers may sink, leading to overturning hazard, if set in soft ground such as:
 - 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 a hole of 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

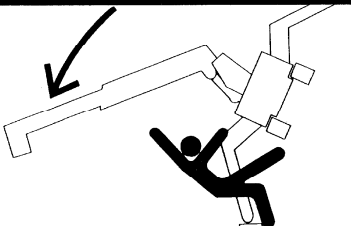
• PROTECTING GROUND

- 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 it is necessary to set the outriggers near the road shoulder, make sure to take precautions to prevent the collapse of the road shoulder.
- When working on a 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 will cause the outriggers to slip or overturn, causing serious accidents.

- If the ground can not be protected or if the outriggers sink even after protecting the ground, do not operate the crane.

⚠ **DANGER**

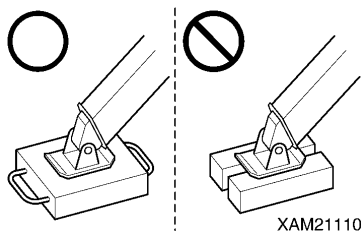


TIPPING THE MACHINE

- If a load exceeds the rated level, the machine possibly cause great danger to yourself and damage to the machine.
- Operate the lever slowly to smoothly start and stop abruptly operate the lever because it may cause the load to swing or unbalance the crane body, possibly resulting in its overturning, abrupt lever operation will also adversely affect the crane. Be sure to swivel at low speed.
- Structurally, outriggers are unable to extend beyond their extension limit. Therefore, before extending outriggers, choose a proper place for optimum extension. Check that each pin has been fully inserted. Be sure to lock the snap pins onto the position pins.

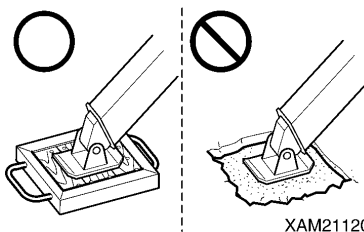
349-4427100

Use of stable sole plate



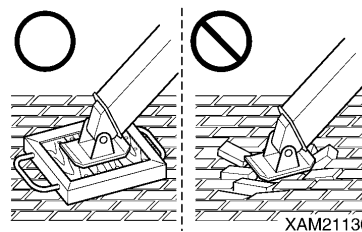
XAM21110

Road surface with low-cost pavement



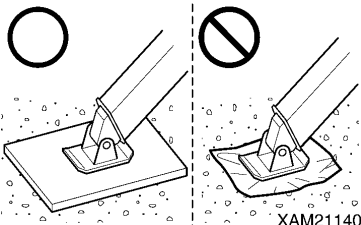
XAM21120

Surface with paving stones



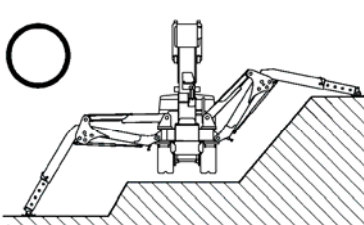
XAM21130

Landfill, etc.



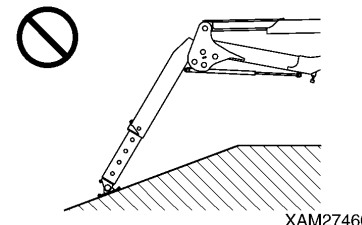
XAM21140

Slope



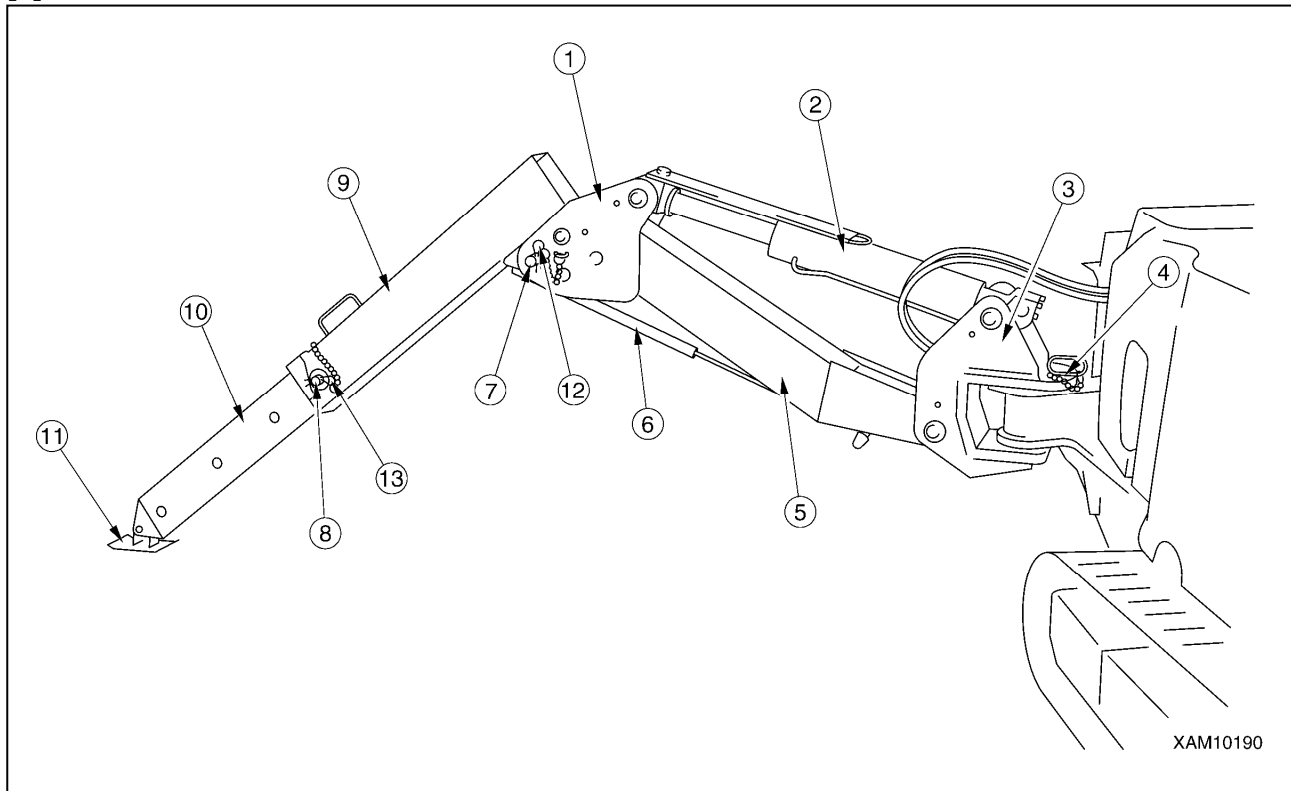
HYS03148

Slope



XAM27460

[1] OUTRIGGER COMPONENTS



- | | |
|-----------------------------------|-------------------------------|
| (1) Outrigger base | (8) Inner box position pin |
| (2) Outrigger cylinder | (9) Outrigger top box |
| (3) Outrigger rotary | (10) Inner box |
| (4) Outrigger rotary position pin | (11) Outrigger adapter (Tray) |
| (5) Outrigger base box | (12) Snap pin |
| (6) Stay (Damper type) | (13) Snap pin |
| (7) Outrigger top position pin | |

[2] TASKS TO BE PERFORMED UPON ENGINE STOP

⚠ WARNING

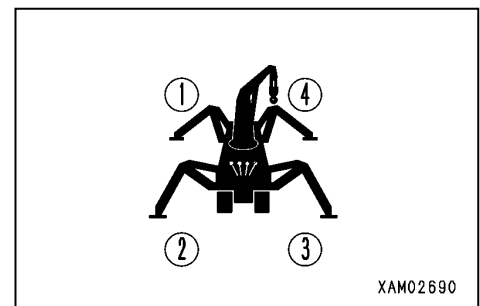
To set the outriggers, locations of holes for outrigger rotaries (3) into which position pins (4) are inserted are different between outriggers [(1)] and [(4)] and outriggers [(2)] and [(3)]. Please read the description in this section thoroughly so that you can install the outriggers properly.

There are 4 outriggers installed on the machine.

The setting method of the outriggers is common to the 4 outriggers except for setting position of the rotary (3).

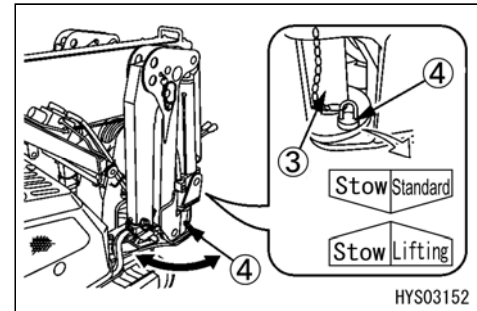
The setting position of the rotary (3) is different between “outriggers (1) and (4)” and “outriggers (2) and (3)”.

Read the descriptions on the following page onward to set it properly.

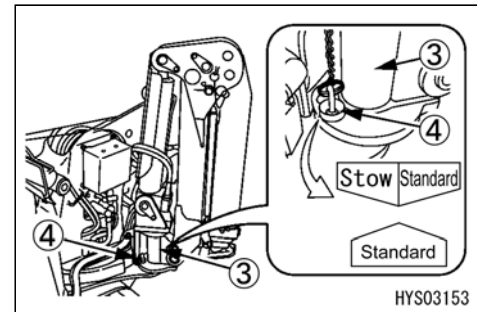


★ Applied to “outriggers (1) and (4)”

1. Pull the position pin (4) out of the outrigger rotary (3) and rotate the outrigger rotary outward.

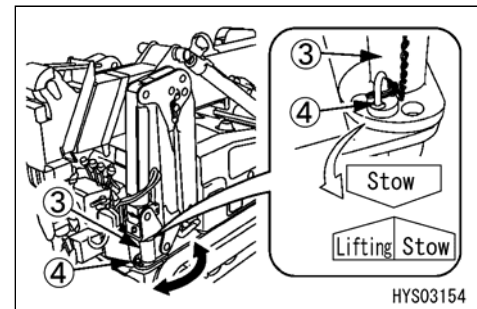


2. Rotate the outrigger rotary (3) so that the sticker “Stow/Standard” affixed to its side and the sticker “Standard” affixed to the side of frame are aligned.
3. Insert positioning pin (12) into the hole of the outrigger rotary (1) sticker “Stow/Standard”.

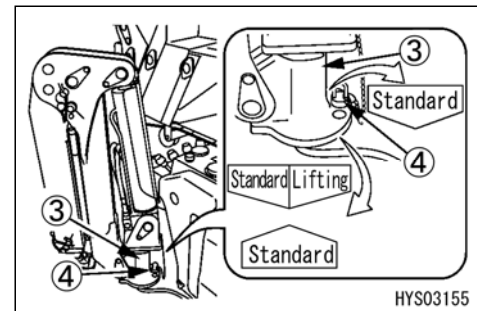


★ Applied to “outriggers (2) and (3)”

4. Pull the position pin (4) out of the outrigger rotary (3) and rotate the outrigger rotary outward.



5. Rotate the outrigger rotary (3) so that the sticker “Standard/Lifting” affixed to the side of the outrigger rotary (3) and the sticker “Standard” affixed to the side of frame are aligned.
6. Insert positioning pin (12) into the hole of the outrigger rotary (1) sticker “Standard/Lifting”.



NOTES

- Each position pin (4) contains a chain which prevents the pin from going missing. Make sure that such chains are not entangled with the frame or cross each other. If so, it may result that position pins (4) are not inserted completely to the end of the hole in the outrigger rotary (3). Due to such an unstable condition, that pin is likely to come out from the hole easily.

7. Pull out the snap pin (12) from the position pin (7) tip of the outrigger base (1) to pull out the position pin (7).
8. Lift up the top box (9) to align the hole in the top box (9) and the hole of the outermost position in the outrigger base (1) (as indicated by the sticker, "MAX").

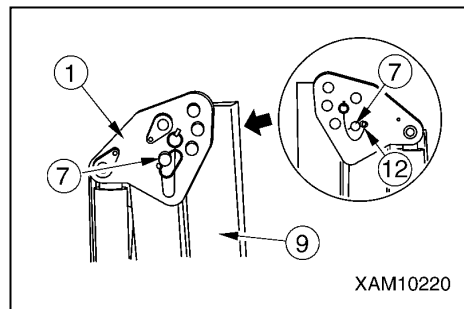
NOTES

Location of the hole of the outermost position in the outrigger base (1) is identifiable by the sticker, "MAX".

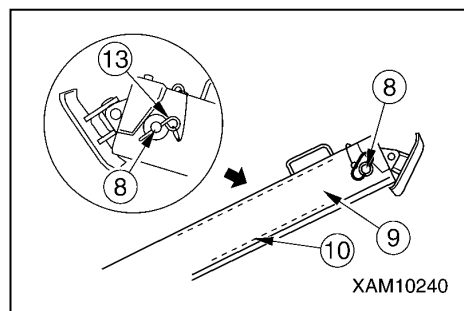
9. Insert the position pin (7) into hole of the outermost position in the outrigger base (1) (as indicated by the sticker, "MAX") and secure it with a snap pin (12) at the end.

NOTES

When the position pin is inserted into any hole in the outrigger base (1) to which a sticker, "MIN" is affixed for outrigger setting, the crane operation shall be limited in accordance with the "Rated Total Load Chart with outrigger extended to minimum".



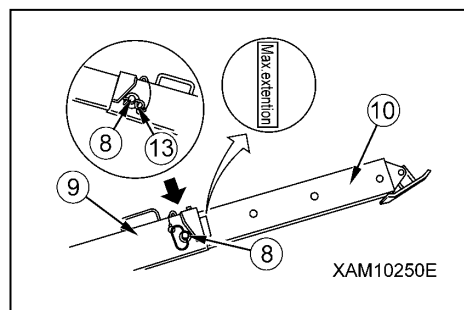
10. Pull out the snap pin (13) from the position pin (8) tip of the top box (9) to pull out the position pin (8).



11. Pull out the inner box (10) from the top box (9) and align the hole in the top box (9) and the hole in the innermost position of the inner box (10).

NOTES

The hole in the innermost position of the inner box is a hole which matches the hole in the top box when a "MAX" sticker which is affixed to the side of the inner box is completely exposed.



12. Insert the position pin (8) into hole of the top box (9) and secure it with a snap pin (13) at the end.

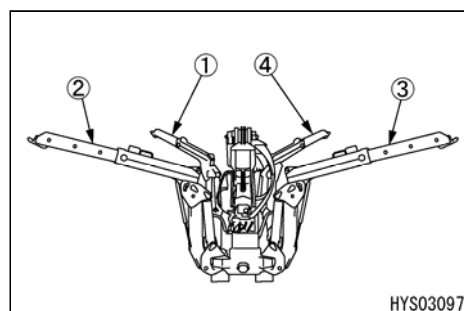
NOTES

When the pin is inserted into the hole of "MIN" of the inner box for outrigger setting, the crane operation shall be limited in accordance with the "Rated Total Load Chart with outrigger extended to minimum".

13. Perform similar preparation work for the other 3 outriggers.

NOTES

When all the above preparations are complete, check again so that each position pin and other instalments are correctly inserted and secured by a snap pin or such.



[3] TASKS TO BE PERFORMED AFTER STARTING THE ENGINE

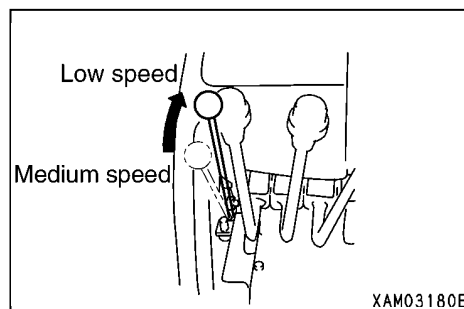
⚠ WARNING

If the machine tilts more than “3 degrees” when outriggers are set, the overturn warning buzzer sounds. Operate the outrigger switches and adjust the machine to be leveled until the warning buzzer stops.

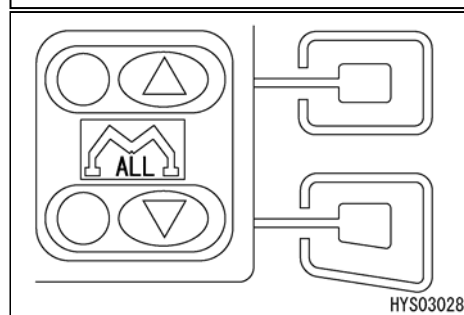
CAUTION

Use the monitor to perform outrigger setting operation.
See “OPERATION 1.5 MONITOR” for monitor operation.

1. See “OPERATION 2.2 STARTING ENGINE” to start the engine.
2. Push the acceleration lever forward and set the engine to low speed.



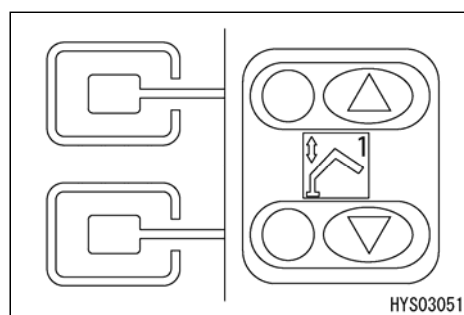
3. Press the outrigger collective operation button “▼” on the monitor panel.
When 4 outrigger cylinders extend and just before the trays contact the ground, release your hand from the collective operation button “▼”.



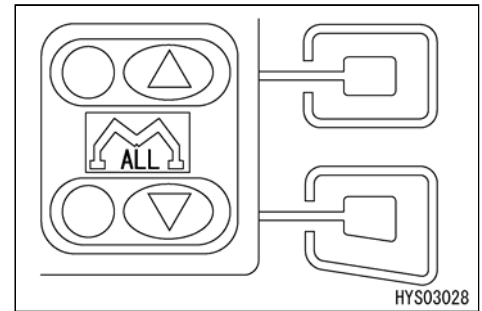
⚠ WARNING

When you control 2 of the outrigger individual buttons at one time, only 2 in the front (outriggers [(2)] and [(3)]) or only 2 in the rear (outriggers [(1)] and [(4)]) shall be operated at the same time. When 2 buttons in either left or right side are controlled at the same time, 2 outriggers on one side may lift up very quickly to cause the machine to overturn.

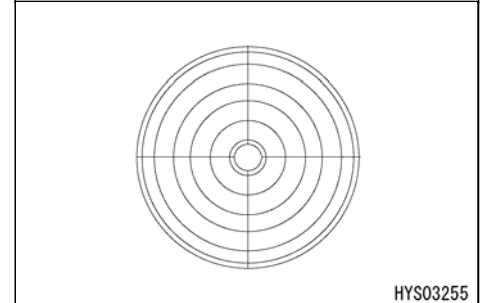
4. Move to the outrigger individual operation screen on the monitor panel and check the number of outriggers which do not contact the ground and the number on the operation plate of the outrigger button section to determine which outrigger to be operated.
5. Press 1 or 2 outrigger individual operating buttons “▼” at the same time to let all 4 outrigger trays contact the ground evenly.



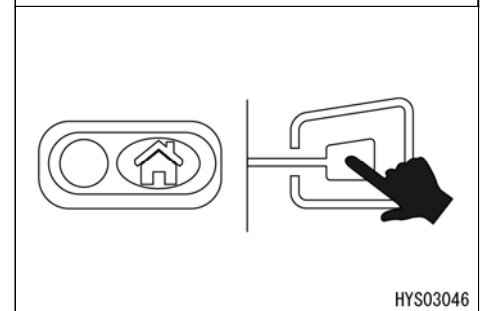
6. After all the trays contact the ground, return to the home screen of the monitor panel and press the outrigger collective operation button “▼”. When the outrigger cylinders extend and the machine has lifted to an approx. height of 80 mm, release your hand from the collective operation button “▼” once.



7. When the machine was raised to about 80mm above the ground, operate the outrigger operation switches so that the bubble in the level comes to the center to adjust the machine to be leveled.



8. After setting the outriggers, release your hand from all the outrigger operation switches and press the home switch (9) to return to the home screen of the monitor panel.



[4] OUTRIGGERS AT MULTI POSITION

! WARNING

If one or more outrigger rotaries are set at multi position (not at the Standard position), a warning will be displayed on monitor.

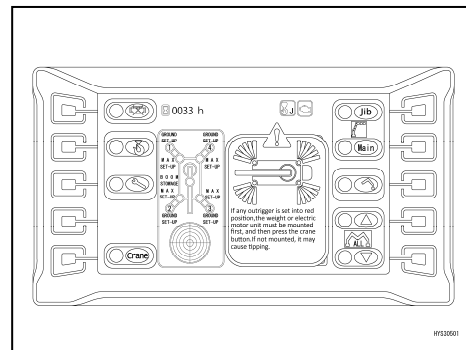
Always follow the instruction of the warning statement and operate crane while warning is displayed.

Operating the crane without following the instruction may cause the crane to tip and thus lead to a serious accident.

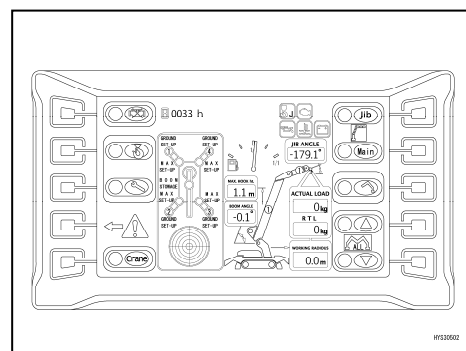
If one or more outrigger rotaries are set at multi position (not at the Standard position), a warning will be displayed on the monitor.

NOTES

If one or more outriggers are set at multi position, two or more adjacent outriggers must be set to maximum. Otherwise the crane cannot enter crane mode.

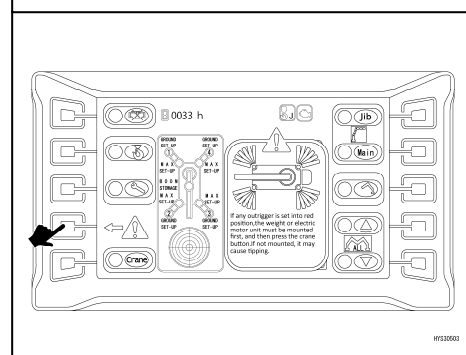


With any outriggers at multi position, a warning mark will be displayed on the monitor all times even if the crane is set in crane mode.



By pressing the warning mark switch, a warning statement appears for 10 seconds.

By pressing the switch again, the warning statement will disappear.



2.13 PRECAUTIONS BEFORE CRANE WORK

⚠ WARNING

Not observing precautions before operation to be described below may result in serious accidents. Before starting crane work, be sure to match the presence/absence of winch unit installation and the type of a hook set on the monitor with the actual machine.

CAUTION

When operating the winch lever without installing a hook block in the case of the winch specification, operate the above while pulling the wedge socket by hand. Otherwise, the winch drum may fall into an irregular winding state and parts near the wire rope or winch drum may be damaged.

- Verify that the emergency stop cancel switch is at the “OFF” position.
If the switch is at the “ON” position, the operation will not stop.

NOTES

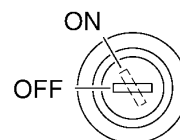
If the emergency stop cancel switch is turned to the “ON” (cancel) position, a warning buzzer sounds intermittently.

- Set up the outrigger securely. Then, press the “crane mode” button of the monitor panel. After the circle on the left turns from red to green and the mode changes to crane, the crane comes ready for operation.

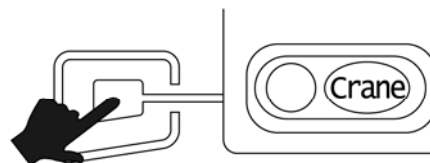
[Winch specification]

- In the case of the winch specification, over hoisting the hook block will activate the warning buzzer of the over hoist detector and the operation stops.

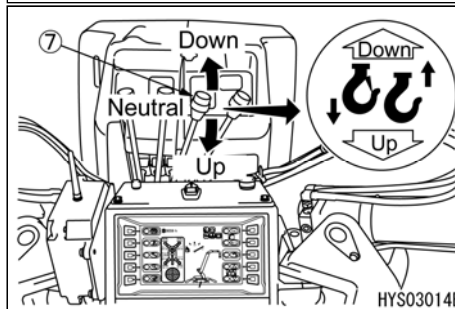
When the warning buzzer sounds, release your hand immediately from the winch lever (7) to the “NEUTRAL” position to stop raising the hook. Then, operate the winch lever (7) to “DOWN” (push forward) side to lower the hook block.



XAM19641

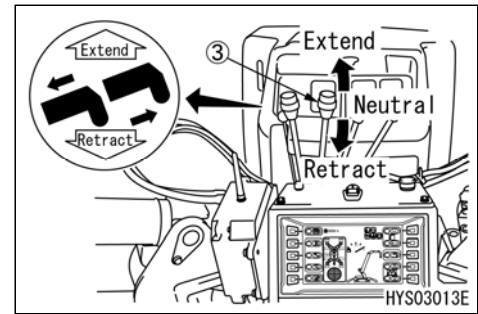


HYS03032

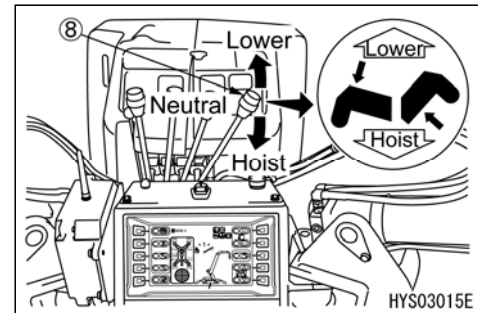


HYS03014E

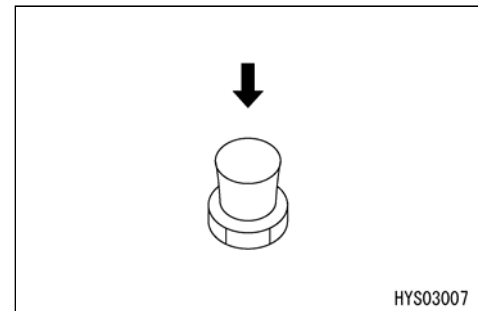
- Extending the main boom or jib will hoist the hook block, activating the warning buzzer of the over hoist detector and the operation stops. When the warning buzzer sounds, release your hand immediately from the main boom/jib telescoping lever (3) to the "NEUTRAL" position to stop the extension operation. Then, operate the main boom/jib telescoping lever (3) to "RETRACT" (pull toward you) side to retract the main boom or jib.



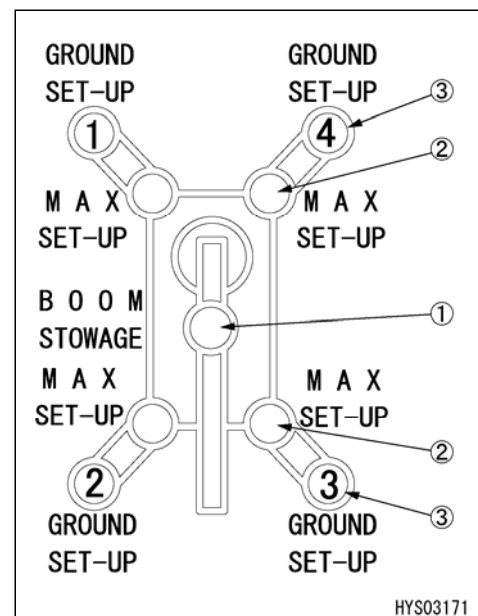
- Similarly, raising the jib will hoist the hook block, activating the warning buzzer of the over hoist detector and the operation stops. When the warning buzzer sounds, release your hand immediately from the main boom/jib derricking lever (8) to the "NEUTRAL" position to stop derricking operation. Then, operate the main boom/jib derricking lever (8) to "LOWER" (push forward) side to lower the jib.



- Use the horn switch to honk the horn to notify the people around of the danger during the crane operation.



- Verify that all the outriggers are extended and set. For the outrigger extension and slewing limit lamps (2) in the monitor panel, unless adjacent 2 or more lamps illuminate in green or no lamp illuminates in red, and all outrigger ground contact lamps (3) illuminate in green, it is unable to press the crane mode button to operate the crane.

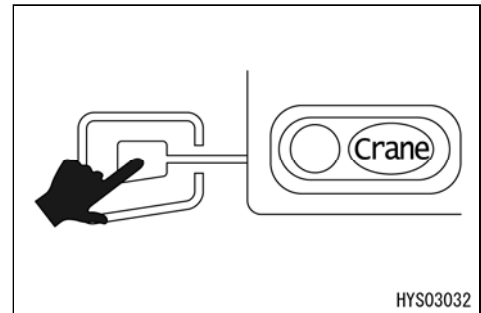


2.14 CRANE OPERATION POSTURE

CAUTION

When using a winch, see “WINCH 2.2 OPERATIONS BEFORE CRANE WORK” and be sure to perform crane work with a hook block installed.

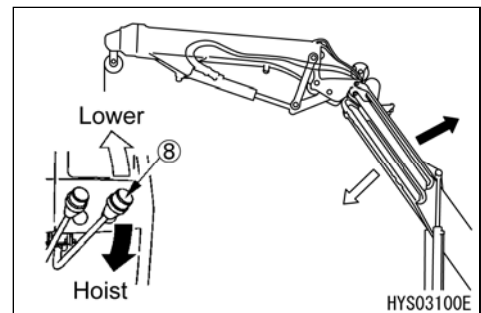
1. Set up the outrigger securely. Then, press the “crane mode” button of the monitor panel. After the circle on the left turns from red to green and the mode changes to crane, the crane comes ready for operation.



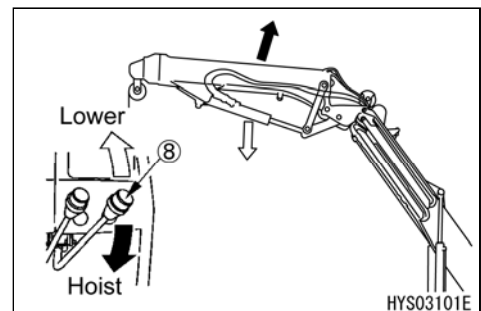
2. Press the main boom selector button of the monitor panel to select the main boom. (The circle on the left of "Main" is displayed in green.) Operate the main boom/jib derricking lever (8) to “HOIST” side (pull toward you) to raise the main boom.

NOTES

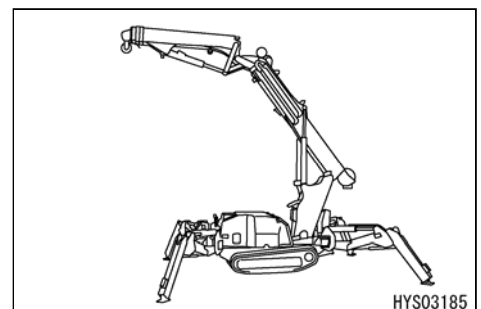
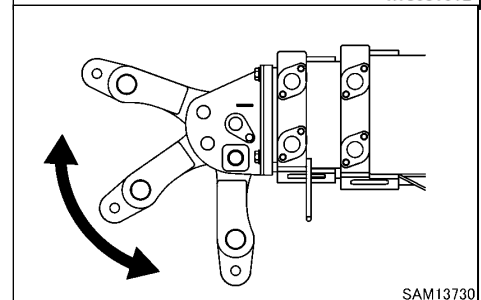
The jib cannot be brought to working posture in terms of safety unless the main boom is raised to 40 degrees or more.
Raise the main boom to 40 degrees or more.



3. Press the jib selector button of the monitor panel to select the jib. (The circle on the left of “Jib” is displayed in green.) Operate the main boom/jib derricking lever (8) to "HOIST" side (pull toward you) to raise the jib tip from -90 degrees (directly below).



4. Move jib head to the required angle for the work, and secure with lynch pin to the tip of position pin.



2.15 MAIN BOOM/JIB DERRICKING OPERATION

WARNING

- Perform the main boom/jib derricking lever operation as slowly as possible. Especially avoid sudden lever operations when the load is hoisted, which may cause the load to waggle 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 operating by derricking the main boom, pay extra attention so that the mass (weight) of the load at the time the boom is most lowered does not cause overloading.
- When the jib is brought close to a horizontal state, the working radius increases, and the rated total load that can be hoisted decreases. When working by derricking the jib, pay extra attention so that the mass (weight) of the load at the time the jib is horizontal does not cause overloading.
- Depending on the lowering operation of the main boom or the “lowering” operation of the jib, the load or jib may hit the machine, damaging the machine or causing it to overturn. When performing the lowering operation, be careful not to allow the load or jib to hit the machine.

CAUTION

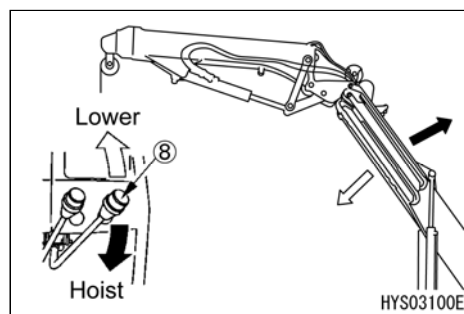
The hook block is raised or lowered while the main boom/jib are raised/lowered. Perform the winch operation at the same time to adjust the hook block height.

Operate the main boom/jib derricking lever (8) as follows.

In the case of the main boom:

Press the main boom selector button of the monitor panel to select the main boom. (The circle on the left of “Main” is displayed in green.)

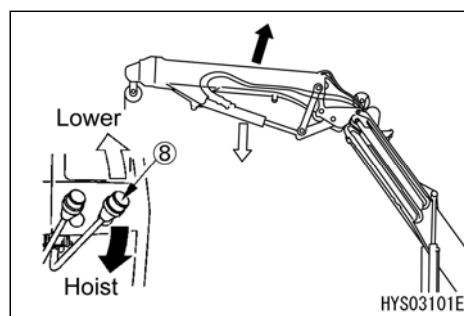
- Lowering : Push the lever forward (LOWER).
The lever returns to the NEUTRAL position and the boom derricking stops.
- Neutral : Release your hand from the lever.
- Raising : Pull the lever toward you (HOIST).



In the case of the jib:

Press the jib selector button of the monitor panel to select the jib. (The circle on the left of “Jib” is displayed in green.)

- Lowering : Push the lever forward (LOWER).
The lever returns to the NEUTRAL position and the boom derricking stops.
- Neutral : Release your hand from the lever.
- Raising : Pull the lever toward you (HOIST).



NOTES

Adjust the main boom/jib derricking speed with the main boom/jib derricking lever and the stroke of the acceleration lever.

2.16 MAIN BOOM/JIB TELESCOPING OPERATION

⚠ WARNING

- Perform the main boom/jib telescoping lever operation as slowly as possible. Especially avoid sudden lever operations when the load is hoisted, which may cause the load to waggle and give large impact to the Machine, and thus may damage the crane or trip the Machine.
 - Do not pull the load horizontally or pull in the load by telescoping the main boom/jib.
 - When the main boom is extended, the working radius increases, and the rated total load that can be hoisted decreases. When working with extending/retracting the main boom, pay extra attention so that the mass (weight) of the load at the time the main boom is most extended does not cause overloading.
 - When the jib is extended, the working radius increases, and the rated total load that can be hoisted decreases. When working with extending/retracting the jib, pay extra attention so that the mass (weight) of the load at the time the jib is most extended does not cause overloading.
 - When the main boom/jib are extended, the hook block is raised.
- If the warning buzzer of the over hoist detector sounds during the main boom/jib extending operation, return the main boom/jib telescoping lever immediately to the "NEUTRAL" position and stop the main boom/jib extending operation.

CAUTION

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

Operate the main boom/jib telescoping lever (3) as follows.

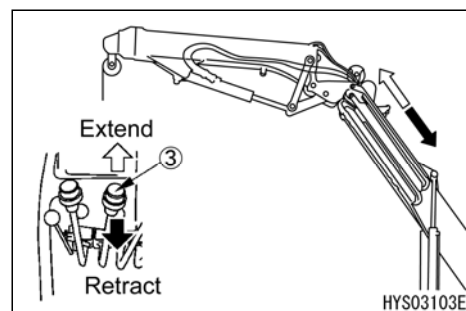
In the case of the main boom:

Press the main boom selector button of the monitor panel to select the main boom. (The circle on the left of "Main" is displayed in green.)

- Extend : Push the lever forward (EXTEND).
- Neutral : Release your hand from the lever.

The lever returns to the "NEUTRAL" position and the main boom telescoping stops.

- Retract : Pull the lever toward you (RETRACT).



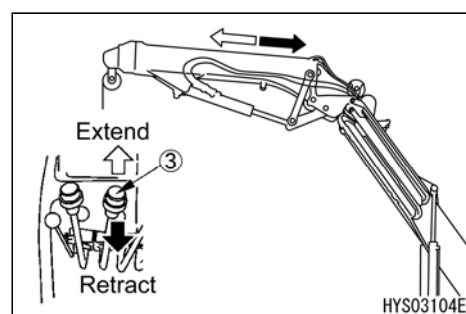
In the case of the jib:

Press the jib selector button of the monitor panel to select the jib. (The circle on the left of "Jib" is displayed in green.)

- Extend : Push the lever forward (EXTEND).
- Neutral : Release your hand from the lever.

The lever returns to the "NEUTRAL" position and the jib telescoping stops.

- Retract : Pull the lever toward you (RETRACT).



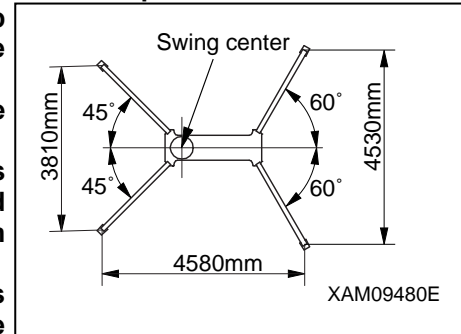
NOTES

Adjust the main boom/jib telescoping speed with the main boom/jib telescoping lever and the stroke of the acceleration lever.

2.17 SLEWING OPERATION

⚠ WARNING

- Check the safety in the vicinity and honk the horn before slewing.
- Perform the slewing lever operation as slowly as possible. Make sure to start smoothly, slew at low speed, and stop quietly. Especially avoid sudden lever operations when the load is hoisted, which may cause the load to waggle and cause the Machine to lose balance, and thus may damage the crane or trip the Machine.
- When slewing 360 degrees while hoisting a load, always set up outriggers in the standard extension direction as shown in the figure on the right.
Even if outriggers are extended to maximum, use sufficient care because stability in the lateral direction is poor.
- If the outriggers cannot be set up in the extension direction as shown in the figure on the right, check a position where a load can be hoisted and a position where a load cannot be hoisted in advance before performing hoisting operation.
- Depending on how outriggers are extended or how the jib is operating, the main boom/jib may hit the outrigger during the slewing operation, breaking the crane or overturning the machine. Be careful to prevent the main boom/jib from hitting outriggers during slewing operation.
With the boom stowed, the jib hits the travelling lever during slewing operation, causing damage. Raise the boom during slewing operation so that it does not hit the travelling lever.

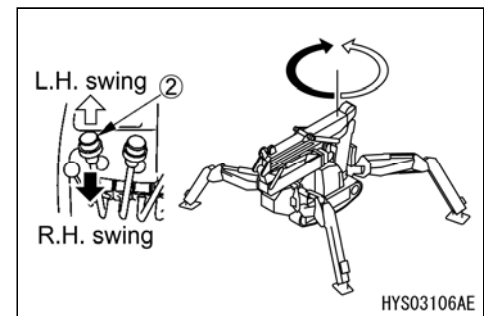


Operate the slewing lever (2) as follows.

- L.H.swing : Push the lever forward "LEFT".
- Neutral : Release your hand from the lever.
The lever returns to the NEUTRAL position and the slewing stops.
- R.H.swing : Pull the lever toward you "RIGHT".

NOTES

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



2.18 CRANE ACCELERATOR OPERATION

⚠ WARNING

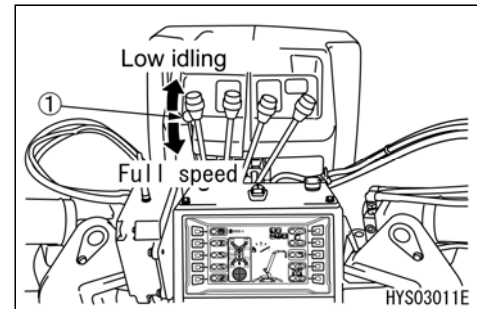
Accelerating the operation speed of the crane units more than necessary is dangerous.

CAUTION

Decrease the speed at the beginning and near the end of an operation. Change the speed to low or high according to the load.

Operate the accelerator lever (1) as follows.

- Low idling : Push the lever fully forward.
The engine speed decreases and the operation speed of the crane units slows down.
- Full speed : Pull the lever fully toward you.
The engine speed increases and the operation speed of the crane units accelerates.

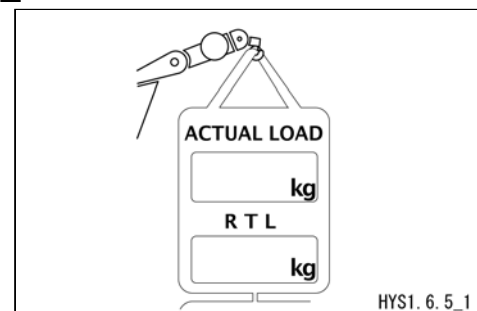


NOTES

At the desired engine speed for your work, release the lever. It will stop at that position.

2.19 RECOMMENDED OPERATION PROCEDURE

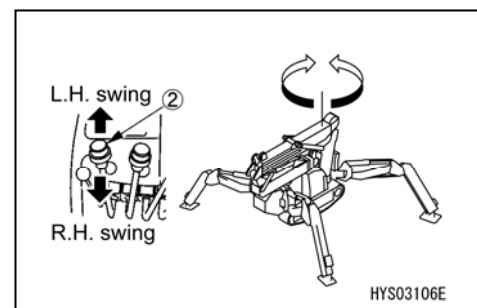
1. Fully retract main boom and jib. Slightly hoist load from the ground with smallest possible working radius, and confirm weight of the load on monitor.



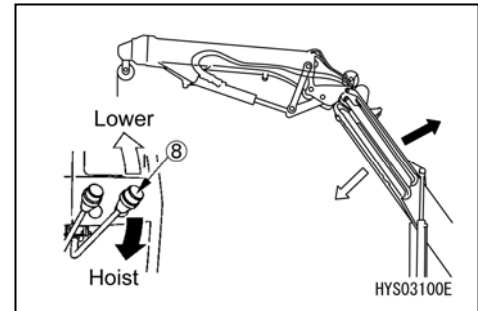
2. Choose below conditions in the rated total load chart based on the load weight.

- Main boom angle
- Jib angle
- Main boom stage
- Jib stage

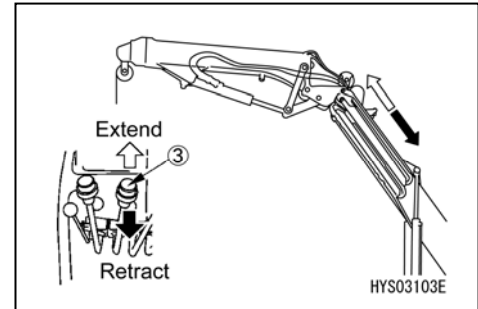
3. Slew the boom to the desired direction.



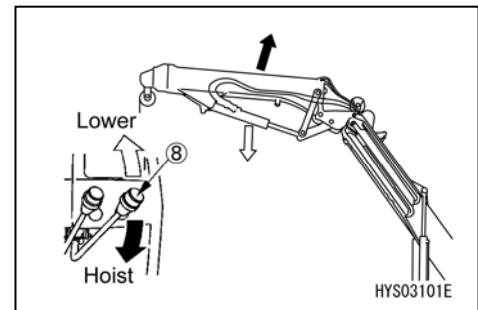
4. Raise the main boom to the main boom angle of the selected condition.



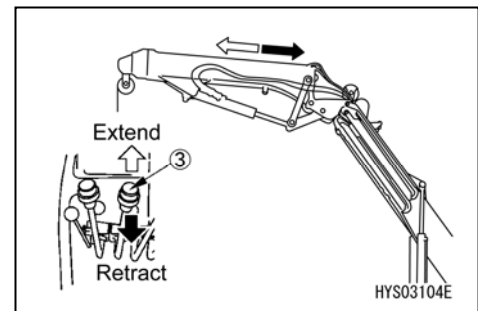
5. Extend the main boom to the main boom stage of the selected condition.



6. Raise the jib to the jib angle of the selected condition.



7. Extend the jib to the jib length of the selected condition. Crane is now set to the targeted point.



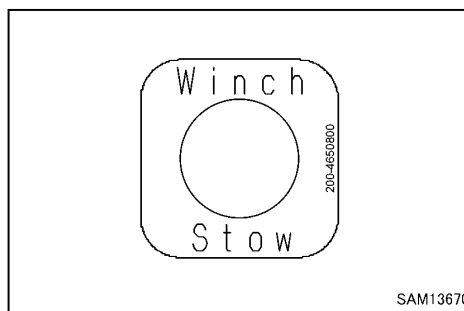
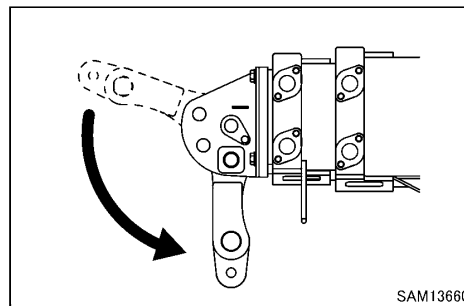
8. To return from the targeted point, follow the reverse order of the preceding.

2.20 CRANE STOWAGE OPERATION (FIXED HOOK SPECIFICATION)

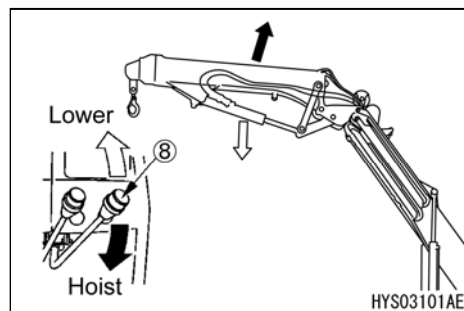
CAUTION

- When stowing the jib, be careful not to allow the jib to hit the machine.
- When the crane is stowed, the jib head hits the machine body, damaging the machine, during stowage of the main boom. Set the jib head to other position than "Stow".

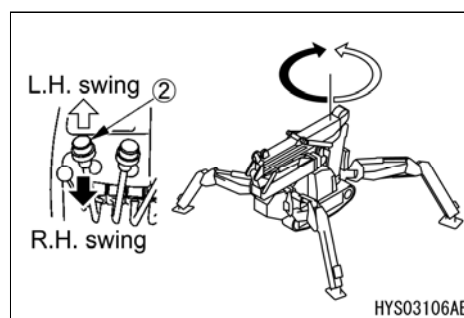
1. Make the main boom and jib "fully retracted".
2. If the jib head is not in the "Stow" position, remove the position pin of the jib head and pull out the position pin.
3. Align the hole of the head with the hole to which the sticker of "Stow" is affixed.
4. Pass the position pin through the aligned hole and secure the linchpin to the tip of the position pin.
5. Raise the main boom to 40 degrees or more.



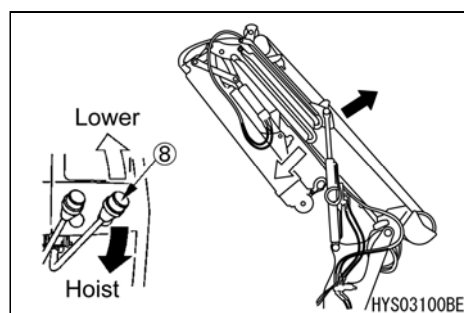
6. Press the jib selector button of the monitor panel to select the jib. (The circle on the left of "Jib" is displayed in green.)
Operate the main boom/jib derricking lever (8) to "LOWER" (push forward) so that the jib does not hit the machine and lower it to a position where the jib stops.



7. Operate the slewing lever (2) to the "counter clockwise" or "clockwise" slewing direction so that the main boom slews to the center of the machine. In other directions, the main boom cannot be lowered to less than 40 degrees to prevent interference of the travelling lever.



8. Press the main boom selector button of the monitor panel to select the main boom. (The circle on the left of "Main" is displayed in green.)
Operate the main boom/jib derricking lever (8) to "LOWER" (push forward) and lower it to a position where the main boom stops.



2.21 OUTRIGGER STOWING OPERATION

⚠ WARNING

- Do not let people approach the machine when stowing the outriggers. Close proximity to the machine may cause serious accidents such as getting caught between the outrigger and the machine main unit.
- 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 cause serious accidents when stowing the outriggers.
- Stop the engine for all operations except for extending/retracting the outrigger cylinders. The third person touching an outrigger switch may result in sudden movement of the outrigger cylinder, which may lead to serious accidents.
- When the position pins are removed, the box and bracket lose the support and fall. Be sure to hold the box and bracket with one hand when removing the position pins.
- Wear thick gloves and do not put hands or fingers around the gaps of movable areas when stowing the outriggers. Otherwise, they may get caught, leading to serious accidents.
- Insert the position pins to the end and install snap pins as retainers when stowing the outriggers.
- When operating the outriggers, reduce the engine speed to low. When the engine is controlled to high speed, outriggers move too quickly which may result in serious accidents including tipping of the machine.
- To lower the lifted machine to the ground by control of the outrigger collective operation switch, use the procedure as follows.
 - Do not lower the machine continuously and at a stretch on a slope or rough terrain. Doing so may cause the machine to overturn. Repeat pressing and releasing the switch “▲” alternately and lower the machine to the ground while checking that the 4 outriggers retract evenly.
 - If the 4 outriggers do not retract evenly, operate the individual operating switch of the outrigger that does not retract so that all of them retract evenly.
- To lower the lifted machine to the ground by control of the outrigger individual operation switches, use the procedure as follows.
 - There are 4 outriggers. Be careful not to confuse the use of respective 4 outrigger individual operation switches. Check both the outrigger numbers indicated in the “control panel” of the switch and “number labels” attached to each outrigger. A serious accident may occur if the outrigger numbers are confused.
 - When you control 2 of the individual switches at one time, only 2 in the front (outriggers [(1)] and [(4)]) or only 2 in the rear (outriggers [(2)] and [(3)]) shall be operated at the same time. When 2 individual operation switches in either left or right side are controlled at the same time, 2 outriggers on one side may retract very quickly to cause the machine to overturn.
 - Use each of 4 individual operation switches properly so that 4 outriggers retract slowly and evenly. Sudden retracting will cause instability and may overturn the machine.

CAUTION

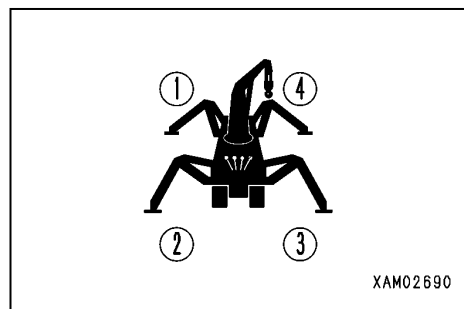
- When the outrigger operation switch is operated, a warning buzzer sounds intermittently.

There are 4 outriggers installed on the machine.

The stowing method of the outriggers is common to the 4 outriggers except for the stowing position of the rotary (1).

The stowing position of the rotary (1) is different between “outriggers (1) and (4)” and “outriggers (2) and (3)”.

Read descriptions on the following page onward to stow it properly.



[1] TASKS TO BE PERFORMED AFTER STARTING THE ENGINE

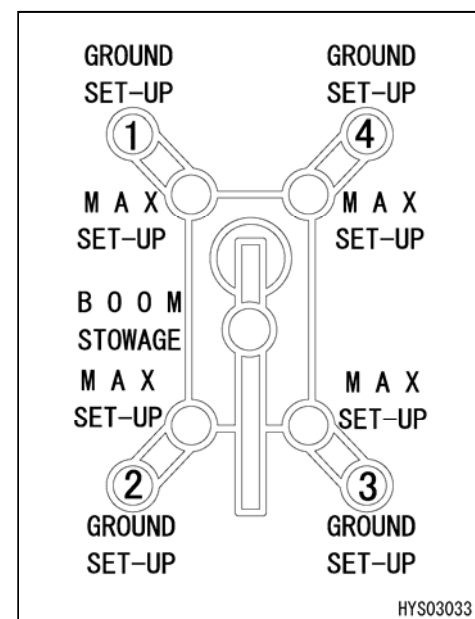
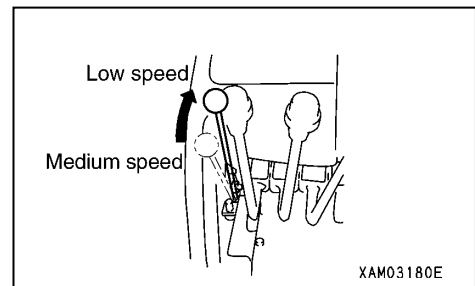
⚠ WARNING

- Avoid the use of the outrigger collective operation switch in a place where the height of ground the 4 outriggers touch is different. Doing so may tilt the machine sharply, causing it to overturn.
- When stowing the outriggers, be careful so that your body or clothes will not get caught between the machine and outrigger.

CAUTION

- Use the outrigger collective operation switch when the height of ground the 4 outriggers touch is equal. The machine can be raised or lowered safely and smoothly.
- Use the monitor to perform outrigger setting operation. See “OPERATION 1.5 MONITOR” for monitor operation.

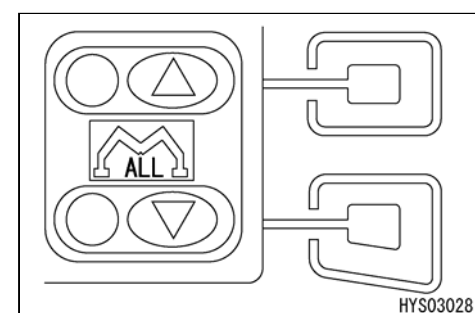
1. See “OPERATION 2.2 STARTING ENGINE” to start the engine.
2. Push the acceleration lever forward and set the engine to low speed.



3. Press the outrigger collective switch “▲” on the monitor panel. Continue to press the switch until the outrigger cylinders retract and the machine lowers, and the rubber tracks fully lower to the ground.

CAUTION

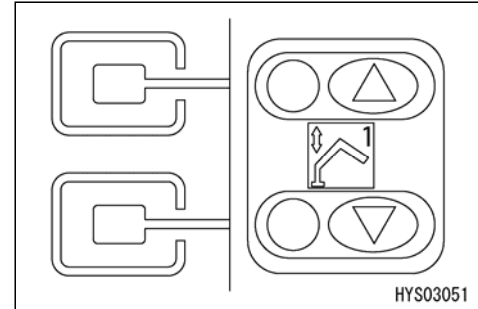
On a level ground, operate the outrigger collective switch “▲” to retract the four outriggers in the same manner. The machine can be safely lowered to the ground.



4. If the height of ground the 4 outriggers touch is different, operate the outrigger individual operation switches as follows.

⚠ WARNING

- When you control 2 of the individual switches on the outrigger switch section at one time, only 2 in the front (outriggers [(1)] and [(4)]) or only 2 in the rear (outriggers [(2)] and [(3)]) shall be operated at the same time. When 2 switches in either left or right side are controlled at the same time, 2 outriggers on one side may lower very quickly to cause the machine to overturn.



CAUTION

In a place where the height of ground the 4 outriggers touch is different, operate the individual operation switches to gradually lower the machine until the rubber tracks completely lower to the ground.

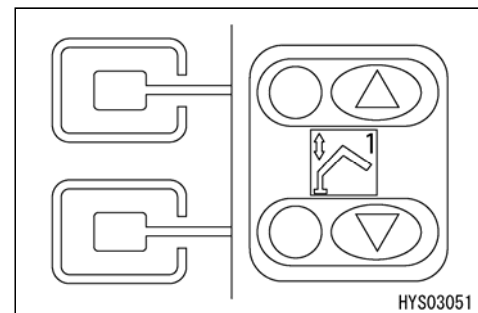
5. Move to the outrigger individual operation screen on the monitor panel and check the number on the operation plate at the switch section on the outrigger operation panel to determine which outrigger to be operated.

6. Press 1 or 2 outrigger individual operation switches “▲” at the same time.

When the outrigger cylinders retract and the machine begins to lower, release your hand from the individual operation switches “▲” once.

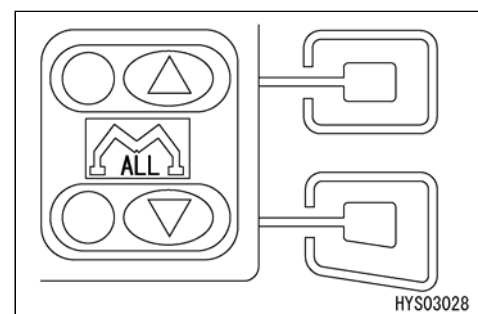
Operate the remaining individual operation switches in the same way to lower the machine as horizontally as possible and release your hand from the individual operation switches “▲”.

Repeat this operation to gradually lower the machine until the rubber tracks go down completely on the ground.

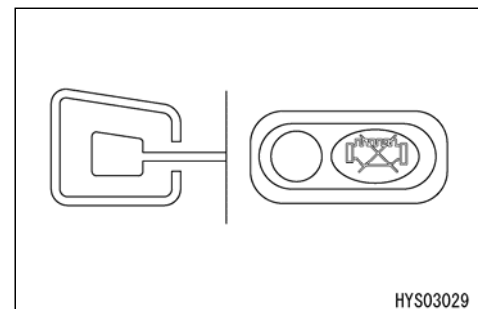


7. After the right and left rubber tracks touch the ground completely, return to the home screen of the monitor panel and press the outrigger collective operation switch “▲2”.

When 4 outrigger cylinders completely retract and the top box is raised to the upper limit, release your hand from the collective operation switch “▲”.

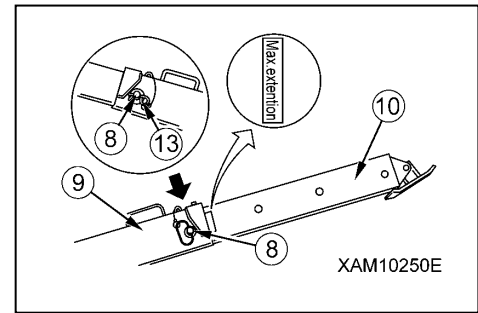


8. Press the auxiliary starter switch of the monitor panel.
The engine stops.

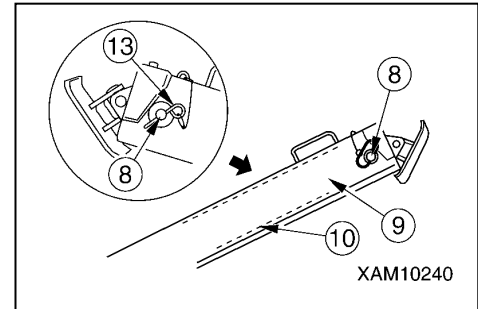


[2] TASKS TO BE PERFORMED UPON ENGINE STOP

1. Pull out the snap pin (13) from the position pin (8) tip of the top box (9) to pull out the position pin (8).

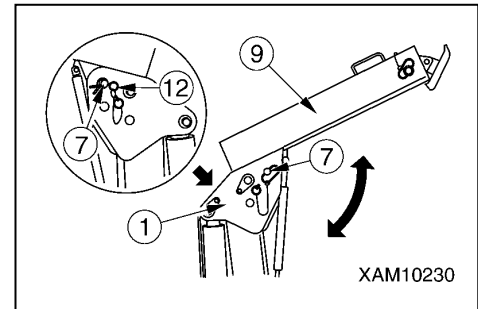


2. Push the inner box (10) into the top box (9) and align the hole in the top box (9) and the hole in the outermost position of the inner box (10).



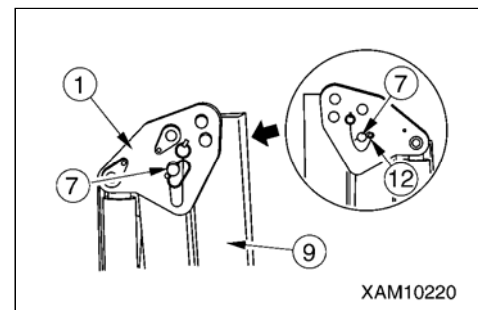
3. Insert the position pin (8) into hole of the top box (9) and secure it with a snap pin (13) at the end.

4. Pull out the snap pin (12) from the position pin (7) tip of the outrigger base (1) to pull out the position pin (7).



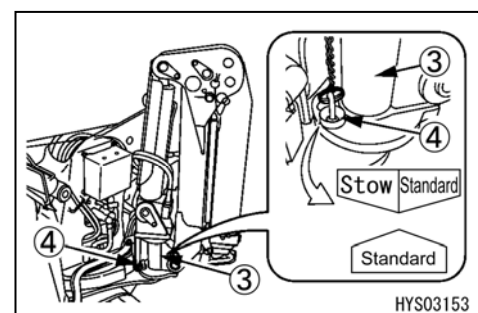
5. Lower the top box (9) to align the hole in the top box (9) and the hole of the innermost position in the outrigger base (1).

6. Insert the position pin (7) into hole of the outermost position in the outrigger base (1) and secure it with a snap pin (12) at the end.

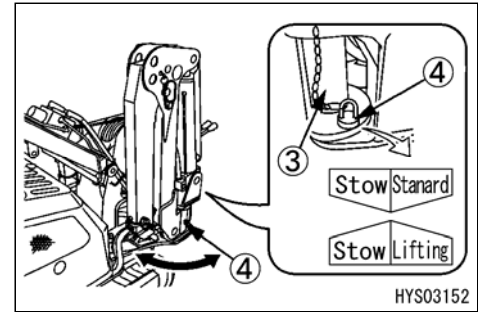


★ Applied to “outriggers (1) and (4)”

7. Pull the position pin (4) out of the outrigger rotary (3) and rotate the outrigger rotary(3) inward.

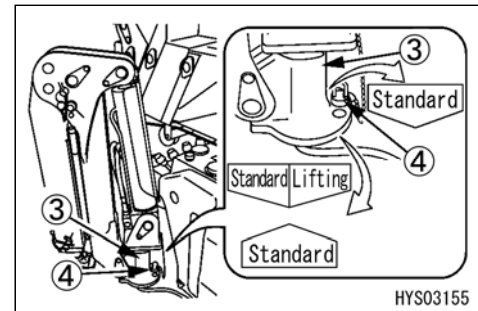


8. Rotate the outrigger rotary (3) so that the sticker "Stow/Standard" affixed to the side of the outrigger rotary (3) and the sticker "Stow/Lifting" affixed to the side of frame are aligned.
9. Insert positioning pin (4) into the hole of the outrigger rotary (3) sticker "Stow/Standard".

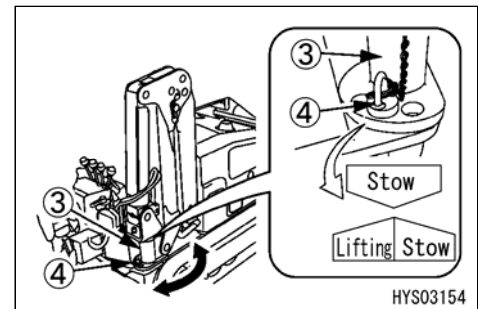


★ Applied to "outriggers (2) and (3)"

10. Pull the position pin (4) out of the outrigger rotary (3) and rotate the outrigger rotary (3) inward.



11. Rotate the outrigger rotary (3) so that the sticker "Stow" affixed to the side of the outrigger rotary (3) and the sticker "Lifting/Stow" affixed to the side of frame are aligned.
12. Insert positioning pin (4) into the hole of the outrigger rotary (3) sticker "Stow".
13. After stowing the outriggers, check again so that each position pin is correctly inserted and secured by a snap pin or such.



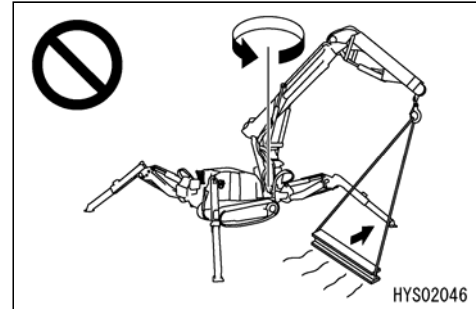
2.22 PROHIBITED OPERATIONS DURING CRANE WORK

WARNING

- Always set the outriggers on level, solid ground when performing the crane operations.
- Never perform travelling hoist or crane operations without setting the outriggers.
The machine will be unstable and overturn, leading to serious accidents.
- See the cautions given in the “Safety” besides the dos and don'ts in this section.

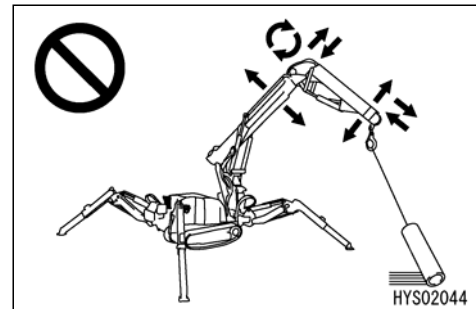
[1] DON'T OPERATE WITH SLEWING FORCE

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



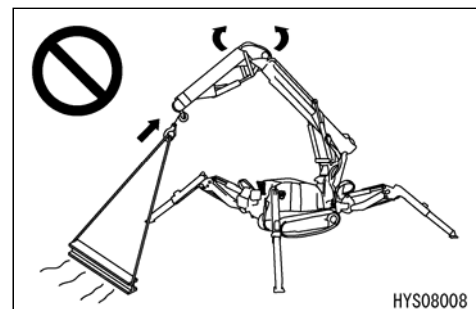
[2] DON'T OPERATE WITH DERRICKING FORCE

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



[3] DON'T PULL SIDEWARD, DRAW IN OR HOIST DIAGONALLY

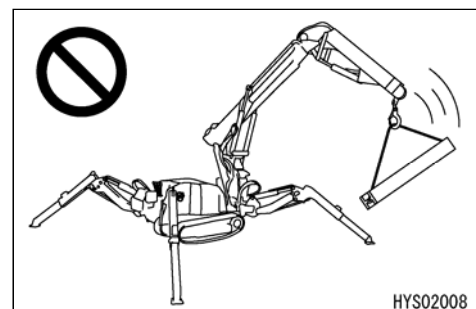
Pulling the load sideways, drawing it in, or hoisting diagonally applies unreasonable force on the machine. It not only damages the machine body, but also is dangerous. Never operate in this way. The hook must lift right above the centre of gravity of the load hoisted.



[4] DON'T OPERATE VIOLENTLY DURING WORK

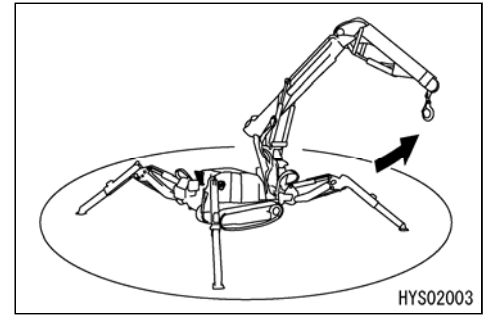
Do not operate the lever suddenly.

Especially, “slewing”, “lowering”, and “hook lowering” must be operated at low speeds.



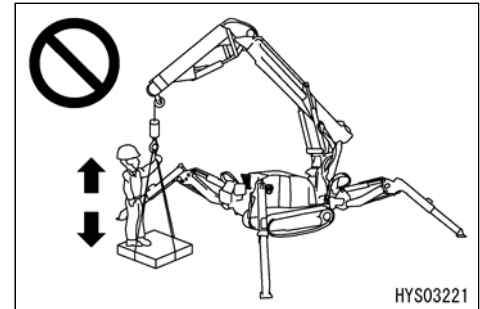
[5] DON'T ACCESS INTO WORKING RADIUS

Do not allow personnel to approach the working radius such as letting operators enter under a hoisted load.



[6] DON'T USE FOR OTHER THAN MAIN APPLICATIONS

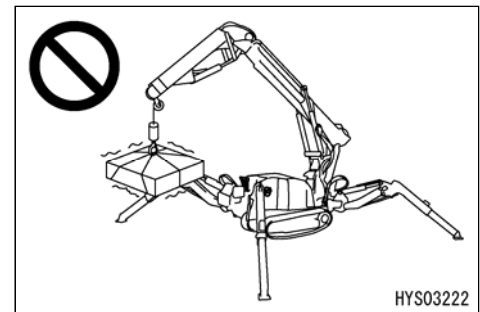
Do not move people up/down with the crane.



[7] DON'T PERFORM UNREASONABLE OPERATIONS

Operations requiring more than the machine performance can cause accidents.

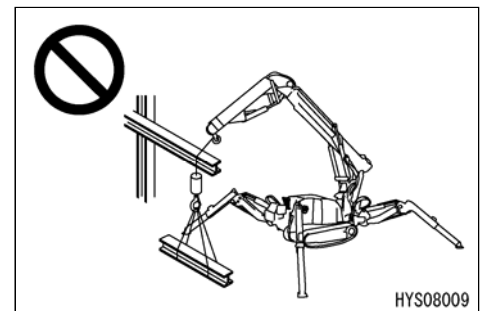
Crane operations must always be carried out according to the rated total load chart.



[8] DON'T WIND WIRE BY FORCE

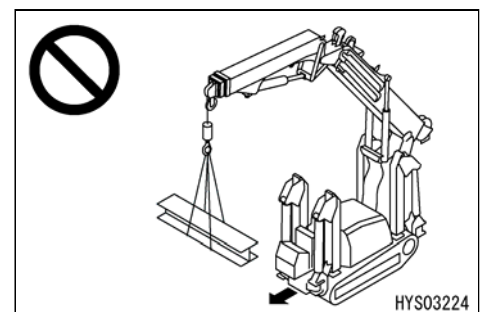
Be careful not to hook the wire rope over a tree or steel beam while working.

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



[9] DON'T OPERATE DURING TRAVELLING HOIST

Travelling hoist or crane operations without setting the outriggers may overturn the machine. Never perform such operations.



3. HANDLING RUBBER TRACKS

3.1 GOOD USE

While the rubber tracks demonstrate many advantages not found in iron shoes, their advantages cannot be fully demonstrated if they are used in the same manner as the iron shoes.

Proceed with reasonable operations depending on the worksite condition and operation content.

NOTES
This machine is equipped with rubber tracks as standard. There is no optional setting of iron shoes.

Comparison between rubber tracks and iron shoes

Comparison item	Rubber tracks	Iron shoes
Less vibration	◎	△
Smooth travelling (no squeaks)	◎	○
Noise is small.	◎	△
Do not damage paved road surfaces.	◎	△
Handling is easy.	◎	△
Less vulnerable to damage	△	◎
Large towing force	◎	◎

◎: Excellent ○: Good △: Normal

While the rubber tracks demonstrate many advantages thanks to its performance characteristic to the material, it has a weak point in strength.

Therefore, we would like you to sufficiently understand the characteristics of the rubber tracks and to respect prohibited operations and observe the cautions on handling so that the life of the rubber tracks can be extended and its advantages exercised.

Be sure to read “OPERATION 3.3 PROHIBITED OPERATIONS” and “OPERATION 3.4 CAUTIONS IN USING RUBBER TRACKS” before use.

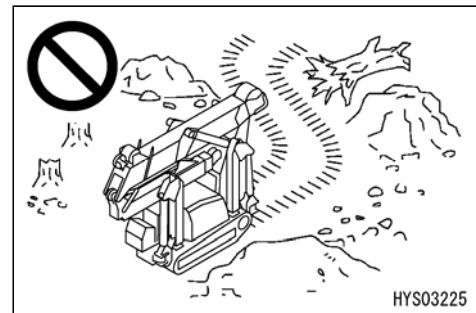
3.2 WARRANTY

Verification of proper tension of the rubber tracks, maintenance of rubber tracks, and damage caused by the fault of customers such as not respecting prohibited operation or not observing cautions in working, for example, “worked at the site where there were objects that may tear the rubber blocks, such as steel plates, U-shaped gutters, corners of bricks, corners of sheer broken stones and rocks, reinforcing steels, and iron scraps”, are not covered by warranty.

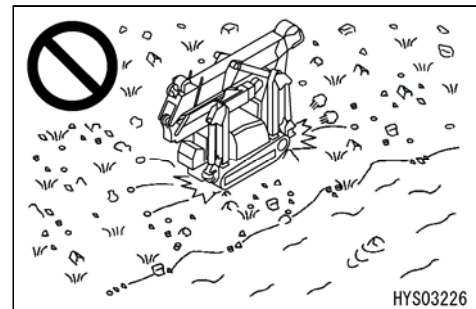
3.3 PROHIBITED OPERATIONS

The following operations are prohibited.

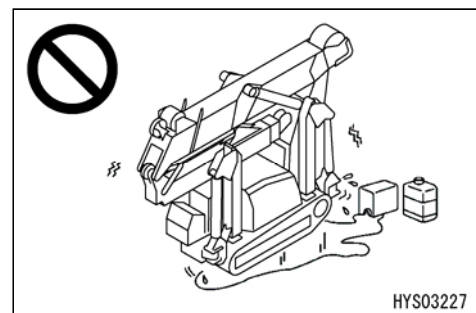
- Working and slewing on the ground with broken stones, hard rock ground with great irregularity, reinforcing steels, iron scraps, and near the edge of the steel plates will damage the rubber tracks.



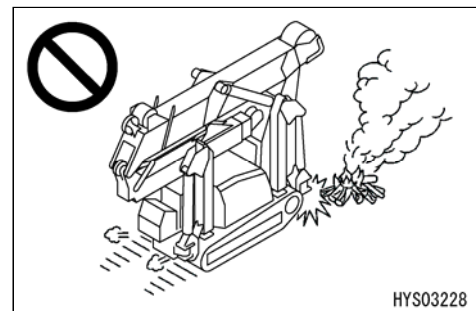
- Locations where there are many large and small stones, such as river beds, stones will pass under the machine and may damage the rubber tracks. In extreme cases, the rubber tracks may come off.



- Keep the oil and chemical solvents away from the rubber tracks. If these materials come into contact with the rubber tracks, wipe off immediately. Do not travel over road surfaces where the oil has built up.



- Do not enter hot areas such as open fires, steel plates left under the blazing sun, or recently poured asphalt.



- Keep the rubber tracks indoor where there is no direct sunlight or rain when storing them for long time (3 months or more).

3.4 CAUTIONS IN USING RUBBER TRACKS

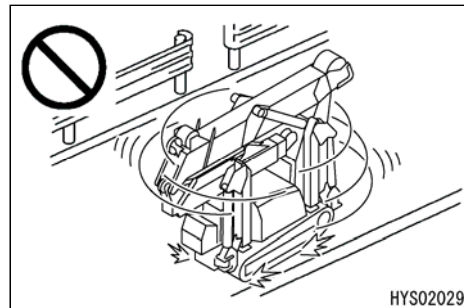
WARNING

Not observing these cautions will cause serious accidents or damage to the rubber tracks.

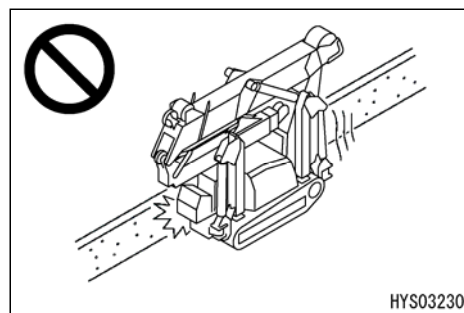
Keep the following in mind during operation.

- Avoid making spin turns on concrete surfaces.

Avoid making sudden steering whenever possible, since it will cause early wear or defect on the rubber tracks.

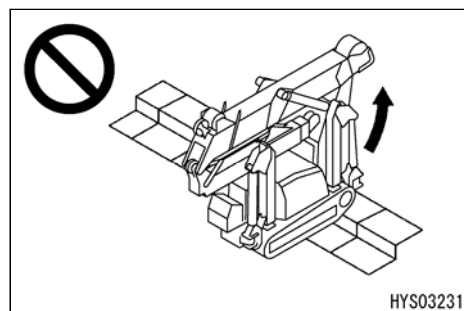


- Do not operate the machine in a way that the edge of the rubber tracks is pressed against the concrete and walls.

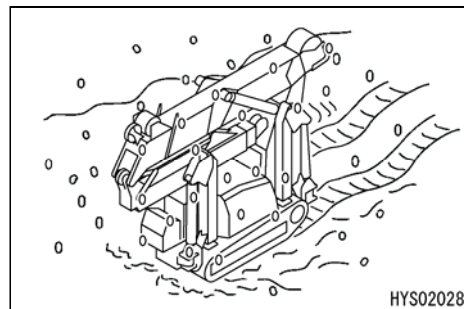


- Avoid steering at a location with great step.

Make the machine perpendicular to the step when going over it. Going over the step diagonally may result in the rubber tracks coming off.



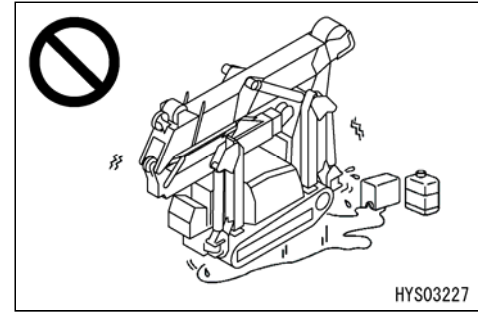
- The rubber tracks slip very easily on a wet steel plate or snowed and frozen surfaces. Be especially careful not to slip when operating on the slope.



- Avoid using the rubber tracks whenever possible depending on the material to be worked on.

If it is necessary to use the rubber tracks on the materials listed below, make sure to wash thoroughly after use.

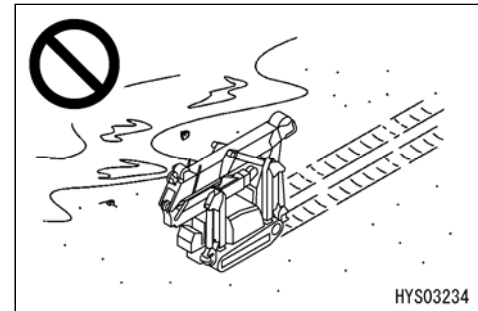
- Avoid the operation on the material crushed and yielding oil (such as soy beans, corns, rape cake, etc.)
- Handling salt, ammonium sulphate, potassium chloride, potassium sulfate or concentrated superphosphate corrodes the bonding at the cored bar section.



- Salt corrodes the bonding at the cored bar section. Avoid using the machine on the beach whenever possible.

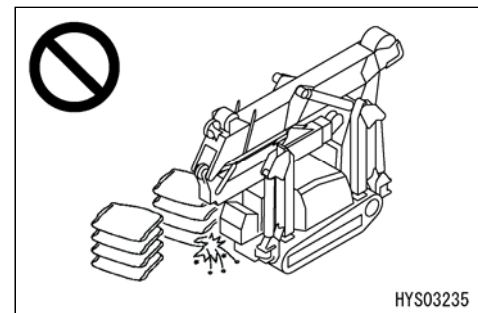
- The operation in the very cold land changes the material of the rubber tracks, shortening its life.

Use the rubber tracks in the range of -25°C to +55°C, due to the physical property of the rubber.



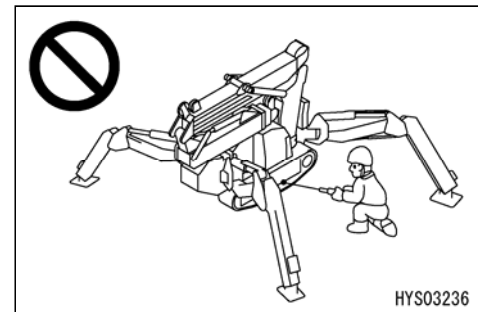
- When handling food such as salt, sugar, wheat, and soybeans, some pieces of wire or rubber may be mixed in the food if there is any deep scratch on the rubber tracks.

Use the rubber tracks after repairing the cracked rubber.



- Always use the rubber tracks at appropriate tension to prevent the rubber track from coming off.

Loose tension will allow the rubber tracks to come off.



4. HANDLING WIRE ROPES

4.1 CRITERIA FOR WIRE ROPE REPLACEMENT

CAUTION

- The criteria for replacing wire ropes is common to all the wire ropes for winching, telescoping the boom, and slinging.
- The diameter of the wire rope is measured at points where the wire repeatedly runs through the sheave. A mean value needs to be determined through 3 way measurement.
- Do not use old wire rope regardless of the frequency of use.
- See “INSPECTION AND MAINTENANCE 8.5 [2] REPLACEMENT MAIN BOOM TELESCOPING WIRE ROPE” for details.
- Contact us or our sales service agency for replacing/repairing the wire ropes.

[1] WIRE ROPE NOMINAL DIMENSION

- Wire rope for winching : IWRC 6 × WS (26) 0/0 φ8 × 73 m
- No. 3 wire rope for extending main boom : IWRC 6 × Fi (29) 0/0 φ9 × 5.05 m
- No. 3 wire rope for retracting main boom : IWRC 6 × Fi (29) 0/0 φ8 × 5.00 m

[2] CRITERIA FOR WIRE ROPE REPLACEMENT

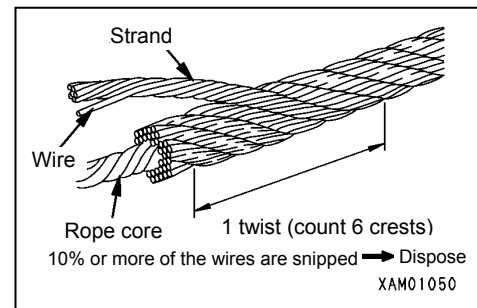
A wire rope undergoes wear and tear over time.

Prompt replacement is required if any of the following appears in the wire rope.

- 10% or more of strands (except a filler wire) in 1 twist of a wire rope (6 crests) are broken.

NOTES

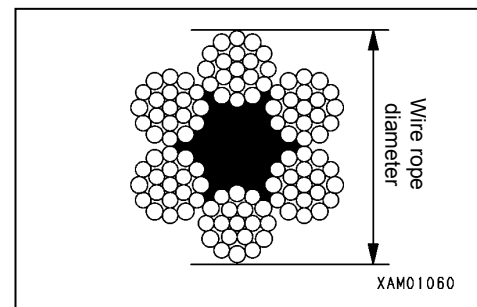
Change wire rope for both winching and boom extending/retracting when 13 or more wires are broken.



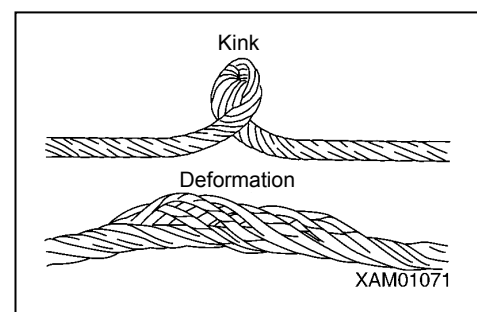
- Wear equivalent to 7% or more of a nominal diameter occurs in the wire rope diameter.

NOTES

- Change the 9-mm diameter wire rope when reduced to 8.4 mm.
- Change the 8-mm diameter wire rope when reduced to 7.5 mm.



- A kink is formed.
- Considerable deformation or corrosion is developed.
- A faulty end socket is used.



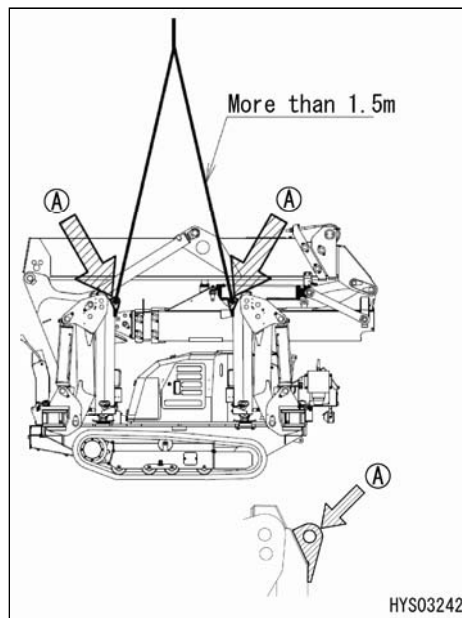
5. TRANSPORTATION

Observe the related regulations and exercise safety during transport.

5.1 HOISTING MACHINE

⚠ DANGER

- When lifting up the machine, always set it to the outrigger machine body lifting position and lift it with “4 rope lifting” at 4 locations of the lifting bracket (A) of each outrigger top box. Any other manner than this or lifting with other than 4 rope lifting using the lifting bracket (A) may cause droppage of the machine and result in a serious injury or death.
If the machine necessarily needs to be lifted in other manner, consult us or our sales service agency.
- Only use a sling (e.g. wire rope and shackles) which is approved and capable of lifting the mass (weight) of the machine.
- The outrigger machine body hoisting position when the machine main body is hoisted must be in a state where position pins (4 pins) are securely inserted into the “Lifting” position.



CAUTION

- When the local laws and regulations are applicable, the person who uses the crane to perform hoisting operation must be qualified to do so. 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.
- 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.

MK1033CW-1 MACHINE WEIGHT

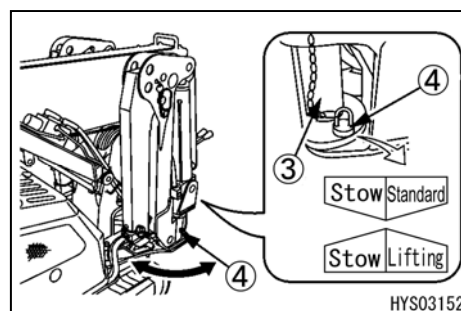
Model	Weight
MK1033CW-1	2290 kg
MK1033CW-1 with winch	2390 kg
MK1033CWE-1	2270 kg
MK1033CWE-1 with winch	2370 kg

200-4680800

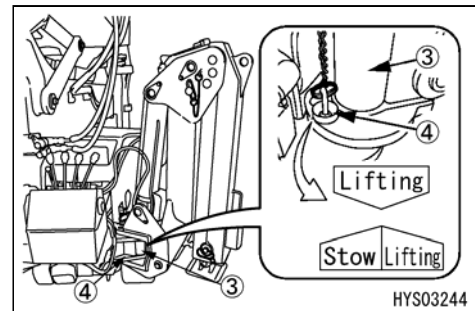
To hoist the machine, the four outriggers must be set in “Lifting” in the hoisting position. This step should be performed on a firm level ground.

★ Applied to “outriggers (1) and (4)”

1. Pull the position pin (4) out of the outrigger rotary (3) and rotate the outrigger rotary outward.

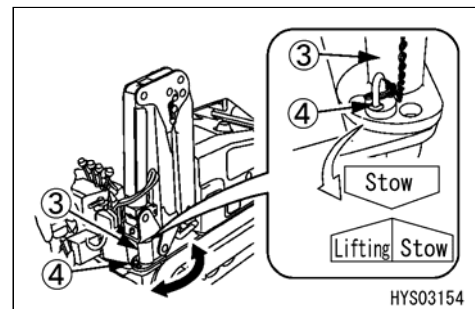


2. Rotate the outrigger rotary (3) so that the sticker "Lifting" affixed to the side of the outrigger rotary (3) and the sticker "Stow/Lifting" affixed to the side of frame are aligned.
3. Insert positioning pin (12) into the hole of the rotary (1) sticker "Lifting".

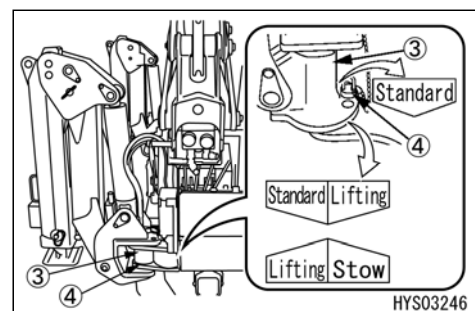


★ Applied to "outriggers (2) and (3)"

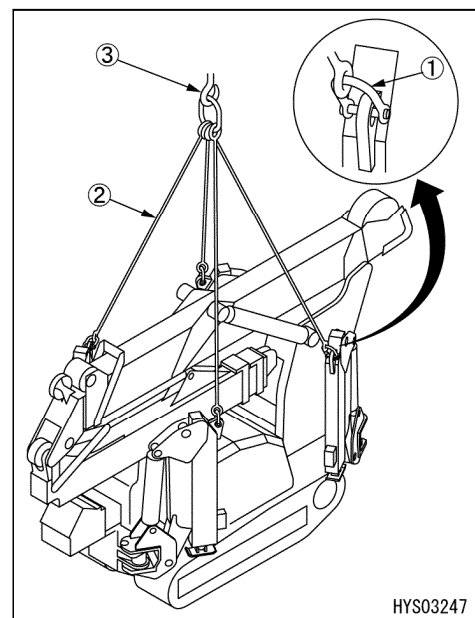
4. Pull the position pin (4) out of the outrigger rotary (3) and rotate the outrigger rotary outward.



5. Rotate the outrigger rotary (3) so that the sticker "Standard/Lifting" affixed to the side of the outrigger rotary (3) and the sticker "Lifting/Stow" affixed to the side of frame are aligned.
6. Insert positioning pin (12) into the hole of the rotary (1) sticker "Standard/Lifting".



7. Attach a shackle (1) to the hole part (4 locations) of each outrigger top box and hang a sling (2) on the hook (3).
8. Immediately after the machine leaves the ground, stop hoisting once, and slowly hoist the machine after it is stabilized.



NOTES

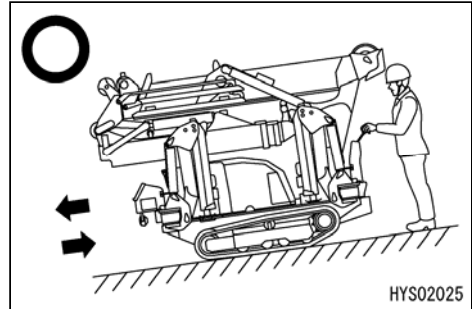
★ Recommended sling

- Wire rope (front 2 ropes) : Rope equivalent at least to JIS13 $\phi 12.5 \times$ length 2150 mm (breaking load 7.5t or more)
One end eye lock, with one end nominal 12A thimble
- Wire rope (rear 2 ropes) : Rope equivalent at least to JIS13 $\phi 12.5 \times$ length 1650 mm (breaking load 7.5t or more)
One end eye lock, with one end nominal 12A thimble
- Shackle : Nominal 14 of BC or SC (breaking load 7.5t or more)

5.2 LOADING/UNLOADING

WARNING

- Use the ramps at 10 degrees or smaller angle. In addition, decide the clearance between ramps to meet the centre of the rubber tracks.
- Always put the machine in the “travelling posture” when loading/unloading the machine. See “OPERATION 2.5 MACHINE TRAVELLING POSTURE” for details.
- Always move backward when loading the Machine. Moving forward may cause the machine to fall. A driver is requested always to be positioned on the load-carrying platform of a truck.
- Always move forward when unloading the Machine. Moving backward may cause the machine to fall. A driver is requested always to be positioned on the load-carrying platform of a truck.
- Be especially careful when loading or unloading the Machine because the risks intervene.
- Use the ramps that have fully strong width, length and thickness, and that enable safe loading/unloading.
- 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.
- Remove the mud and other substances from the footing to prevent the Machine from skidding over the ramps. Remove the substances stuck on the ramps such as grease, oil or ice, and keep clean.
- Never change direction over the ramp. Temporarily leave the ramp before correcting the direction.
- As the center of gravity position moves suddenly on the boundary where the angle changes, slowly operate and travel.

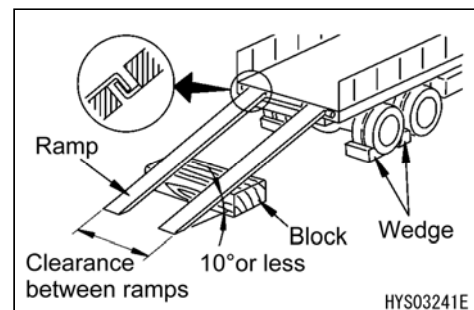


Put the machine in the “travelling posture” and always use ramp boards or forwarding blocks when loading/unloading the machine. Follow the procedure below.

1. Brake the truck securely. Place wheel blocks next to the wheels of the truck to secure the truck.
2. Ramp boards must be suitably aligned so that the machine rests in the centre of the truck.

NOTES

Verify that the two ramp boards are at the same height.



3. Operate the acceleration lever 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 truck. Move backward to load the machine, and forward to unload the machine.
5. On the ramp boards, do not correct the direction in addition to that any other lever than travelling levers must not be operated. Temporarily leave the slope before correcting the direction.
6. Load the machine properly to the desired position on the truck.

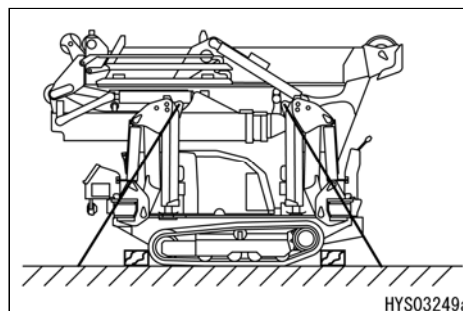
5.3 CAUTIONS WHEN LOADING MACHINE

WARNING

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.

Load the machine to the specified position on the truck and secure the machine with the following procedure.

1. Stop the engine and remove the main starter switch key.
2. Place a square piece of timber in the front and back of the rubber tracks to prevent the machine from moving during transportation. Secure the machine with chain or wire rope. Especially, properly fix it to not let it move from side to side.



5.4 CAUTIONS DURING TRANSPORTATION

WARNING

Take road width, height, and weight into consideration in determining the transportation route.

If there are any applicable local laws or regulations, observe them for safe transportation.

6. HANDLING IN COLD WEATHER

6.1 PREPARING FOR LOW TEMPERATURE

In cold conditions, the machine starts to have some difficulty in starting. Take the following actions.

[1] LUBRICATION

Change the lubricating oil to the one with low viscosity.

See "INSPECTION AND MAINTENANCE 5.1 USE OF LUBRICATING OIL ACCORDING TO TEMPERATURE" for the specified viscosity.

[2] COOLANT

WARNING

Antifreezing fluid is inflammable. Do not put the fluid close to fire.
Do not smoke when handling antifreeze.

CAUTION

Never use antifreezing fluid with methanol, ethanol, and propanol.

See "INSPECTION AND MAINTENANCE 8.10 1000 HOURS MAINTENANCE [2] CLEANING ENGINE COOLING SYSTEM" for the coolant replacement period and mixing rate of antifreezing fluid.

[3] BATTERY

WARNING

- The battery produces combustible gas and can be explosive. Do not put fire close to the battery.
- The battery fluid is a hazardous substance. Keep it away from your eyes and skin. Should it come into the contact with eyes or skin, wash the affected area with plenty of water and consult a physician immediately.

The battery capacity drops when the temperature decreases.

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.

NOTES

Measure the specific gravity of the battery fluid and convert it into the charging rate using the chart below.

		Fluid Temperature (°C)			
		20	0	-10	-20
Charging Rate (%)	100	1.28	1.29	1.30	1.31
	90	1.26	1.27	1.28	1.29
	80	1.24	1.25	1.26	1.27
	75	1.23	1.24	1.25	1.26

[4] CAUTIONS AFTER COMPLETING THE OPERATION

Observe the following 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 dirt and water on the machine.

Keep the hydraulic cylinder rod surface especially clean to prevent seal from being damaged with dirt coming into the seal together with the water drops.

- Park the machine on 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 moving quickly next morning.

- Remove the drain plug of the fuel tank 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 in a warm place to be installed next morning.
- If the electrolyte level is low, refill with distilled water next morning before starting the operation.
Do not refill after the operation in order to prevent the water from freezing during the night.

[5] AFTER COLD WEATHER HAS PASSED

When the season changes and starts to get warm, take the following action.

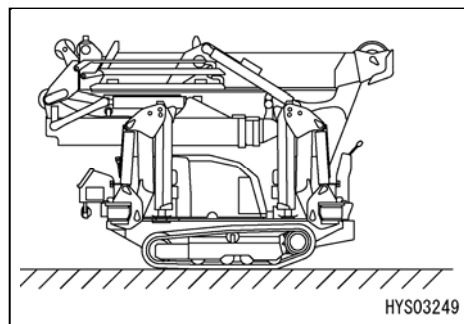
- See "INSPECTION AND MAINTENANCE 5.1 USE OF LUBRICATING OIL ACCORDING TO TEMPERATURE" to change the oil in the system to the one with specified viscosity.
- If "AF-PT antifreezing fluid (winter 1 season type)" is necessarily used, drain the antifreeze completely and clean the inside of the cooling system thoroughly before putting the coolant.

7. LONG-TERM STORAGE

7.1 BEFORE STORING MACHINE

CAUTION

Keep the machine in the posture shown in the figure on the right during long-term storage to protect the cylinder rod. See "OPERATION 2.5 TRAVELLING POSTURE OF MACHINE" for details. (To prevent rust on the cylinder rod)



Store the machine as described below for long-term storage:

- Wash and clean each section of the machine and store indoor.
If you have to leave it outdoors, 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 put on a cover, or dismount the battery from the machine for storage.
- If the temperature will drop to 0°C or below, add antifreezing fluid. See "INSPECTION AND MAINTENANCE 8.10 1000 HOURS MAINTENANCE [2] CLEANING ENGINE COOLING SYSTEM" for the coolant replacement period and mixing rate of antifreezing fluid.

7.2 DURING STORAGE

⚠ WARNING

If you have to perform antirust operation indoors, 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.

7.3 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 following 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 dismounted 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 perform warm-up operation. Carefully check the various parts of the machine.
- If the battery was used at low idling (low rotation speed) throughout the operation hours on a day, leave the crane operating for a while at a high rotation speed after the entire work of that day.

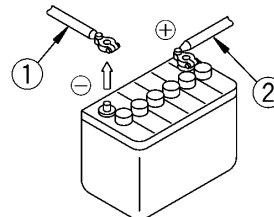
8. HANDLING BATTERY

Observe the following when handling the battery.

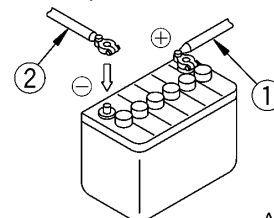
! WARNING

- 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 a moistened cloth.
- The battery produces hydrogen gas, which may cause an 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.
- Slackened battery terminals can cause sparks with poor contact, causing an explosion hazard. Tighten securely when installing the terminals.
- Secure the battery when changing it to prevent it 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.

Disconnect with negative cable first



Connect with positive cable first



AM087770E

8.1 CAUTIONS IN HANDLING BATTERY

- Always try to keep the battery charged.

The battery should not be charged in a rush after being discharged. Measure the specific gravity of the battery fluid in advance and charge the battery as needed.

Keeping the battery in the best condition lengthens the life of the battery.

- Check the electrolyte level earlier than regular check and maintenance schedule during the hot season.
- The battery ability drops significantly 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.

Distilled water should be refilled before starting the work next morning to avoid freezing.

- If the battery was used at low idling (low rotation speed) throughout the operation hours on a day, leave the crane operating for a while at a high rotation speed after the entire work of that day.

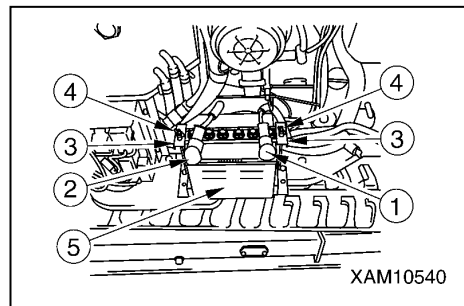
8.2 REMOVING/INSTALLING BATTERY

CAUTION

Verify that the battery does not move after securing the battery.
If it moves, secure it again.

[1] REMOVAL

1. See "OPERATION 1.7 MACHINERY COVER" and remove the machinery cover.
2. Disconnect the (-) terminal (1) on the ground side first and then the (+) terminal (2) to disconnect the battery cable.
3. Remove the wing nut (4), battery fixing brackets (3), and then remove the battery (5).



[2] INSTALLATION

1. Install the battery in the reverse order of removal.
2. Connect the (-) terminal (1) on the ground side last when connecting the battery.

8.3 CAUTIONS IN CHARGING BATTERY

When charging the battery mounted to the machine

- Abnormal voltage may be applied to the alternator, resulting in a breakage. Disconnect the battery terminal wires before charging the battery.
- While charging, remove all the fluid plugs to release the gas generated.
- Stop charging when the battery becomes 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.

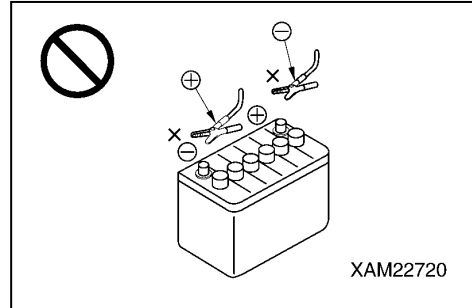
8.4 STARTING ENGINE WITH BOOSTER CABLE

Start the engine with booster cable as described below.

[1] CAUTIONS IN 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 each other.
Because the battery produces hydrogen gas, sparks around the battery can cause an 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 each other or the machine when disconnecting the booster cable.



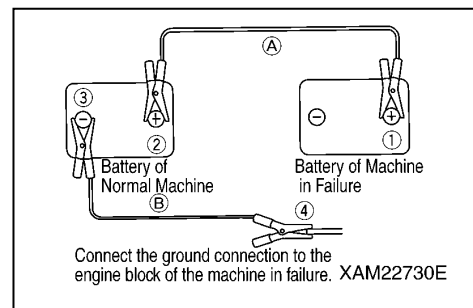
CAUTION

- 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 or corrosion.
- Connect the clips securely.
- Verify that the operation levers of both the normal machine and machine in failure are at the "NEUTRAL" position.

[2] CONNECTING BOOSTER CABLE

Connect the booster cables in the numerical order shown in the figure on the right.

1. Turn the main 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.



[3] STARTING ENGINE

CAUTION

Verify that the operation levers of both the normal machine and machine in failure are at the “NEUTRAL” position.
If the safety lock lever is equipped, also verify that it 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 main 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.

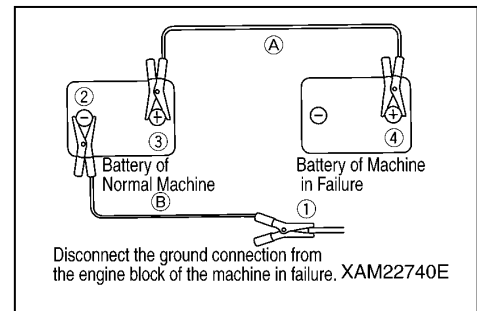
NOTES

See “OPERATION 2.2 STARTING ENGINE” for how to start the engine.

[4] 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.



9. TROUBLESHOOTING

9.1 ELECTRICAL COMPONENTS

- Make sure that you contact us or our sales service agency for the actions marked with ★ in the Actions fields.
- Ask us or our sales service agency for repair if you suspect any other abnormalities or causes than those given below.

Abnormal Phenomenon	Major Cause(s)	Remedy
Dark light even at highest engine speed	• Defective wiring	★ Check and repair slackened terminals and open circuits
Light blinks during engine operation	• Defective alternator • Defective wiring	★ Replacement ★ Inspection and repair
Battery charge monitor remains illuminated even after the engine starts	• Defective alternator • Defective wiring	★ Replacement ★ Inspection and repair
Abnormal noise from alternator	• Defective alternator	★ Replacement
Starter not rotating even after the starter switch is turned	• Defective wiring • Insufficient battery charge	★ Inspection and repair • Charge the battery
Starter pinion going out and in repeatedly (struggling)	• Insufficient battery charge	• Charge the battery
Starter key turning slow	• Insufficient battery charge • Defective starter	• Charge the battery ★ Replacement
Starter disengaged before the engine starts	• Defective wiring • Insufficient battery charge	★ Inspection and repair • Charge the battery

9.2 MACHINE BODY

- Make sure that you contact us or our sales service agency for the actions marked with ★ in the Actions fields.
- Ask us or our sales service agency for repair if you suspect any other abnormalities or causes than those given below.

Abnormal Phenomenon	Major Cause(s)	Remedy
Crane cannot be operated at all but can travel		★ Inspection and repair
• Travelling speed, boom and hook block operation speed too slow • Abnormal noise from pump	• Insufficient hydraulic oil • Clogging in the hydraulic oil tank strainer and element	• Refill with hydraulic oil to the specified oil level, referring to the section "Check before operation" • Clean and replace the strainer and element according to periodic inspection.
Hydraulic oil temperature too high	• Insufficient hydraulic oil	• Refill with hydraulic oil to the specified oil level, referring to the section "Check before operation"
• Rubber tracks coming off • Abnormal wear on the sprockets	• Rubber tracks too loose	• See "Check before operation" and adjust the tension
• The monitor display does not turn on. • Not operable.	• Defective wiring • Insufficient battery charge	★ Inspection and repair

9.3 ENGINE

- Make sure that you contact us or our sales service agency for the actions marked with ★ in the Actions fields.
- Ask us or our sales service agency for repair if you suspect any other abnormalities or causes than those given below.

Abnormal Phenomenon	Major Cause(s)	Remedy
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 before operation” and refuel • Charge the battery ★ Inspection and replacement
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 before operation” and adjust oil level to appropriate one • See causes and actions for “Engine does not start”
Engine power is low, or 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 “Irregular Maintenance” for cleaning or replacement of the parts • Clean ★ Inspection and replacement
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 before operation” and refill coolant. ★ Inspection and repair • See “Periodical Maintenance” 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 before operation” and adjust oil level to appropriate one • See “Periodical Maintenance” to check, or replace ★ Inspection and repair

10. HOW TO REMOVE AND MOUNT A COUNTERWEIGHT

Machine weight can be decreased for transportation by removing the counterweight.

WARNING

- When carrying out removing and mounting work with two people, always ensure the work procedures are understood and use designated signals to each other during the work. If signs are not clearly understood, moving parts may cause a serious accident.
- Removing and mounting work on a slope or uneven ground may cause tipping of the counterweight and it could cause a serious accident. Select level and firm ground to keep a good balance for this work.
- Be careful not to pinch your hand when removing/mounting and transporting the counterweight.
- Use proper hoisting equipment such as a wire rope and shackle with enough strength for weight of the counterweight.
- Securely set hooking section of the counterweight to the frame of the crane body to prevent the counterweight from falling.
If the hooking section is not locked correctly, the counterweight may fall and it causes a serious accident.
- If a warning is displayed on the monitor, always follow displayed instruction and mount the counterweight. Not mounting the counterweight may cause the crane to tip and cause a serious accident.
However if the electric motor is mounted, counterweight is not required.
- When transporting the counterweight, make sure castor wheels are securely fixed.
If castor wheels fall off, it may cause tipping of the counterweight and a serious accident.
- If you store the counterweight with castor rollers, use wheel stops to avoid unnecessary movement.

NOTES

- Using a fixed hook block is recommended for the removing/mounting work of the counterweight.
The winch system can be used for this work, but take such measures as hoisting from a higher height to avoid interference of the hook and machine body.
- Removing and mounting the counterweight may damage floor. Place protection on the floor before work if necessary.

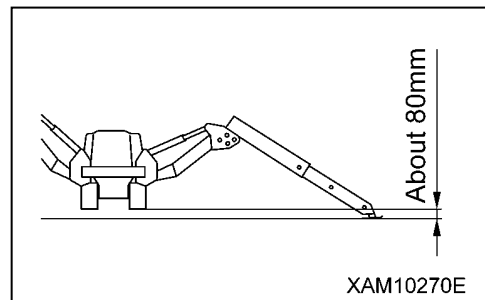
Necessary tools

- Width across flat part: 17mm Spanner, socket, or socket wrench (for the counterweight)
- Width across flat part: 5mm Hexagonal wrench (for the castor wheels)

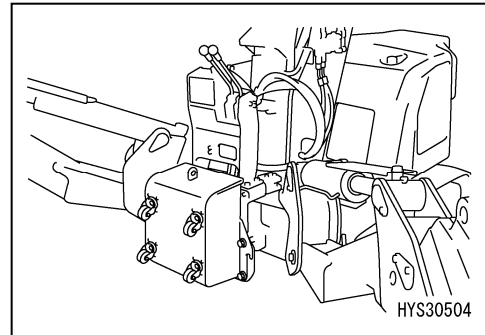
Weight of the counterweight : 200±5kg

10.1 REMOVING THE COUNTERWEIGHT

1. Set outriggers and raise machine body to about 80mm from the ground.



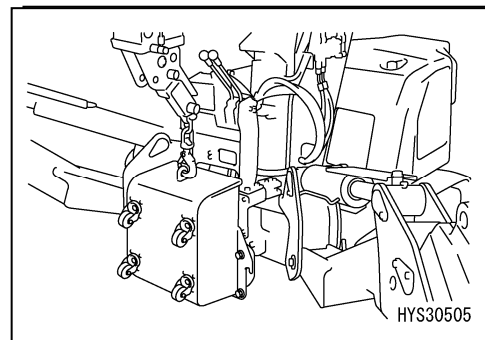
2. If castor wheels are not mounted on the counterweight, mount them. The counterweight can be removed without castor wheels, but transporting the counterweight is easier with castor wheels.



3. Set hook to lifting point of the counterweight, or set hoisting tool to hook.

CAUTION

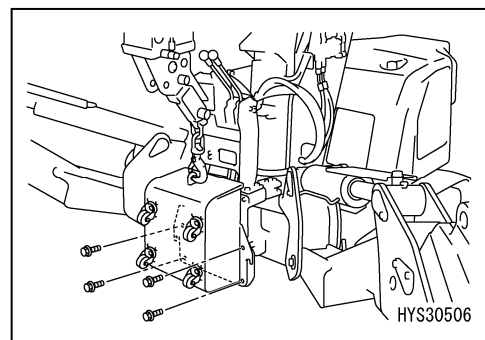
Do not tension or lift the counterweight until fixing bolts of the counterweight are removed. Otherwise it may cause damage to the crane body.



NOTES

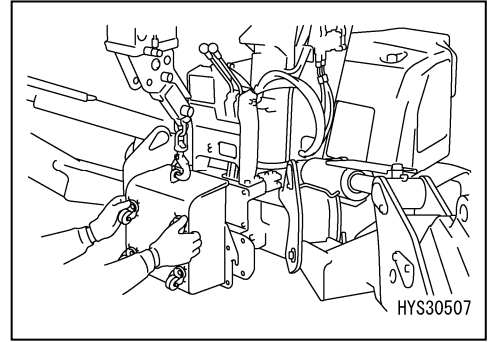
Jib angle must not be less than -90 degrees during the work. Otherwise operation stops automatically.

4. Remove 4 pieces of fixing bolts of the counterweight.

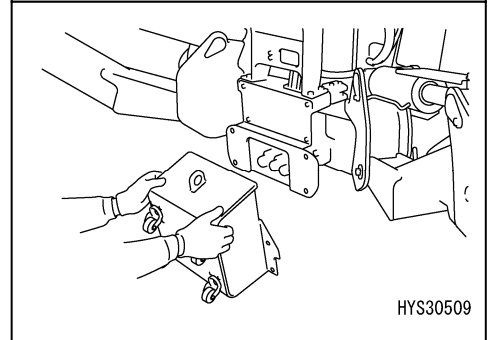
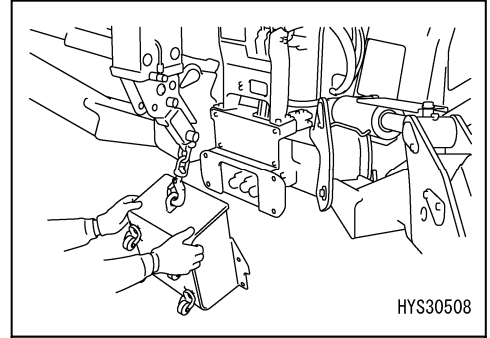


5. Slowly lift the counterweight straight up until the hooking section of the frame (falling prevention) comes off (unlocked).
- To lift by fixed hook, retract jib for lifting up, and extend jib for lifting down.
 - To lift by winch system, raise hook for lifting up, and lower hook for lowering down.

NOTES
Slowly operate to make sure travelling levers do not hit crane.

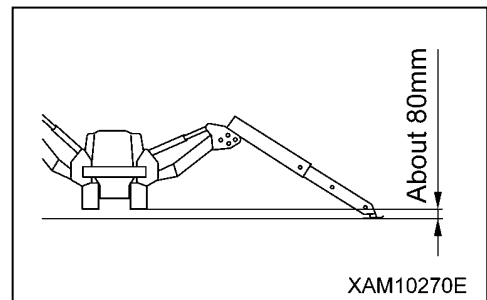


6. Slowly lower down the counterweight onto the ground. Take off the hook or hoisting equipment from the counterweight and this work is completed.



10.2 MOUNTING THE COUNTERWEIGHT

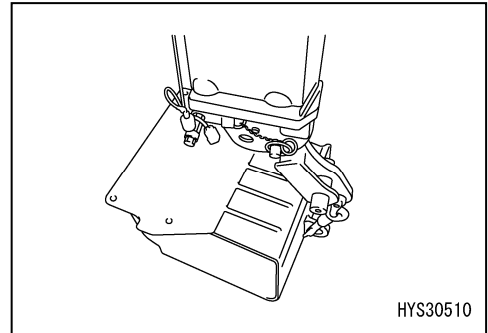
1. Set outriggers and raise crane body to about 80mm from the ground.



2. Prepare the counterweight near mounting part of the crane, and set hook block to the lifting point of the counterweight or to hoisting equipment.

NOTES

Jib angle must not be less than -90 degrees during the work. Otherwise operation stops automatically.

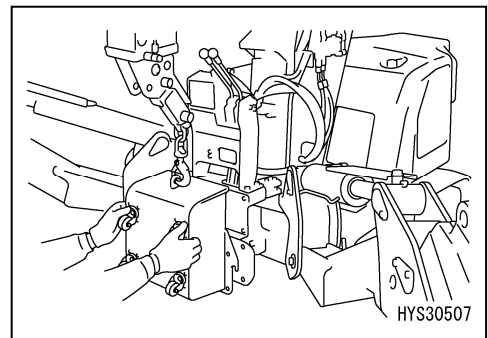


3. After lifting up the counterweight, slowly lower it down to hooking section of the frame (falling prevention) from straight above and lock the hooking section.

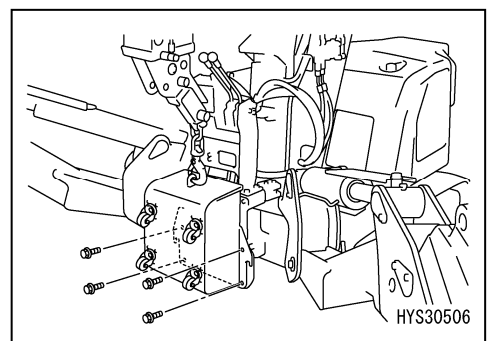
- To lift by fixed hook, retract jib for lifting up, and extend jib for lowering down.
- To lift by winch system, raise hook for lifting up, and lower hook for lowering down.

NOTES

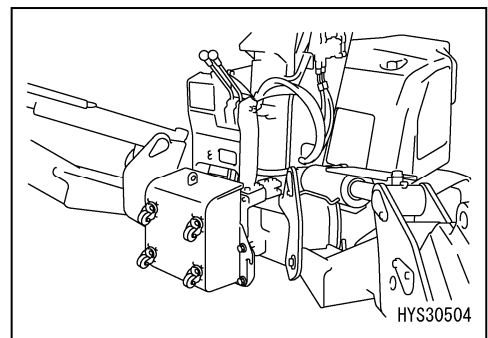
Slowly operate to make sure travelling levers do not hit crane.



4. Mount 4 pieces of fixing bolts of the counterweight.



5. Take off hook or hoisting equipment from the counterweight and this work is completed.



INSPECTION AND MAINTENANCE

1. PRECAUTIONS FOR MAINTENANCE	4- 2
2. BASIC MAINTENANCE	4- 4
3. LEGAL INSPECTION	4- 7
4. CONSUMABLES	4- 7
5. LUBRICATING OIL	4- 8
6. ACCESSORY TOOLS AND STANDARD TIGHTENING TORQUE	4- 9
7. INSPECTION AND MAINTENANCE LIST	4-11
8. MAINTENANCE PROCEDURES	4-14

1. PRECAUTIONS FOR MAINTENANCE

A thorough understanding of the inspection and maintenance items is required to perform efficient inspection and maintenance that will contribute to the safe use of this machine.

WARNING

- **Do not perform any inspection or maintenance that is not described in this manual.**
A 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 agent to request repair.
- **In the event that a failure or malfunction is encountered while the machine is in operation or found during an inspection, report it to your employer or supervisor immediately. Contact us or our sales service agent to request a repair accordingly.**
- **Inspection and maintenance should be performed with the machine placed on a level and strong footing.**

[1] CHECK THE SERVICE METERS

Read the service meters daily to check for any maintenance item that has reached the obligatory maintenance period.

[2] USE GENUINE PARTS FOR REPLACEMENT

Always use Maeda genuine parts as specified in the parts catalog for part replacement.

[3] USE PURE GREASE

Always use Maeda pure grease. The viscosity of grease must conform to specifications according to ambient temperature.

[4] USE CLEAN OIL AND GREASE

Always use clean oil or grease, and keep in a secure container to reduce contact with impurities.

[5] KEEP THE MACHINE CLEAN

Wash the machine clean to assist with the detection of a malfunction. Especially keep the grease nipple, breather, and oil level gauge (oil access door) clean to prevent impurities from entering the machine.

[6] HANDLE WATER AND OIL AT LOW TEMPERATURE

Drained oil, and engine oil filter will be at elevated temperatures immediately after the machine is stopped. Only replace drained oil and filter after they drop in temperature for safety.

On the contrary, if the oil is cold, raise the temperature of the oil (to approx. 20 to 40°C).

[7] CHECK DRAINED OIL AND OIL FILTER

For replacement of oil and filter, check the drained oil and filter to make sure no large amount of metal powder or foreign objects are present.

[8] CAUTIONS IN REFUELING

Do not remove the fuel tank strainer when refueling.

[9] PROTECT OIL FROM IMPURITIES

Avoid dust when inspecting and replacing the oil to keep impurities out of the oil.

[10] ATTACH A WARNING TAG

When draining coolant and oil, always attach a warning tag to the travelling operation unit to prevent accidental engine ignition.

[11] FOLLOW SAFETY PRECAUTIONS

Safety precautions provided on the machine should always be followed when using the machine.

[12] CAUTIONS FOR WELDING REPAIRS

- Make sure the machine is turned off. (Turn the main starter switch to the “OFF” position.)
- Do not continuously apply 200V or greater.
- Ground the machine within 1 meter from the welding point.
- Disconnect the connectors of the remote controller receiver and monitor display.
- 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.

[13] KEEP CLEAR OF FLAMES

Always clean the parts with non-combustible cleaning agent.

Keep the machine away from flames when using light oil.

[14] KEEP THE ATTACHMENT SURFACE CLEAN

Be sure to clean the attachment surface after removing a part to which an O-ring and gasket sealing are attached.

Replace the part using a new O-ring and gasket.

[15] EMPTY YOUR POCKETS

Always empty your pockets before performing inspection and maintenance of the machine to avoid dropping items into the machine.

[16] ASSURE SAFE RUBBER TRACK

When performing a crane operation in a rocky location, make sure of no damage to the rubber track and no looseness, cracks or abrasion of bolts and nuts. Slacken the tension of the crawler track a little more than usual.

[17] 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 a clean cloth, rinsing off dirt and dust.

[18] PRE- AND POST-WORK INSPECTION

Before performing crane operation in muddy water, rain, snow or on the coast, always check for loose fitting plugs and valves. Post-operation inspection requires checks to all units for cracks and damage; loose or missing bolts and nuts, after the machine has been washed.

Carry out early greasing. Grease operating pins that enter muddy water on a daily basis.

[19] CAUTIONS FOR WORKING ON A DUSTY SITE

The following precautions should be observed when working on a dusty site.

- Frequently check the air cleaner for clogging.
- Clean and replace the fuel filter on a regular bases.
- Be sure to clean the electrical parts, especially the starter and alternator, to protect them from dust.

[20] DO NOT MIX OIL

Never mix oil of different brands and different types under any circumstance.

Replace the oil entirely when replenishing a different type of oil.

Always use Maeda genuine parts for part replacement.

2. BASIC MAINTENANCE

[1] OIL HANDLING

- Oil is used under extremely harsh conditions (high temperature, high pressure) in the engine etc, 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 the machines blood. Exercise due caution to handle oil, keeping impurities (such as water, metal powder or dust) out of the oil. Most of mechanical failures are attributed to the intrusion of impurities.

Extra caution is required to prevent impurities entering during machine storage and lubrication.

- Do not mix oil with oil of a different grade or brand.
- Oil lubrication must conform to the designated quantity of oil.

Failure to lubricate the correct quantity can lead to a machine failure.

- In the event that the oil used turns cloudy, a potential intrusion of moisture or air into the oil may be Considered.

Contact us or our sales service agent.

- When replacing oil, always replace the relevant filter as well.
- “ISO VG32” is adopted for the hydraulic oil system as factory standard.

Do not use any hydraulic oil that is not recommended by us. Failure to follow this instruction may cause the filters to get clogged.

A small amount of oil remaining in piping and cylinders does not cause problems even when mixed with other oil.

[2] 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 entering during machine storage and lubrication.

- Do not remove the strainer when replenishing fuel.
- Always use oil that meets requirements such as grade and operating temperature defined in the operation manual.
- Ensure that the fuel tank is full each day after finishing work to prevent condensation of the humid air inside the fuel tank as this 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 when the fuel filter is replaced.
- Clean the tank and fuel system if any foreign substances enter the fuel tank.

[3] STOCKING AND STORAGE OF OIL AND FUEL

- 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, lay 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 unavoidably storing them outside.
- To prevent deterioration of oil and fuel resulting from long-term storage; employ the first-in first-out for using oil and fuel.

[4] GREASE HANDLING

- Grease is designed to prevent the joints 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 has adhesion of sands and dust as this accelerates the wearing away of the rotating part.

[5] 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 amount of oil used.
- Do not reuse any washed filters (cartridge-typed ones) under any circumstances.
- After replacing an oil filter, check the used filter for any metal particles.
If metal particles are found on the used filter, contact us or our sales service agent.
- Always unpack the replacement filter just prior to its use.
- Always use Maeda genuine filters.

[6] COOLANT HANDLING

- River water contains a large amount of calcium and impurities. Use of river water results in accumulation of water stain in the engine and radiator, which causes heat exchange error leading to overheating.
Use only tap water.
- Always use antifreeze following precautions stated in the Operation Manual.
- Keep antifreeze away from flames. Antifreeze is a flammable solution.
- The mixing proportion of antifreeze varies with outside air temperature.
See "INSPECTION AND MAINTENANCE 8.10 MAINTENANCE EVERY 1000 HOURS [2] CLEANING ENGINE COOLING SYSTEM" for the mixing proportions.
- In the event of overheating, replenish coolant when the engine is cold.
- A machine low in coolant may cause overheating and corrosion of the radiator attributed to aeration.

[7] ELECTRICAL PART HANDLING

- A current leakage is developed if the electrical parts are wet or have a damaged coating, which causes the machine to be out of order and malfunction.
- Inspection and maintenance include the checking of belt tension, belt damage, and battery electrolyte 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 or used in the rain.
- When using the machine on coastal areas, keep the electrical parts free of water and impurities to prevent corrosion.

[8] 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 stop 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 drops 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 release the pressure by removing the 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 scratches are found, replace it.
- Bleeding the air from 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 removal.

3. LEGAL INSPECTION

If periodic inspection for machine safety assurance is stipulated by laws and regulations of your country, perform inspection complying with the inspection items listed below.

1. Make sure no abnormal event is present in the safety devices.
2. Check the hoisting accessories including hook block for any abnormalities.
3. Check the hydraulic hoses for oil leaks and friction flaws on the surface. Replace the hose if a surface flaw is detected.
4. Check the structural parts including the boom for cracks and deformations.
5. Check for loose or missing mounting bolts and joints.
6. Check if the booms perform proper operation and stop in extending, retracting, raising, lowering, and slewing.

If a malfunction is found as a result of inspection, contact us or our sales service agent.

If a malfunction is found, contact us or our sales service agency.

4. CONSUMABLES

Replace consumables such as a filter element and wire rope upon periodic maintenance or prior to the wear limit.

Proper replacement of consumables delivers increased economy of machine.

Always use Maeda genuine parts for part replacement.

See the parts catalogue for part numbers when ordering parts.

LIST OF CONSUMABLES

Item	Replacement cycle
Hydraulic oil return filter, engine oil filter, fuel filter	Every 500 hrs
Cylinder packing	★Every 3 yrs
Main boom, jib slide plate	Every 500 hrs
Main boom and jib extending wire rope	★Every 3 yrs
Main boom and jib retracting wire rope	★Every 3 yrs
Cableveyor (hose guides)	★Every 2 yrs
Winch wire rope	★Every 3 yrs
Sheaves	Every 500 hrs

★The cycles marked with a “★” in Replacement cycle include a halt period.

★Contact us or our sales service agent for part replacement.

★If any abnormality is found in the above parts or if they reach the replacement requirement, replace them even before the replacement period.

5. LUBRICATING OIL

5.1 USE OF LUBRICATING OIL ACCORDING TO TEMPERATURES

Use of lubricating oil should vary with changes in temperature.9

Point of refiling	Oil type	Use according to temperature (°C)										Specified oil quantity (L)	Replacement oil quantity (L)
		-30	-20	-10	0	10	20	30	40	50			
Engine oil pan	Engine oil				SAE 30WCD							Hi : 2.3 Lo : 1.0	Hi : 2.3 Lo : 1.0
				SAE 10WCD									
			SAE 10W-30CD										
			SAE 15W-40CD										
Hydraulic oil tank	Abrasion-resistant hydraulic oil	ISO VG22										20	20
		ISO VG32											
		ISO VG46											
Slewing reduction gear	Gear oil										0.6	0.6	
Winch reduction gear		ISO VG320										0.5	0.5
Traveling motor reduction gear											0.33	0.33	
Fuel tank	Light oil											12	—
Cooling system	Water	Add antifreeze									2.1	2.1	

Correct spelling for Travelling

- 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 daytime temperature to approx. 10°C.
- Be sure to use our recommended abrasion-resistant hydraulic oil for the hydraulic oil system; ISO VG46, VG32 and VG22.
- For adjustment of antifreeze concentrations in coolant with temperature at -10°C or below, see “INSPECTION AND MAINTENANCE 8. 10 MAINTENANCE EVERY 1000 HOURS [2] CLEANING ENGINE COOLING SYSTEM”.

6. ACCESSORY TOOLS AND STANDARD TIGHTENING TORQUE

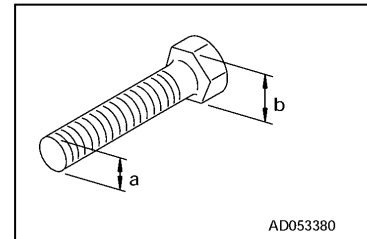
6.1 ACCESSORY TOOLS

Contact us or our sales service agent to request a tool for inspection and maintenance, when necessary.

6.2 STANDARD TIGHTENING TORQUE LIST

Torque the metric bolts and nuts with no specific indication to the values shown in this table.

Adequate tightening torque is determined with respect to a width across flat (b) of a bolt or nut.



[Table 1]

Nominal size a (mm)	Width across flat b (mm)	[1] Metric thread bolts with no specific indication		[2] Bolt marked with "8.8" (strength classification) on its head	
		Tightening torque {N·m (kgf·m)}		Tightening torque {N·m (kgf·m)}	
		Target value	Tolerance	Target value	Tolerance
6	10	3.0 (0.30)	2.6 to 3.5 (0.26 to 0.35)	7.8 (0.80)	6.8 to 9.0 (0.70 to 0.92)
8	13	7.5 (0.75)	6.5 to 8.6 (0.65 to 0.85)	19.0 (1.95)	16.5 to 21.9 (1.70 to 2.24)
10	17	14.5 (1.45)	12.6 to 16.7 (1.25 to 1.65)	37.5 (3.85)	32.6 to 43.1 (3.35 to 4.43)
12	19	25.0 (2.55)	21.7 to 28.8 (2.20 to 2.95)	65.5 (6.70)	57.0 to 75.3 (5.85 to 7.70)
14	22	40.0 (4.10)	34.8 to 46.0 (3.55 to 4.70)	104 (10.6)	90.4 to 120 (9.2 to 12.2)
16	24	62.5 (6.40)	54.3 to 71.9 (5.55 to 7.35)	163 (16.6)	142 to 187 (14.4 to 19.1)
18	27	86.0 (8.75)	74.8 to 98.9 (7.60 to 10.0)	224 (22.8)	195 to 258 (19.8 to 26.2)
20	30	122 (12.4)	106 to 140 (10.8 to 14.3)	318 (32.4)	277 to 366 (28.2 to 37.3)
22	32	166 (16.9)	144 to 191 (14.7 to 19.4)	432 (44.0)	376 to 497 (38.3 to 50.6)
24	36	211 (21.5)	183 to 243 (18.7 to 24.7)	549 (56.0)	477 to 631 (48.7 to 64.4)
27	41	309 (31.4)	269 to 355 (27.3 to 36.1)	804 (81.9)	699 to 925 (71.2 to 94.2)
30	46	419 (42.6)	364 to 482 (37.0 to 49.0)	1,090 (111)	948 to 1,250 (96.5 to 128)
33	50	570 (58.0)	495 to 656 (50.4 to 66.7)	1,485 (151)	1,290 to 1,710 (131 to 174)
36	55	732 (74.5)	636 to 842 (64.8 to 85.7)	1,910 (194)	1,660 to 2,200 (167 to 223)

[Table 2]

Nominal size a (mm)	Width across flat b (mm)	[3] Bolt marked with “10.9” (strength classification) on its head		[4] Bolt marked with “12.9” (strength classification) on its head	
		Tightening torque {N·m (kgf·m)}		Tightening torque {N·m (kgf·m)}	
		Target value	Tolerance	Target value	Tolerance
6	10	11.0 (1.1)	9.4 to 12.7 (0.93 to 1.26)	13.0 (1.30)	11.1 to 15.0 (1.11 to 1.50)
8	13	27.0 (2.7)	23.0 to 31.1 (2.3 to 3.10)	31.5 (3.20)	26.8 to 36.2 (2.72 to 3.70)
10	17	53.0 (5.4)	45.0 to 61.0 (4.6 to 6.21)	62.5 (6.40)	53.1 to 71.9 (5.44 to 7.35)
12	19	93.0 (9.5)	79.0 to 107 (8.10 to 10.9)	109 (11.1)	92.7 to 125 (9.44 to 12.8)
14	22	148 (15.1)	126 to 170 (12.8 to 17.4)	174 (17.7)	148 to 200 (15.0 to 20.4)
16	24	231 (23.5)	196 to 266 (20.0 to 27.0)	271 (27.7)	230 to 312 (23.5 to 31.9)
18	27	317 (32.3)	269 to 365 (27.5 to 37.1)	373 (38.1)	317 to 429 (32.4 to 43.8)
20	30	450 (45.9)	383 to 518 (39.0 to 52.8)	529 (54.0)	450 to 608 (45.9 to 62.1)
22	32	612 (62.4)	520 to 704 (53.0 to 71.8)	720 (73.4)	612 to 828 (62.4 to 84.4)
24	36	778 (79.3)	661 to 895 (67.4 to 91.2)	915 (93.3)	778 to 1,050 (79.3 to 107)
27	41	1,130 (116)	961 to 1,300 (98.6 to 133)	1,340 (136)	1,140 to 1,540 (116 to 156)
30	46	1,540 (158)	1,310 to 1,770 (134 to 182)	1,820 (185)	1,550 to 2,090 (157 to 213)
33	50	2,100 (214)	1,790 to 2,410 (182 to 246)	2,470 (252)	2,100 to 2,840 (214 to 290)
36	55	2,700 (275)	2,300 to 3,100 (234 to 316)	3,180 (324)	2,700 to 3,660 (275 to 373)

7. INSPECTION AND MAINTENANCE LIST

Inspection and maintenance items	Page
8.1 INITIAL 10 HOUR MAINTENANCE (Only the 1st maintenance of a new machine)	4-14
[1] GREASING MACHINE UNITS	4-14
8.2 INITIAL 50 HOUR MAINTENANCE (Only the 1st maintenance of a new machine)	4-14
[1] REPLACEMENT ENGINE LUBRICATING OIL AND ENGINE LUBRICATING OIL FILTER CARTRIDGE	4-14
[2] OIL REPLACEMENT IN HYDRAULIC OIL TANK	4-14
[3] REPLACEMENT HYDRAULIC OIL RETURN FILTER CARTRIDGE	4-14
[4] CHECKING/ADJUSTING ALTERNATOR BELT TENSION	4-14
8.3 INITIAL 250 HOUR MAINTENANCE (Only the 1st maintenance of a new machine)	4-14
[1] OIL REPLACEMENT IN SLEWING REDUCTION GEAR CASE	4-14
[2] OIL REPLACEMENT IN TRAVELLING MOTOR REDUCTION GEAR CASE	4-14
[3] OIL REPLACEMENT IN WINCH REDUCTION GEAR CASE (WINCH SPECIFICATION)	4-14
8.4 PRE-OPERATION INSPECTION	4-15
2.1.1 VISIBLE CHECKS	3-49
[1] INSPECTION OF JIB DERRICK CYLINDER	3-50
[2] INSPECTION OF JIB	3-50
[3] INSPECTION OF JIB TELESCOPE CYLINDER	3-50
[4] INSPECTION OF MAIN BOOM DERRICK CYLINDER	3-50
[5] INSPECTION OF MAIN BOOM	3-50
[6] INSPECTION OF MAIN BOOM TELESCOPE CYLINDER	3-50
[7] INSPECTION OF LINK	3-50
[8] INSPECTION OF HOSE GUIDE	3-50
[9] INSPECTION OF MEASURING CORD REEL	3-50
[10] INSPECTION OF POST	3-50
[11] INSPECTION OF OUTRIGGER	3-50
[12] INSPECTION OF OUTRIGGER CYLINDER	3-50
[13] INSPECTION OF GROUND DETECTOR	3-50
[14] INSPECTION AROUND ENGINE	3-51
[15] INSPECTION OF HYDRAULIC SYSTEM OF UNDERCARRIAGE (Travel motor, control valve, hydraulic oil tank, hose and joint)	3-51
[16] INSPECTION OF UNDERCARRIAGE (Rubber track, track roller, sprocket and idler)	3-51
[17] INSPECTION OF EACH OPERATION LEVER	3-51
3.1.1 VISIBLE CHECKS (Winch specification)	8-11
[1] INSPECTION OF WIRE ROPE (Winch specification)	8-11
[2] INSPECTION OF GUIDE SHEAVE (Winch specification)	8-11
[3] INSPECTION OF OVER HOIST DETECTOR (Winch specification)	8-11
[4] INSPECTION OF WINCH MOTOR (Winch specification)	8-11
[5] INSPECTION OF WINCH DRUM (Winch specification)	8-11
[6] INSPECTION OF HOOK BLOCK (Winch specification)	8-11
[7] INSPECTION OF EACH OPERATION LEVER (Winch specification)	8-11

Inspection and maintenance items	Page
2.1.2 CHECKING BEFORE STARTING ENGINE	3-52
[1] CHECKING/REFILLING ENGINE COOLANT	3-52
[2] CHECKING/CLEANING RADIATOR FINS	3-53
[3] CHECKING/REFILLING OIL LEVEL IN ENGINE OIL PAN	3-54
[4] CHECKING/REFUELING FUEL LEVEL IN FUEL TANK	3-55
[5] CHECKING/CLEANING WATER SEPARATOR	3-56
[6] CHECKING FUEL FILTER	3-57
[7] CHECKING/REFILLING OIL LEVEL IN HYDRAULIC OIL TANK	3-58
[8] CHECKING/REFILLING OIL LEVEL IN SLEWING REDUCTION GEAR CASE	3-59
[9] CHECKING BATTERY ELECTROLYTE LEVEL	3-60
[10] CHECKING HORN FOR OPERATION	3-61
[11] CHECKING HEADLIGHTS FOR OPERATION	3-61
[12] CHECKING FUSE BOX FOR DAMAGE	3-62
[13] CHECK JIB, MAIN BOOM AND FRAME FOR CRACKS, DEFORMATION OR DAMAGE	3-62
[14] GREASING ON SHACKLE	3-62
3.1.2 CHECKING BEFORE STARTING ENGINE (Winch specification)	8-12
[1] CHECK DEFORMATION, DAMAGE OR WEAR OF WIRE ROPE (Winch specification)	8-12
2.1.3 CHECKING AFTER STARTING ENGINE	3-63
[1] CHECKING/ADJUSTING RUBBER TRACK TENSION	3-63
[2] CHECKING RUBBER TRACK FOR DAMAGE AND WEAR	3-66
[3] CHECKING OUTRIGGER OPERATION	3-67
[4] CHECKING CRANE OPERATIONS	3-68
[5] INSPECTION OF MOMENT LIMITER	3-70
[6] CHECKING EMERGENCY STOP SWITCH FOR OPERATION	3-70
[7] CHECKING ENGINE EXHAUST GAS COLOUR, NOISE AND VIBRATION	3-70
3.1.3 CHECKING AFTER STARTING ENGINE (Winch specification)	8-12
[1] CHECKING CRANE OPERATIONS (Winch specification)	8-12
[2] INSPECTION OF OVER HOIST DETECTOR (Winch specification)	8-13
[3] INSPECTION OF EXCESSIVE UNWIND DETECTOR (Winch specification)	8-13
8.5 IRREGULAR MAINTENANCE	4-15
[1] REPLACEMENT RUBBER TRACK	4-15
[2] REPLACEMENT MAIN BOOM TELESCOPING WIRE ROPE	4-17
[3] CHECKING/ADJUSTMENT MAIN BOOM TELESCOPING WIRE ROPE	4-18
[4] REPLACEMENT OF WINCH WIRE ROPE (WINCH SPECIFICATION)	4-20
8.6 MAINTENANCE EVERY 30 HOURS	4-24
[1] CHECKING/CLEANING AIR CLEANER ELEMENT	4-24
8.7 MAINTENANCE EVERY 50 HOURS	4-26
[1] DRAINING CONTAMINANT WATER/DEPOSITS IN FUEL TANK	4-26
[2] GREASING MACHINE UNITS	4-27
8.8 MAINTENANCE EVERY 250 HOURS	4-30
[1] CHECKING/ADJUSTING ALTERNATOR BELT TENSION	4-30
[2] CHECKING/REFILLING OIL LEVEL IN TRAVELLING MOTOR REDUCTION GEAR CASE	4-31

Inspection and maintenance items	Page
8.9 MAINTENANCE EVERY 500 HOURS	4-32
[1] REPLACEMENT ENGINE LUBRICATING OIL AND ENGINE OIL FILTER CARTRIDGE	4-32
[2] REPLACEMENT FUEL FILTER	4-34
[3] REPLACEMENT HYDRAULIC OIL RETURN FILTER	4-35
8.10 MAINTENANCE EVERY 1000 HOURS	4-37
[1] REPLACEMENT AIR CLEANER ELEMENT	4-37
[2] CLEANING ENGINE COOLING SYSTEM	4-38
[3] OIL REPLACEMENT IN HYDRAULIC OIL TANK	4-41
[4] OIL REPLACEMENT IN SLEWING REDUCTION GEAR CASE	4-43
[5] OIL REPLACEMENT IN TRAVELLING MOTOR REDUCTION GEAR CASE	4-44
[6] OIL REPLACEMENT IN WINCH REDUCTION GEAR CASE (WINCH SPECIFICATION)	4-45
8.11 MAINTENANCE EVERY 2000 HOURS	4-46
[1] INSPECTION/ADJUSTMENT ENGINE VALVE CLEARANCE	4-46
[2] CHECKING ALTERNATOR AND STARTER	4-46

8. MAINTENANCE PROCEDURES

8.1 INITIAL 10 HOUR MAINTENANCE

The following maintenance should be performed after 10 hours of operation, limited to the 1st maintenance of a new machine.

[1] GREASING MACHINE UNITS

See "INSPECTION AND MAINTENANCE 8.7 MAINTENANCE EVERY 50 HOURS [2] GREASING MACHINE UNITS" for maintenance places and procedure.

8.2 INITIAL 50 HOUR MAINTENANCE

The following maintenance should be performed after 50 hours of operation, limited to the 1st maintenance of a new machine.

[1] REPLACEMENT ENGINE LUBRICATING OIL AND ENGINE LUBRICATING OIL FILTER CARTRIDGE

See "INSPECTION AND MAINTENANCE 8.9 MAINTENANCE EVERY 500 HOURS [1] REPLACEMENT ENGINE LUBRICATING OIL AND ENGINE LUBRICATING OIL FILTER CARTRIDGE" for maintenance places and procedure.

[2] OIL REPLACEMENT IN HYDRAULIC OIL TANK

See "INSPECTION AND MAINTENANCE 8.10 MAINTENANCE EVERY 1000 HOURS [3] OIL REPLACEMENT IN HYDRAULIC OIL TANK" for maintenance places and procedure.

[3] REPLACEMENT HYDRAULIC OIL RETURN FILTER

See "INSPECTION AND MAINTENANCE 8.9 MAINTENANCE EVERY 500 HOURS [3] REPLACEMENT HYDRAULIC OIL RETURN FILTER" for maintenance places and procedure.

[4] CHECKING/ADJUSTING ALTERNATOR BELT TENSION

See "INSPECTION AND MAINTENANCE 8.8 MAINTENANCE EVERY 250 HOURS [1] CHECKING/ADJUSTING ALTERNATOR BELT TENSION" for maintenance places and procedure.

8.3 INITIAL 250 HOUR MAINTENANCE

The following maintenance should be performed after 250 hours of operation, limited to the 1st maintenance of a new machine.

[1] OIL REPLACEMENT IN SLEWING REDUCTION GEAR CASE

See "INSPECTION AND MAINTENANCE 8.10 MAINTENANCE EVERY 1000 HOURS [4] OIL REPLACEMENT IN SLEWING REDUCTION GEAR CASE" for maintenance places and procedure.

[2] OIL REPLACEMENT IN TRAVELLING MOTOR REDUCTION GEAR CASE

See "INSPECTION AND MAINTENANCE 8.10 MAINTENANCE EVERY 1000 HOURS [5] OIL REPLACEMENT IN TRAVELLING MOTOR REDUCTION GEAR CASE" for maintenance places and procedure.

[3] OIL REPLACEMENT IN WINCH REDUCTION GEAR CASE (WINCH SPECIFICATION)

See "INSPECTION AND MAINTENANCE 8.10 MAINTENANCE EVERY 1000 HOURS [6] OIL REPLACEMENT IN WINCH REDUCTION GEAR CASE " for maintenance places and procedure.

8.4 PRE-OPERATION INSPECTION

Inspections described in this section should be conducted before the 1st engine start-up of the day.

See "7. INSPECTION AND MAINTENANCE LIST" for the items of pre-operation inspection.

See "OPERATION 2.1 PRE-OPERATION INSPECTION)" for maintenance places and procedure of pre-operation inspection.

8.5 IRREGULAR MAINTENANCE

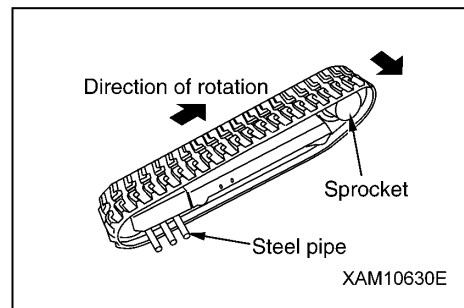
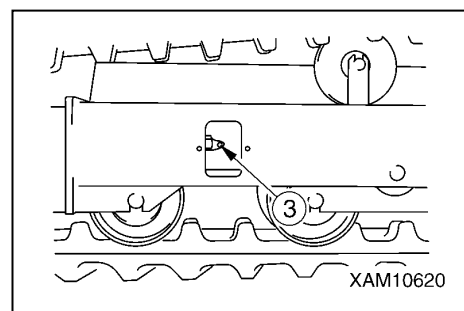
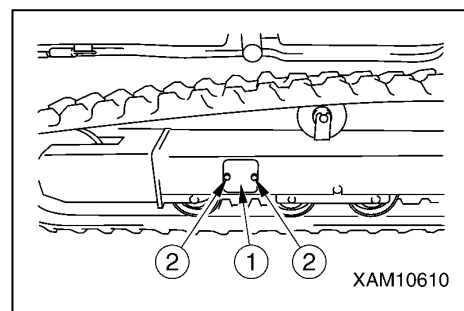
[1] REPLACEMENT RUBBER TRACK

⚠ WARNING

- Grease is sealed inside the rubber track tension adjuster. The grease is at a high pressure because of the tension of the rubber track. Attempting to release the grease without observing the following precautions may cause the grease valve to pop out and result in serious accident.
- Do not loosen the tension adjustment grease valve more than 1 full turn.
Doing so may cause the grease valve to pop out.
- To avoid risk during tension adjustment, do not place your body in front of the grease valve.
- Ensure that grease is completely removed from the inside of the rubber track before rotating the sprocket to remove the rubber track.

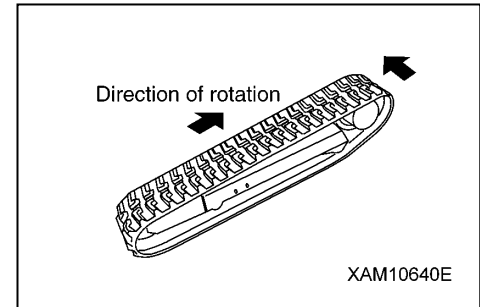
[REMOVAL RUBBER TRACK]

- Have a steel pipe available.
1. See "OPERATION 2.12 OUTRIGGER SETUP OPERATION" to set outriggers and raise the machine about 80 mm above the ground.
 2. Remove the mounting bolts (2) (2 bolts) and then remove the inspection cover (1).
 3. Slowly loosen the grease valve (3) to drain the grease.
 4. When loosening the grease valve (3), do not loosen by more than 1 turn.
 5. Insert the steel pipe between the idler and rubber track, as shown in the diagram (right). Rotate the sprocket backward.
 6. When the inserted steel pipe detaches the rubber track from the idler, slide the crawler in a lateral direction to remove it.

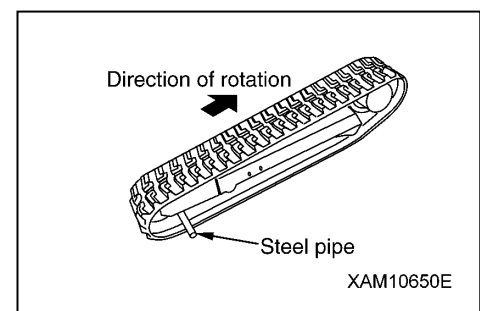


[INSTALLATING RUBBER TRACK]

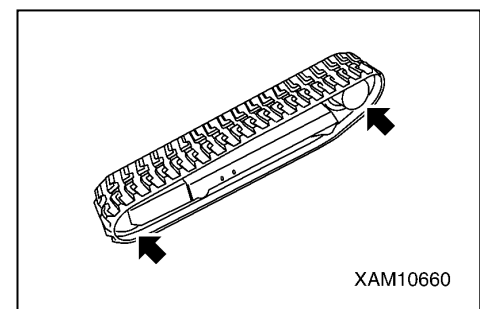
- Have a grease gun available.
 - Have a steel pipe available.
1. See “OPERATION 2.12 OUTRIGGER SETUP OPERATION” to set outriggers and raise the machine about 80 mm above the ground.
 2. With the rubber track engaged with the sprocket, put the crawler on the idler.
 3. With the sprocket rotating backward, push the rubber track in to stop rotation.



4. Fit the steel pipe into the rubber track, and re-rotate the sprocket to put the crawler on the idler properly.



5. Stop rotation, and ensure that the rubber track is on the sprocket and idler properly.



6. See “OPERATION 2.1.3 CHECKING AFTER STARTING ENGINE [1] CHECKING/ADJUSTING RUBBER TRACK TENSION” to adjust rubber track tension.
7. Ensure that adequate engagement and tension of the rubber track, sprocket, and idler are obtained.
8. See “OPERATION 2.21 OUTRIGGER STOWAGE OPERATION” to stow the outriggers and lower the machine on the ground.

[2] REPLACEMENT MAIN BOOM TELESCOPING WIRE ROPE

⚠ WARNING

Always put on thick leather work gloves when replacing the wire rope.

CAUTION

- The diameter of the wire rope is measured at points where the wire repeatedly runs through the sheave. A mean value needs to be determined through 3way measurement. (A measurement should be performed not only at 1 point but also at several points, spacing between the points.)
- Do not use old wire rope regardless of the frequency of use.

[CRITERIA FOR WIRE ROPE REPLACEMENT]

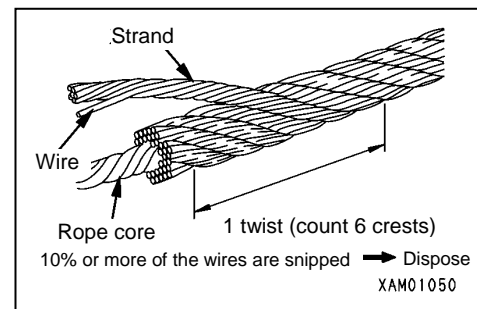
A wire rope undergoes wear and tear over time.

Prompt replacement is required if any of the following appears in the wire rope.

- 10% or more of strands (except a filler wire) in 1 twist of a wire rope (6 crests) are broken.

NOTES

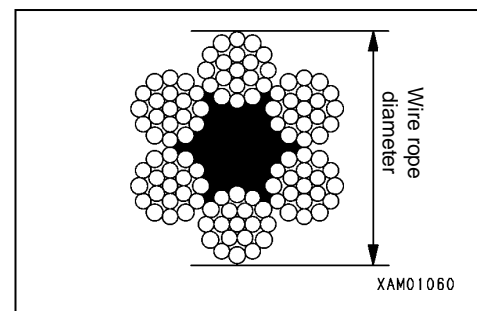
Change main boom telescoping wire rope when 13 or more wires are broken.



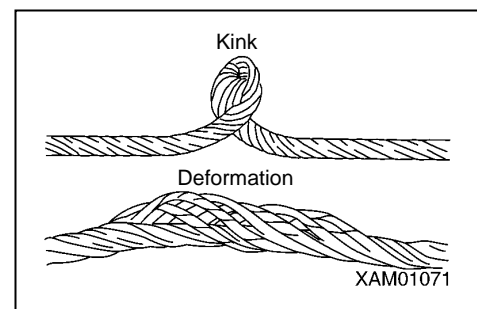
- Wear equivalent to 7% or more of a nominal diameter occurs in the wire rope diameter.

NOTES

- Change the 9-mm diameter wire rope when reduced to 8.4 mm.
- Change the 8-mm diameter wire rope when reduced to 7.5 mm.



- A kink is formed.
- Considerable deformation or corrosion is developed.
- A faulty end socket is used.



NOTES

When main boom telescoping wire rope needs to be replaced, contact Maeda or our sales service agent.

[3] CHECKING/ADJUSTING MAIN BOOM TELESCOPING WIRE ROPE

⚠ WARNING

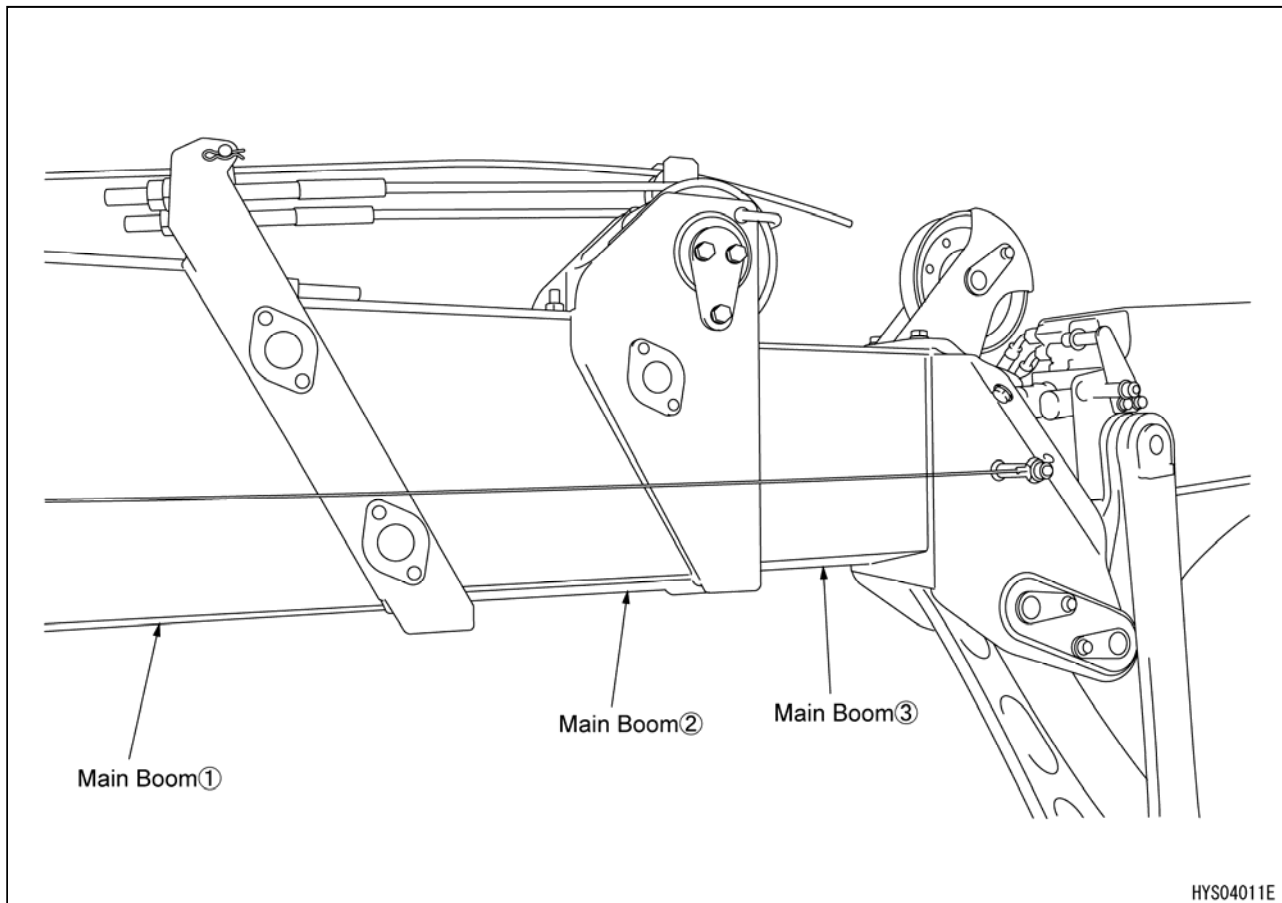
Always put on thick leather work gloves when checking/replacing the wire rope.

[CHECKING WIRE ROPE]

When the boom extending wire rope shows a condition as shown in the figure below, adjust as follows:

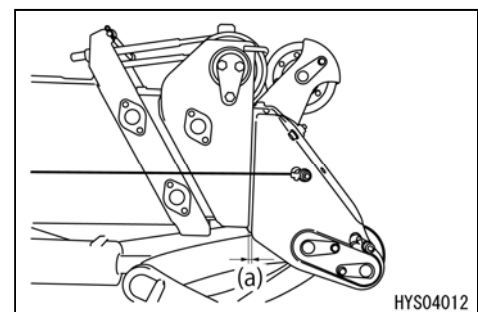
1. Keep the boom level and check whether the centre of the extending wire rope sags during the boom retracting operation.

When it sags, refer to the section, "Adjustment of Wire Rope".



2. Check for a 5 mm or more gap between booms No.2 and 3 (gap (a) shown in diagram, right), when the booms are in a fully retracted and horizontal position.

If check finds clearance of 5 mm or more, perform proper adjustment according to "Adjustment of Wire Rope".



[ADJUSTING WIRE ROPE]

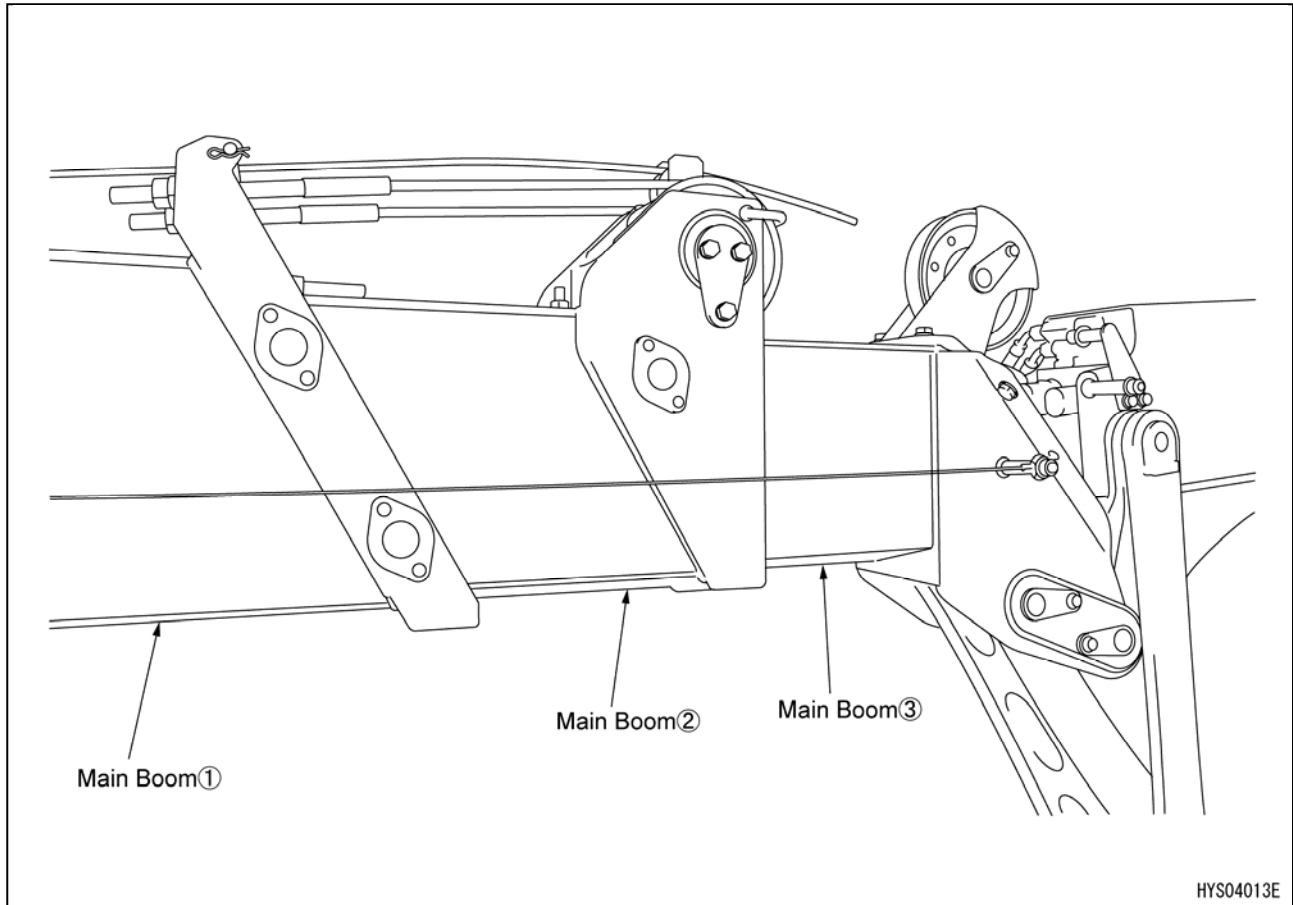
CAUTION

When adjusting each wire rope, be careful of overtension of the wire ropes.

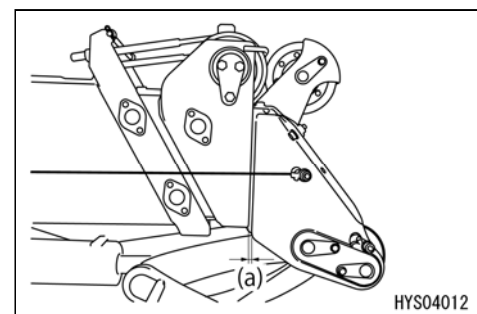
A boom extending wire rope and retracting wire rope (2 pieces each) are used in this machine.

Adjustment of these 2 wire ropes must conform to the specified procedure. Be sure to use the following procedure for wire rope adjustment.

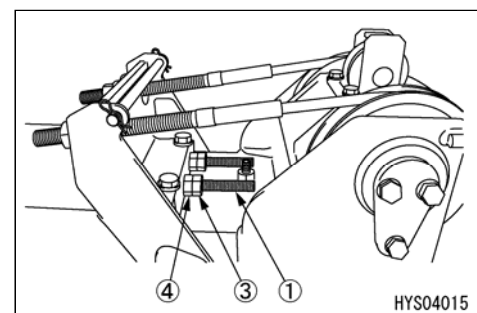
1. With the booms retracted in a horizontal position, extend the telescoping booms by approx. 2 m.



2. Retract the booms completely and at a slow speed.
Measure clearance (a) in this condition to check the following for proper adjustment.
 - If there is 5 mm or more clearance (a) found, adjust the No. 3 boom retracting wire rope (1).
 - If clearance (a) is "0 (zero)", adjust the extending wire rope (6) according to step 4 "Adjustment of No.3 boom extending wire rope (2)".

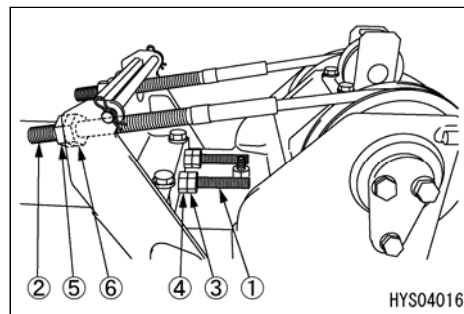


3. Adjustment of No. 3 boom retracting wire rope (1)
 - (1) With the lock nut (3) loose, tighten the right and left adjusting nut (4) evenly in a direction where the retracting wire rope (1) becomes tight until clearance (a) is closed.
 - (2) If clearance (a) is 5 mm or more after performing operation and measurement in steps 1 and 2, readjustment is required.



4. Adjustment of No. 3 boom extending wire rope (2)

- (1) With the lock nut (5) loose, tighten the right and left adjusting nut (6) evenly in a direction where the No. 3 boom extending wire rope (2) becomes tight until just before the No.3 boom begins to extend.
- (2) Retighten both the right and left adjusting nuts (4) of the No.3 boom retracting wire rope (1).
- (3) Secure the adjusting nut (4) and (6) of the No.3 boom retracting and extending wire rope (1) and (2) with the respective lock nut (3) and (5).



[4] REPLACEMENT OF WINCH WIRE ROPE (WINCH SPECIFICATION)

⚠ WARNING

Always put on thick leather work gloves when replacing the wire rope.

CAUTION

- The diameter of the wire rope is measured at points where the wire repeatedly runs through the sheave. A mean value needs to be determined through 3way measurement. (A measurement should be performed not only at 1 point but also at several points, spacing between the points.)
- Do not use old wire rope regardless of the frequency of use.

[CRITERIA FOR WIRE ROPE REPLACEMENT]

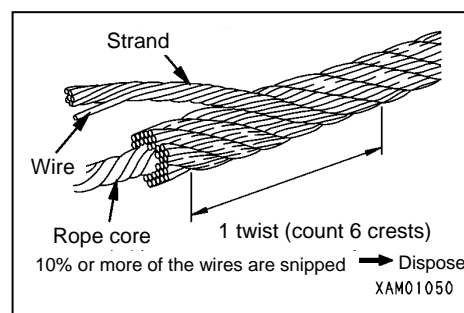
A wire rope undergoes wear and tear over time.

Prompt replacement is required if any of the following appears in the wire rope.

- 10% or more of strands (except a filler wire) in 1 twist (count 6 crowns) of a wire rope are snapped.

NOTES

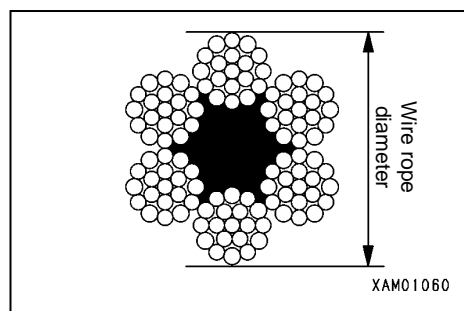
Change winching wire rope when 13 or more wires are broken.



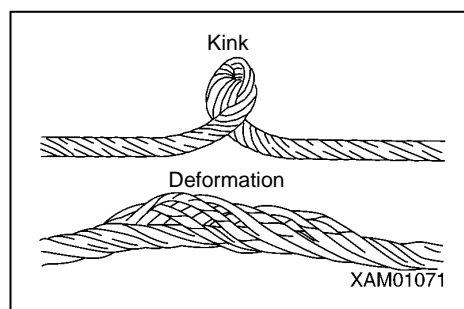
- Wear equivalent to 7% or more of a nominal diameter occurs in the wire rope diameter.

NOTES

Change the 8-mm diameter wire rope when reduced to 7.5 mm.



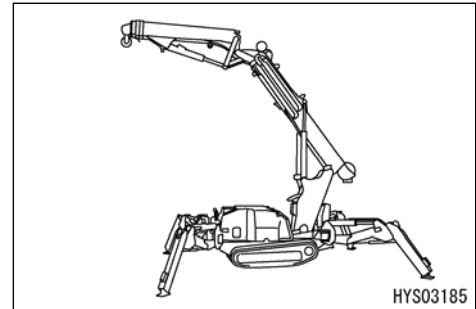
- A kink is formed.
- Considerable deformation or corrosion is developed.
- A faulty end socket is used.



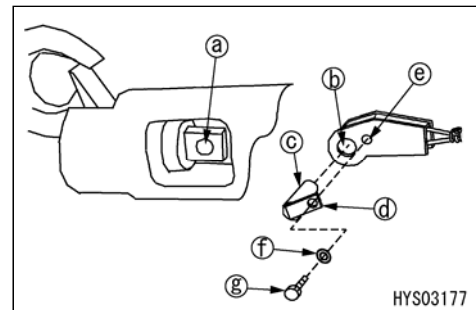
[REMOVAL OF WIRE ROPE]

Use the following procedure to remove the wire rope.

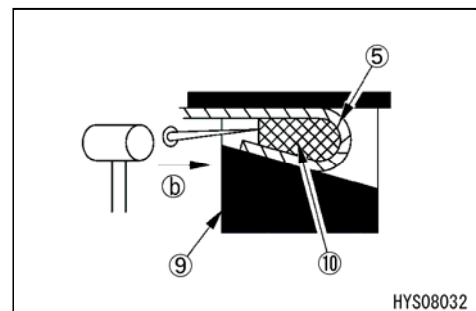
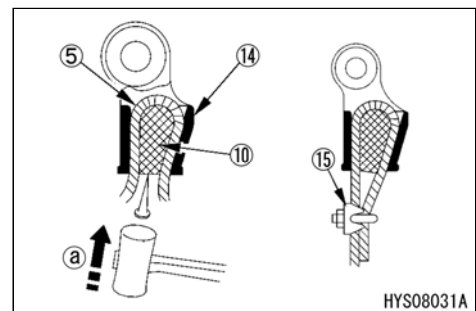
1. When replacing wire rope of the crane, see "OPERATION 2.12 OUTRIGGER SETUP OPERATION" for details and always set the outriggers to maximum.
2. Place the machine on a level and firm surface.
3. Use the main starter switch on the machine side to start the engine.
4. See "OPERATION 2.13 PRECAUTIONS BEFORE CRANE WORK" and "OPERATION 2.14 CRANE OPERATION POSITION" and configure the Crane as shown in the figure on the right.
5. Operate the winch lever to "DOWN" (push it forward) to lower the hook block on to the ground.



6. Remove the bolt (g) and spring washer (f) from the wedge socket pin hole (d) and wedge socket hole (e), and pull out wedge socket pins (c) from the connection base hole (a) and wedge socket hole (b) inside the hook block.



7. Remove the wire clip (15).
8. Pull the wire rope (5) out of the wedge socket (14), following the procedure provided below.
 - (1) Bring a 4 to 6 mm round bar into contact with the rope wedge (10).
 - (2) Remove the rope wedge (10) by lightly tapping the round bar with a hammer in the direction indicated by the arrow (a).
9. Operate the winch lever to "DOWN" (push it forward) to play out the wire rope (5) from the winch drum.
10. After playing out the wire rope from the winch drum, detach the end of the wire rope (5) fixed to the winch drum (9) by following the procedure provided below.
 - (1) Bring a 4 to 6 mm round bar into contact with the rope wedge (10).
 - (2) Remove the rope wedge (10) by lightly tapping the round bar with a hammer in the direction indicated by the arrow (b).
11. Play out the remaining wire rope (5) completely.



Removal of the winch wire rope is completed.

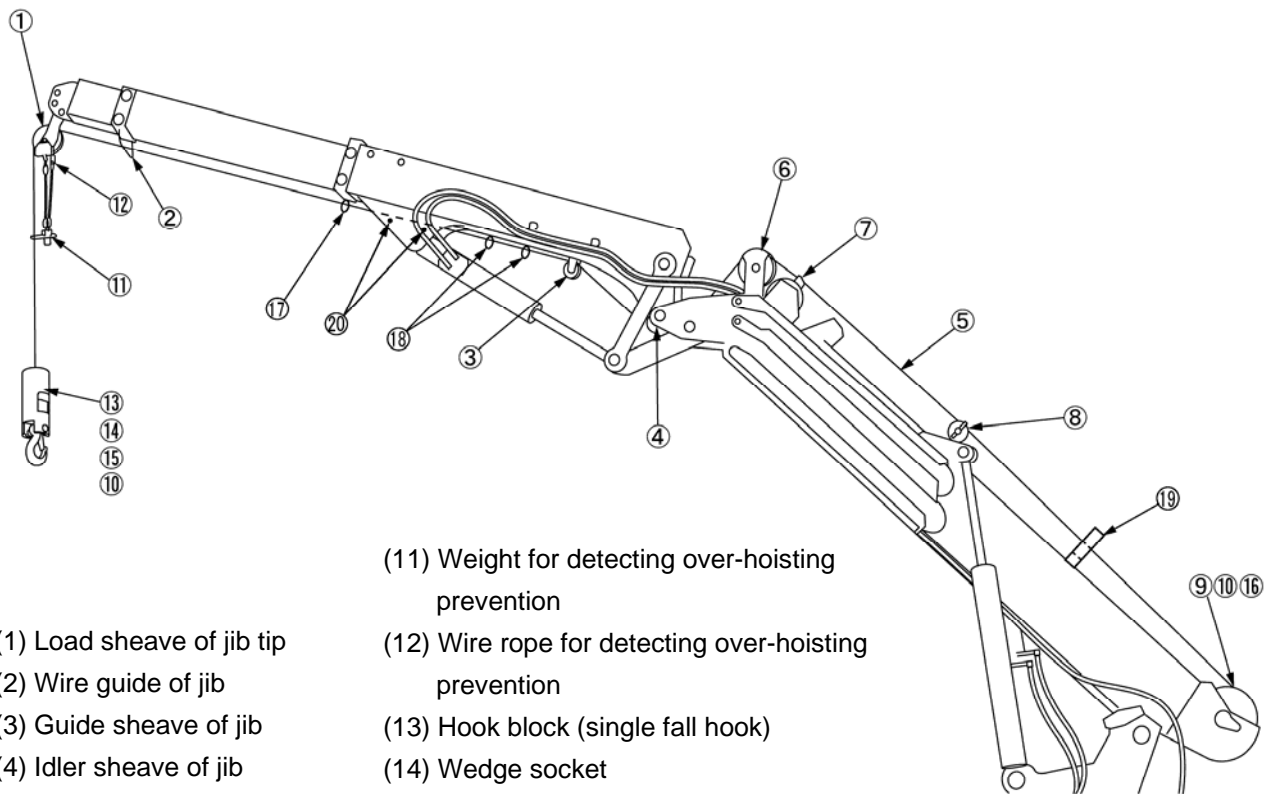
[INSTALLATION OF WIRE ROPE]

⚠ WARNING

Be sure to attach the rope wedge properly to secure the wire rope. Serious accidents may occur if the wire rope is detached during crane operations.

CAUTION

- The procedure in this section is based on the condition that the winch and winch related parts are installed.
- Avoid irregular winding of the wire rope on the winch drum.
- When installing a new rope, wind up the wire rope on the winch drum while applying a load. If a load is not applied, the wire rope will fall, causing irregular winding.
After winding the wire rope, extend the main boom fully and raise the jib fully, hang a load (2.9 to 4.9 kN [300 to 500 kg]), repeatedly wind and unwind the hook to break in the rope.
- The wire rope is coiled. Exercise caution not to form a kink in the rope when winding it up. Be sure to unravel by rotating the wire rope to pull it out of the winch drum.



- | | |
|-----------------------------|---|
| (1) Load sheave of jib tip | (11) Weight for detecting over-hoisting prevention |
| (2) Wire guide of jib | (12) Wire rope for detecting over-hoisting prevention |
| (3) Guide sheave of jib | (13) Hook block (single fall hook) |
| (4) Idler sheave of jib | (14) Wedge socket |
| (5) Wire rope | (15) Wire clip |
| (6) Load sheave of boom tip | (16) Winch guard |
| (7) Guide sheave 2 of boom | (17) Wire guide 1 |
| (8) Guide sheave 1 of boom | (18) Wire guide 2 |
| (9) Winch drum | (19) Wire guard |
| (10) Rope wedge | (20) Wire guard pin |

SAM17170

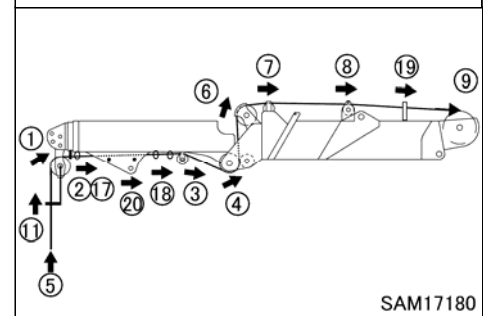
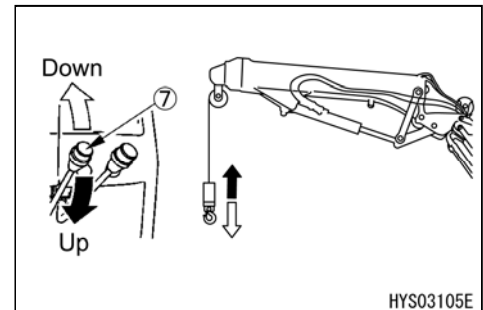
1. See "OPERATION 2.14 CRANE OPERATION POSTURE", put the crane into the work posture and put the main boom and jib into horizontal position.

NOTES

Lower the jib as necessary to facilitate the work.

2. Pull the wire rope (5) so that it is not winded irregularly, operate the winch lever (7) to the "DOWN" side, and thread the wire rope in the following order.

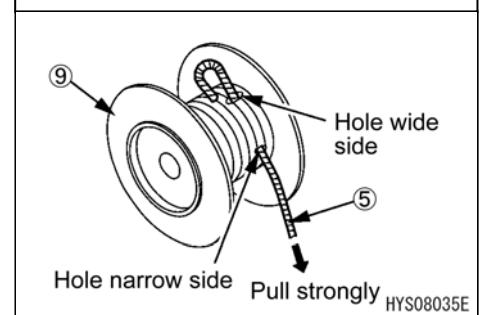
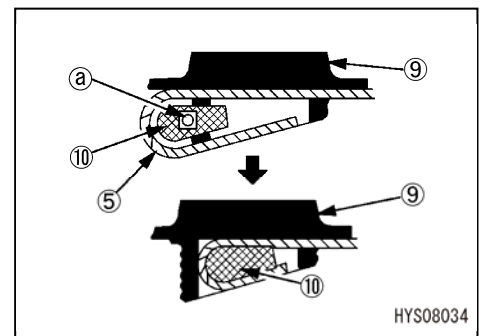
- Weight for detecting over-hoisting prevention (11)
- Load sheave of jib tip (1)
- Wire guide of jib (2)
- Wire guide 1 (17)
- Wire guard pin (20)
- Wire guide 2 (18)
- Guide sheave of jib (3)
- Idler sheave of jib (4)
- Load sheave of boom tip (6)
- Guide sheave 2 of boom (7)
- Guide sheave 1 of boom (8)
- Wire guard (19)



3. Pass the wire rope (5) through the rope mounting hole of the winch drum (9) as follows.

- (1) Draw the slackened wire rope (5) through the winch drum (9).
- (2) Put the rope wedge (10) in position (a) and pass the wire rope (5) around the rope wedge and yank at the rope in the direction indicated by the arrow.

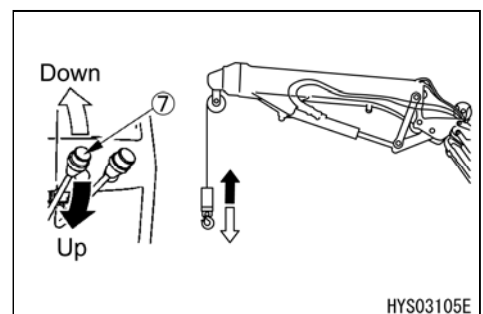
Adjust the length of the wire rope (5) to keep the end of the wire rope from protruding from the narrow hole in the winch drum (9).



4. Slowly operate the winch lever (7) to the "UP" side and wind it onto the winch drum (9) while applying tension to the wire rope (5).

NOTES

- Winding the wire rope (5) in without tension causes irregular winding.
- When attaching the hook block (single fall hook), see "WINCH 3.5 WHEN CHANGING TO HOOK BLOCK (SINGLE FALL HOOK)".



8.6 MAINTENANCE EVERY 30 HOURS

[1] CHECKING/CLEANING/REPLACING AIR CLEANER ELEMENT

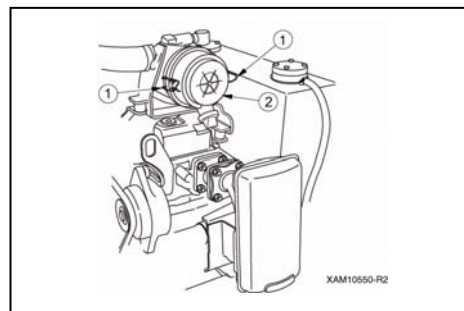
WARNING

- Do not clean and replace the air cleaner element when the engine is running. Doing so may cause damage to the engine.
- Use of compressed air when cleaning the element causes particles to become airborne. Always wear protective goggles to prevent damage to eyes.

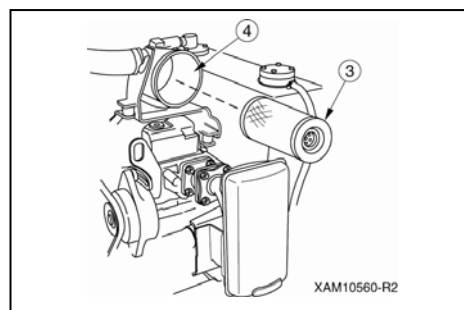
CAUTION

- Clean the air cleaner element every 20 to 30 hours as a guideline. Assure pre- or post-work cleaning when using the machine in a dusty site.
- Do not tap or bump the element whilst cleaning it.
- Avoid using of an element if the groove, gasket, or sealing is damaged.
- Be sure to replace the element after 5 cleanings or a lapse of 1 year from initial use.
- Always use Maeda genuine elements.

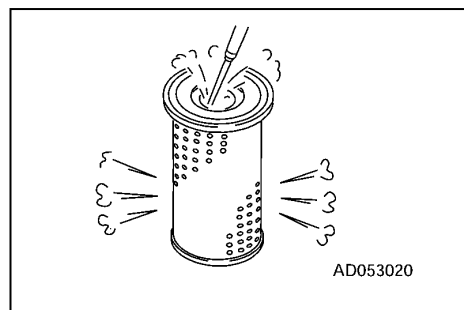
1. See "OPERATION 1.7 MACHINERY COVER" and remove the machinery cover.
2. Disengage the clamp (2 places) and remove the dust pan (2).



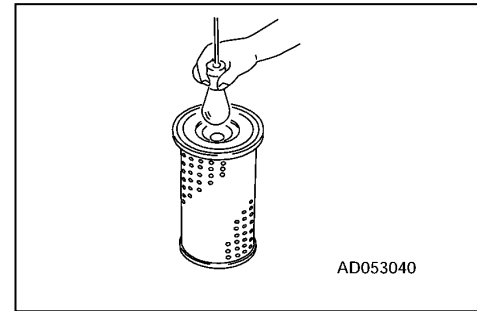
3. Pull out the element (3).
4. Cover the duct entrance located at the back of the air cleaner body (4) with a clean cloth or tape, to keep impurities out of the duct entrance.
5. Clean the inside of the air cleaner body (4).



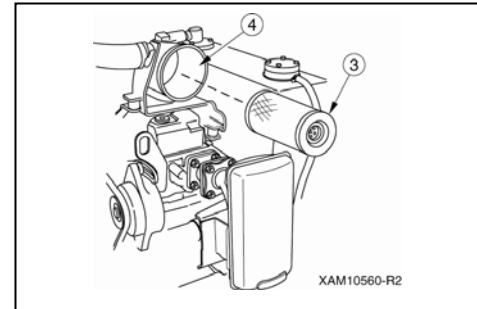
6. Blow dry compressed air on the inside of the element along the grooves at {max. 0.69 MPa (7 kg/cm²)}. Blow compressed air on the outside of the element along the grooves, and re-blow the air on the inside.



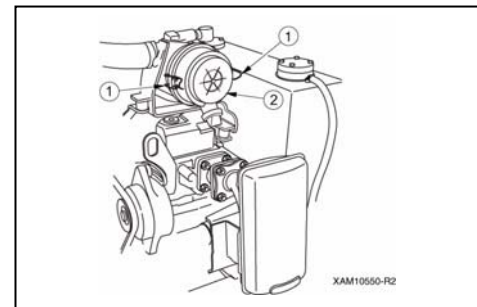
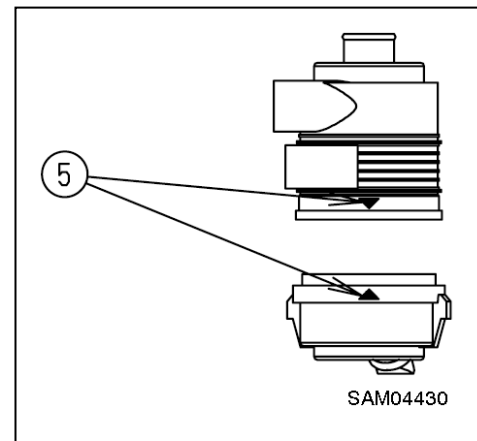
7. Shine a light bulb into the element after cleaning for check. If check finds a porous or thinned part, replace the element.



8. Remove the cloth or tape from the air connector at the back of the air cleaner body (4).
9. Insert the cleaned element (3) into the air cleaner body (4).



10. Connect dust pan (2) and air cleaner body (4) aligning the marks (5). Securely fasten with the clamps (1) (2 places).



11. See "OPERATION 1.7 MACHINERY COVER" and install the machinery cover.

8.7 MAINTENANCE EVERY 50 HOURS

[1] DRAINING CONTAMINANT WATER/DEPOSITS IN FUEL TANK

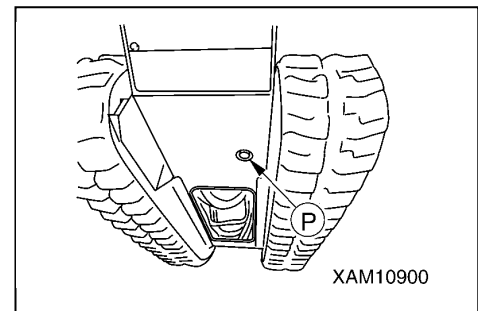
WARNING

- Be extremely careful with fire such as cigarettes.
- Always stop the engine before draining fuel.
Potential ignition may occur through spilled fuel if disregarded.
- Always refit the fuel tank drain plug and secure it after draining fuel.
- The fuel tank drain plug is mounted directly below the machine.
To drain fuel, use outriggers to raise the rubber track about 80 mm, allowing access under the machine.
If the machine is unstable and sways, place supports (stands) under the front and rear sides of the machine to stabilize it.

- Fuel drain pan: Prepare a container of at least 1 litre.
 1. Place the machine on a level surface.
 2. See “OPERATION 2.12 OUTRIGGER SETUP OPERATION” to set outriggers and raise the machine about 80 mm above the ground.
 3. Place a container to collect the drained fuel directly underneath the drain plug (P) of the fuel tank.
 4. Turn the drain plug (P) slowly to avoid splashing fuel on yourself, and drain fuel.

NOTES

Remove the fuel tank cap if normal or smooth fuel draining fails.



5. After draining the fuel, install and tighten the drain plug (P) securely.
6. See “OPERATION 2.21 OUTRIGGER STOWAGE OPERATION” to stow the outriggers.

[2] GREASING MACHINE UNITS

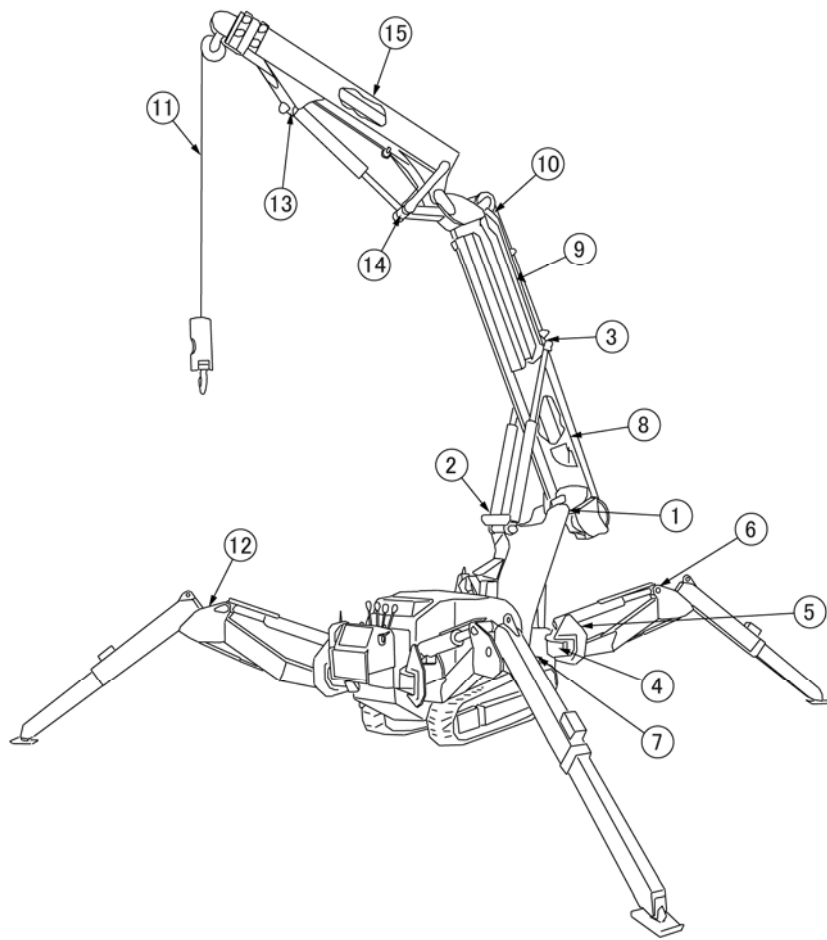
CAUTION

- Grease type varies with greasing points. Failure to grease properly may cause the machine to shorten its useful life.
- Greasing a new machine is required once every 10 hours until the machine reaches the first 100 hours of operation and initial fit emerges.

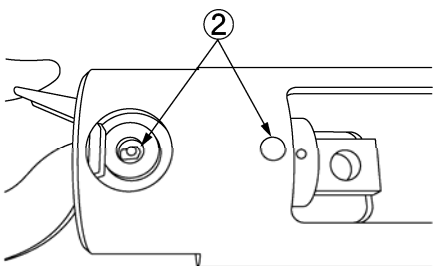
- Use proper grease specified below according to the greasing points.

No.	Greasing point		Grease type
1	Greasing of the main boom mounting pin	1 place	Lithium grease
2	Greasing of the main boom derricking bottom mounting pin	1 place	
3	Greasing of the main boom derricking cylinder rod mounting pin	1 place	
4	Greasing of the outrigger rotary shaft	4 place	
5	Greasing of the outrigger cylinder bottom mounting pin	4 place	
6	Greasing of the outrigger cylinder rod mounting pin	4 place	
7	Greasing of the slewing gear	2 place	Molybdenum grease
8	Greasing of the main boom slide plate	8 place	
9	Greasing of both sides and underside of the main boom	Each boom	Rope grease
10	Greasing of the main boom extending and retracting wire ropes	2 piece	
11	Greasing of the winch wire rope	1 piece	Lithium grease
12	Greasing of the outrigger top box pin	4 place	
13	Greasing of the jib derricking cylinder bottom mounting pin	1 place	
14	Greasing of the jib derricking cylinder rod mounting pin	1 place	Molybdenum grease
15	Greasing of both sides, top face and underside of the jib	Each boom	
16	Greasing of 1 fall hook	2 places	Lithium grease

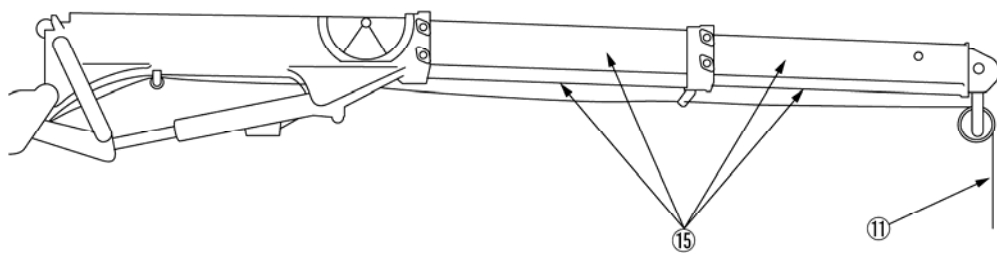
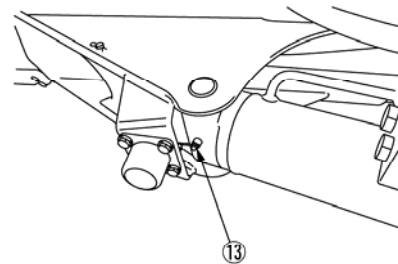
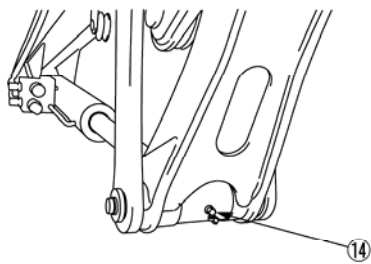
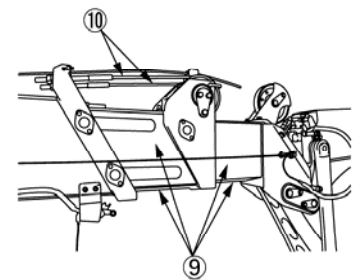
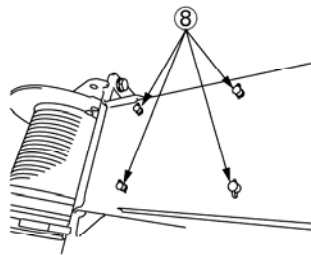
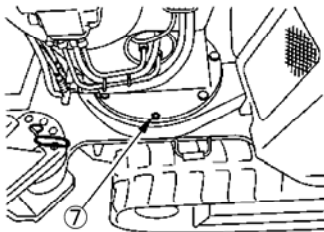
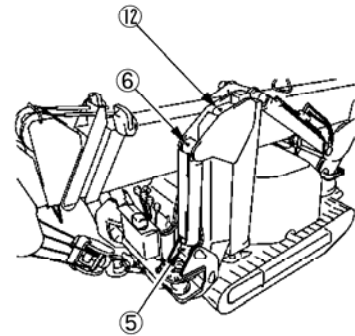
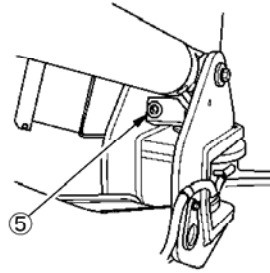
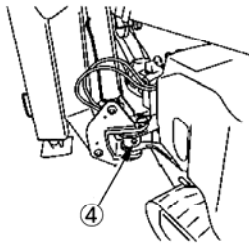
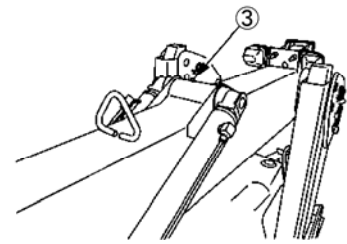
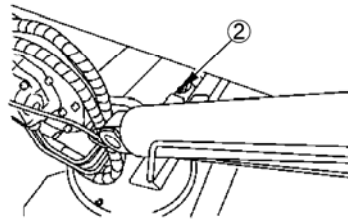
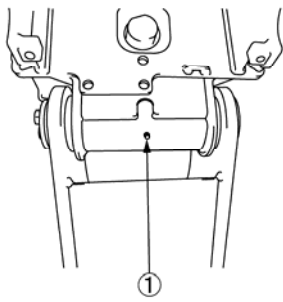
1. With the use of the grease gun, inject grease through corresponding grease plugs indicated in the arrow (see the following page) of the above table "No.1 to 8, 11 to 13".
2. Wipe off old grease squeezed out after greasing.
3. Place the outriggers when greasing the outrigger cylinders.
4. Place the 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 underside of the boom and wire rope.
(Winch specification)
6. Apply rope grease to prevent wire rope abrasion and rust formation .Remove soils from the rope surface before greasing.



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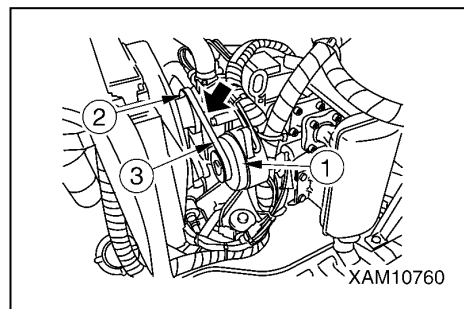
8.8 MAINTENANCE EVERY 250 HOURS

Perform this maintenance in tandem with maintenance every 30/50 hours.

[1] CHECKING/ADJUSTING ALTERNATOR BELT TENSION

[TENSION CHECK]

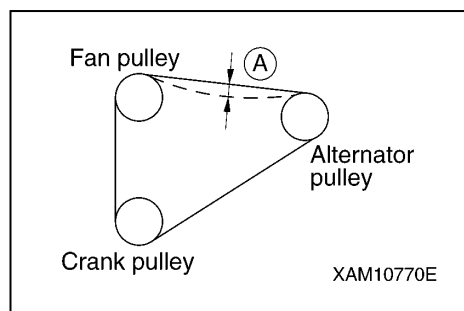
1. See "Operation 1.7 Machinery Cover" and remove the machinery cover.
2. With fingers, push (by approximately 98N {10kgf}) the midpoint between the fan pulley (2) and alternator pulley (1) of the belt (3), and if the movement is between 7 and 10 mm, it is within standard.



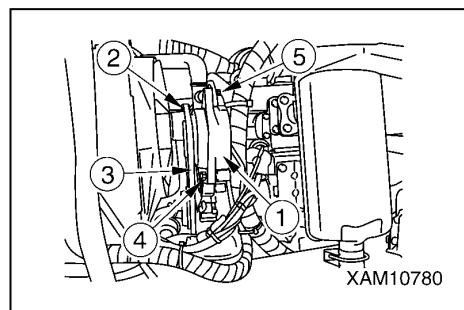
[TENSION ADJUSTMENT]

- Have a wooden bar available.

1. Insert the bar between the alternator (1) and cylinder block.



2. Loosen the lower bolt (4) and adjusting bolt (5).
3. Pull back the bar and slide the alternator (1) so that the amount of slack (A) of the belt (3) is about 7 to 10 mm (about 98N 10 kgf).
4. Tighten the alternator lower bolt (4) and then the adjusting bolt (5) to secure the alternator (1).
5. Check pulley, V groove and belt for damage and wear. In particular, make sure that the belt is not in contact with the bottom of V groove.
6. If the belt has elongated to the extent that the adjusting allowance is lost or it has a scar or crack on it, replace it with a new one.
7. When the belt has been replaced, check adjustment again after 1 hour of operation.
8. See "OPERATION 1.7 MACHINERY COVER" and install the machinery cover.

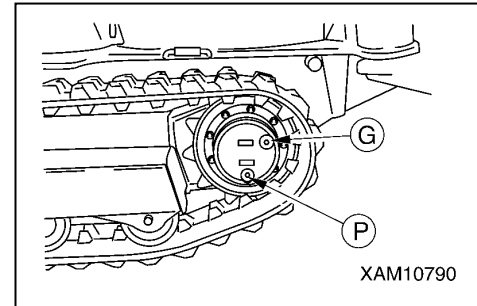


[2] CHECKING/REFILLING OIL IN TRAVELLING MOTOR REDUCTION GEAR CASE

CAUTION

- See “INSPECTION AND MAINTENANCE 5.1 USE OF LUBRICATING OIL ACCORDING TO TEMPERATURE” for the oil to be used.
- Use seal tape, etc. at the thread of the oil level check plug to stop the oil leak and securely tighten the plug after checking/refilling the oil.

1. Move the machine forward and backward so that drain plug (P) of the travelling motor reduction gear case will come to the bottom.
2. Remove the oil level check plug (G) of the travelling motor reduction gear case to check if the oil comes out of the plug hole.
3. If the oil level is low, refill the gear oil from the plug hole of the oil level check plug (G).



NOTES

Pour in the gear oil until the oil comes out of the oil level check plug hole.

4. Securely tighten the oil level check plug (G) after checking/refilling the oil.

8.9 MAINTENANCE EVERY 500 HOURS

Perform this maintenance in tandem with maintenance every 30/50/250 hours.

[1] REPLACEMENT ENGINE LUBRICATING OIL AND ENGINE LUBRICATING OIL FILTER CARTRIDGE

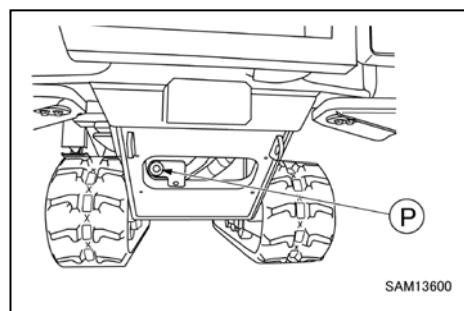
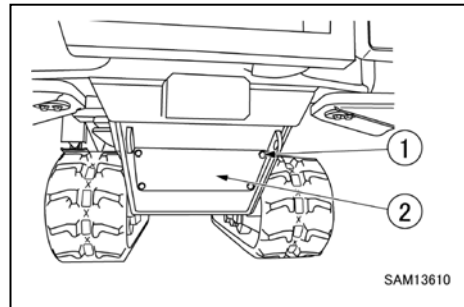
WARNING

- The drain plug of the engine oil pan is mounted at the cover under the control lever. When draining engine oil, use outriggers to raise the machine approximately 80 mm. Always place timbers beneath right and left crawlers and ground for safety.
- Securely tighten the oil level gauge after checking/refilling the oil. If the oil level gauge falls during the operation, the hot oil may spout out of the pan, causing burns.
- Various parts are at elevated temperatures immediately after engine operation. Do not proceed with oil or filter cartridge replacement immediately but wait for the engine to cool to the extent that you can touch it with your hand.

CAUTION

- Make sure that old packing is not stuck to filter base. If it is, it can cause oil leakage.
- See “INSPECTION AND MAINTENANCE 5.1 USE OF LUBRICATING OIL ACCORDING TO TEMPERATURE” for the oil to be used. Using oil other than those specified may shorten the life of the engine. Be sure to refill the specified oil.
- Keep the engine oil at an appropriate level.
- When the engine is cold, oil cannot be drained completely. Drain the oil in a condition in which the engine cools down to the extent that it is touchable by hand.
- Be careful not to let any foreign substance go into the filler opening when refilling the oil.

- Oil drain pan: Prepare a container of at least 3 litres.
 - Volume of oil actually to be replaced in the oil pan: 2.3 litres
1. Place the machine on a level surface.
 2. See “OPERATION 2.12 OUTRIGGER SETUP OPERATION” to set outriggers and raise the machine about 80 mm above the ground.
 3. Remove the bolt (1) at 4 places and remove the cover (2).
 4. Place a container to collect the drained fuel directly underneath the drain plug (P) of the engine lower part.
 5. Turn the drain plug (P) slowly to avoid splashing oil on yourself, and drain oil.
 6. Check the drained oil and if it contains an unacceptable amount of metal particles or foreign matter, contact our sales service agent.
 7. Reinstall the drain plug (P) and the cover (2).
 8. See “OPERATION 2.21 OUTRIGGER STOWAGE OPERATION” to stow the outriggers.
 9. See “OPERATION 1.7 MACHINERY COVER” and remove the machinery cover.



10. By means of a filter wrench, turn filter cartridge (3) counterclockwise to remove it.

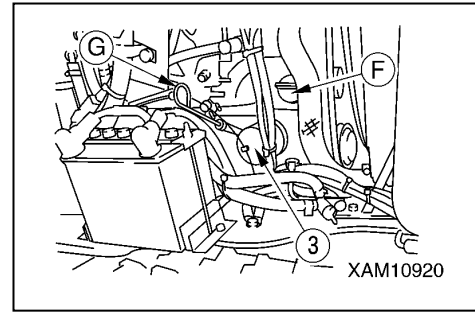
NOTES

Wait for about 10 minutes before removing the filter cartridge (3) because plenty of oil comes out if it is done immediately after stopping the engine.

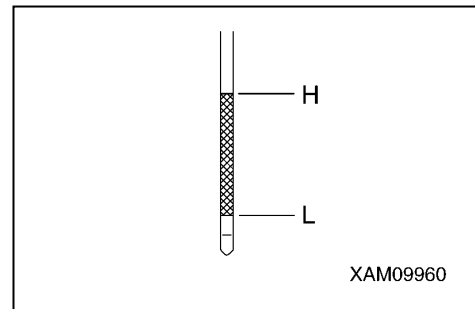
11. Clean the filter base and reinstall a new filter cartridge after coating its packing and threaded portion with clean engine oil (or lightly with grease).

NOTES

When reinstalling the filter cartridge, tighten it 1/2 to 3/4 of a turn after the packing surface touches the sealing surface of the filter base. Be sure to do it manually.
--



12. After replacing the filter cartridge (3), feed engine oil through filler port (F) to the specified level.
13. Pull the oil level gauge (G) out and wipe the oil with a disposable cloth.
14. Insert the oil level gauge (G) into the filler port (F) and pull it out again.
15. Make sure that the oil level is between the markings "H" and "L" on the oil level gauge (G).
16. Securely install the oil level gauge (G) and filler cap (F) after changing the oil.
17. Start and run the engine at idle for approx. 5 minutes and stop the engine.
18. Check the oil level again and make sure that the oil level is between the markings "H" and "L" on the oil level gauge (G).
19. See "OPERATION 1.7 MACHINERY COVER" and install the machinery cover.



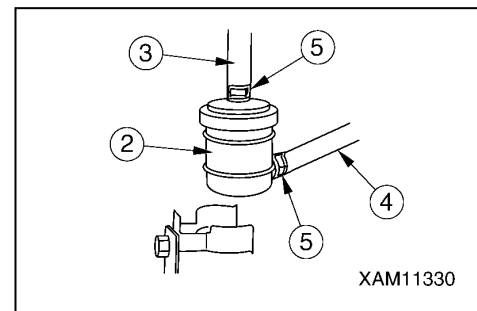
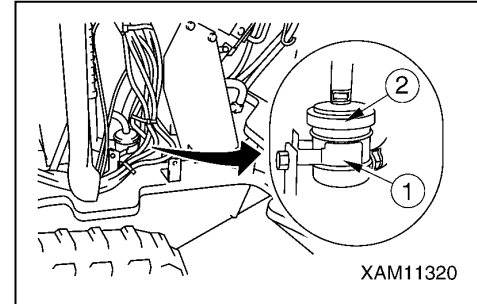
[2] REPLACEMENT FUEL FILTER

WARNING

- Be extremely careful of fire such as cigarettes when replacing the fuel filter.
- Various part are at elevated temperatures immediately after engine operation. Do not proceed with fuel filter replacement immediately but wait for the engine to cool to the extent that you can touch it with your hand.
- Disconnecting the fuel hose occurs during this work. Have a container ready to collect the drained fuel so that fuel in the fuel hose does not splash the surroundings.

- Fuel pan: Prepare a container of at least 1 litre.

1. See “OPERATION 1.7 MACHINERY COVER” and remove the machinery cover.
2. Remove the fuel filter (2) from the holder (1).
3. Loosen the clamps (5) of fuel hoses (3) and (4) connected to the fuel filter (2), and disconnect the fuel hoses (3) and (4).
4. Connect the fuel hoses (3) and (4) to the new fuel filter (2) to prevent them from falling with the clamps (5).
5. Insert the fuel filter (2) into the holder (1) to secure it.



NOTES

After inserting the fuel filter into the holder, lightly shake the fuel filter to check that it is firmly secured.

6. After replacing the fuel filter, bleed the fuel system.

NOTES

Turn the key switch to ON to operate fuel pump and wait up to 5 minutes for the air to be released.

7. See “OPERATION 1.7 MACHINERY COVER” and install the machinery cover.

[3] REPLACEMENT HYDRAULIC OIL RETURN FILTER

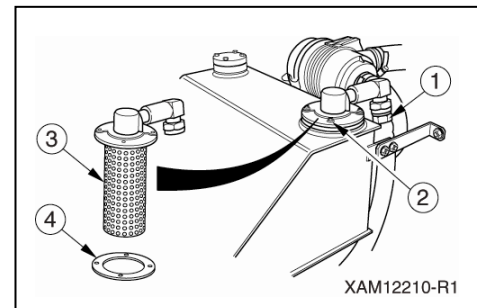
⚠ WARNING

- Various parts are at elevated temperatures immediately after engine operation. Do not replace the filter immediately. Wait until the oil is cooled.
- The oil may spout out when the filler cap of the hydraulic oil tank is removed. Loosen the filler cap mounting bolts so that the filler cap is raised a little to allow the release of inner pressure, then remove the mounting bolts and the filler cap.
- Securely tighten mounting bolts of the oil filler cap after refilling the oil.
If the mounting bolts are loose the filler cap may come off during the operation, and the hot oil may spout out of the pan, causing burns.

CAUTION

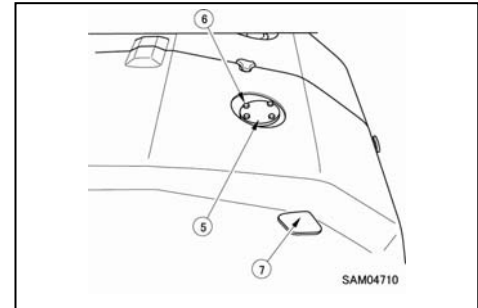
- See “INSPECTION AND MAINTENANCE 5.1 USE OF LUBRICATING OIL ACCORDING TO TEMPERATURE” for the oil to be used.
- Be sure to put the machine in the travelling posture when checking the oil level.
If you check the oil level in the working posture, you will judge the oil level to be low and will feed in excessive oil.
- After replacing the filter of hydraulic oil, do not start the engine for a while until piping and hydraulic equipment are filled with the oil.
- Avoid the oil exceeding the level point (red point) of the level gauge (G).
When the oil goes beyond the correct level, it may spout out from the air breather during travelling or crane operation.
- Be careful not to let any foreign substance go into the filler opening when refilling the oil.

1. Place the machine on a level surface.
2. See “OPERATION 2.5 MACHINE TRAVELLING POSTURE” and put the machine in the “Travelling posture”.
3. See “OPERATION 1.7 MACHINERY COVER” and remove the machinery cover.
4. Remove the hose (1) and elbow joint from the return filter (3).



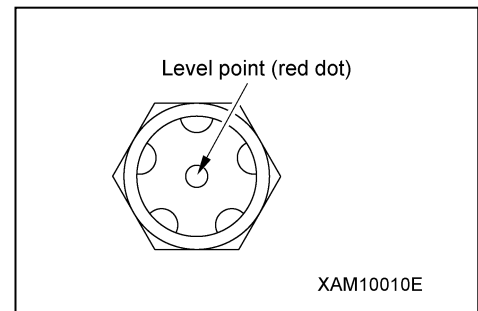
5. Remove the mounting bolts (2) (4 bolts) and lift the return filter (3) to pull it out.
6. Apply liquid packing to the rubber plate (4), mount a new hydraulic oil return filter (3) and securely tighten the mounting bolts (2) (4 bolts).

7. Reinstall the hose (1) and elbow joint removed in step 4.
8. Remove the mounting bolts (6) (4 bolts) of the filler cap (5) and remove the filler cap (5).



9. Feed hydraulic oil through the filler port (5) to the level point (red point) while looking at the oil level gauge (7).
10. After refilling the oil, reset the filler cap (5) and tighten the mounting bolts (6) (4 bolts) securely.

NOTES
Wipe clean whenever the oil spills.



11. Bleed the air according to the following sequence.
 - (1) Start the engine only after piping and hydraulic equipment are filled with the oil.
After engine start, continue to run the engine at low idle for 10 minutes.
 - (2) While keeping the engine speed low, slightly operate each crane control lever to operate each cylinder and winch motor slowly.
Do not operate the boom hoisting cylinder and telescopic boom cylinder to the stroke end, but stop them at a position approximately 100 mm before the stroke end.
Repeat this 4 to 5 times.
 - (3) Extend the outriggers and make the outrigger cylinders telescope in the condition that the machine does not float.
When making the outrigger cylinder telescope, do not operate it to the stroke end, but stop it at a position approximately 100 mm before the stroke end.
Repeat this 4 to 5 times.

8.10 MAINTENANCE EVERY 1000 HOURS

Perform this maintenance in tandem with maintenance every 30/50/250/500 hours.

[1] REPLACEMENT AIR CLEANER ELEMENT

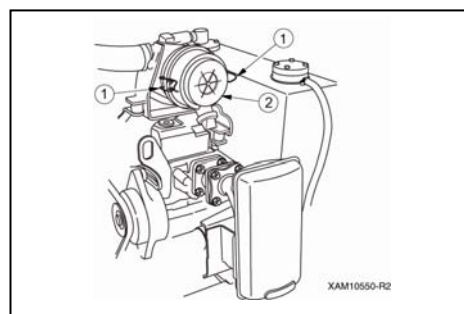
WARNING

**Do not clean and replace the air cleaner element when the engine is in rotation.
Doing so may cause damage to the engine.**

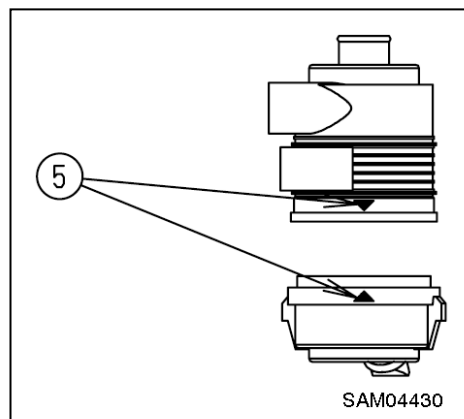
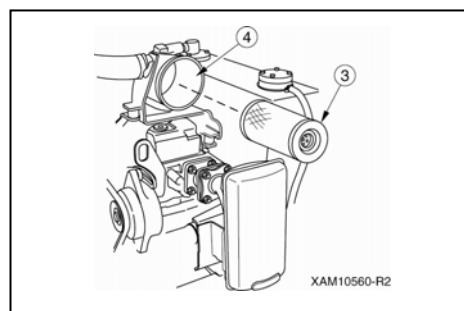
CAUTION

- Avoid using an element if the groove, gasket, or sealing is damaged.
- Be sure to replace the element after 5 cleanings or a lapse of 1 year from initial use.
- Always use Maeda genuine elements.

1. See “OPERATION 1.7 MACHINERY COVER” and remove the machinery cover.
2. Disengage the clamp (1) (2 places) and remove the dust pan (2).



3. Pull out the element (3).
4. Cover the duct entrance located at the back of the air cleaner body (4) with a clean cloth or tape, to keep impurities out of the duct entrance.
5. Clean the inside of the air cleaner body (4).
6. Remove the cloth or tape from the air connector at the back of the air cleaner body (4).
7. Insert a new element (3) into the air cleaner body (4).
8. Connect dust pan (2) and air cleaner body (4) aligning the marks (5). Securely fasten with the clamps (1) (2 places).



9. See “OPERATION 1.7 MACHINERY COVER” and install the machinery cover.

[2] CLEANING ENGINE COOLING SYSTEM

WARNING

- Coolant will be at elevated temperatures immediately after engine operation. If you drain the coolant immediately, you may suffer a burn. Always drain the coolant after the engine is cold.
- Do not remove the radiator cap if radiator coolant is hot. Potential gush of boiling water may occur if disregarded.
Cap removal is allowed when the water drops in temperature. Be sure to relieve internal pressure by slowly rotating the filler cap before cap removal.
- Do not stand in front or behind the machine when starting the engine for cooling system cleaning. Failure to stand aside of the machine may pose a danger in the event of a sudden movement of the machine.
- Keep antifreeze away from flames. Antifreeze is a flammable solution.
Do not smoke when handling antifreeze.

CAUTION

- Always use tap water for coolant. Contact us or our sales service agent if river water, well water, or when water from any other source is substituted for tap water.
- A mixing ratio of antifreeze is recommended to be controlled by a antifreeze concentration meter.

Cooling system cleaning and antifreeze replacement should conform to the cycles specified in the following table.

Antifreeze type	Cooling system cleaning and antifreeze replacement
Anti-corrosive all-season type	Every 2 years (in fall) or every 4000 hours, whichever falls first
All-season type	Every 1 year (in fall) or every 2000 hours, whichever falls first
1 winter season type	Biannually (spring and fall)

Stop the machine on a level place and perform cooling system cleaning and antifreeze replacement.

A mixing ratio of antifreeze varies with temperature. Antifreeze as a volume ratio is min. 30% to yield anticorrosive effect.

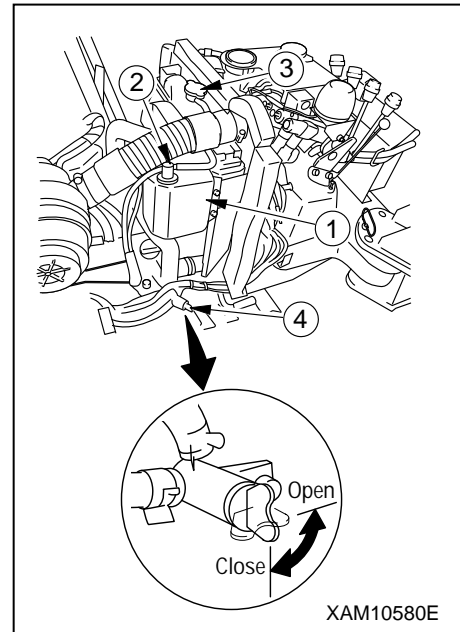
The mixing ratio between water and antifreeze is to be determined with respect to past minimum temperatures, in accordance with "Mixing ratio between water and antifreeze" shown below. For actual mixing, set temperature approx. 10 degrees lower than minimum temperature.

[MIXING RATIO BETWEEN WATER AND ANTIFREEZE] (YANMAR ANTIFREEZE)

Min. temperature (°C)	Min. -15	-20	-24	-29
Mixed quantity (L)				
Antifreeze amount	0.6	0.7	0.8	0.9
Water amount	1.5	1.4	1.3	1.2

- Antifreeze-mixed water drain pan: A 3L container
- Have a water filling hose available.

1. See "OPERATION 1.7 MACHINERY COVER" and remove the machinery cover.
2. Turn the radiator cap (3) slowly until it comes into contact with the stopper to relieve internal pressure from the radiator.
3. With no pressure in the radiator, turn the radiator cap (3) until it reaches the stopper while holding it down. Remove the radiator cap (3).
4. Place a drain pan under the drain valve (4) lying below the radiator to receive coolant (antifreeze-mixed water).
5. Open the drain valve (4) to drain coolant. Close the drain valve (4) upon completion of draining.
6. Supply tap water to the radiator through the radiator supply port. The radiator needs to be filled up to the supply port.
7. Start the engine with the drain valve (4) open, and ensure the engine runs at low idle. Conduct a 10 minute cleaning with running water.



CAUTION

- **The radiator is to retain a high water level during cleaning with running water. Adjust the quantities of water supplied and drained as necessary.**
- **Ensure that the water filling hose stays connected to the radiator supply port properly during cleaning with running water.**

8. After cleaning with running water, stop the engine and water supply and drain tap water .Close the drain valve (4) upon completion of draining.
9. Flush it with cleanser.

NOTES

Cleaning with the cleaning agent must conform to instructions provided on the cleaning agent.

10. Open the drain valve (4) to drain the cleaning agent after cleaning with the agent. Close the drain valve (4) upon completion of draining.
11. Supply tap water to the radiator through the radiator supply port. The radiator needs to be filled up to the supply port.
12. Start the engine with the drain valve (4) open, and ensure the engine runs at low idle. Conduct a cleaning with running water until clean water flows out of the radiator.

CAUTION

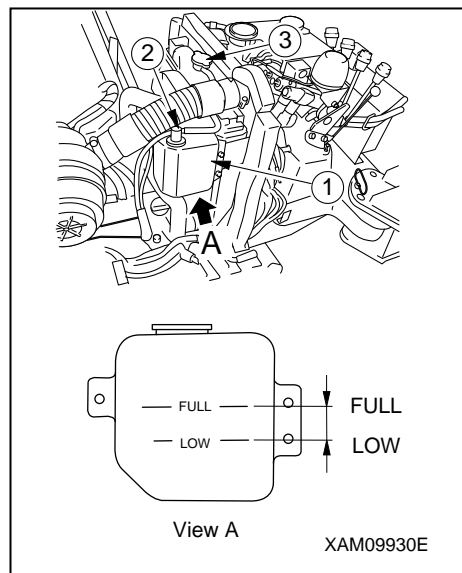
- **The radiator is to retain a high water level during cleaning with running water. Adjust the quantities of water supplied and drained as necessary.**
- **Ensure that the water filling hose stays connected to the radiator supply port properly during cleaning with running water.**

13. Once clean water has flowed out, stop the engine and water supply and drain tap water. Close the drain valve (4) upon completion of draining.
14. Supply coolant mixed of antifreeze and tap water to the radiator through the radiator supply port. The radiator needs to be filled up to the supply port.

NOTES

See the above-mentioned table, "Mixing ratio between water and antifreeze", for the mixing ratio of antifreeze and tap water.

15. Start the engine with the radiator cap (3) removed, and ensure 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.
16. Wait for approx. 3 minutes after stopping the engine. Supply tap water to the radiator through the radiator supply port, up to the supply port. Close the radiator cap (3).
17. Remove the reserve tank (1). Clean the inside of the reserve tank with coolant drained from the tank.
18. Put the reserve tank (1) in place, supply tap water through the supply port to "FULL". Install the cap (2) properly.
19. See "OPERATION 1.7 MACHINERY COVER" and install the machinery cover.



[3] OIL REPLACEMENT IN HYDRAULIC OIL TANK

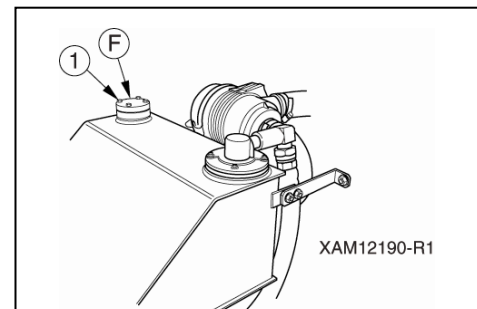
⚠ WARNING

- Various parts are at elevated temperatures immediately after engine operation. Do not change the oil immediately. Wait until the oil is cooled.
- The oil may spout out when the filler cap of the hydraulic oil tank is removed. Loosen the filler cap mounting bolts so that the filler cap is raised a little to allow the release of inner pressure, then remove the mounting bolts and the filler cap.
- Securely tighten mounting bolts of the oil filler cap after refilling the oil.
If the mounting bolts are loose the filler cap may come off during operation, and the hot oil may spout out of the pan, causing burns.

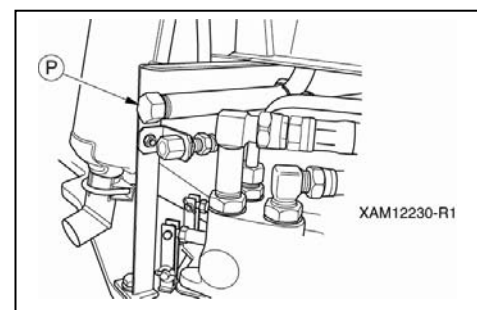
CAUTION

- See “INSPECTION AND MAINTENANCE 5.1 USE OF LUBRICATING OIL ACCORDING TO TEMPERATURE” for the oil to be used.
- Be sure to put the machine in the travelling posture when checking the oil level.
If you check the oil level in the working posture, you will judge the oil level to be low and will feed in excessive oil.
- After replacing the hydraulic oil, do not start the engine for a while until piping and hydraulic equipment are filled with the oil.
- Avoid the oil exceeding the level point (red point) of the level gauge (G).
When the oil goes beyond the correct level, it may spout out from the air breather during travelling or crane operation.
- Be careful not to let any foreign substance go into the filler opening when refilling the oil.

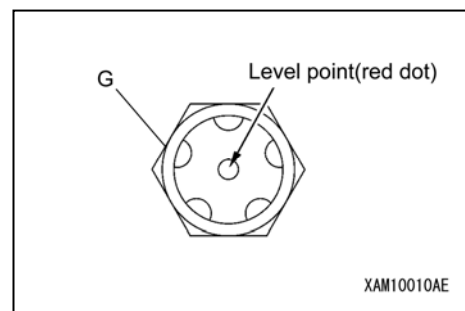
- Oil drain pan: Prepare a container of at least 25 L.
 - Quantity of oil in hydraulic oil tank for replacement: 20L
1. Place the machine on a level surface.
 2. See “OPERATION 2.5 MACHINE TRAVELLING POSTURE” and put the machine in the “Travelling posture”.
 3. See “OPERATION 1.7 MACHINERY COVER” and remove the machinery cover.
 4. Remove the filler cap (F) by removing the mounting bolts (1) (4 bolts) at the top of the hydraulic oil tank.



5. Place a drain pan directly underneath the drain port cap (P) to receive drained oil.
6. Remove the drain port cap (P) slowly to drain the oil, keeping from contact with draining oil.
7. Check the drained oil and if it contains an unacceptable amount of metal particles or foreign matter, contact our sales service agent.
8. Install the drain port cap (P).



9. Feed hydraulic oil through the filler port (F) to the level point (red point) while looking at the oil level gauge (G).
10. After refilling the oil, reset the filler cap (F) and tighten the mounting bolts (1) (4 bolts) securely.
11. See "OPERATION 1.7 MACHINERY COVER" and install the machinery cover.



12. Bleed the air according to the following sequence.
 - (1) Start the engine only after piping and hydraulic equipment are filled with the oil.
After engine start, continue to run the engine at low idle for 10 minutes.
 - (2) While keeping the engine speed low, slightly operate each crane control lever to operate each cylinder and winch motor slowly.
Do not operate the boom hoisting cylinder and telescopic boom cylinder to the stroke end, but stop them at a position approximately 100 mm before the stroke end.
Repeat this 4 to 5 times.
 - (3) Extend the outriggers and make the outrigger cylinders telescope in the condition that the machine does not float.
When making the outrigger cylinder telescope, do not operate it to the stroke end, but stop it at a position approximately 100 mm before the stroke end.
Repeat this 4 to 5 times.

[4] OIL REPLACEMENT IN SLEWING REDUCTION GEAR CASE

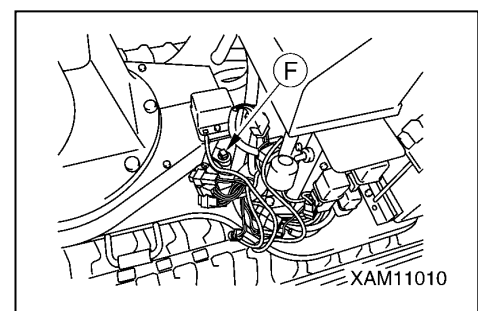
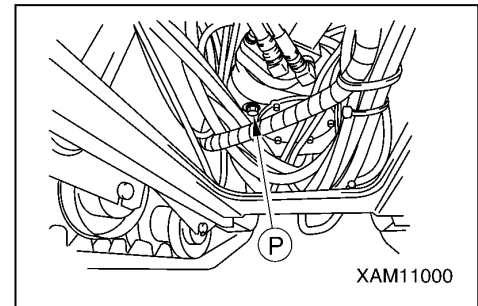
WARNING

The drain plug of the slewing reduction gear case is located directly underneath the machine. Place the outriggers and raise the machine 80 mm 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

- See “INSPECTION AND MAINTENANCE 5.1 USE OF LUBRICATING OIL ACCORDING TO TEMPERATURE” for the oil to be used.
- Use seal tape, etc. at the thread of the drain plug and filler plug to stop the oil leak and securely tighten the plugs after changing the oil.

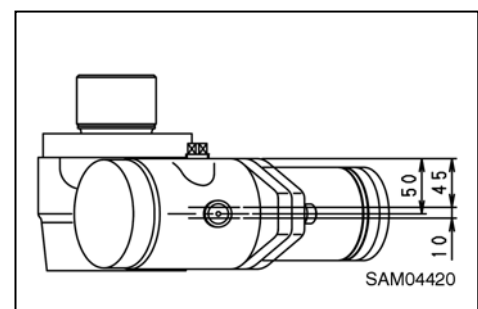
- Oil drain pan: Prepare a container of at least 1L.
 - Oil replacement quantity in slewing reduction gear case: 0.6L
1. Place the machine on a level surface.
 2. See “OPERATION 2.12 OUTRIGGER SETUP OPERATION” to set outriggers and raise the machine about 80 mm above the ground.
 3. Place a drain pan directly underneath the drain plug (P) of the slewing reduction gear case to receive drained oil.
 4. Turn the drain plug (P) slowly to avoid splashing oil on yourself, and drain oil.
 5. Check the drained oil and if it contains an unacceptable amount of metal particles or foreign matter, contact our sales service agent.
 6. Reinstall the drain plug (P).
 7. See “OPERATION 2.21 OUTRIGGER STOWAGE OPERATION” to stow the outriggers.
 8. See “OPERATION 1.7 MACHINERY COVER” and remove the machinery cover.
 9. Remove the filler plug (F) at slewing reduction gear case. Fill with gear oil from the plug hole up to the middle of the gear case.



NOTES

The height at centre of gear case is 50 mm from the top of the filler plug.
50 mm (±5 mm) is the appropriate oil level.
Do not allow ingress of dust or dirt when measuring or filling oil.

10. Securely tighten the filler plug (F) after changing the oil.
11. See “OPERATION 1.7 MACHINERY COVER” and install the machinery cover.

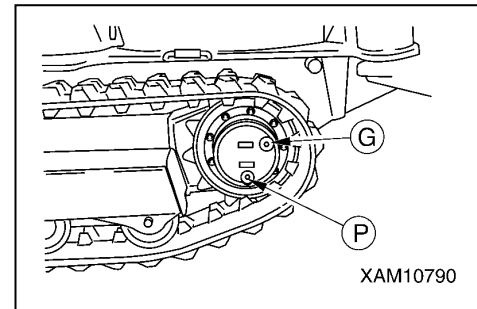


[5] OIL REPLACEMENT IN TRAVELLING MOTOR REDUCTION GEAR CASE

CAUTION

- See “INSPECTION AND MAINTENANCE 5.1 USE OF LUBRICATING OIL ACCORDING TO TEMPERATURE” for the oil to be used.
- Use seal tape, etc. at the thread of the drain plug and oil level check plug to stop the oil leak and securely tighten the plugs after checking/refilling the oil.

- Oil drain pan: Prepare a container of at least 1 L.
 - Oil replacement quantity in travelling motor reduction gear case:
0.33 L
1. Place the machine on a level surface.
 2. 1. Move the machine forward and backward so that drain plug (P) of the travelling motor reduction gear case will come to the bottom.
 3. Place a drain pan directly underneath the drain plug (P) to receive drained oil.
 4. Remove the oil level check plug (G).
 5. Turn the drain plug (P) slowly to avoid splashing oil on yourself, and drain oil.
 6. Check the drained oil and if it contains an unacceptable amount of metal particles or foreign matter, contact us or our sales service agent.
 7. Securely tighten the drain plug (P).
 8. Feed the gear oil through the plug hole of the oil level check plug (G).



NOTES

Pour in the gear oil until the oil comes out of the oil level check plug hole.

9. Securely tighten the oil level check plug (G) after refilling the oil.

[6] OIL REPLACEMENT IN WINCH REDUCTION GEAR CASE (WINCH SPECIFICATION)

WARNING

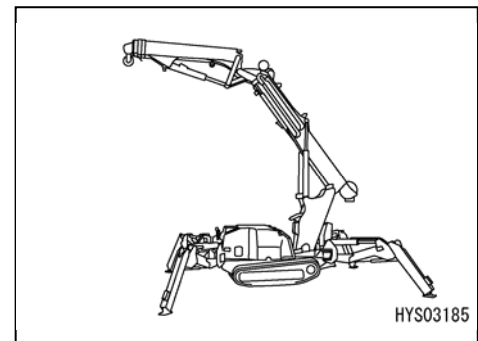
Oil is at elevated temperatures immediately after engine operation. Do not remove the plug of the inspection port or drain port immediately. Wait until the oil cools down.

CAUTION

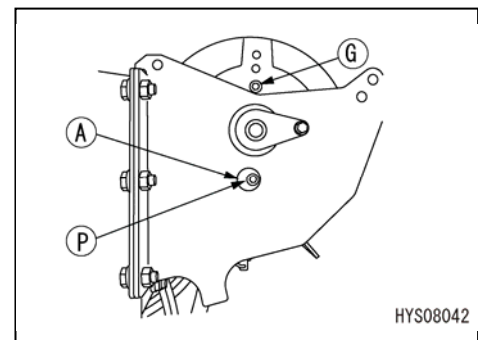
- See “INSPECTION AND MAINTENANCE 5.1 USE OF LUBRICATING OIL ACCORDING TO TEMPERATURE” for the oil to be used.
- After oil replacement, use seal tape for the threaded portion of the oil level inspection plug and drain plug to stop leakage and securely tighten the plugs.

- Oil drain pan : Prepare a container of at least 1 L.
- Allen key to remove a plug : 8 mm
- Oil replacement quantity in slewing reduction gear case : 0.75 L

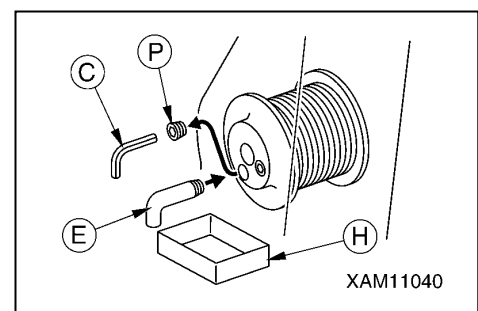
1. Place the machine on a level surface.
2. See “OPERATION 2.12 OUTRIGGER SETUP OPERATION” to set the outriggers to maximum.
3. Use the main starter switch on the machine side to start the engine.
4. See “OPERATION 2.13 PRECAUTIONS BEFORE CRANE WORK” and “OPERATION 2.14 CRANE OPERATION POSTURE” and configure the Crane as shown in the figure on the right.



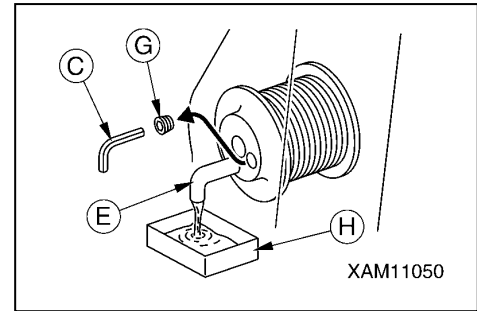
5. Slowly turn the winch and stop it at a position where the drain plug (P) is visible through the inspection hole (A) on the winch side.



6. With the Allen key (C), turn and remove the drain plug (P).
7. Mount the elbow (E) for draining oil into the screw hole of the drain plug (P).
8. Place a container (H) to collect the drained oil just below the elbow (E).



9. With the Allen key (C), turn and remove the oil inspection plug (G). Gear oil in the reduction gear case is drained.
10. After gear oil in the reduction gear case is completely drained, detach the elbow (E), and reinstall the drain plug (P) and securely tighten it.

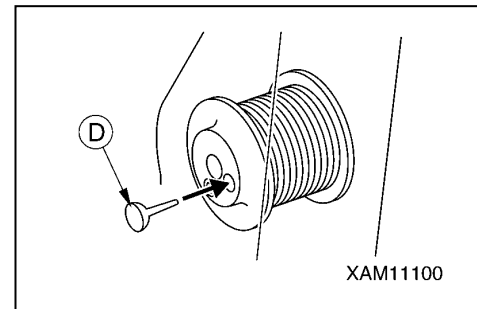


11. Feed gear oil through the hole of the oil inspection plug (G) to the specified quantity (0.75 L) with an oil pump (D).

NOTES
Wipe away any oil spills.

12. After the replenishment of oil, securely tighten the oil inspection plug (G).

NOTES
After changing the oil, operate the winch for 5 minutes to lubricate all parts, without hoisting load.



8.11 MAINTENANCE EVERY 2000 HOURS

Perform this maintenance in tandem with maintenance every 30/50/250/500/1000 hours.

[1] INSPECTION/ADJUSTMENT ENGINE VALVE CLEARANCE

Inspection and adjustment of valve clearance require special tools. Contact us or our sales service agent to request inspection and repair.

[2] CHECKING ALTERNATOR AND STARTER

CAUTION
Inspection every 1000 hours is recommended in case of frequent engine starting.

There may be wearing down of the brush and insufficient grease. Contact us or our sales service agent to request inspection and repair.

SPECIFICATIONS

1. PRINCIPLE SPECIFICATION LIST	5- 2
2. SPECIFICATION DIMENSIONAL DRAWING	5- 4
3. DIMENSIONAL DRAWING OF OUTRIGGER WIDTH	5- 5
4. RATED TOTAL LOAD CHART	5- 6
5. WORKING RADIUS/LIFTING HEIGHT	5- 7

1. PRINCIPLE SPECIFICATION LIST

Equipment/Item		MK1033CW-1	
Weight and dimensions	Machine mass	2290 kg [2390 kg]	
	Overall length × width × height	2865 mm × 750 mm × 1955 mm [3030 mm × 750 mm × 1990 mm]	
	Distance between center idler and sprocket	975 mm	
	Track gauge	550 mm	
	Width of crawler	200 mm	
	Minimum ground height	130 mm	
Performance	Maximum rated total load × working radius	0.995 t × 1.3 m (main boom 2 sections 80°/jib 1 section 60°)	
	Maximum working radius	9.9 m	
	Maximum lifting height above ground	11.3 m	
[Winch system]	Type	Swash plate type axial piston motor, epicycle reduction gear, friction disc type brake	
	Hook hoist speed	37.8 m/min (5 layers, 1 part of line)	
	Hoist wire rope	IWRC 6 × WS (26) 0/0 B type φ8 × 73 m	
Main boom	Telescoping system	Type	Telescoping hydraulic cylinder × 1 + wire rope telescoping system × 1
		Type of boom	Automatic hydraulic 3-section pentagonal telescopic 2 to 3 section: simultaneous telescoping
		Boom length 1st section	2590 mm
		Boom length 2nd section	4310 mm
		Boom length 3rd section	6030 mm
		Boom extending speed	3.44 m/15.5 sec
	Derricking System	Derricking type	Hydraulic double acting cylinder, direct acting type × 2
		Boom derricking angle/time	0 to 80°/36.4 sec (main boom 1st section/jib 1st section)
Jib	Telescoping system	Jib type	Telescoping hydraulic cylinder × 2
		Jib type	Automatic hydraulic 3-section pentagonal telescopic
		Jib length 1st section	1876 mm
		Jib length 2nd section	3006 m
		Jib length 3rd section	4111 mm
		Jib extending speed	2.235 m/22.4 sec
	Derricking System	Derricking type	Hydraulic double acting cylinder, direct acting type × 1 + link mechanism
		Jib derricking angle/time	-100 to 80°/26.4 sec (main boom 80°/jib 1st section)
Slewing system	Type	Swing bearing support, hydraulic motor driven, worm, spur gear reduction, worm self-lock	
	Slewing angle/speed	360° continuous/70 sec	
Outrigger system	Type	1st stage with flexible stay damper, 2nd stage manual pullout, hydraulic cylinder direct acting type	
	Max extended width	(Right/left) 4580 mm × (Front) 4530 mm × (Rear) 3810 mm	
Travelling system	Type	Hydraulic motor driven, Step-less speed changer	
	Travel speed	0 to 2.0 km/h	
	Grade ability	15°	
	Ground pressure	52.6 kPa (0.54 kgfcm²)	

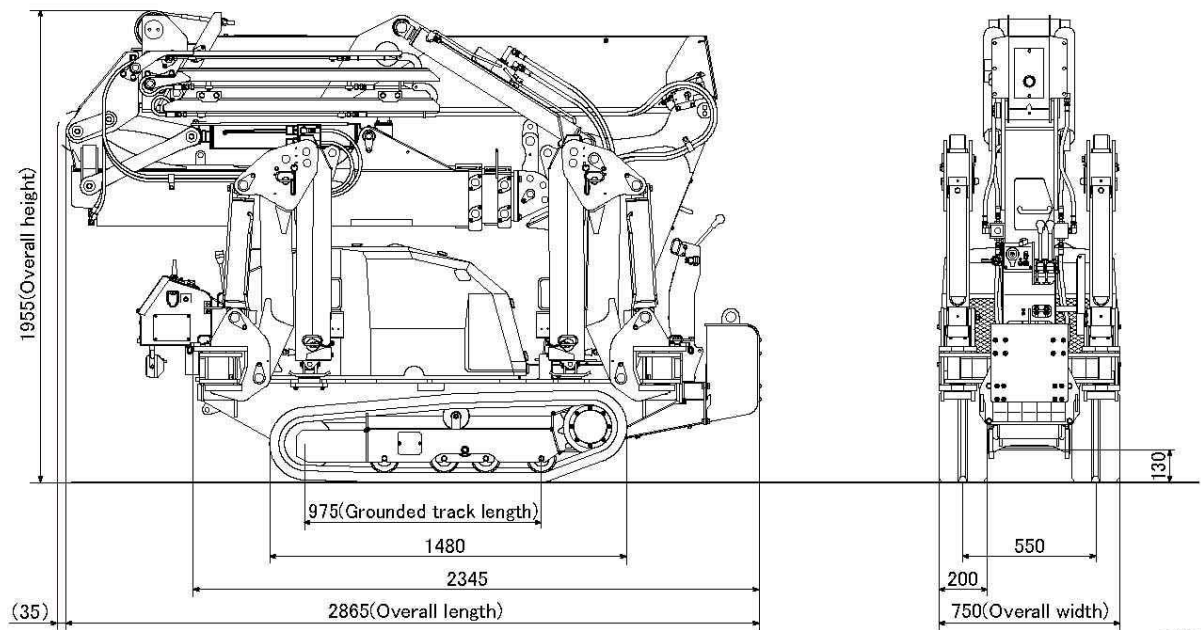
[Winch specification]

Equipment/Item		MK1033CW-1
Hydraulic system	Hydraulic pump	Variable piston pump (6 cc/rev × 2)
	Rated pressure	20.6 MPa (210 kgf/cm ²)
	Hydraulic oil tank capacity	20 L
Engine	Model	Yanmar 2TNV70-NMBA
	Type	4 cycle, vertical type, water cooled in-line 2-cylinder, precombustion chamber type
	Displacement	0.569 L (569 cc)
	Rated output (continuous)	7.4 kW/2500 min ⁻¹ (10.1PS/2500 rpm)
	Fuel tank capacity	12 L
Battery	Model	55B24R
Safety device	[Over hoist detector], [over un-winding detector], moment limiter, alarm buzzer, hydraulic safety valve, automatic hydraulic lock device, [wire rope latch], levelling instrument, machine body inclination alarm, tri-colour lights, crane outrigger interlock device, slewing direction limiter, main boom and jib retracting and extending interlock	

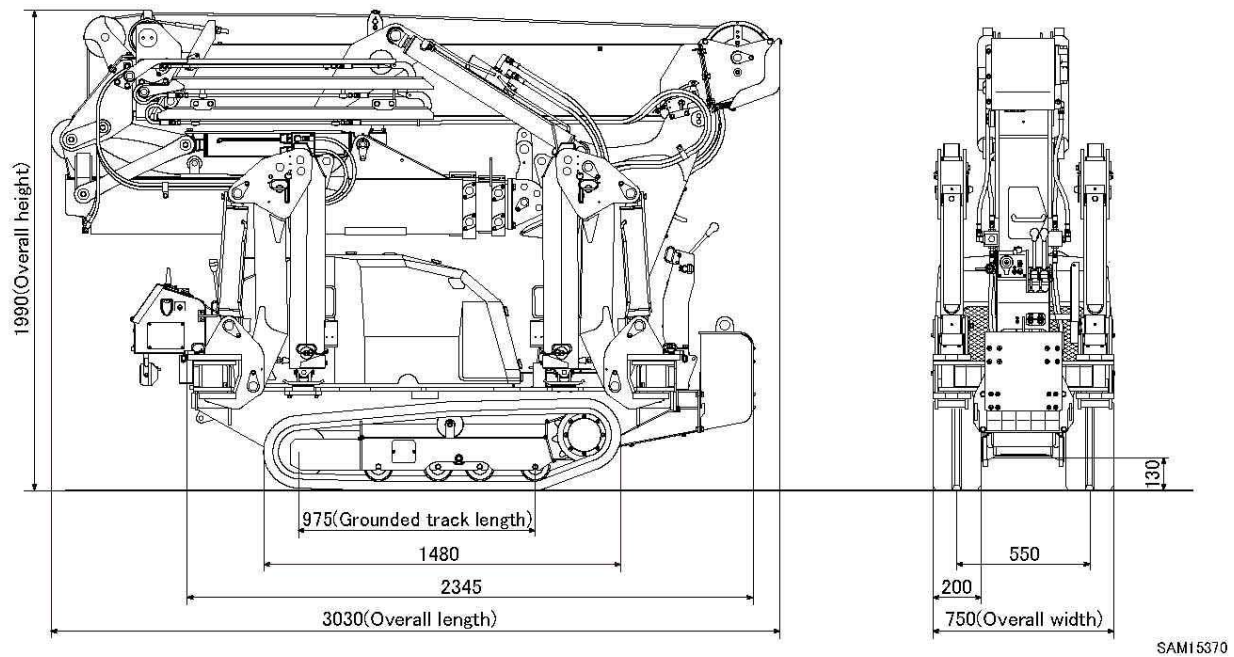
[Winch specification]

2. SPECIFICATION DIMENSIONAL DRAWING

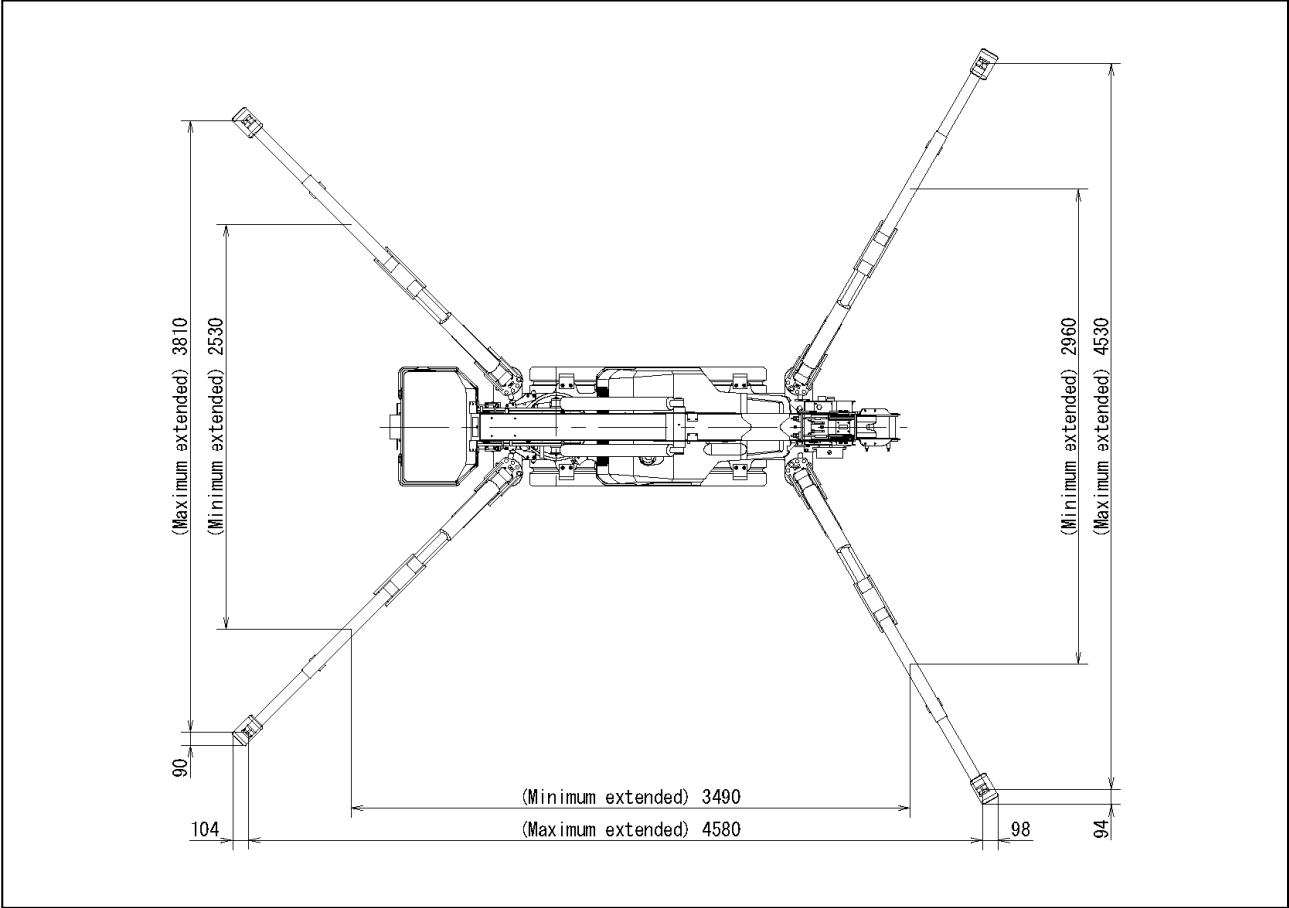
Standard specifications



Standard specifications with winch attached



3. DIMENSIONAL DRAWING OF OUTRIGGER WIDTH



4. RATED TOTAL LOAD CHART

Outrigger Position : MAX

Main Boom (1)				(kg)		
				Jib Stage		
				First	Second	Third
Main Boom Angle	80°	Jib Angle	90°	995		
			80°	995	995	850
			60°	995	675	535
			40°	795	600	475
			0°	700	530	420
	55°	Jib Angle	90°	965		
			55°	965	665	525
			40°	795	600	475
			0°	700	530	420
	0°	0°	0°	700	530	420

Outrigger Position : MIN

Main Boom (1)				(kg)		
				Jib Stage		
				First	Second	Third
Main Boom Angle	80°	Jib Angle	90°	995		
			80°	995	995	850
			60°	995	675	535
			40°	795	600	475
			0°	700	530	420
	55°	Jib Angle	90°	965		
			55°	965	665	525
			40°	795	600	475
			0°	700	530	380
	0°	0°	0°	485	315	235

Main Boom (2)				(kg)		
				Jib Stage		
				First	Second	Third
Main Boom Angle	80°	Jib Angle	90°	995		
			80°	995	995	850
			60°	995	675	535
			40°	795	600	475
			0°	700	530	420
	65°	Jib Angle	90°	910		
			65°	910	680	540
			50°	805	620	460
			35°	725	565	450
			0°	630	490	380
	45°	Jib Angle	90°	640		
			45°	640	545	440
			30°	605	500	400
			0°	570	465	375
	0°	0°	0°	545	395	320

Main Boom (2)				(kg)		
				Jib Stage		
				First	Second	Third
Main Boom Angle	80°	Jib Angle	90°	995		
			80°	995	995	850
			60°	995	675	535
			40°	795	600	475
			0°	700	530	420
	65°	Jib Angle	90°	910		
			65°	910	680	540
			50°	805	620	460
			35°	725	565	395
			0°	630	425	320
	45°	Jib Angle	90°	515		
			45°	470	345	290
			30°	440	305	235
			0°	370	250	190
	0°	0°	0°	170	115	85

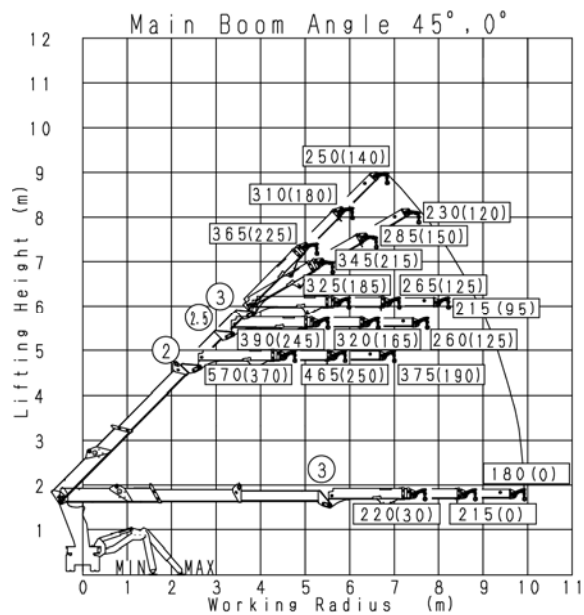
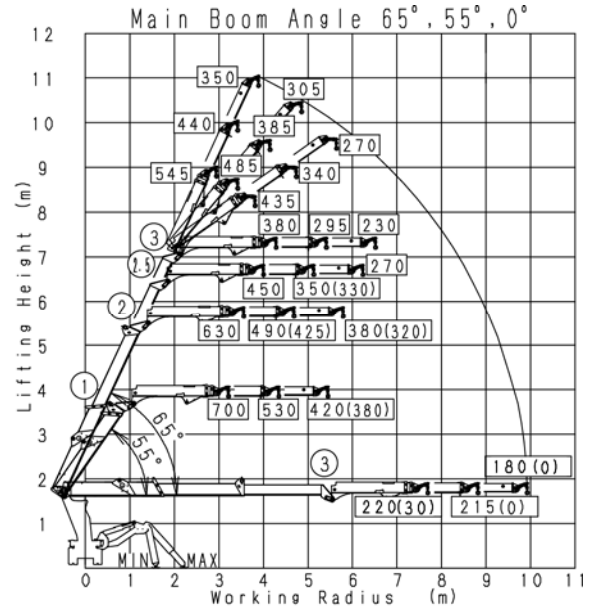
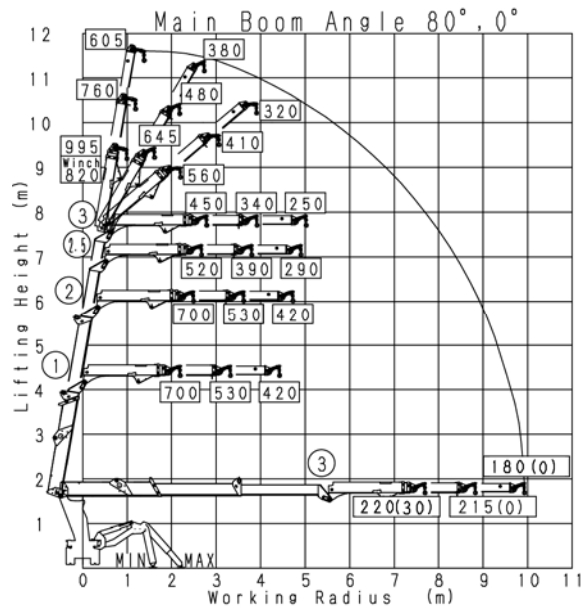
Main Boom (2.5)				(kg)		
				Jib Stage		
				First	Second	Third
Main Boom Angle	80°	Jib Angle	90°	995		
			80°	995	880	700
			60°	745	555	440
			40°	645	475	370
			0°	520	390	290
	65°	Jib Angle	90°	645		
			65°	645	520	415
			50°	575	455	360
			35°	515	400	320
			0°	450	350	270
	45°	Jib Angle	90°	440		
			45°	440	375	300
			30°	415	340	275
			0°	390	320	260
	0°	0°	0°	335	280	225

Main Boom (2.5)				(kg)		
				Jib Stage		
				First	Second	Third
Main Boom Angle	80°	Jib Angle	90°	995		
			80°	995	880	700
			60°	745	555	440
			40°	645	475	370
			0°	520	390	290
	65°	Jib Angle	90°	645		
			65°	645	520	415
			50°	575	455	360
			35°	515	400	320
			0°	450	330	270
	45°	Jib Angle	90°	325		
			45°	300	230	185
			30°	265	200	155
			0°	245	165	125
	0°	0°	0°	75	40	30

Main Boom (3)				(kg)		
				Jib Stage		
				First	Second	Third
Main Boom Angle	80°	Jib Angle	90°	995		
			80°	995	760	605
			60°	645	480	380
			40°	560	410	320
			0°	450	340	250
	65°	Jib Angle	90°	545		
			65°	545	440	350
			50°	485	385	305
			35°	435	340	270
			0°	380	295	230
	45°	Jib Angle	90°	365		
			45°	365	310	250
			30°	345	285	230
			0°	325	265	215
	0°	0°	0°	220	215	180

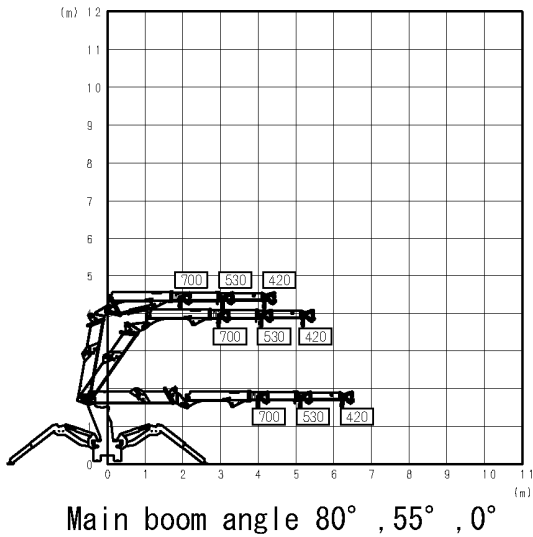
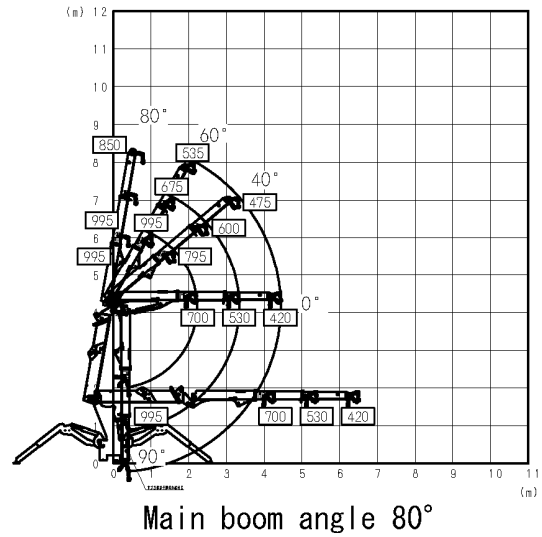
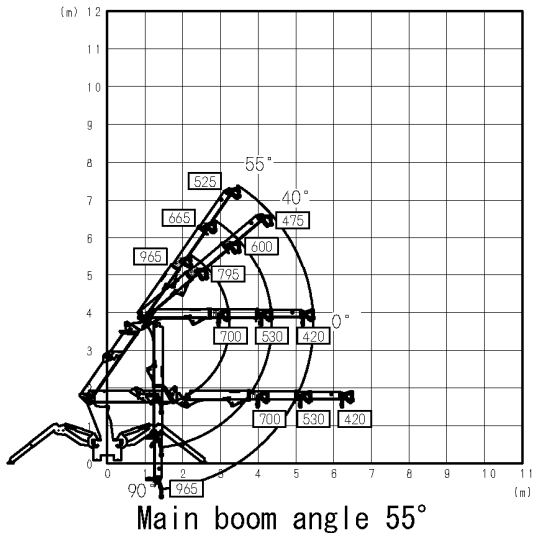
Main Boom (3)				(kg)		
				Jib Stage		
				First	Second	Third
Main Boom Angle	80°	Jib Angle	90°	995		
			80°	995	760	605
			60°	645	480	380
			40°	560	410	320
			0°	450	340	250
	65°	Jib Angle	90°	545		
			65°	545	440	350
			50°	485	385	305
			35°	435	340	270
			0°	380	295	230
	45°	Jib Angle	90°	245		
			45°	225	180	140
			30°	215	150	120
			0°	185	125	95
	0°	0°	0°	30	0	0

5. WORKING RADIUS/LIFTING HEIGHT

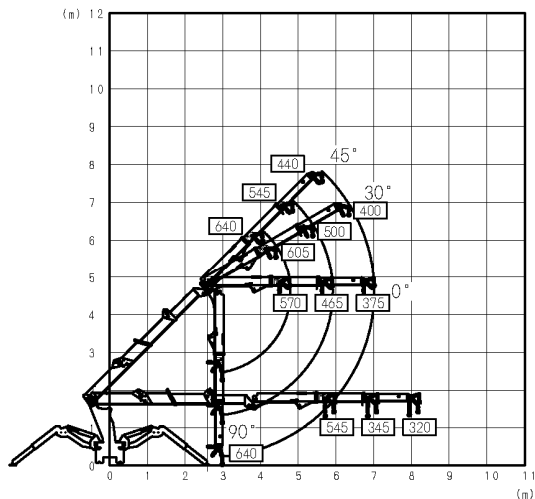


SAM12480

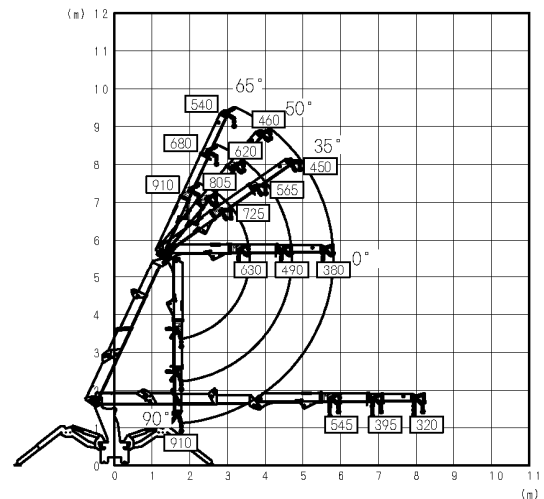
Working range diagram Outrigger extended to maximum Main boom 1 section



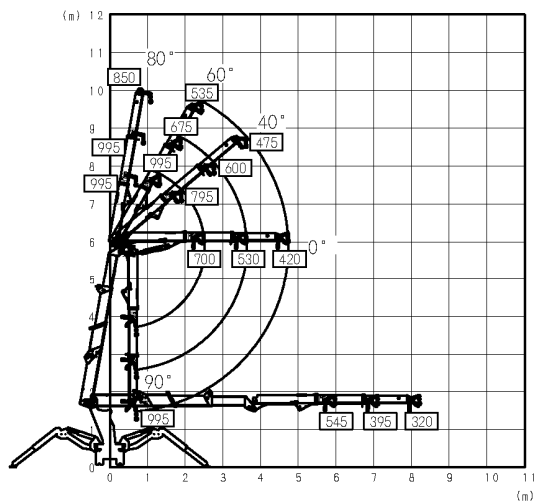
Working range diagram Outrigger extended to maximum Main boom 2 sections



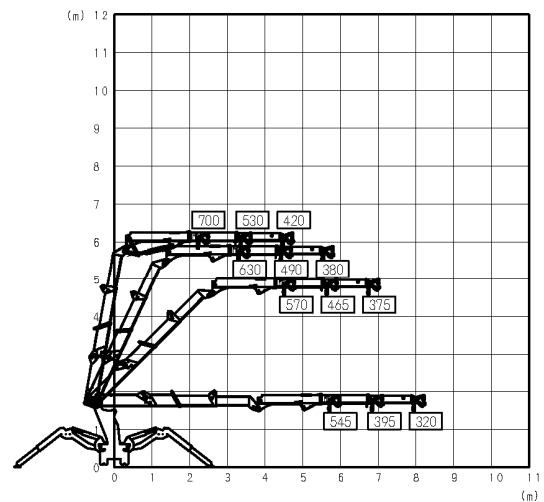
Main boom angle 45°



Main boom angle 65°

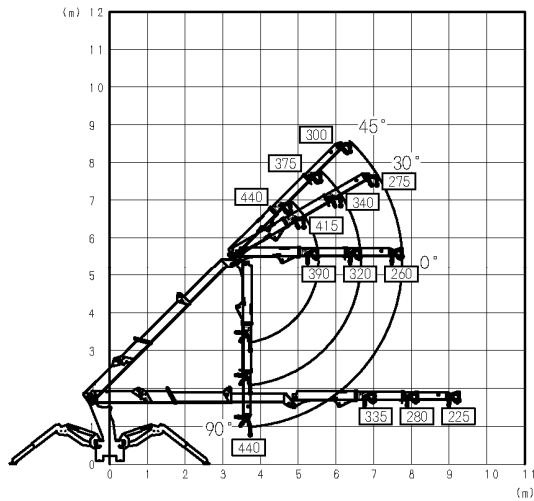


Main boom angle 80°

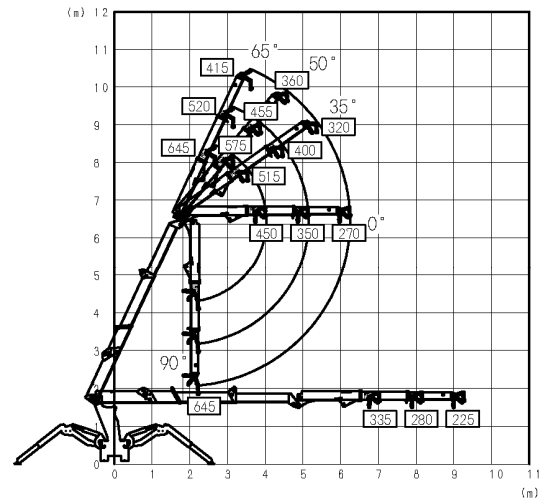


Main boom angle 80° , 65° , 45° , 0°

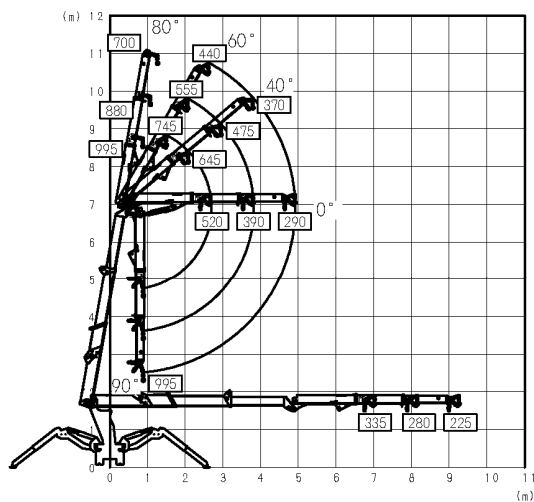
Working range diagram Outrigger extended to maximum Main boom 2.5 sections



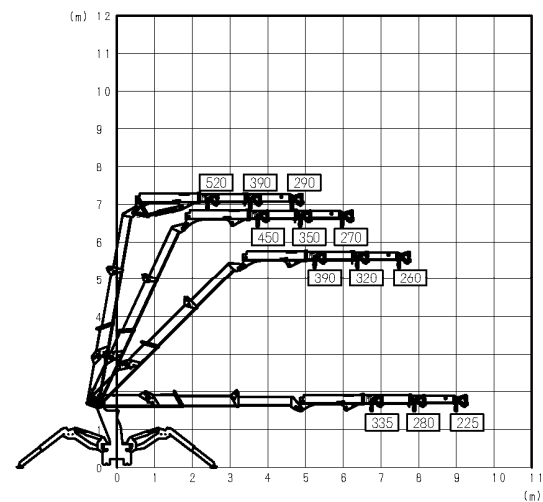
Main boom angle 45°



Main boom angle 65°

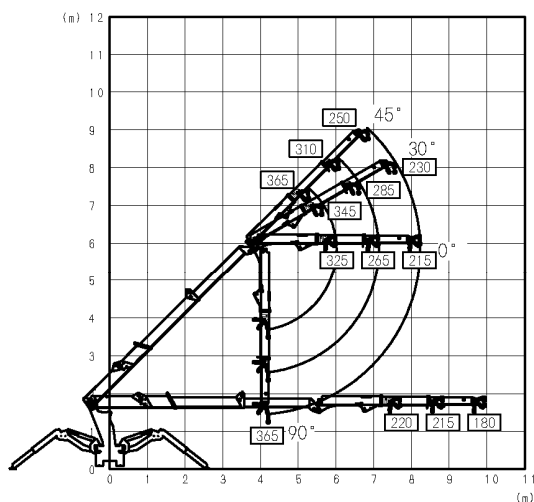


Main boom angle 80°

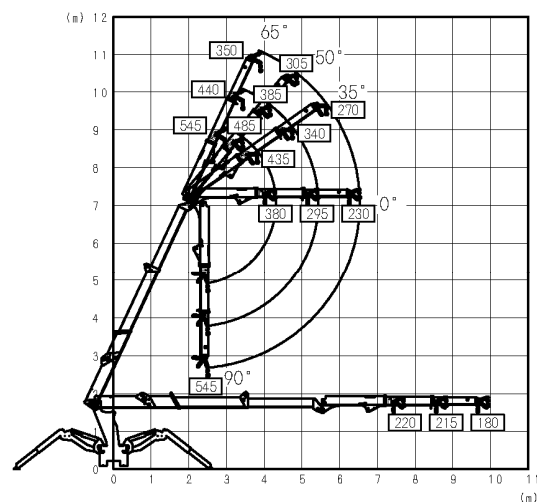


Main boom angle 80° , 65° , 45° , 0°

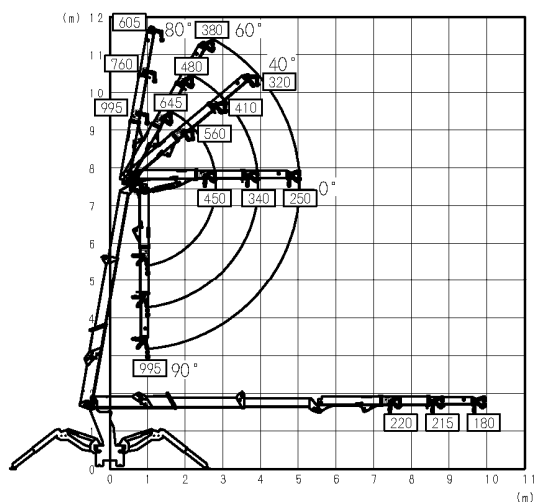
Working range diagram Outrigger extended to maximum Main boom 3 sections



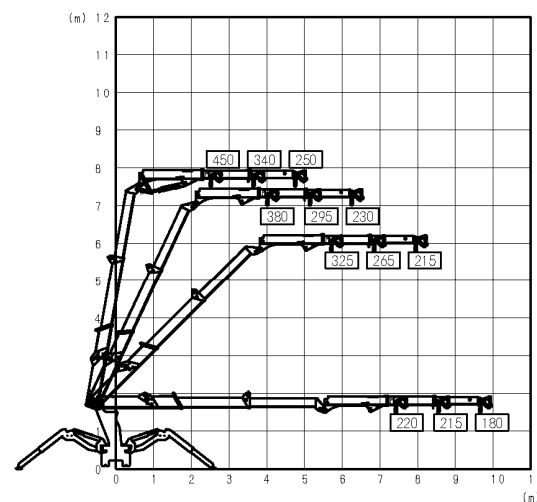
Main boom angle 45°



Main boom angle 65°

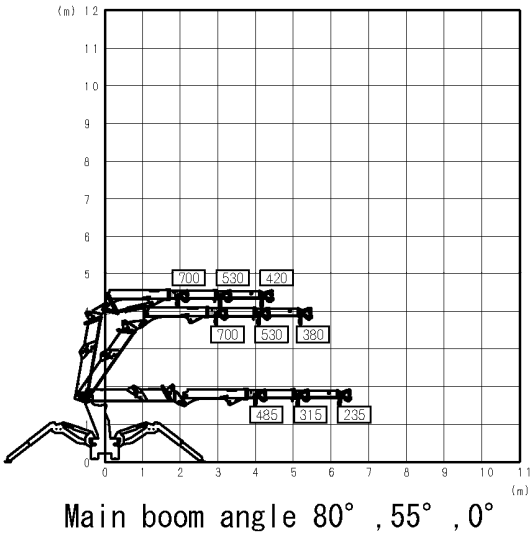
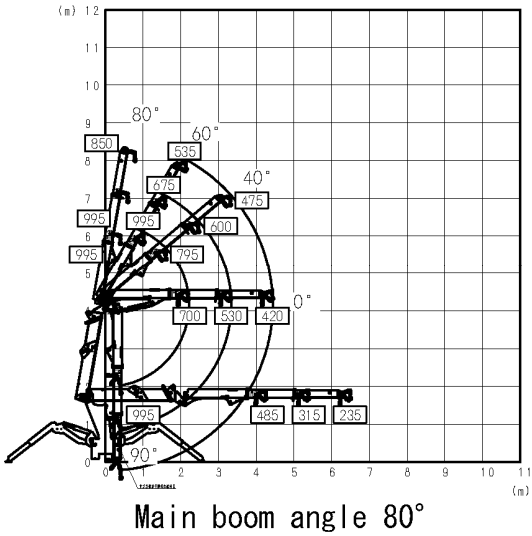
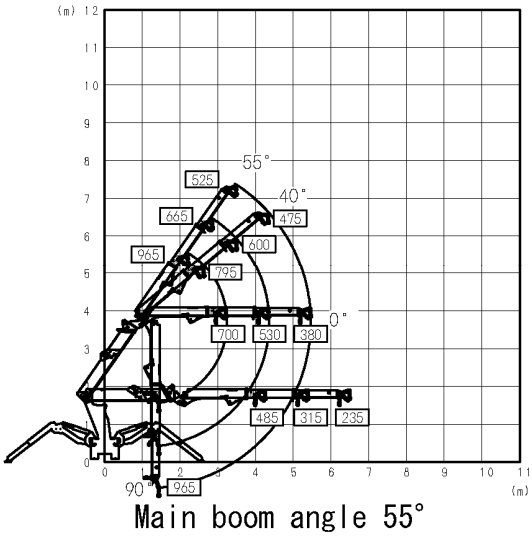


Main boom angle 80°

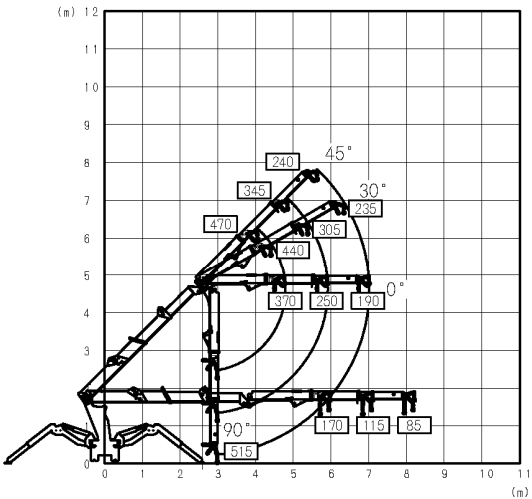


Main boom angle 80° , 65° , 45° , 0°

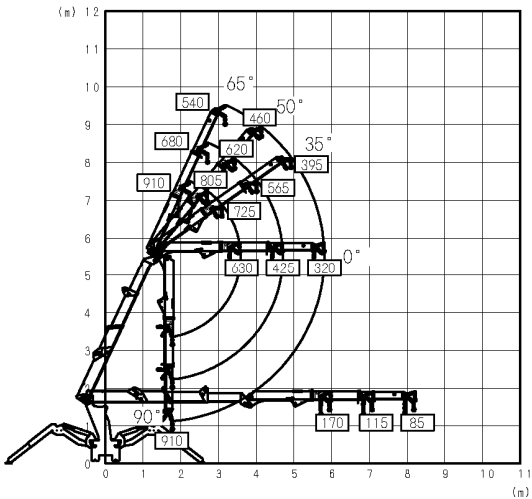
Working range diagram Outrigger extended to minimum Main boom 1 section



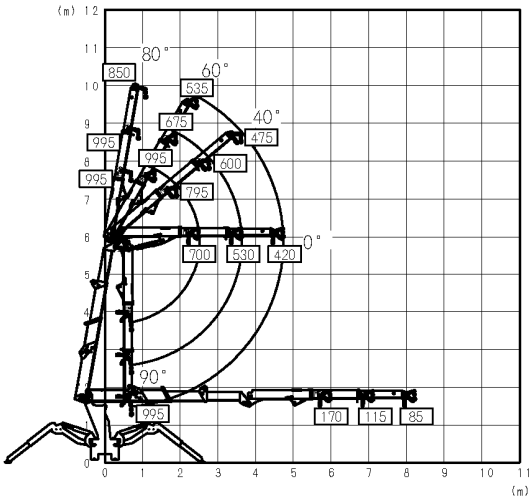
Working range diagram Outrigger extended to minimum Main boom 2 sections



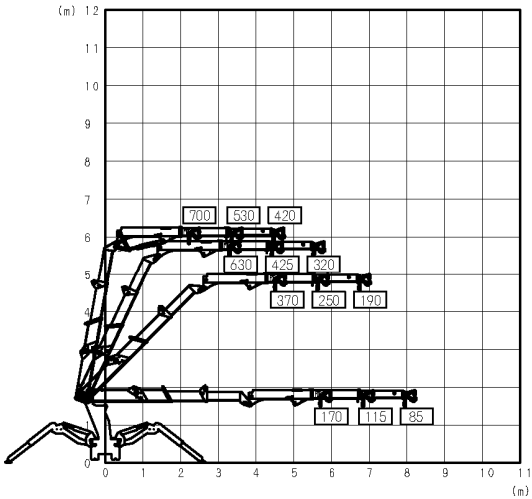
Main boom angle 45°



Main boom angle 65°

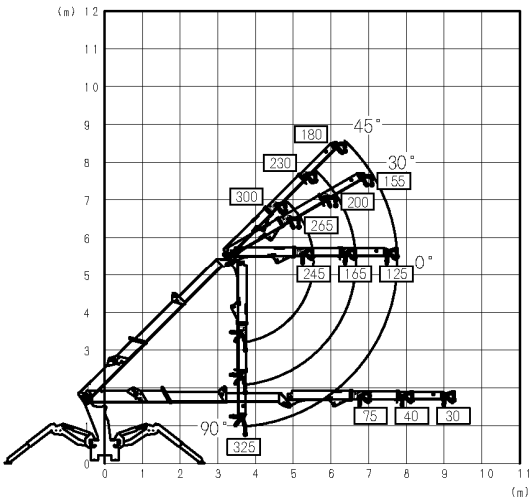


Main boom angle 80°

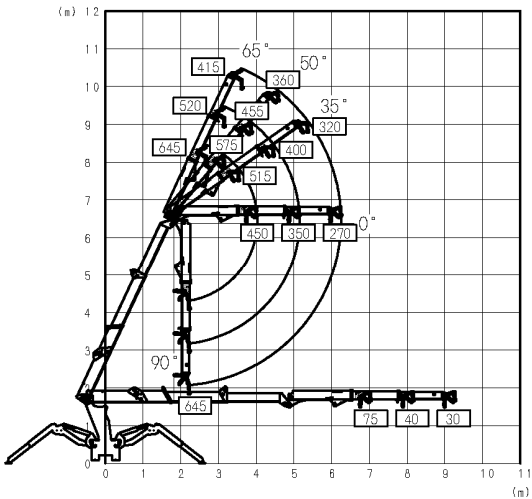


Main boom angle 80° , 65° , 45° , 0°

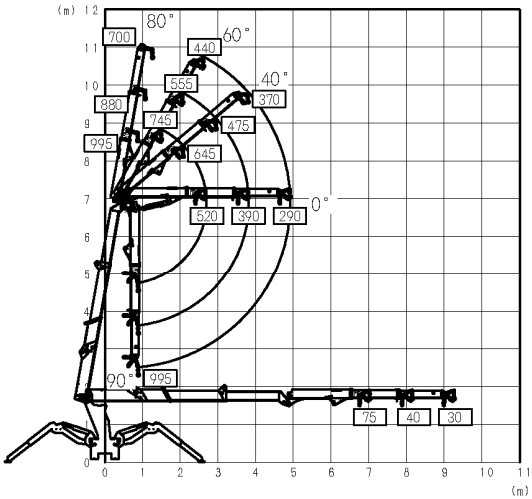
Working range diagram Outrigger extended to minimum Main boom 2.5 sections



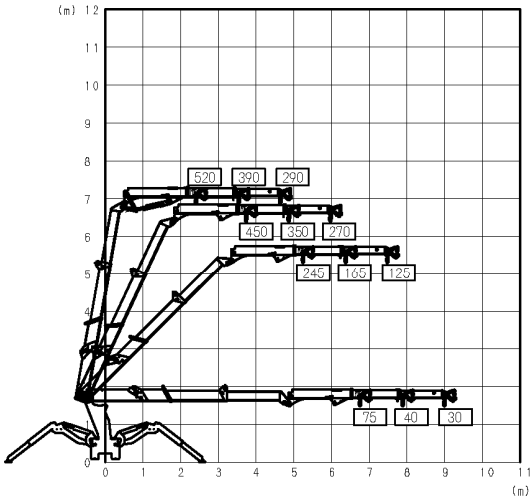
Main boom angle 45°



Main boom angle 65°

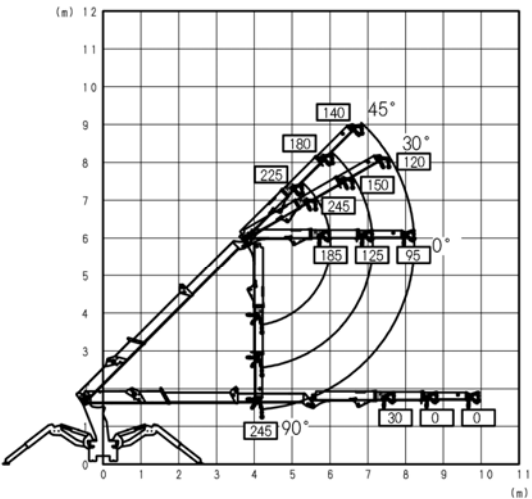


Main boom angle 80°

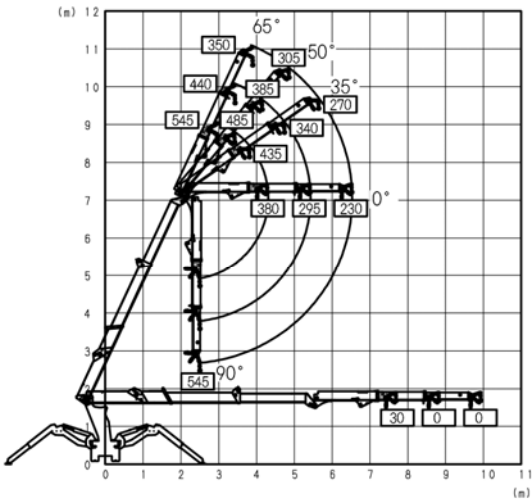


Main boom angle 80° , 65° , 45° , 0°

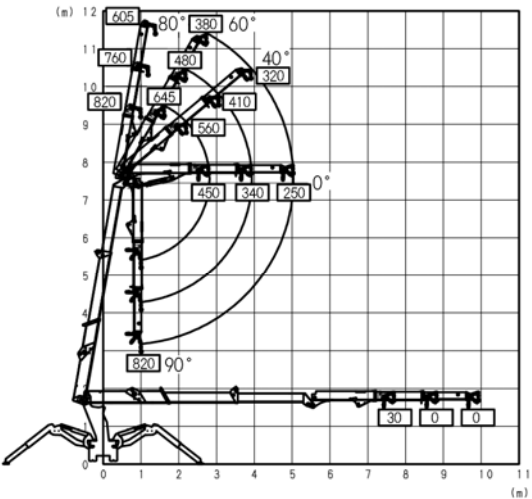
Working range diagram Outrigger extended to minimum Main boom 3 sections



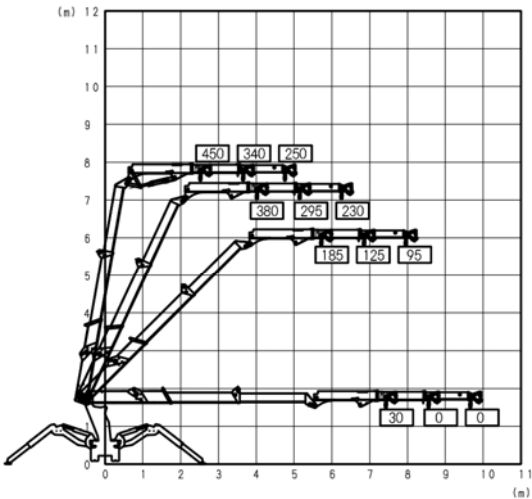
Main boom angle 45°



Main boom angle 65°



Main boom angle 80°



Main boom angle 80° , 65° , 45° , 0°

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REMOTE CONTROL

1. OUTLINE OF REMOTE CONTROLLER	6- 2
2. SAFETY PRECAUTIONS	6- 4
3. SAFETY LABEL LOCATIONS	6-10
4. COMPONENTS OF THE TRANSMITTER	6-11
5. COMPONENTS OF THE RECEIVER	6-19
6. PRE-OPERATION INSPECTION	6-21
7. OPERATION	6-29
8. HANDLING BATTERY	6-39
9. TROUBLESHOOTING	6-41
10. PRINCIPLE SPECIFICATION LIST	6-44

1. OUTLINE OF REMOTE CONTROLLER

1.1 FEATURE

This device is to be used for the following operation.

This Remote Controller includes both the Transmitter and Receiver which facilitate remote control of the Crane which is purchased with this device.

This is a wireless Remote Controller; the Crane can be operated at the most convenient place away from it within the radio wave range.

1.2 CONFIGURATION

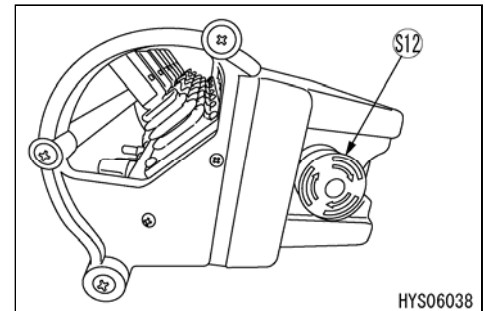
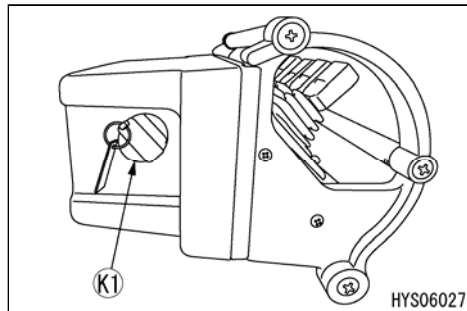
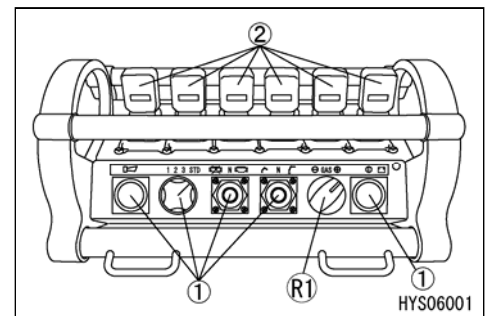
1.2.1 CONFIGURATION OF REMOTE CONTROLLER

This device is composed of the following units and systems:

[1] TRANSMITTER

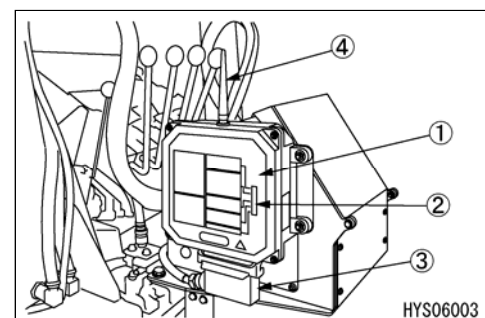
The Transmitter is equipped with five control switches (1), six crane operation levers (2), acceleration dial (R1), electronic key (K1) and emergency stop switch (S12).

The Transmitter sends signals for crane operations to the Receiver mounted on the main body of the Machine so that remote operation of the Crane can be carried out.



[2] RECEIVER

The Receiver which is installed on the Crane is equipped with Control box (1), Monitor LED (2), Connector (3), Antenna (4), etc. The Receiver receives operation signals from the Transmitter and controls the Crane.



1.3 FUNCTIONS

1.3.1 FUNCTIONS OF REMOTE CONTROLLER

- The Acceleration dial and operation levers control the Crane operation speed continuously from stand-by, up to maximum speed.
- In addition to handling the crane by remote control transmitter, manual operation can be performed on the machine side, depending on the type of operation required.
- This remote control system is equipped with an electronic key having ID data necessary for the operation of the Transmitter.

If communications are not established when the power is turned ON or if they are interrupted (poor reception or beyond reaching distance) during operation, the “Forced zero position” function is activated to return to the state in which no operation lever is pressed, to avoid misoperation or erroneous activation.

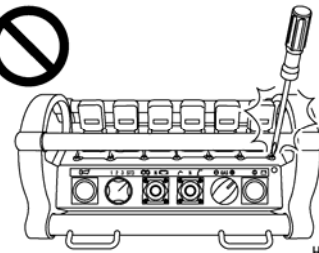
- This remote control system detects an unused frequency automatically.

2. SAFETY PRECAUTIONS

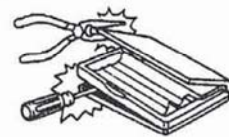
2.1 PRECAUTIONS ON HANDLING

DO NOT MODIFY

- Never disassemble or modify the Transmitter, Receiver and accessories. Otherwise, an electric shock or fire may be caused.



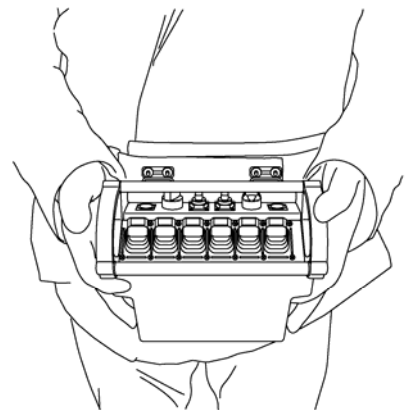
HYS06004



HYS06098

HOLDING THE TRANSMITTER

- See the illustration on the right for the operation method of the Transmitter.
Operate the control levers and buttons with your thumb.
Firmly grasp the grip with other fingers and hold the Transmitter.
- Always operate the control levers and switches of the Transmitter with your fingers.
Do not attempt to operate it by any other method such as a screwdriver etc.
It may make a hole in the Transmitter which allows water to enter inside the body causing problems or failures which may lead to a serious hazard.



HYS06006

NO WATER WASHING

- Always clean the Transmitter and keep it unsoiled. Oil or mud on surface may cause miss-operation with slipping hands, which may result in a serious hazard.
- Never attempt to high pressure wash or wash with water the Transmitter and Receiver.
Doing so allows water to enter inside and may cause problems or failures which could cause an electric shock or other serious hazard.
- Scrub the Transmitter and Receiver with a damp cloth or diluted detergent to remove the dirt.
Avoid alkaline or alcoholic cleaners or sprayer cleaners. Doing so deteriorates plastics and produces cracks.

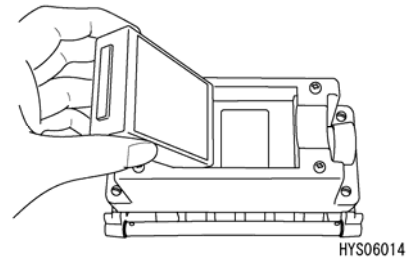
**DO NOT
PRESSURE
WASH!**

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

Do not put metals, flammables or water in the battery storage section of the transmitter or the inside of the opening of the battery charger.

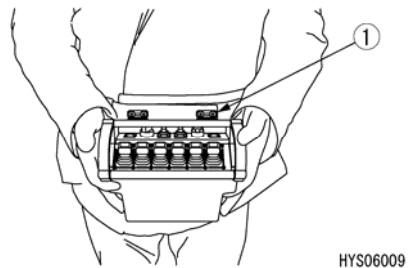
Do not connect the battery storage section of the transmitter or the terminal section of the inside of the opening of the battery charger with a metal or do not insert a metal into these parts.

Doing so may cause an electric shock or fire.



NO SHOCK TO THE TRANSMITTER

- While using the Transmitter, always use a waist belt (1) to prevent accidental dropping of the unit during operation.



- Try to avoid needless impact to the Transmitter, such as hitting it on any object.

As this may result in damage to the enclosure or internal components which may cause a failure or malfunction including electrical shock or other serious hazard.

- In the event of such damages, remove the battery in the Transmitter and contact us or our sales service agency for repair. Using a damaged Transmitter will result in misoperation and may cause an electrical shock or other serious hazard.



PRECAUTION FOR OPERATIONS IN COLD SEASONS

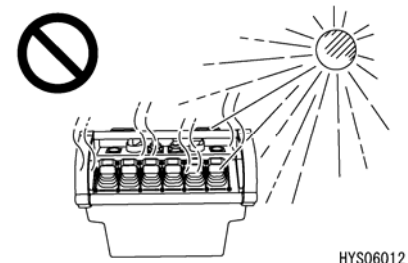
- Avoid the use of the Transmitter in a condition where the ambient temperature makes a sudden change or becomes extremely low (-25°C or below) or cold air is blowing directly to it. Sudden change in temperature may cause dew formation inside the Transmitter and can cause failure or malfunction and leads to a serious hazard.

- In cold conditions, warm up sufficiently prior to starting crane operations. In cold conditions, the temperature of the hydraulic fluid is low and its viscosity is high. This can result in a delay in crane operations.

- When storing the Transmitter, make sure to keep it away from conditions listed below.

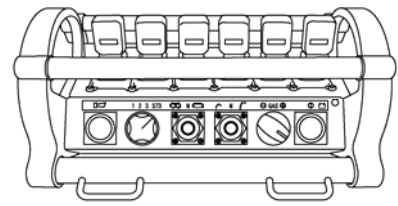
Not observing the above may cause deformation or discolouration of the Transmitter case and can cause failure or malfunction of the inside devices, leading to a serious hazard.

- Extremely low temperature (-25°C or below) or in direct cold air.
- Direct sun light.
- Adjacent to warm air outlets of vehicles.
- Adjacent to housing heating system.
- High humidity.



PRECAUTIONS IN OPERATION ENVIRONMENT OF REMOTE CONTROL

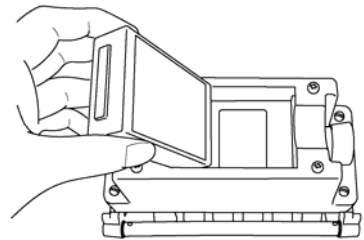
This remote control system cannot be used for operation in a place where there is danger of explosion.



HYS06013

USING SPECIFIED EQUIPMENT

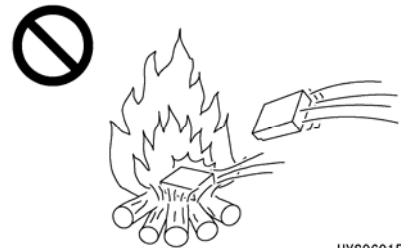
- Use a specified battery for the remote control system.
The use of battery other than specified may cause electrolyte leakage, heat generation and rupture of the battery.
- When setting a battery in the transmitter of the remote control system, be careful not to turn the battery upside down. Doing so may cause a failure of the inside devices of the transmitter, and electrolyte leakage, heat generation and rupture of the battery.



HYS06014

PRECAUTIONS IN HANDLING THE BATTERY

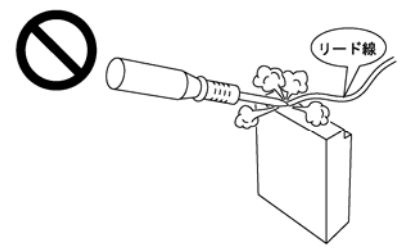
- Do not heat the battery or put it in fire.
Doing so may cause electrolyte leakage and rupture of the battery.
- Do not disassemble or modify the battery.
Doing so may cause electrolyte leakage, heat generation and rupture of the battery.
- Do not solder directly to the battery.
Doing so may cause electrolyte leakage, heat generation and rupture of the battery.
- If leaked electrolyte contacts your eyes, immediately wash it away with plenty of water and promptly see a doctor.
- Periodically charge and discharge the battery within six months.



HYS06015



HYS06016



HYS06017

TEMPORARY STORAGE WHEN ABNORMALITY IS FOUND WITHIN THIS SYSTEM

In case this system is found with an abnormality and is therefore stored temporarily waiting for service, apply following measures to notify all persons in the office that “the use is prohibited due to failure”.

1. Put up a sign showing “Use Prohibited”.

Write clearly the information such as abnormality contents, name and contact of the storage manager, and the term of storage.

2. Take out the battery.
3. Never perform operation using a failed remote control system.

CAUTIONS DURING WELDING REPAIR

Weld in a location with good facility, and, only authorized personnel are permitted to weld.

- Disconnect the battery terminals to prevent battery explosions.
- Disconnect the electric wiring connection section with the receiver. Otherwise, the electric system of the receiver will be destroyed.

2.2 OPERATION RELATED PRECAUTIONS

WARNING

For operation related precautions, be sure to read “Safety” thoroughly in addition to this section.

2.2.1 BEFORE STARTING ENGINE

INSPECTION BEFORE STARTING ENGINE

- Execute inspections specified for this machine before the first engine start-up of the day. Omitting these inspections may result in serious bodily accidents. Always repair if any result of the inspection is faulty.
- When using this remote controller, perform operations carefully upon fully understanding what actions you let it do.
- When an operator operates this remote control system, he/she may mistake the operating direction of the control section of the transmitter depending on the standing position and visibility angle with respect to the system. Always check in advance to avoid a mistake of the operating direction of the system.
- Before starting to operate this remote control system, check that no personnel are under a hoisted load or in the vicinity and perform operations safely.

CAUTIONS WHEN STARTING ENGINE

- Make sure no person or object is in the vicinity of the machine before starting engine.
- Honk the horn for warning before starting the engine.
- Do not start the engine by short-circuiting the starter circuit. This may cause a fire.

INSPECTION PRIOR TO TURNING ON THE TRANSMITTER

- Check for any dirt, damage or cracks in the enclosure, control levers, and operation switches of the Transmitter.
- Ensure that the control levers, operation switches and the acceleration dial of the Transmitter move smoothly and properly.
- Check if the battery is correctly installed and if there is any foreign matter such as a metal or paper in the case of the remote control system transmitter.

INSPECTION AFTER TURNING ON THE TRANSMITTER

- Check that the status LED of the Transmitter flashes in green. (Status LED: P. 6-13)
- Check that the remote control mode display on the monitor illuminates. (Monitor: P. 6-19)

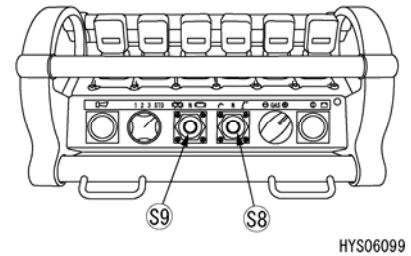
INSPECTION PRIOR TO TURNING ON THE RECEIVER

- Check for any dirt, damage or cracks in the Control box, Monitor LED, Antenna, etc. of the Receiver.

2.2.2 AFTER STARTING ENGINE

OPERATION CHECK OF OUTRIGGER MODE BY TRANSMITTER AND CAUTIONS DURING OPERATION

- Set to the “OUTRIGGER MODE” with the outrigger/crane selector switch (S8) and check that the mode has switched to the outrigger mode.
- Push down the “Engine start/stop switch (S9)” to the start side and check that the engine starts.
- Push down the “Engine start/stop switch (S9)” to the stop side and check that the engine stops.
- Operate the outrigger control lever and check that the corresponding outrigger operates properly.
- Check that position pins and retainers of the outriggers are securely set.



OPERATION CHECK OF CRANE MODE BY TRANSMITTER AND CAUTIONS DURING OPERATION

- Before switching the operation mode to “CRANE MODE” make sure all the outriggers are extended and securely placed on the ground.
- Set to the “CRANE MODE” with the outrigger/crane selector switch (S8) and switch to the crane mode with the “Crane” button of the monitor.
- Operate the crane control lever and check that the crane operates properly.
- When performing crane operations, always refer to the “Portable rated total load chart” and avoid over-loaded operations.
- Activate the control levers of the Transmitter slowly at all times.
- Before starting operations, check to make sure that the emergency stop switch functions. At this time, the status LED of the Transmitter goes off. If it does not go off, immediately stop the use.
- If you perform compound operation with the remote controller, only one side may operate. As this is very dangerous, do not perform compound operation.

2.2.3 DURING OPERATION

OPERATION CHECK OF CRANE MODE BY TRANSMITTER AND CAUTIONS DURING OPERATION

- Never move your hand off the Transmitter whose power is turned ON. Be sure to turn OFF the power of the Transmitter when moving a place, performing work other than remote control, taking a break and terminating work.
- Immediately press the emergency stop switch to stop the Transmitter in an emergency or when a malfunction, however small it is, occurs in the working range of the machine.

2.2.4 AT THE END OF OPERATION

PRECAUTIONS FOR TERMINATING THE OPERATION BY THE TRANSMITTER

- Before stowing the outriggers, ensure that the main boom and the jib are stowed in the correct positions.
- Before stowing the outriggers, set the operation mode to the “OUTRIGGER MODE” with the outrigger/crane selector switch (S8) and check that the mode is switched correctly.
- When all the operation of the Transmitter is complete, always turn “OFF” the power of the Transmitter.
- Under no condition will the Transmitter be ON unless the Crane is in operation. Be sure to keep the power turned “OFF”. Otherwise, unexpected touching or contact of operation levers or buttons of the Transmitter with any other object may cause undesired motion of the Crane and a serious accident such as tipping or collision may occur.

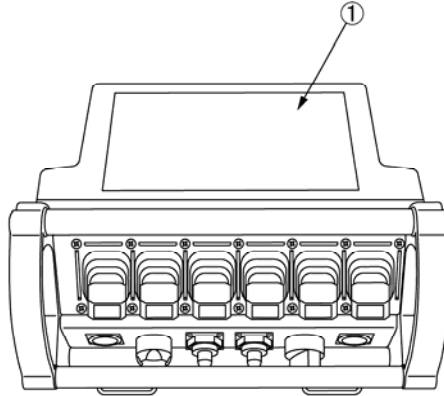
3. SAFETY LABEL LOCATIONS

Keep safety labels clean and visible at all times.

If lost, replace immediately or apply for a new one.

There are other labels than safety labels shown below and treat them in the same manner.

Transmitter



① Operation pattern

NOTICE

RULES FOR HANDLING Read the Operations Manual carefully before using.

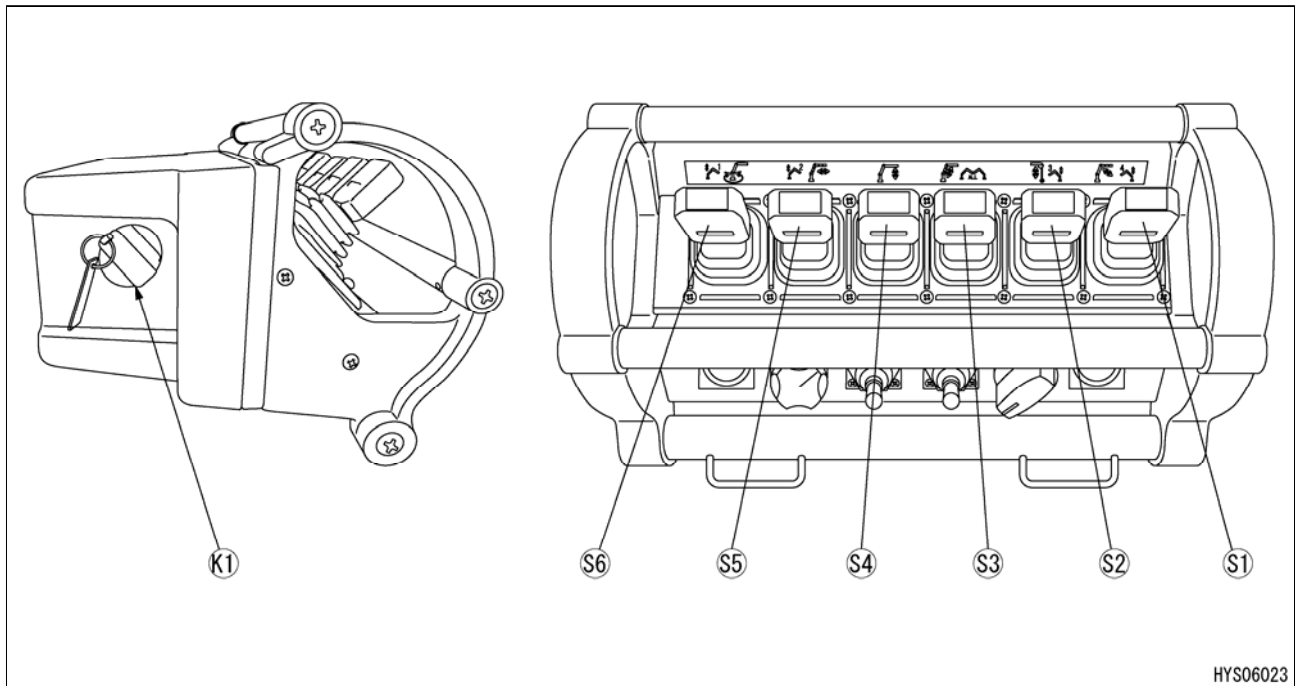
1. Always carry the Portable Total Rated Load Chart during Work and avoid over-loading or tipping over.	4. Transmitter or receiver should not be immersed or cleaned in water.
2. Never attempt to modify or disassemble this unit.	5. Simultaneous telescopic operation of main boom and jib is not possible.
3. Do not expose transmitter to strong shock such as dropping it.	6. Simultaneous derricking operation of main boom and jib is not possible.

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4. COMPONENTS OF THE TRANSMITTER

4.1 UPPER PART COMPONENTS OF THE TRANSMITTER



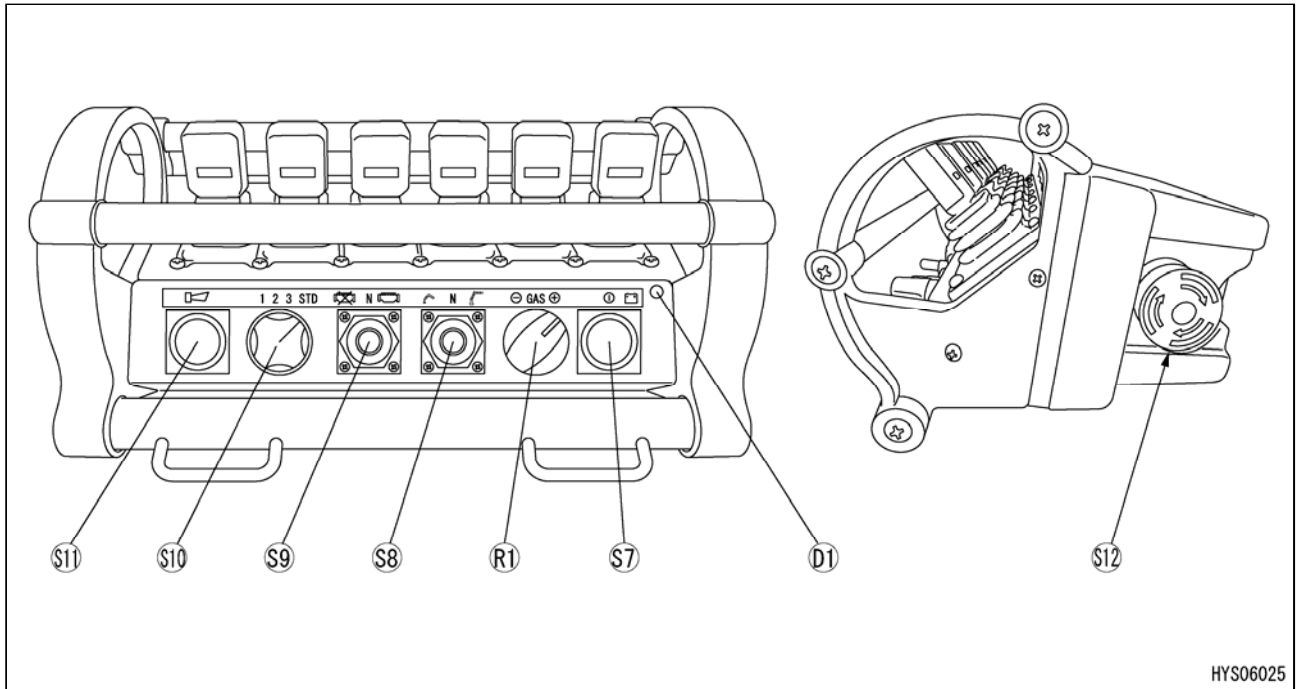
- | | |
|---|---|
| (K1) Electronic key | (S3) Main boom telescoping/collective outrigger operation lever |
| (S1) Main boom derricking/No.4 outrigger operation lever | (S4) Jib derricking |
| (S2) Hook raising and lowering/No.3 outrigger operation lever | (S5) Jib telescoping/No.2 outrigger operation lever |
| | (S6) Slewing/No.1 outrigger operation lever |

CAUTION

The remote control system provides the following safety functions:

- (1) **Misoperation avoidance function when the remote control system is interrupted**
This is a function to return to the state in which nothing is pressed (Forced zero position) if communications are not established when the power is turned ON or if communications are interrupted (poor reception or beyond reaching distance) during operation.
This is a function to avoid misoperation or erroneous activation when connections of the remote control system are interrupted.
To resume, place the operation lever of the Transmitter in the neutral position and press the start button twice to turn the power "ON".
- (2) **Electronic Key**
This system is provided with an electronic key.
The key has ID data necessary for the Transmitter and the system is not activated without the electronic key.
- (3) **Automatic Power OFF Circuit**
Power of the Transmitter will automatically turn OFF when the remote control of crane operations is discontinued for a specific time.
To resume, place the operation lever of the Transmitter in the neutral position and press the start button twice to turn the power "ON".
- (4) **Transmitter Battery Voltage Drop Display**
When the battery voltage drops, the status LED of the Transmitter flashes in red and the signal sound starts to sound.
The Transmitter stops in a few minutes if it is used as it is.
Replace the battery with a charged one.

4.2 LOWER PART COMPONENTS OF THE TRANSMITTER



- | | |
|---------------------------------------|-------------------------------------|
| (D1) Status LED | (S9) Engine start/stop switch |
| (R1) Acceleration dial (engine speed) | (S10) Speed selection rotary switch |
| (S7) Start button | (S11) Horn switch |
| (S8) Outrigger/crane selector switch | (S12) Emergency stop switch |

4.3 DESCRIPTION OF COMPONENTS OF THE TRANSMITTER

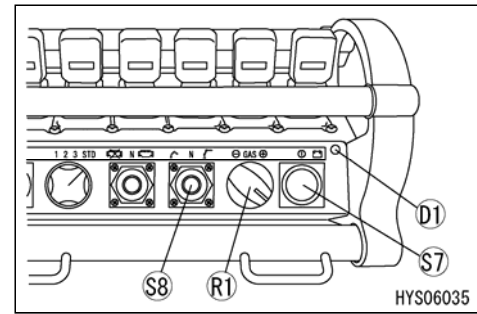
[1] STATUS LED (D1)

This displays the power supply of the Transmitter.

- Flashing of green LED: The power of the Transmitter is ON.
- Flashing of red LED (signal sound): The voltage of the battery is dropping.

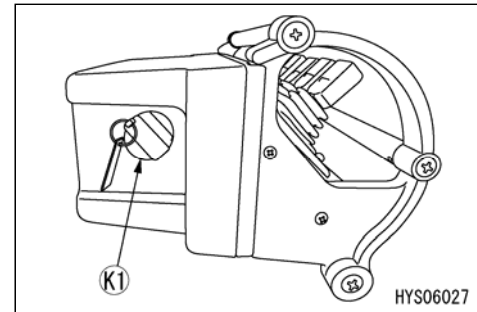
The Transmitter stops in a few minutes if it is used as it is.

Replace the battery with a charged one.



[2] ELECTRONIC KEY (K1)

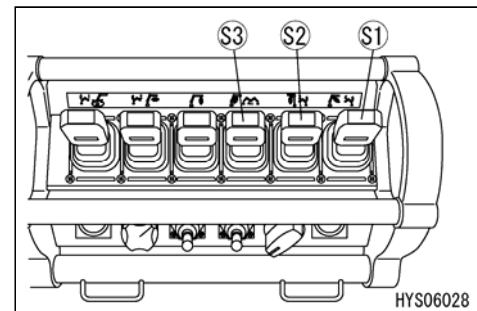
The key has ID data necessary for operation of the Transmitter. Install it on the Transmitter.



[3] MAIN BOOM DERRICKING/No.4 OUTRIGGER OPERATION LEVER (S1)

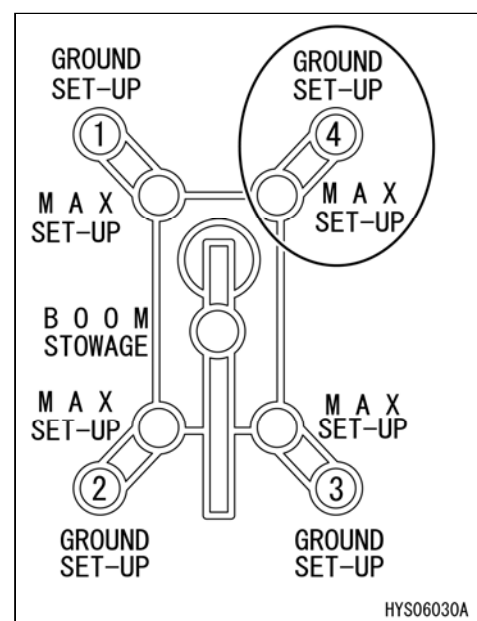
This operation lever functions in two ways:

- This lever is used to raise/lower the main boom in the CRANE MODE.
 - Main boom lowering: Push the lever up.
 - Neutral: Release your finger from the lever.
 - Main boom raising: Push the lever down.
- This lever is used to extend (set) and retract (stow) the No.4 outrigger in the OUTRIGGER MODE.
 - Retraction (stowing): Push the lever up.
 - Neutral: Release your finger from the lever.
 - Extension (setting): Push the lever down.



NOTES

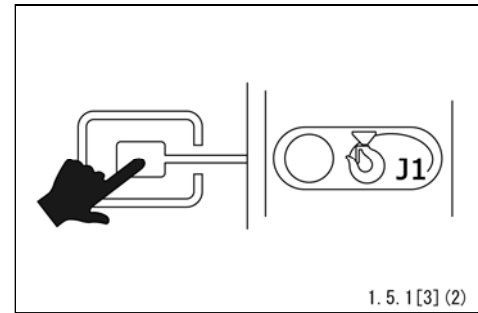
- As the common circuit is used for the raising/lowering operation of the main boom and the jib, compound operation cannot be performed. Return the lever to the neutral position once and then perform the next operation.



[4] HOOK RAISING, LOWERING/No.3 OUTRIGGER OPERATION LEVER (S2)

This operation lever functions in two ways:

- This lever is used to raise/lower the hook in the CRANE MODE.
- Operates only when wire 1 fall selector button is selected on the monitor
 - Hook lowering: Push the lever up.
 - Neutral: Release your finger from the lever.
 - Hook raising: Push the lever down.



CAUTION

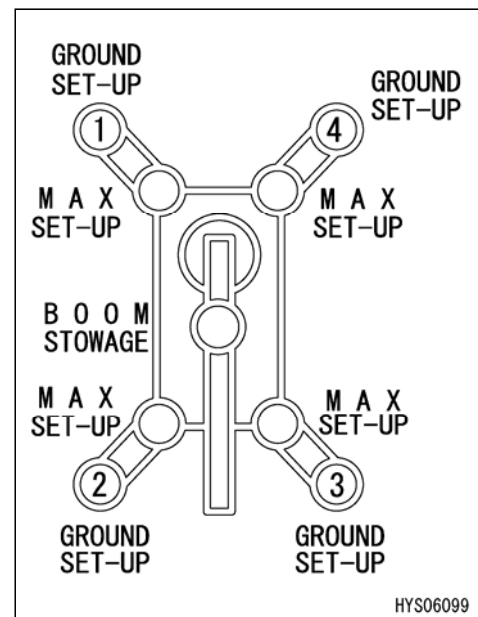
When “wire 1 fall” operation is completed, be sure to press “fixed hook selector button” to change the mode to the J mode to avoid misoperation.

- This lever is used to extend (set) and retract (stow) the No.3 outrigger in the OUTRIGGER MODE.
 - Retraction (stowing): Push the lever up.
 - Neutral: Release your finger from the lever.
 - Extension (setting): Push the lever down.

[5] MAIN BOOM TELESCOPING/COLLECTIVE OUTRIGGER OPERATION LEVER (S3)

This operation lever functions in two ways:

- This lever is used to extend/retract the main boom in the CRANE MODE.
 - Main boom extension: Push the lever up.
 - Neutral: Release your finger from the lever.
 - Main boom retraction: Push the lever down.
- This lever is used to extend (set) and retract (stow) the 4 outriggers at the same time in the OUTRIGGER MODE.
 - Retraction (stowing): Push the lever up.
 - Neutral: Release your finger from the lever.
 - Extension (setting): Push the lever down.



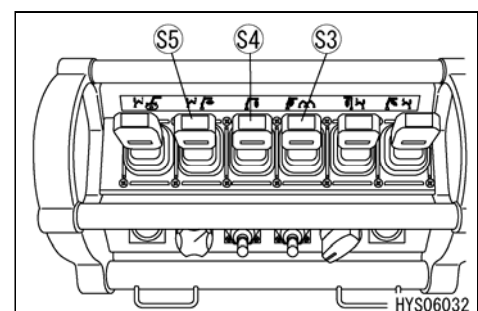
NOTES

- As the common circuit is used for the extension/retraction operation of the main boom and the jib, compound operation cannot be performed. Return the lever to the neutral position once and then perform the next operation.

[6] JIB DERRICKING (S4)

This operation lever functions as follows:

- This lever is used to raise/lower the jib in the CRANE MODE.
 - Jib lowering: Push the lever up.
 - Neutral: Release your finger from the lever.
 - Jib raising: Push the lever down.
- The outriggers do not operate in the OUTRIGGER MODE.



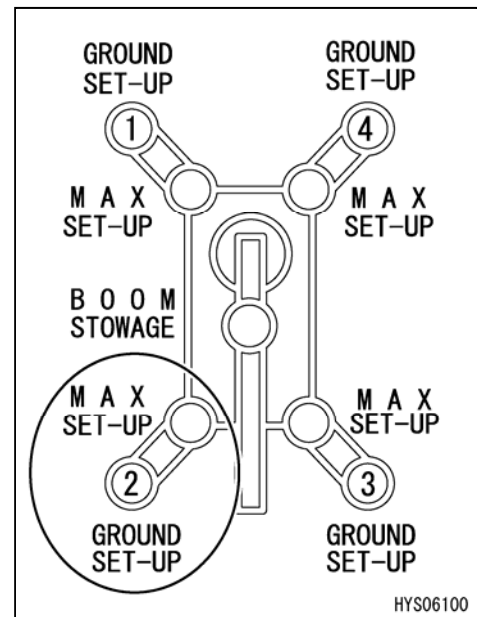
NOTES

- Perform raising/lowering operation of the jib as slowly as possible using the micro speed mode.

[7] JIB EXTENSION & RETRACTION/No.2 OUTRIGGER OPERATION LEVER (S5)

This operation lever functions in two ways:

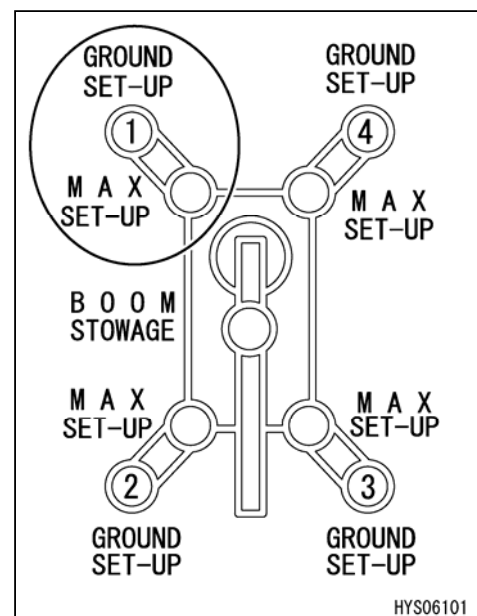
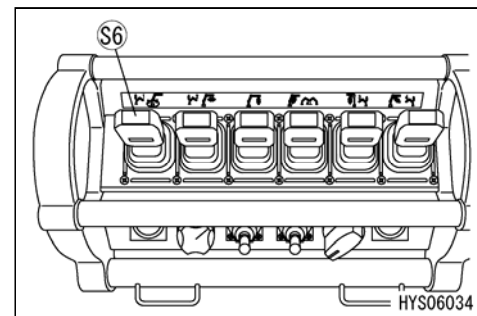
- This lever is used to extend/retract the jib in the CRANE MODE.
 - Jib extension: Push the lever up.
 - Neutral: Release your finger from the lever.
 - Jib retraction: Push the lever down.
- This lever is used to extend (set) and retract (stow) the No.2 outrigger in the OUTRIGGER MODE.
 - Retraction (stowing): Push the lever up.
 - Neutral: Release your finger from the lever.
 - Extension (setting): Push the lever down.



[8] SLEWING/No.1 OUTRIGGER OPERATION LEVER (S6)

This operation lever functions in two ways:

- This lever is used to slew the crane in the CRANE MODE.
 - Counterclockwise slewing: Push the lever up.
 - Neutral: Release your finger from the lever.
 - Clockwise slewing: Push the lever down.
- This lever is used to extend (set) and retract (stow) the No.1 outrigger in the OUTRIGGER MODE.
 - Retraction (stowing): Push the lever up.
 - Neutral: Release your finger from the lever.
 - Extension (setting): Push the lever down.



[9] ACCELERATION DIAL (R1)

This is used to adjust the maximum engine speed.

1. Set the speed selector rotary switch (S10) to "STD".
2. Set the acceleration dial (engine speed) to any position.
(The maximum engine speed can be set to increase on the + side.)
3. When each operation lever is pushed down, the crane speed increases according to the operation amount and the engine speed increases also.

NOTES

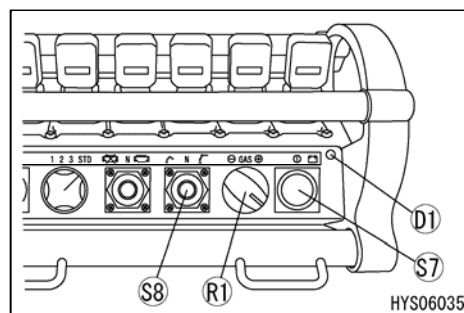
- When the speed selector rotary switch (S10) is set to "STD", the acceleration dial is set to MAX (turn the dial fully to the + side) and each operation lever is pushed down to the maximum, the crane speed becomes the maximum (engine speed becomes the maximum).
- When the speed selector rotary switch is set to "STD" and the acceleration dial is set to the minimum (return the dial fully to the - side), engine speed does not increase even if each operation lever is pushed down to the maximum.

[10] START BUTTON (S7)

This is used when the power of the Transmitter is turned ON.

Press the start button twice while the operation lever of the Transmitter is in the neutral position to turn the power "ON".

When the power is properly turned ON, the status LED flashes in green.



NOTES

- The crane does not start to operate when the start button is pressed just once.
- When a radio wave is properly received, a remote control mode display illuminates on the monitor.

[11] OUTRIGGER/CRANE SELECTOR SWITCH (S8)

This switches between the outrigger mode and the crane mode.

Outrigger mode: When the selector switch is pushed down to the outrigger side, a buzzer (continuous sound) sounds and the mode is switched to the outrigger mode.

When the operation levers are pushed down, the outriggers operate.

Crane mode: Push down the selector switch to the crane side.

When the operation levers are pushed down, the crane operates.

After completing the operation, return the selector switch to the neutral (N) position.

[12] ENGINE START/STOP SWITCH (S9)

This is used to start and stop the engine.

Starting the engine: Push down the selector switch to the engine start side.

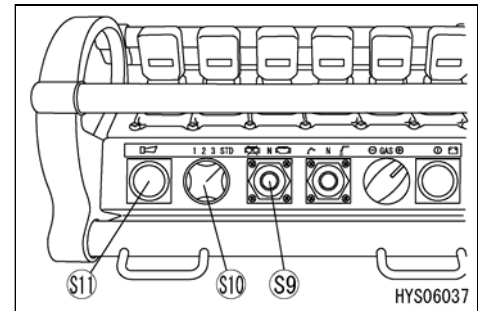
The engine starts.

When you release your hand, the switch returns to the neutral position.

Stopping the engine: Push down the selector switch to the engine stop side.

The engine stops.

When you release your hand, the switch returns to the neutral position.



[13] SPEED SELECTOR ROTARY SWITCH (S10)

The maximum speed of the crane can be selected with this rotary switch.

Select the speed.

Rotary switch 1: Micro speed 1

Rotary switch 2: Micro speed 2

Rotary switch 3: Micro speed 3 (User micro speed mode)

Rotary switch STD: Usually interlocked with the acceleration dial.

Slow



Fast

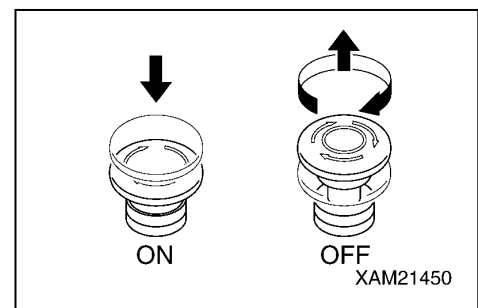
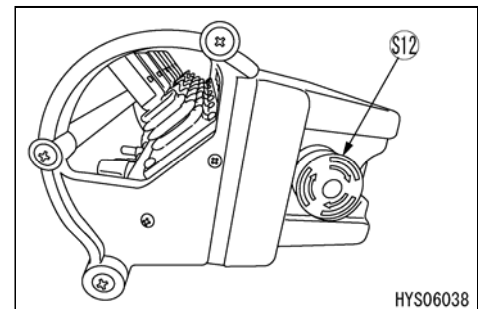
[14] HORN BUTTON (S11)

This is used to honk the horn.

[15] Emergency stop switch (S12)

This is used to turn OFF the power of the Transmitter.

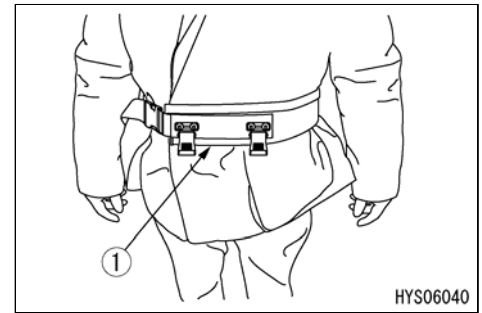
- ON: Press the switch. The power of the Transmitter turns OFF.
- OFF: Turn the switch clockwise. The switch returns to the original position.



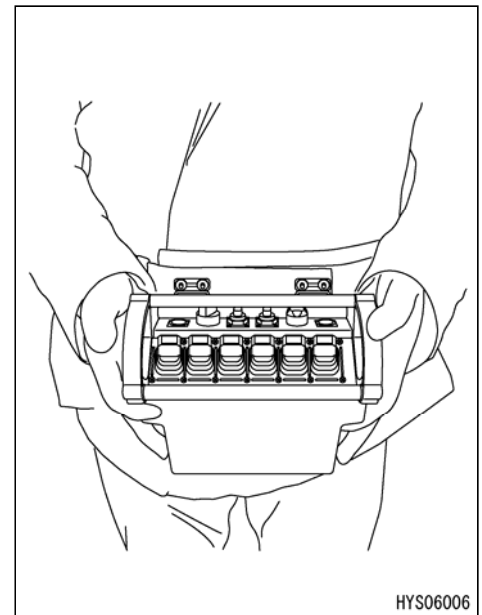
[16] WAIST BELT (1)

Wear the belt when you operate the Transmitter.

- Wear the waist belt around your waist.

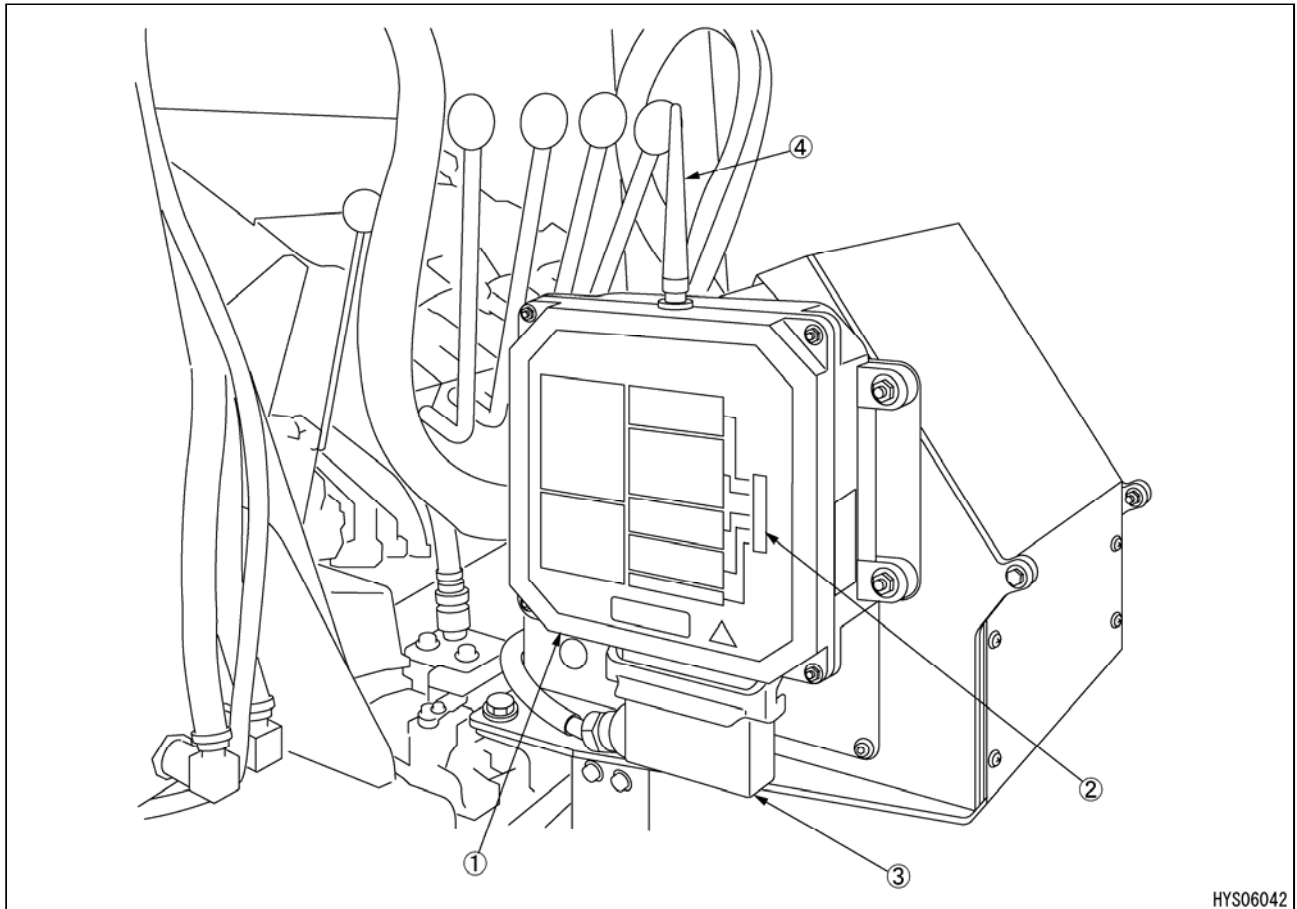


- Attach the Transmitter to the waist belt.

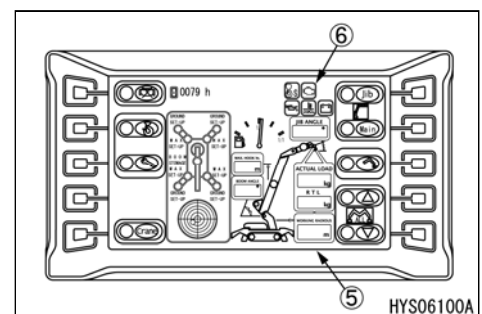


5. COMPONENTS OF THE RECEIVER

5.1 COMPONENTS OF THE RECEIVER



- | | |
|-----------------|---------------------------------|
| (1) Control box | (4) Antenna |
| (2) Monitor LED | (5) Monitor |
| (3) Connector | (6) Remote control mode display |



[1] CONTROL BOX (1)

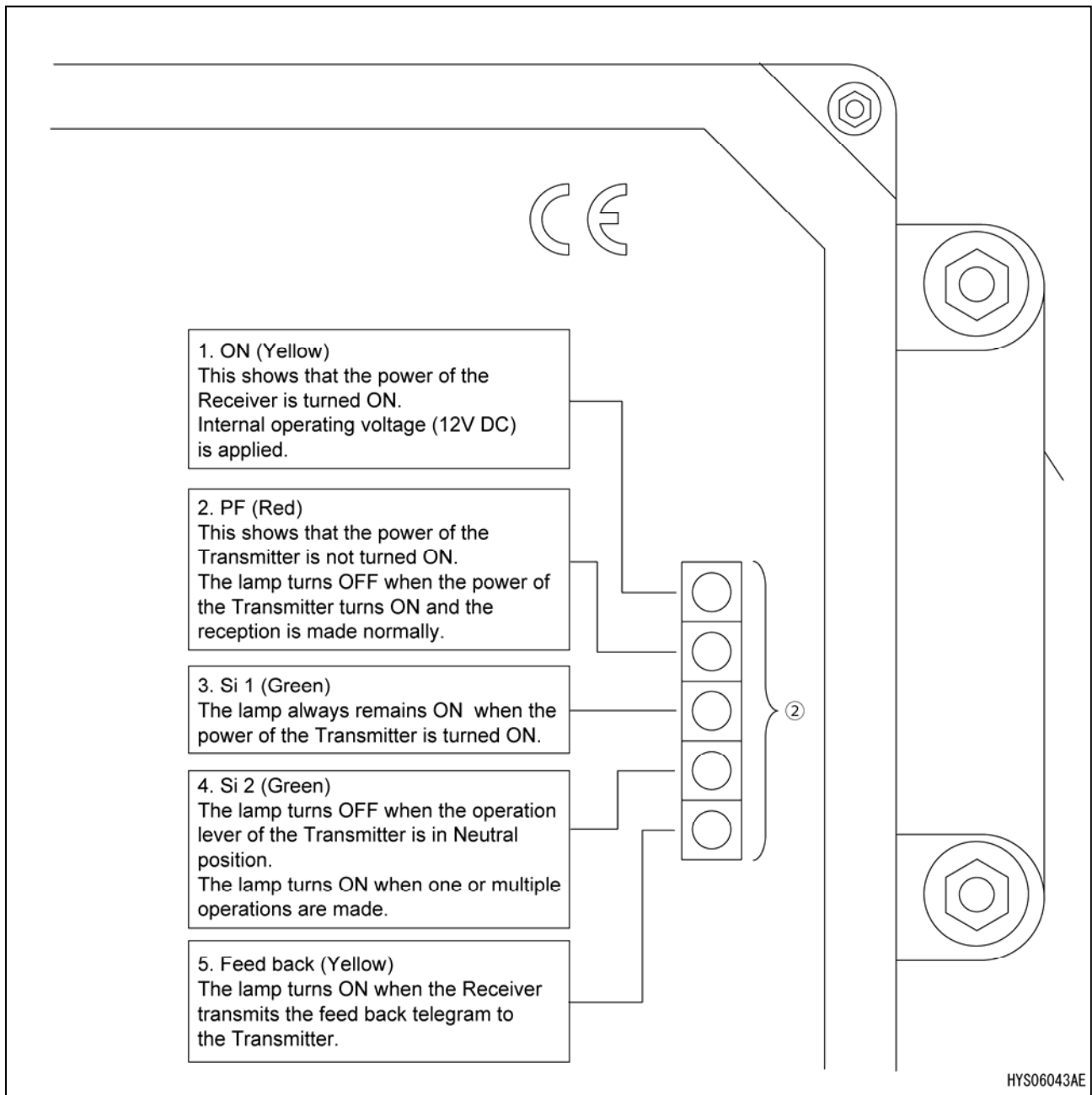
⚠ WARNING

**Do not disassemble or modify the control box under any circumstances.
Otherwise, an electric shock or fire may be caused.**

The Control box contains the receiver devices and control devices.

[2] MONITOR LED (2)

The Transmitter cover is equipped with monitor LED that shows the operation status of the remote control system.



6. PRE-OPERATION INSPECTION

6.1 CHECKING BEFORE STARTING ENGINE

WARNING

Check the following in this section before starting the work every day.

Omitting these inspections may cause serious bodily accidents.

SEE “OPERATIONS 2.1.2 CHECKING BEFORE STARTING ENGINE” to inspect the main body of the machine also.

If there is any abnormality, be sure to fix it or contact us or our sales service agency.

6.1.1 CHECKING BEFORE TURNING ON THE TRANSMITTER

WARNING

When checking before turning ON the Transmitter, ensure that the engine starter key is in the “OFF” position.

Otherwise, the engine may unexpectedly start during inspection of the Transmitter and cause serious bodily injury.

Perform the following inspections while the Transmitter power is “OFF”:

- Check the control levers, operation switches and exterior for oily dirt or other contaminants.
Scrub away any dirt with a clean cloth.
- Also check for small particles such as stones, grit or sand that may have been caught in small gaps near the control levers and/or operation switches.
If found, remove such particles completely. In the event where offending particles are caught in the small openings near the control levers and/or operation switches, they may disturb correct operations, causing unexpected movement of the Crane and resulting in a serious accident.
- Check for any cracks and/or damage to the Transmitter enclosure, or impairment to the rubber cover of the control levers and operation switches.
If cracks or damage is found, repair immediately.
Cracks or damage to the Transmitter may allow water to enter inside, causing a malfunction and creating a serious hazard.
- Make sure the control levers and operation switches all operate smoothly and properly, and return to the original position (neutral position) automatically when you release your finger.
If the control levers or operation switches show any sign of a fault or malfunction, repair immediately.
Failure to repair faults may cause unexpected movement of the Crane which result in a serious hazard.
- Open the battery cover and check that the battery is installed in the correct direction.
If the battery is not installed correctly, install it again. If it is not installed correctly, internal devices of the Transmitter may malfunction, causing the Crane to perform unexpected operation and resulting in a serious accident.
- Check if there is any foreign matter such as a metal or paper in the electrode of the battery.
If found, remove such particles completely. Otherwise, an electric shock or fire may be caused.

6.1.2 CHECKING AFTER TURNING ON THE TRANSMITTER

Perform the following inspections while the Transmitter power is "ON":

[1] CHECKING DISPLAY AFTER TURNING THE POWER ON

Press the start button (S7) twice when the control lever of the Transmitter is in the neutral position. Check that the power is properly turned ON and that the status LED (D1) flashes in green.

Immediately stop the use of the remote control system if the status LED (D1) does not flash.

NOTES

- The crane does not start to operate when the start button (S7) is pressed just once.
- When a radio wave is properly received, a remote control mode display illuminates on the monitor.
(Figure on the right)



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6.1.3 INSPECTION OF THE RECEIVER

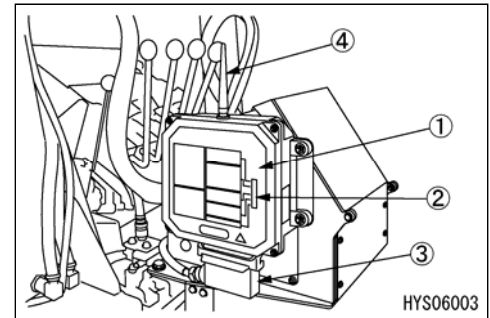
Perform the following inspections.

- Check the control box (1), monitor LED (2), connector (3) and antenna (4) for oily dirt.

Scrub away any dirt with a clean cloth.

- Check the control box (1), monitor LED (2), connector (3) and antenna (4) for cracks, damage, looseness, etc.

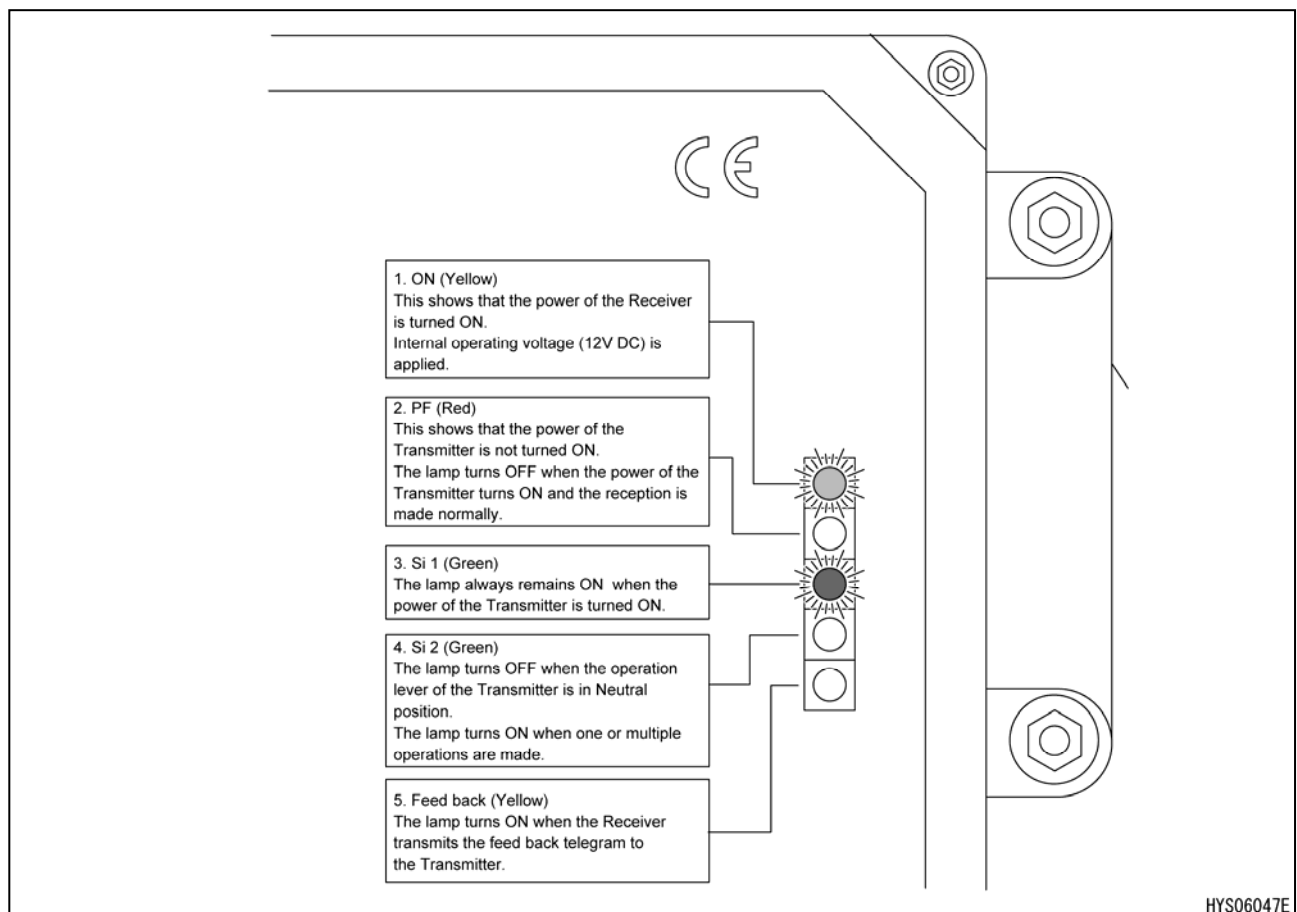
If cracks, damage or looseness is found, repair immediately.
Cracks or damage to the Receiver may allow water to enter inside, causing a malfunction and creating a serious hazard.



- Operate “ON/OFF” of the main starter switch and check that the power of the Receiver is turned ON or OFF.

LED ON (yellow) on the uppermost part of the monitor LED (2) comes ON.

- When pressing the “Start button” (S7) of the Transmitter twice and operating the power to the “ON” position, check that two locations of the monitor LED (2) shown in the figure below come ON.



6.2 CHECKING AFTER STARTING ENGINE

WARNING

Check the following in this section before starting the work every day.

Omitting these inspections may cause serious bodily accidents.

SEE “OPERATIONS 2.1.2 INSPECTION BEFORE STARTING ENGINE” to inspect the main body of the machine, before starting the engine.

If there is any abnormality, be sure to fix it or contact us or our sales service agency.

6.2.1 VERIFICATION FOR THE ENGINE START AND STOP

WARNING

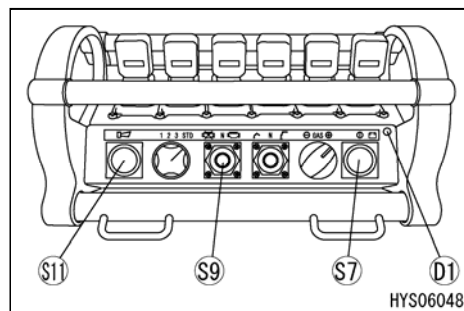
Ensure that the main boom and jib, and outriggers are all stowed in the correct positions.

If they are not in the correct positions, use the applicable levers on the machine side to stow them correctly.

Otherwise, the Transmitter operation may cause damage to the Crane or tipping that results in serious injury.

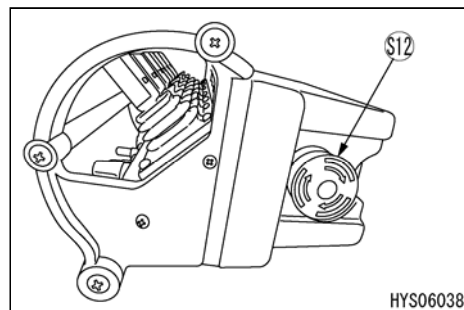
[1] ENGINE START OPERATION CHECK

1. Turn “ON” the main starter switch on the machine side.
2. Press the “start button” (S7) of the Transmitter twice to turn the power “ON”. Check that “status LED” (D1) flashes in green.
3. Press the “horn button” (S11) and check that the horn sounds.
4. Push down the “Engine start/stop switch” (S9) to the start side and check that the engine starts.



[2] ENGINE STOP OPERATION CHECK

1. After the engine has started as outlined in above [1], push down the “Engine start switch” (S9) to the stop side to check that the engine stops.
2. After the engine has started as outlined in above [1], press the “emergency stop switch” (S12) to check that the engine stops.

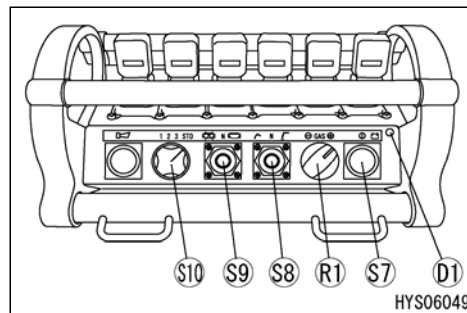


6.2.2 OUTRIGGER MODE OPERATION CHECK

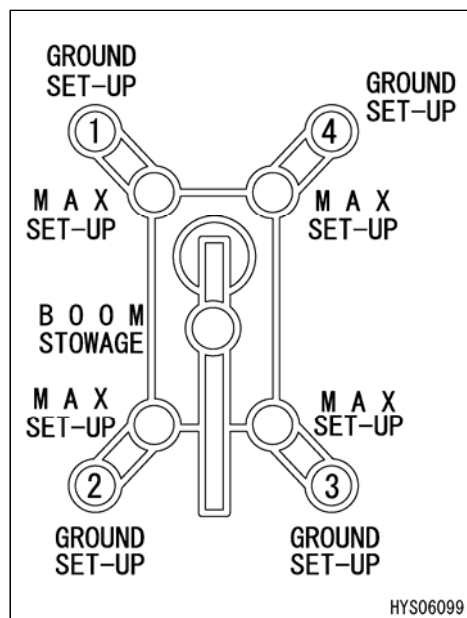
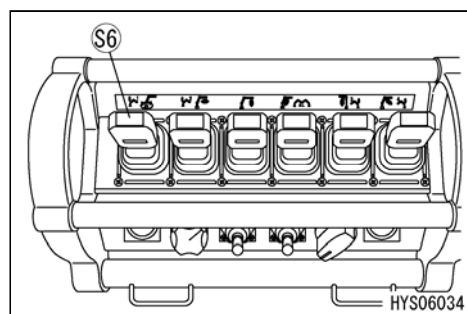
1. Turn "ON" the main starter switch on the machine side.
2. Press the "start button" (S7) of the Transmitter twice to turn the power "ON". At this time, "status LED" (D1) flashes in green.
3. Push down the Transmitter "Outrigger/Crane" selector switch (S8) to the outrigger side and set the operation mode to the "Outrigger mode".

WARNING

When operating the outriggers, perform the above operation 3 and be sure to check that the outrigger mode is set.



4. Set the "speed selector rotary switch" (S10) of the Transmitter to the STD position and "acceleration dial" (R1) to the idling position.
5. Push down the "Engine start switch" (S9) to the start side to start the engine.
6. Use the "Slewing/No.1 Outrigger operation lever" (S6), to both the "Extend (lower)" and "Retract (upper)" area, and check that the No.1 outrigger follows the lever operation.
7. Slowly push the operation lever up and down and check that the No.1 outrigger operates at speed responding to an operation amount of the acceleration dial.
8. Operate the other outrigger operation levers in the same way and check that the outriggers correctly respond to the lever control.

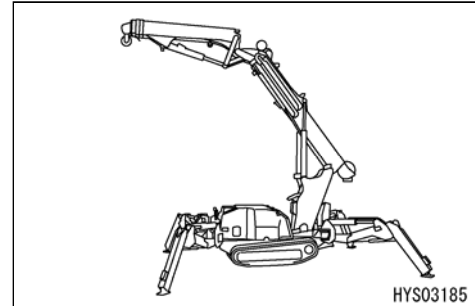


6.2.3 CRANE MODE OPERATION CHECK

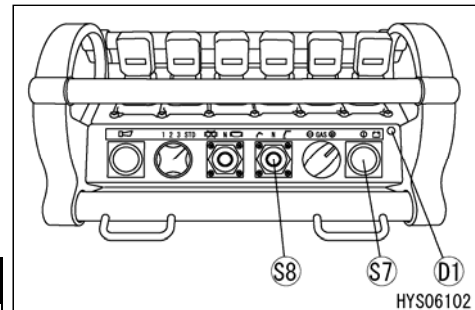
⚠ WARNING

- Ensure that all the outriggers are securely settled, before starting crane operations. Any crane operations where outriggers are improperly used may cause the crane to tip over or other serious accidents.
If there is any abnormality, be sure to fix it or contact us or our sales service agency.

1. Use the main starter switch on the machine side to start the engine.
2. SEE “OPERATION 2.13 PRECAUTIONS BEFORE CRANE WORK” and “OPERATION 2.15 CRANE OPERATION POSITION” and manually configure the Crane as shown in the figure at the right.



3. Press the “start button” (S7) of the Transmitter twice to turn the power “ON”. At this time, “status LED” (D1) flashes in green.
4. Push down the Transmitter “Outrigger/Crane” selector switch (S8) to the crane side and set the operation mode to the “Crane mode”.



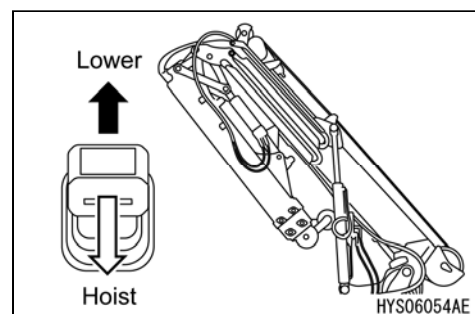
⚠ WARNING

When operating the crane, perform the above operation in 3 and be sure to check that the crane mode is set.

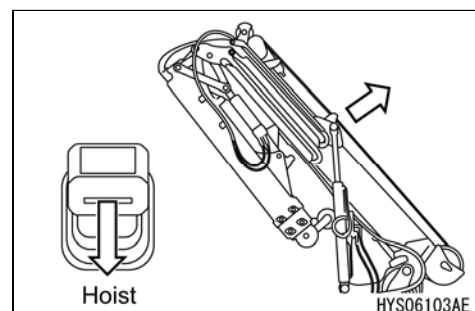
5. Set the “speed selector rotary switch” (S10) of the Transmitter to the STD position and “acceleration dial” (R1) to the idling position.
6. Move the “Main boom derricking lever” (S1) to both the “Lower” (push it up) and “Hoist” side (push it down), and check that the main boom follows the lever operation.

CAUTION

When an optional winch is installed, remove the fixed part of the wedge socket before performing raising operation. Be careful not to allow the winch wire to be wound irregularly during raising operation.



7. Raise the boom to a sufficient angle (approximately 40 degrees) using the “Main boom derricking lever” (S1), pushing to the “Hoist” side (push it down).



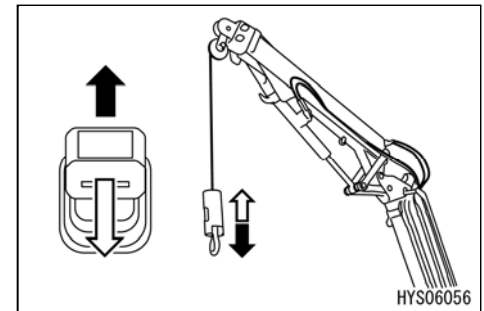
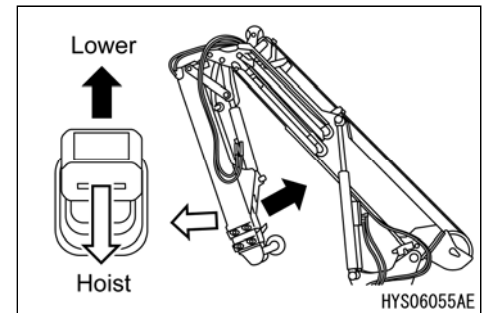
8. Move the "Jib derricking lever" (S4) to both the "Lower" (push it up) and "Hoist" (push it down) side, and check that the jib follows the lever operation.
9. Operate the "Jib derricking lever" (S4) to the "Hoist" (push it down) side to raise the jib.

(Winch specification)

10. Operate the "Hook hoisting and lowering lever" (S2) to both "Lower" (push it up) and "Hoist" (push it down)" side, and check that the hook follows the lever operation.

(Winch specification)

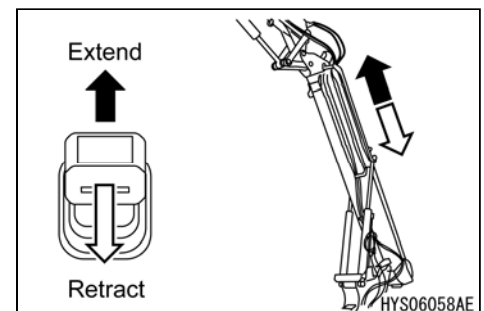
11. Operate the "Hook hoisting and lowering lever" (S2) to the "Lower" (push it up) side and lower the hook as much as possible.



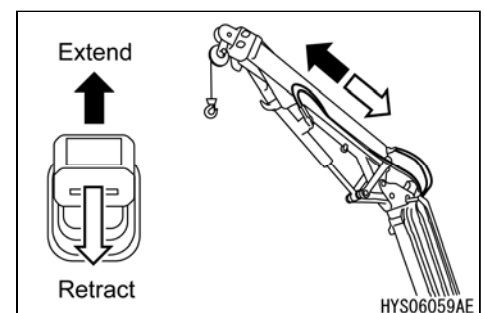
CAUTION

Be careful not to allow the winch wire to slack during hook operation. If it is wound irregularly, the wire may be damaged and the roller may be broken.

12. Use the "Main boom telescoping lever" (S3) to both the "Extend" (push it up) and "Retract" (push it down) area, and check that the main boom follows the lever operation.

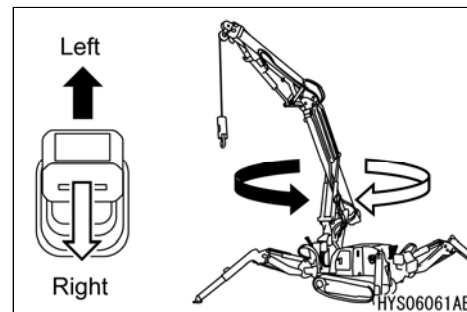


13. Operate the "Jib telescoping lever" (S5) to both the "Extend" (push it up) and "Retract" (push it down) side, and check that the jib follows the lever operation.



14. Operate the “Slewing lever” (S6) to both the “Left” (push it up) and “Right” (push it down) side, and check that the crane follows the lever operation.

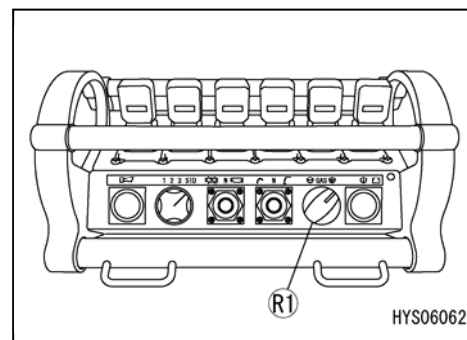
In addition, practice a slew around “360 degrees” or more to check for any abnormal conditions.



15. Set the “Acceleration dial” (R1) (maximum engine speed) to any position.

(The maximum engine speed can be set to increase on the + side.)

Check that when each operation lever is pushed down, the crane speed increases according to the operation amount and the engine speed increases also.



NOTES

- When the speed selector rotary switch is set to “STD”, the acceleration dial is set to MAX (turn the dial fully to the + side) and each operation lever is pushed down to the maximum, the crane speed becomes the maximum (engine speed becomes the maximum).
- When the speed selector rotary switch is set to “STD” and the acceleration dial is set to MIN (return the dial fully to the - side), engine speed does not increase even if each operation lever is pushed down to the maximum.

16. During each control lever operation of step 5 through step 13, above, operate the crane using respective commands of the “Speed selector rotary switch” (S10) and check that the speed of each operation (micro speed) corresponds to respective commands.

NOTES

- Rotary switch 1: Micro speed 1
- Rotary switch 2: Micro speed 2
- Rotary switch 3: Micro speed 3 (User micro speed mode)
- Rotary switch STD: Usually interlocked with the acceleration dial.

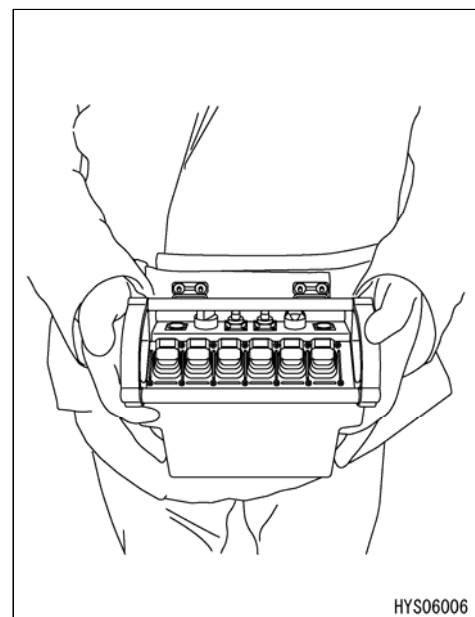
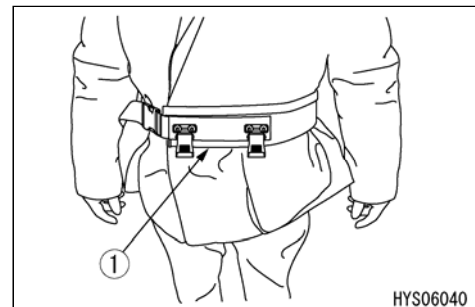
7. OPERATION

WARNING

- Never attempt to dismantle or modify the Transmitter and Receiver. Otherwise, an electric shock or fire may be caused.
- Avoid dropping or hitting the Transmitter. A damaged part of the enclosure allows water to enter inside that can cause trouble or failures and may result in a serious hazard, such as a malfunction or electrical shock.
In the event of dropping and damage, contact us or our sales service agency for repair.
- Never wash the Transmitter and Receiver with water. That allows water to enter inside and can cause trouble or failures and may result in a serious hazard, such as a malfunction or electrical shock.
- Simultaneous remote control operation and manual operation of the crane are allowed.
That may cause unexpected behaviour of the Crane and result in a serious hazard. The Crane must be operated by one method only.
- Prior to starting the remote control operations, always conduct inspections of both the Transmitter and Receiver, in accordance with “6. PRE-OPERATION INSPECTION”.

7.1 CAUTIONS BEFORE OPERATION

1. To prevent the Transmitter from being accidentally dropped, wear the waist belt (1) around your waist and attach the Transmitter to the waist belt (1).
2. Always conduct inspections of both the Transmitter and Receiver, in accordance with “6. PRE-OPERATION INSPECTION”.
3. Be sure to honk the horn to let operators on the worksite know before starting remote control operation.



NOTES

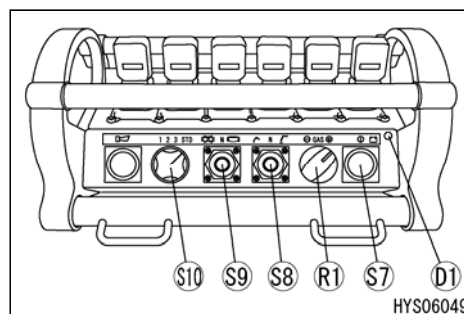
- In the case of the remote control system, replace the battery with a charged one as soon as the status LED flashes in red and a signal sound starts to sound.
- In the case of the remote control system, radio wave may not be received even at close range due to jammer or depending on reflection conditions in the vicinity.
Operate as close to the Receiver antenna as possible.
- In the event that the remote control operation is discontinued for the length of the “Auto shut -OFF time” or longer during the crane operation, the Transmitter power will automatically turn “OFF”. To resume the remote control operation, press the start button of the Transmitter twice to turn the power “ON”.

7.2 OPERATION IN OUTRIGGER MODE

! WARNING

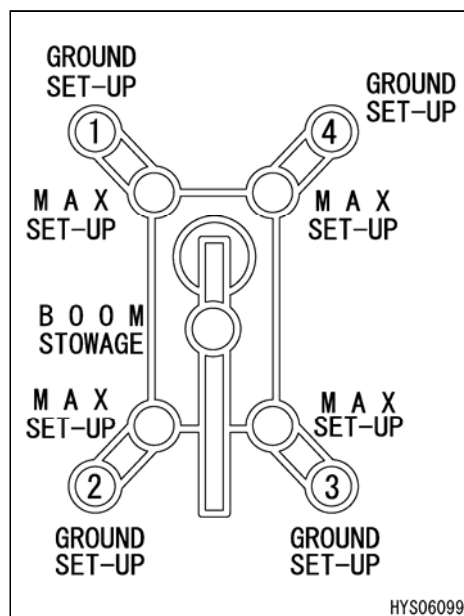
- Make sure the Transmitter operation levers all operate smoothly and return to the neutral position when you release your finger.
- Each operation lever of the Transmitter will be blocked by its stopper when it is pushed fully. When it is blocked, do not attempt to push further. Otherwise, it may damage the Transmitter and cause faults and result in a serious accident.
- When operating the outriggers, be sure to switch the “Outrigger/Crane” selector switch (S8) to the outrigger mode. In the Crane mode, the crane operates unexpectedly, which is very dangerous.
- When operating the outriggers, always keep the engine speed in the low or middle range. When the engine is controlled to high speed, outriggers move too quickly which may result in serious accidents including tipping of the machine.
- When operating the outriggers, always configure the Crane to the stow position. In the condition that the boom is raised or any load is lifted, it may cause a serious accident, such as tipping of the Crane.
- When operating the outriggers, always ensure that the position pin of each outrigger is securely inserted. In the event where the pins are missing during operation, the machine may be tipped over and cause a serious hazard.

1. Turn “ON” the main starter switch on the machine side.
2. Press the “start button” (S7) of the Transmitter twice to turn the power “ON”. At this time, “status LED” (D1) flashes in green.
3. Push down the Transmitter “Outrigger/Crane” selector switch (S8) to the outrigger side and set the operation mode to the “Outrigger mode”.
4. Set the “speed selector rotary switch” (S10) of the Transmitter to the STD position and “acceleration dial” (R1) to the idling position (return to the - side fully).
5. Push down the “Engine start switch” (S9) to the start side to start the engine.

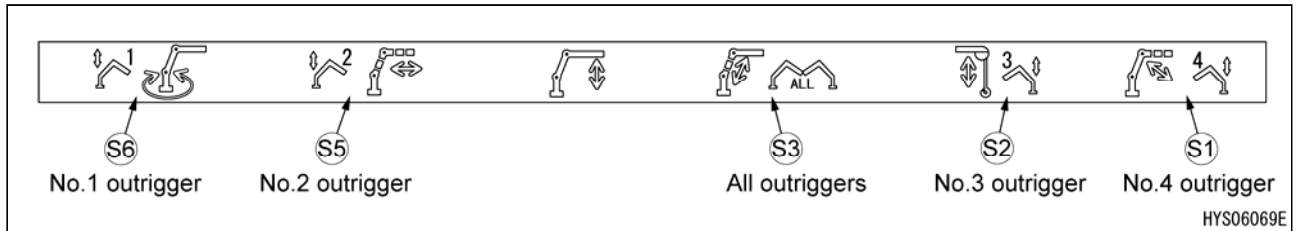


NOTES

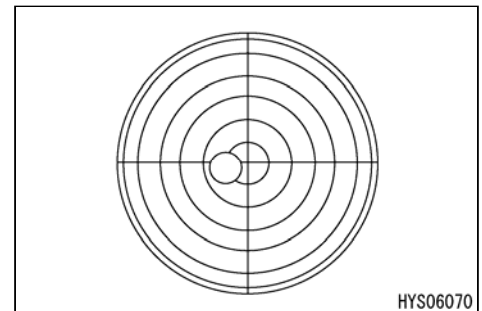
This Crane is equipped with 4 sets of outriggers and number labels (1) to (4) are fixed on each. These labels correspond to the number of each operation lever in the Transmitter. (See the figure on the right)



7.2.1 OUTRIGGER SETTING



1. Operate one of outrigger operation levers to “Extend” (lower) side to set the outrigger.
2. Repeat the same process for the other three outriggers and slowly extend the four outriggers evenly to set the machine to the specified height.
3. Set the outriggers so that the machine is elevated “approximately 80 mm” from the ground.
4. Use the level gauge on the machine body and check the levelness of the machine. When the machine is not level, operate each outrigger individually so that the machine is set level.



CAUTION

- When setting the outriggers with the “Collective outrigger” operation lever, release your finger from the collective outrigger operation lever and place the lever in the “neutral” position when the first outrigger makes contact with the ground. Have the remaining three outriggers make contact with the ground using each outrigger operation lever. After that, set the outriggers so that the machine is elevated “approximately 80 mm” from the ground.
- When switching the mode from “Outrigger mode” to “Crane mode”, push down the “Outrigger/Crane” selector switch (S8) to the crane side.

7.2.2 OUTRIGGER STOWING

1. Operate the outrigger operation lever to “Retract” (upper) side.
2. When the machine makes contact with the ground, release your finger from the outrigger operation lever and place it in the “neutral” position.
3. Repeat the same process for the other three outriggers and slowly retract the four outriggers evenly to have the machine contact the ground.
4. After the machine has contacted the ground, retract the four outriggers completely.

CAUTION

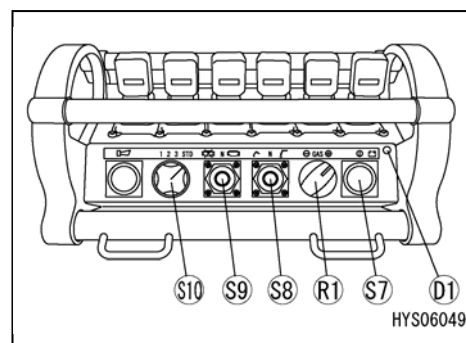
- When stowing the outriggers with the “Collective outrigger” operation lever, operate it to “Retract” (upper) side to stow the four outriggers simultaneously. Be careful that the machine body does not tilt.
- When switching the mode from “Outrigger mode” to “Crane mode”, push down the “Outrigger/Crane” selector switch (S8) to the crane side.

7.3 OPERATION IN CRANE MODE

⚠ WARNING

- When operating the crane, check that all outriggers are securely set and switch to the crane mode with “Crane” button on the monitor.
Any crane operations where outriggers are improperly used may cause the crane to tip over or other serious accidents.
- 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, resulting in a serious hazard.
- Make sure the Transmitter operation levers all operate smoothly and return to the neutral position when you release your finger.
- Each operation lever of the Transmitter will be blocked by its stopper when it is pushed fully. When it is blocked, do not attempt to push further. Otherwise, it may damage the Transmitter and cause faults and result in a serious accident.
- When changing the operation direction of the operation lever of the Transmitter or changing to other operation lever operation, do not make a sudden change. Return the lever to the neutral position once and then perform the operation.
- When operating the crane, be sure to switch the “Outrigger/Crane” selector switch (S8) to the crane mode. In the Outrigger mode, the outrigger operates unexpectedly, which is very dangerous.
- Always actuate the operation lever with caution.
Make adjustments to achieve the optimal operation speed for crane operation to avoid abrupt movement.
Any abrupt acceleration or deceleration especially while a load is hoisted will make a large impact to the Crane and may result in a serious hazard such as Crane tipping or damage.
- While hoisting a load, do not attempt to perform multiple operations simultaneously. That may cause an abrupt change of the load condition and cause a serious hazard such as the Crane tipping or damage.

1. Turn “ON” the main starter switch on the machine side.
2. Press the “start button” (S7) of the Transmitter twice to turn the power “ON”. At this time, “status LED” (D1) flashes in green.
3. Push down the Transmitter “Outrigger/Crane” selector switch (S8) to the crane side and set the operation mode to the “Crane mode”.
4. Set the “speed selector rotary switch” (S10) of the Transmitter to the STD position and “acceleration dial” (R1) from the idling position (return to the - side fully) to the middle speed or slower position.
5. Push down the “Engine start/stop switch” (S9) to the start side to start the engine.



7.3.1 SLEWING OPERATION

WARNING

When performing slewing operations, actuate the operation lever carefully and always keep to a low speed.

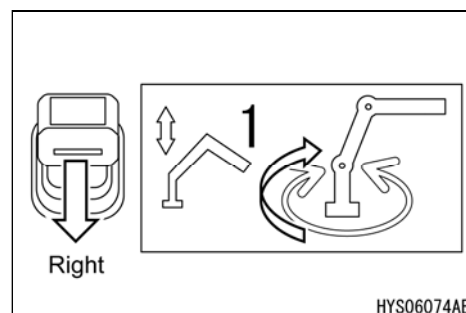
To avoid abrupt slewing, actuate the slewing operation lever slowly and carefully.

Any abrupt acceleration or deceleration especially while a load is hoisted will make a large impact to the Crane and may result in a serious hazard such as Crane tipping or damage.

[1] CLOCKWISE SLEWING

Operate the slewing operation lever (S6) to “Right” (lower) side.

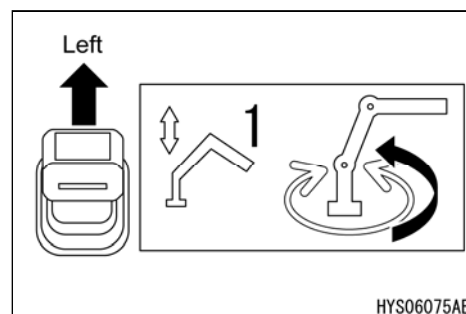
The boom slews clockwise, looking down at the Crane from the sky.



[2] COUNTERCLOCKWISE SLEWING

Operate the slewing operation lever (S6) to “Left” (upper) side.

The boom slews counterclockwise, looking down at the Crane from the sky.



[3] STOP SLEWING

Release your finger from the slewing operation lever (S6) and return it to the neutral position.

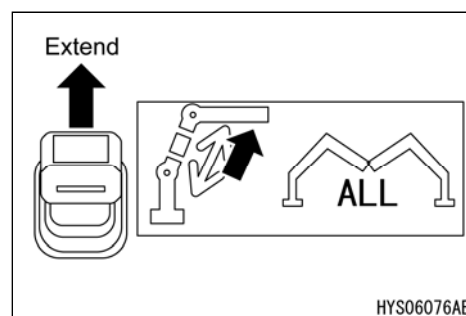
The boom stops slewing.

7.3.2 MAINBOOM TELESCOPING

[1] MAIN BOOM “EXTENDING”

Operate the main boom telescoping operation lever (S3) to “Extend” (upper) side.

The main boom extends.



[2] MAIN BOOM “RETRACTING”

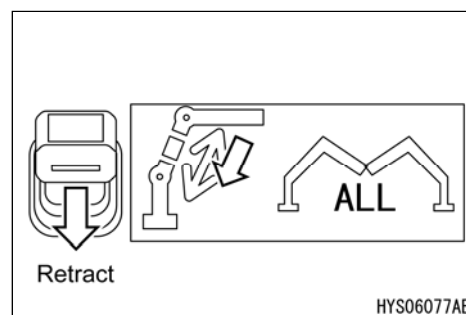
Operate the main boom telescoping operation lever (S3) to “Retract” (lower) side.

The main boom retracts.

[3] STOP MAIN BOOM TELESCOPING

Release your finger from the main boom telescoping operation lever (S3) and return it to the neutral position.

The main boom stops telescoping.



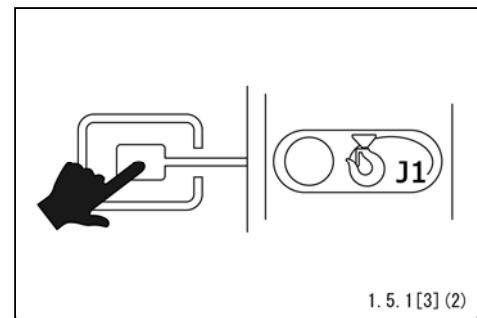
7.3.3 HOOK RAISING AND LOWERING (WINCH SPECIFICATION)

⚠ WARNING

- In the event of operation of “Over-hoist preventive device” or “Over-hoist detector” during the hook raising operation, stop winding immediately. Otherwise, it may break a wire-rope or cause damage to the Crane, resulting in a sudden drop of the hook or load, which may lead to serious accidents.
- When the load has reached the ground, additional lowering of the hook may cause irregular winding and damage the wire rope, thus shortening its life. There is also a risk of the wire rope becoming entangled, preventing further winching. When lowering the hook, pay due attention so that the wire rope will not be wound irregularly.
- The hook is also raised or lowered by main boom and jib telescoping and jib derricking. The same attention must be paid to the boom telescoping and derricking as in the hook raising and lowering operation.

[1] SETTING OF MONITOR

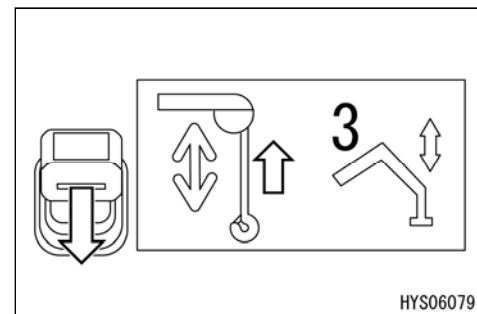
SEE “WINCH 1.3 MONITOR” and set to the wire single fall specification: J1.



[2] HOOK RAISING

Operate the hook raising and lowering operation lever (S2) to “Raise” (push it down) side.

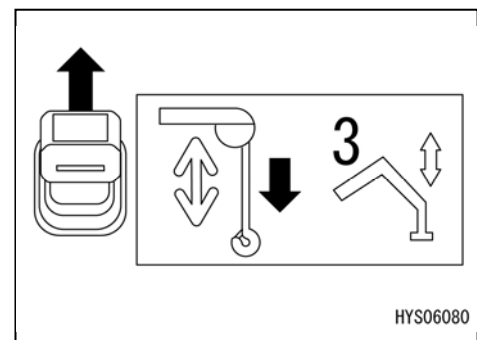
The hook starts to rise.



[3] HOOK LOWERING

Operate the hook raising and lowering operation lever (S2) to “Lower” (push it up) side.

The hook starts to lower.



[4] STOP RAISING OR LOWERING

Release your finger from the hook raising and lowering operation lever (S2) and return it to the neutral position.

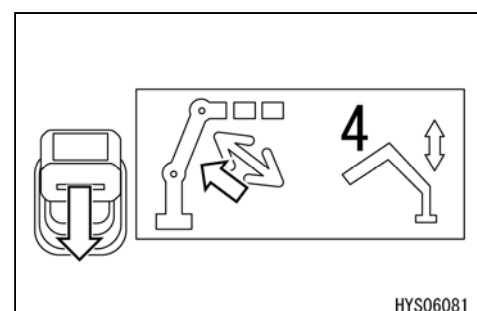
The hook stops raising or lowering.

7.3.4 MAIN BOOM DERRICKING

[1] MAIN BOOM “HOISTING”

Operate the main boom derricking operation lever (S1) to “Hoist” (push it down) side.

The main boom will rise.



[2] MAIN BOOM “LOWERING”

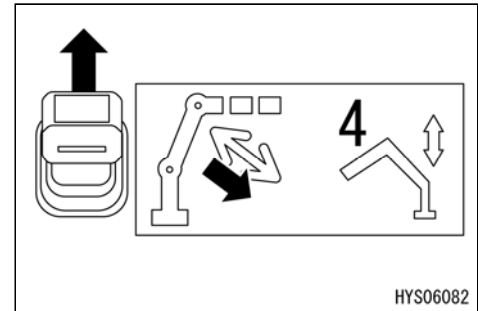
Operate the main boom derricking operation lever (S1) to “Lower” (push it up) side.

The main boom will lower.

[3] STOP MAIN BOOM DERRICKING

Release your finger from the main boom derricking operation lever (S1) and return it to the neutral position.

The main boom stops derricking.

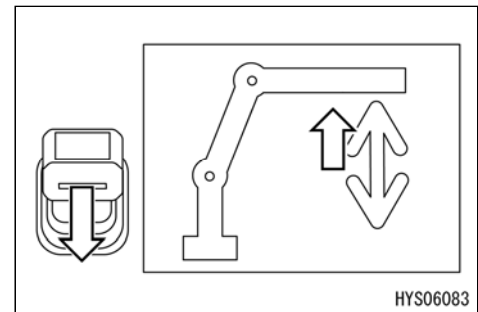


7.3.5 JIB DERRICKING

[1] JIB “HOISTING”

Operate the jib derricking operation lever (S4) to “Hoist” (push it down) side.

The jib will rise.



[2] JIB “LOWERING”

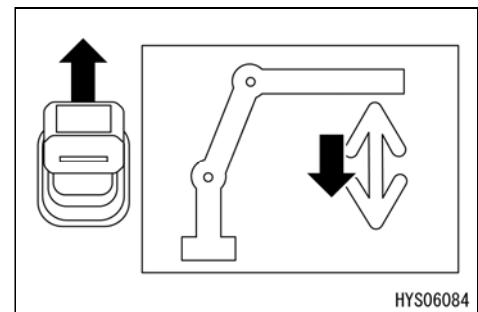
Operate the jib derricking operation lever (S4) to “Lower” (push it up) side.

The jib will lower.

[3] STOP JIB DERRICKING

Release your finger from the jib derricking operation lever (S4) and return it to the neutral position.

The jib stops derricking.

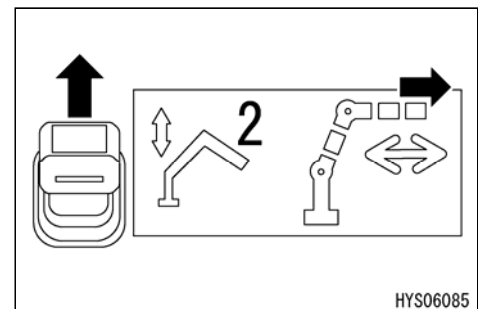


7.3.6 JIB TELESCOPING

[1] JIB “EXTENSION”

Operate the jib telescoping operation lever (S5) to “Extend” (upper) side.

The jib extends.



[2] JIB “RETRACTION”

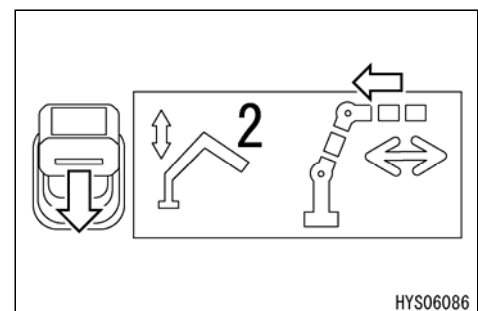
Operate the jib telescoping operation lever (S5) to “Retract” (lower) side.

The jib retracts.

[3] STOP JIB TELESCOPING

Release your finger from the jib telescoping operation lever (S5) and return it to the neutral position.

The jib stops telescoping.



7.3.7 SPEED SELECTOR ROTARY SWITCH: (S10)

When it is required to operate the Crane at low speed, the maximum speed of the Crane is limited if the speed selector rotary switch is set to any of 1, 2 and 3, and speed control at low speed can be performed smoothly.

Set value of speed selector rotary switch

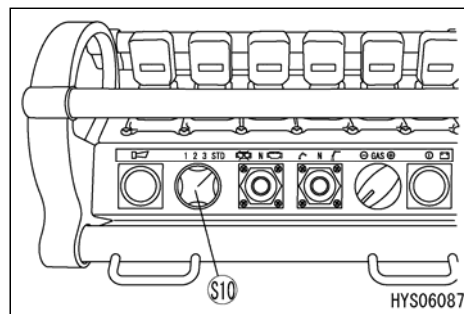
- 1 Micro speed 1
- 2 Micro speed 2
- 3 Micro speed 3 (User micro speed mode)
- STD Ordinary

Linked operation with acceleration dial R1

Slow



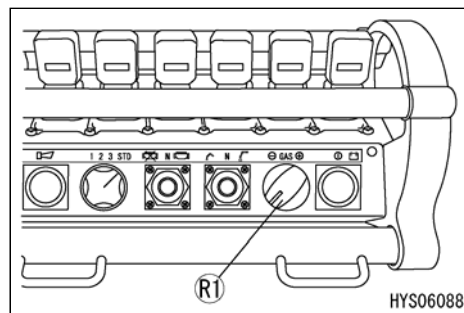
Fast



7.3.8 ACCELERATION DIAL: R1

This is used to adjust the maximum engine speed.

1. Set the acceleration dial (engine speed) to any position.
(The maximum engine speed can be set to increase on the + side.)
2. Set the speed selector rotary switch (S10) to STD. (See P.6 - 16)
3. When each operation lever is pushed down, the Crane speed increases according to the operation amount and the engine speed increases also.



NOTES

1. When the speed selector rotary switch is set to STD, the acceleration dial is set to MAX (turn the dial fully to the + side) and each operation lever is pushed down to the maximum, the Crane speed becomes the maximum (engine speed also becomes the maximum).
2. When the speed selector rotary switch is set to STD and the acceleration dial is set to MIN (return the dial fully to the - side), engine speed does not increase even if each operation lever is pushed down to the maximum.

7.3.9 EMERGENCYSTOP SWITCH OPERATION

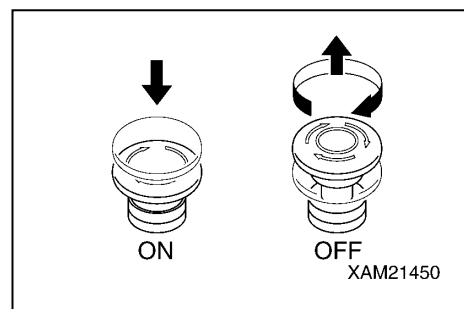
⚠ WARNING

- For any abnormalities in crane operations, immediately press the emergency stop switch to stop the engine. Abnormal cases include: continuation of crane operations even after the release of operational levers, or automatic crane operation before the operation levers are used.
- In the event of an emergency stop of the engine, investigate the cause for the abnormality and repair the fault location.
- The emergency stop switch can be used to turn the power of the remote control Transmitter OFF and to stop the engine.

Press the emergency stop switch to turn the power of the Transmitter OFF or when an abnormality has occurred in the crane operation.

The power of the Transmitter turns OFF and the engine stops.

To cancel, turn the emergency stop switch clockwise. The switch returns to the original position.



NOTES

To operate manually, press the emergency stop switch and then return it to the original position.

7.3.10 ENGINE START AND STOP OPERATION

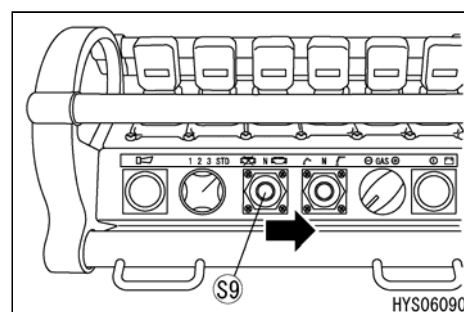
[1] ENGINE START OPERATION

To start the engine with the Transmitter, push down the start/stop switch (S9) to the start side. The engine starts.

When you release your finger, the switch returns to the neutral (N) position.

CAUTION

When starting the engine by pushing down the start/stop switch, turn the main starter switch on the main body of the machine side to the “ON” position. When the main starter switch on the main body of the machine side is in the “OFF” position, the engine does not start even if the start/stop switch is pushed down.



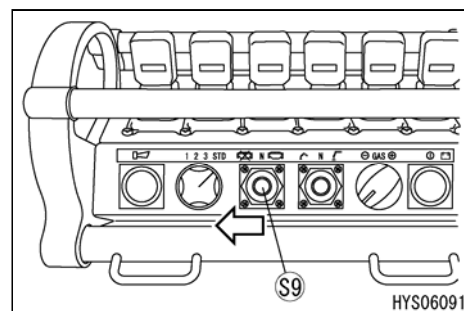
[2] STOP OPERATION

To stop the engine with the Transmitter, push down the start/stop switch (S9) to the stop side. The engine stops.

When you release your finger, the switch returns to the neutral (N) position.

NOTES

- When the engine is running, the engine starter is not activated even if the start/stop switch is pushed down to the start side.
- To operate the start/stop switch, press the start button of the Transmitter twice to turn the power “ON”.



7.4 CHECKING AFTER CRANE OPERATION

WARNING

- When the operation of the Crane is finished, always press the emergency stop switch of the Transmitter to turn the power “OFF”.
- On no occasion except for Crane operations, must the power of the Transmitter be turned ON. This could cause unexpected movement of the Crane resulting in a serious hazard, such that the Crane hitting someone or an object, or the Crane could tip.
- When it is required to turn ON the Transmitter for the purpose of inspection or such, ensure that the engine is not running.

1. Switch the “Outrigger/Crane” selector switch (S8) of the Transmitter to the “Crane Mode”.
2. Operate the operation levers to set the main boom and jib to be fully retracted and lowered and stow them in place.
3. Switch the “Outrigger/Crane” selector switch (S8) of the Transmitter to the “Outrigger Mode”.
4. Use the operation levers and stow all the outriggers so that the Crane is configured to the travelling position.
5. Press the emergency stop switch of the Transmitter to turn the power “OFF”. The engine also stops.
6. Turn the main starter switch on the machine side to the “OFF” position to turn the power OFF.
7. Check the Transmitter and Receiver.
 - (1) Check operation levers and switches of the Transmitter for any faults.
 - (2) Wipe off oil or dirt with a clean cloth.
 - (3) Repair all cracks or damages without fail.
8. Store the Transmitter in a dry and cool place where the wind and rain or direct sun light is sheltered.

8. HANDLING BATTERY

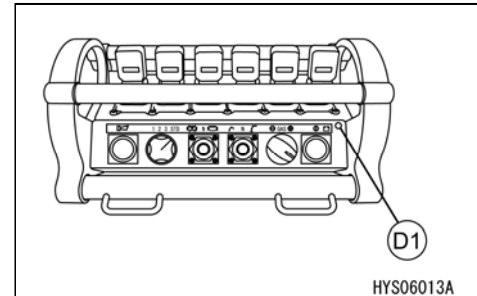
NOTES

- The battery used for the Transmitter is an exclusive battery. The model is BA225030 (6V DC/1500mAh).

8.1 REPLACEMENT TIMING OF BATTERY

Replace the battery when the status LED (D1) of the Transmitter flashes in red and a signal sound starts to sound.

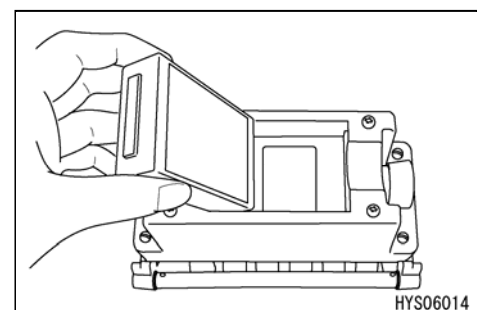
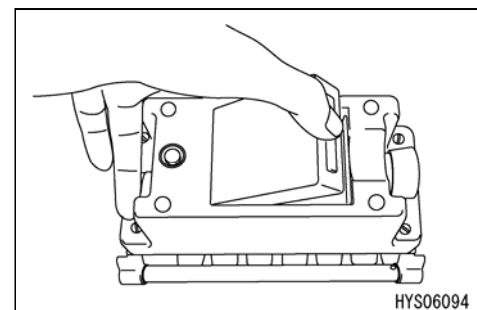
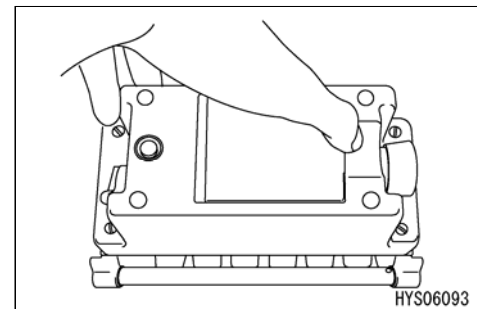
If the battery is not replaced, the Transmitter stops in a few minutes.



8.2 REPLACEMENT METHOD OF BATTERY

Replace the battery of the Transmitter in the procedure described below.

1. Turn "OFF" the power of the Transmitter.
When the emergency stop switch (S12) is pressed and turned in the arrow direction for cancellation, the power turns "OFF".
2. Lift the battery upward while pushing it. The battery comes off.
3. Insert a charged battery into the Transmitter while pushing it.
4. Check that the power turns "ON" with the start button (S7). Press the start button (S7) twice and check that the status LED (D1) flashes in green.



8.3 CHARGING METHOD OF BATTERY

To charge the battery, use only the supplied battery charger.

⚠ WARNING

- Use the battery charger only for charging of the battery described on the model label.
- Do not charge the battery in an explosion hazardous area under any circumstances.
- Use the battery charger only under the voltage condition described on the back.
- Do not use the battery charger outside the described temperature range.
- Protect the battery charger from overheat, dust, humidity, etc.
- Do not cover the battery charger with an object during charging.
- Pull the battery charger out of the power supply when not in use.
- If any damage is found on the battery charger body or its cord, stop using it at once.
- Do not modify or change the battery charger or cord.

CAUTION

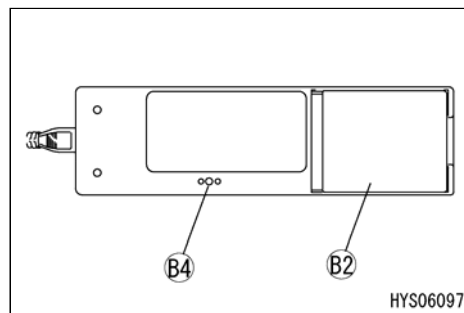
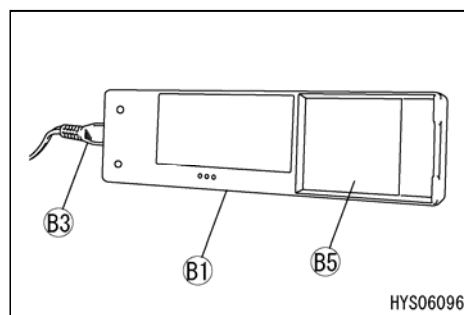
- The battery capacity depends on the number of years used and environmental temperature. The capacity decreases when the battery becomes old. The battery capacity decreases substantially at 0C° or less and at 40C° or above.
- Be sure to charge the battery before the initial use or when at least 6 months have passed since the last use. The whole capacity can be used from around the time when the battery is discharged and charged 3 to 5 times.
- Charge the battery at ambient temperature of 0 - 40C°.
- Charge the battery when the status LED (D1) flashes in red and an intermittent signal sound starts to sound.
- To avoid overdischarge, charge the battery fully before long-term storage. Be careful not to leave the battery standing for 6 months or longer.
- Keep the battery at room temperature.
- Use a supplied protective cap at the time of storage and never allow the battery to be short-circuited.
- When the battery is correctly used, it can be charged and discharged 500 times or more.
- When the overdischarged battery is charged, red LED illuminates for a few seconds before charging starts (orange LED comes on).

Charge the battery of the Transmitter in the procedure described below.

1. Install the battery (B2) to the charging case (B5) while pushing it.
Connect the battery charger (B1) to the cord (B3) and insert the cord plug into the power supply (100-240V AC).
3. The battery charger LED (B4) illuminates in orange and charging starts.
4. When charging is completed (after 1 - 2 hours), LED (B4) turns into green.
5. After charging is completed, disconnect the cord plug from the power supply.

NOTES

- The charging state is displayed in the following 3 LED lamps.
GreenLED: Illuminates when charging is completed.
OrangeLED: Illuminates during charging.
RedLED: Illuminates when the battery is overdischarged or fails.



9. TROUBLESHOOTING

9.1 BEFORE TROUBLESHOOTING

“While the Crane operates perfectly from control on the machine body side, part or whole functions are inoperable from the remote control.” In the event of failure as above, perform the DIAGNOSIS shown in the following pages.

CAUTION

Before performing troubleshooting on the following page onward, check according to the inspection item order shown below.

Such an error may be occasionally fixed by simple practice, such as applying another operation procedure or replacing the battery.

If the faults persist after the following check items and troubleshooting on the following pages onward are performed, contact us or our sales service agent for repair.

In the case of an electric failure of this equipment, the crane can be operated with manual operation on the machine body side after the power is turned “OFF” with the emergency stop switch of the Transmitter.

Check item	Cause and Action
Does the crane operate with the operation on the machine body side?	If the crane operates, there is an abnormality in this equipment. If the crane does not operate, troubleshoot the machine body.
Is the power turned ON with the Transmitter and main key switches?	If the power is not turned ON, turn it ON.
Does the emergency stop switch remain ON?	Cancel the emergency stop switch on the Transmitter and machine body side.
Is the outrigger/crane selector switch in the neutral (N) position?	Switch the outrigger/crane selector switch.
Does the status LED of the Transmitter flash in green?	If it flashes in red, replace the battery with a charged battery.
Is the Transmitter deformed or broken?	If the Transmitter is deformed or broken, repair or replace it.
Is each operation lever of the Transmitter in the neutral position?	If the control levers or operation switches show any sign of a fault or malfunction, repair or replace them.
Is the fuse in the Receiver blown?	Check whether the fuse is blown or not; check the cause when blown, then replace with a new one.

9.2 ERRORS IN THE REMOTE CONTROL DEVICES

- When diagnosing the error, always verify on the monitor LED of the Receiver and the status LED (D1) on the Transmitter. Then, match the error with a suitable description from the table below, guess the cause and take actions.
- First, perform the “Remedy 1” in the table, then continue to “Remedy 2” if the error persists.
- Make sure that you contact us or our sales service agent for the actions marked with ★ in the table.
- When any other causes are suspected, other than listed below, contact us or our sales service agent.

Symptom		Major Cause(s)	Remedy	
Transmitter	Receiver		Remedy 1	Remedy 2
When the power of the Transmitter is turned ON with the start button (S7), the status LED (D1) does not flash in green. (remains OFF)	—	• Reception error/Beyond reachable range	<ul style="list-style-type: none"> • Press the emergency stop switch once to cancel and then press the start button twice. • Perform the above operation near the Receiver. 	★ Inspection, repair, replacement
		• The operation lever is not in the neutral position.	• Check that the operation lever is in the neutral position and press the start button twice.	★ Inspection, repair, replacement
		• The emergency stop switch remains ON.	• Cancel the emergency stop switch.	
		• The battery is faulty. (The life of the battery, etc.)	• Replace the battery with a charged one.	★ Inspection, repair, replacement
		• The power is not turned ON.	<ul style="list-style-type: none"> • Check the battery terminal for damage and contamination. • Insert the battery correctly. 	★ Inspection, repair, replacement
		• The operating temperature range is exceeded.	• Use it in the range of 0 - 40C°.	
When the power of the Transmitter is turned ON with the start button (S7), the status LED (D1) flashes in red.	—	• The battery is overdischarged.	<ul style="list-style-type: none"> • Replace the battery with a charged one. • Charge the battery with the exclusive battery charger and replace. 	★ Inspection, repair, replacement
		• The battery is faulty. (The life of the battery, etc.)	• Replace the battery with a charged one.	★ Inspection, repair, replacement

Symptom		Major Cause(s)	Remedy	
Transmitter	Receiver		Remedy 1	Remedy 2
Although the status LED (D1) of the Transmitter flashes in green, the crane speed is slow.	—	<ul style="list-style-type: none"> The speed selector rotary switch is set to 1, 2 and 3. 	<ul style="list-style-type: none"> Set the speed selector rotary switch to STD. 	
Although the status LED (D1) of the Transmitter flashes in green, the crane does not operate even if the operation lever is operated. (It operates properly from manual operation on the crane body side.)	—	<ul style="list-style-type: none"> The “outrigger/crane” selector switch is in the neutral (N) position. 	<ul style="list-style-type: none"> Switch the “outrigger/crane” selector switch. 	
		<ul style="list-style-type: none"> The start button is pressed only once. 	<ul style="list-style-type: none"> Press the start button twice and check that the remote control mark is displayed on the monitor. 	
	ON of the monitor LED (yellow) does not illuminate.	<ul style="list-style-type: none"> Broken wire on the Receiver side 	★ Inspection, repair, replacement	
		<ul style="list-style-type: none"> Fault of the Receiver 	★ Inspection, repair, replacement	

10. PRINCIPLE SPECIFICATION LIST

Item		
Compliant Radio Law		Overseas specification
Radio frequency		2402-2480MHzband
Transmission output		100 mW
Channel spacing		1 MHz
Reachable range of radio waves		100 m or longer (under a good condition where there is no radio interference)
Unique address		Extracted and set from 1 million or more addresses at the time of shipment from factory
Waterproof		IP65
System configuration		Combined use of manual operation and remote control operation
Transmitter antenna		Built-in type
Operating status display		Status LED • Battery status display • Reception fault Monitor LED • Receiver power status display • Transmitter power status display • Feedback and telegram display
Safety device		Emergency stop switch
		Misoperation avoidance function during interruption of remote control
		Electronic key (unique address)
		Automatic power OFF device (Auto power off device)
		Transmitter stop function when battery capacity decreases
		Alarm switch
Transmitter voltage		Battery BA225030 (6VDC-1500mAh)
Receiver voltage		Power of crane main body (12VDC)
Continuous operating hours of Transmitter		Approx. 20 hours
Ambient operating temperature		-25°C to +70°C
Transmitter mass		Approx. 1.5 Kg (including battery)
Operation items of Transmitter	Operation lever switch	Main boom derricking/No.4 outrigger
		Hook raising and lowering/No.3 outrigger
		Main boom telescoping/All outriggers
		Jib derricking
		Jib telescoping/No.2 outrigger
		Slewing/No.1 outrigger
	Push button switch	Start button
		Horn
		Emergency stop switch
	Toggle switch	Engine start/stop
		Outrigger/Crane selector switch
	Rotary switch	Speed selector rotary
	Dial switch	Accelerator

ELECTRIC MOTOR

1. PRECAUTIONS FOR USE OF ELECTRIC MOTOR	7- 2
2. SAFETY LABEL LOCATIONS	7- 3
3. NAME OF EACH SECTION	7- 5
4. OPERATION	7-12
5. LONG-TERM STORAGE	7-20
6. ELECTRIC MOTOR TROUBLESHOOTING	7-21
7. METHOD OF REMOVING AND INSTALLING POWER UNIT	7-22
8. PRINCIPLE SPECIFICATION LIST	7-27
9. SPECIFICATION DIMENSIONAL DRAWING	7-29

1. PRECAUTIONS FOR USE OF ELECTRIC MOTOR

⚠ WARNING

The following precautions should always be observed when using this machine. If these, or the electric motor are disregarded, a serious accident may occur.

- Installation work using this machine must comply with laws and regulations of your country. Contact us or our sales service agency if no laws or regulations are applied.
- Only an electrical chief engineer under the voluntary security system based on the Electric Utility Industry Law or a registered electrician based on the Electricians Act is allowed to establish power connection of the power supply equipment or inspect and repair the electric system. Contact us or our sales service agency if there is no person having the above qualification.
- 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: 90%RH or less (no condensation)
 - Atmosphere: Outdoor environment free from explosive, flammable, and corrosive gases, moisture, and excessive dust particles
 - Altitude: 1000 m or less
 - Vibration: 1G or less
- Turn "OFF" the power supply equipment breaker promptly in the event of anything abnormal on the machine during operation. Fire or an electric shock may occur if disregarded.
- Turn "OFF" the power supply equipment breaker promptly in the event of a power failure during operation. Otherwise the machine may inadvertently operate upon energization.
- Always turn "OFF" the power supply equipment breaker before performing inspection and maintenance of the electric system. An electric shock may occur during work if disregarded. In addition, notify all personnel at the workplace that inspection and maintenance are being performed and attach a warning tag indicating "Operation Prohibited" to the power supply equipment breaker so that other persons will not accidentally operate the breaker.
- Always turn "OFF" the power supply equipment breaker and wait for 10 minutes or longer before performing inspection and maintenance of the electric system. Measure the voltage using a tester and ensure that no voltage is applied to the power supply box.
- All the parts are at elevated temperatures immediately after machine operation. Performing inspection and maintenance of the electric system under this condition causes burns. Wait until the temperature lowers, then execute the inspection/maintenance following the procedure described in this manual.
- Do not spray water directly on the power supply box and inverter board. Water entering the electrical system is dangerous and may cause faulty or improper operations.
- Contact us or our sales service agency for repairs inside of the inverter board.

CAUTION

See "SAFETY" for safety precautions that are not provided in this section.

However, the weight (mass) of a machine varies between a standard specification machine and a machine fitted with both electric motor.

See the following figure for the weight (mass) of the machine described in "SAFETY 3. TRANSPORT PRECAUTIONS".

MK1033CW—1 MACHINE WEIGHT	
Model	Weight
MK1033CW-1	2290 kg
MK1033CW-1 with winch	2390 kg
MK1033CWE-1	2270 kg
MK1033CWE-1 with winch	2370 kg

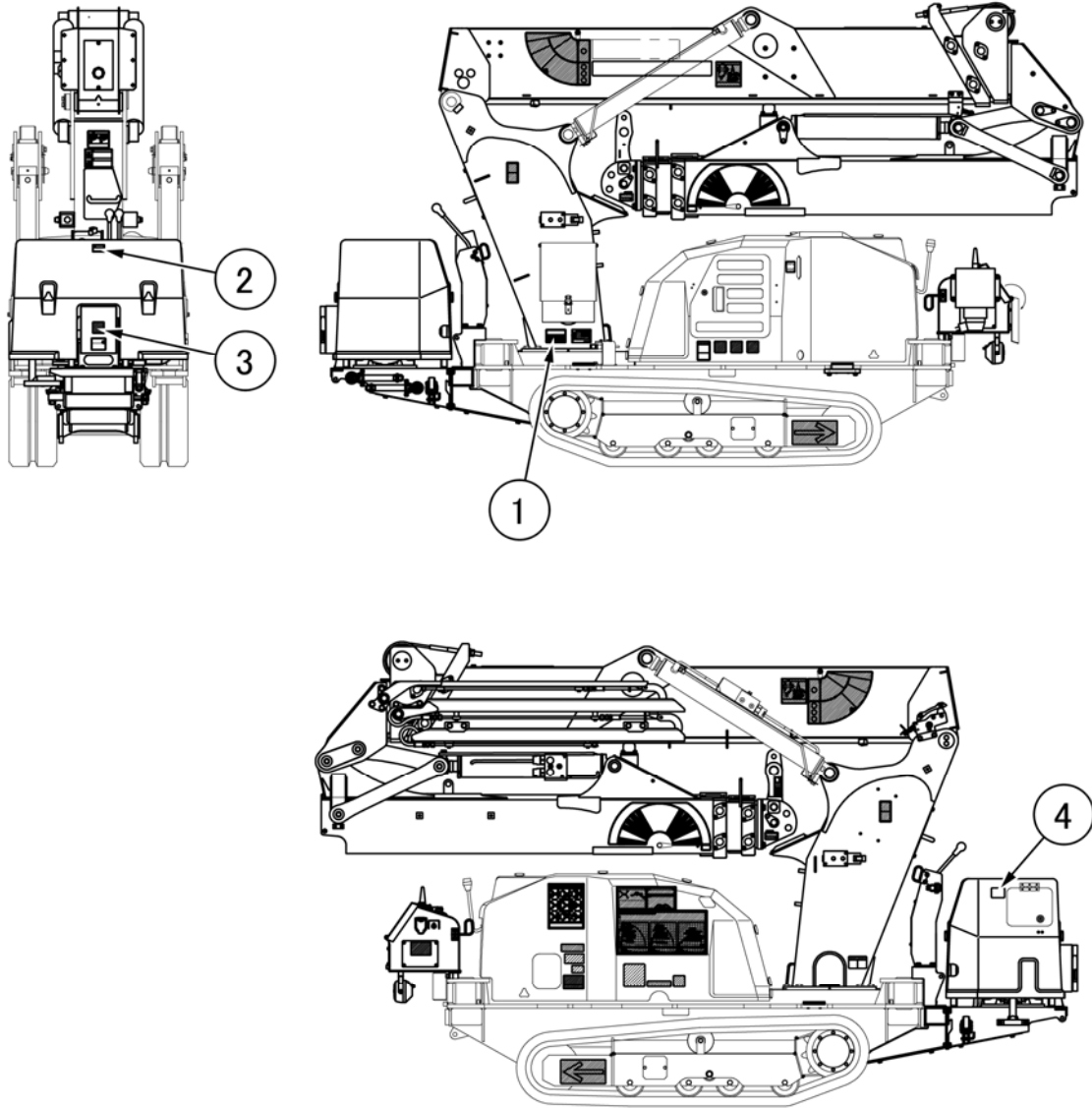
200-4680800

2. SAFETY LABEL LOCATIONS

Keep safety labels clean and visible at all times.

If lost, replace immediately or apply for a new one.

There are labels other than safety labels shown below, treat them in the same manner.



SAM12551

CAUTION

Different and supplementary labels are applied to the machine according to the electric motor, compared with the standard specification machine. This section describes the labels designed for the machine fitted with the electric motor.

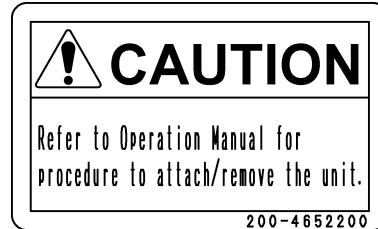
See “SAFETY 6. Safety LABEL LOCATIONS” for the safety labels that are not described in this section.

(1) Total machine weight (200-4680800)

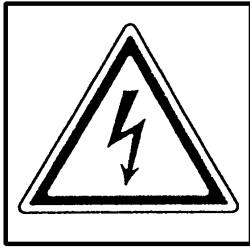
MK1033CW—1 MACHINE WEIGHT	
Model	Weight
MK1033CW-1	2290 kg
MK1033CW-1 with winch	2390 kg
MK1033CWE-1	2270 kg
MK1033CWE-1 with winch	2370 kg

200-4680800

(2) Removal/Attach method (200-4652200)



(3) Electric shock caution (553-4267300)



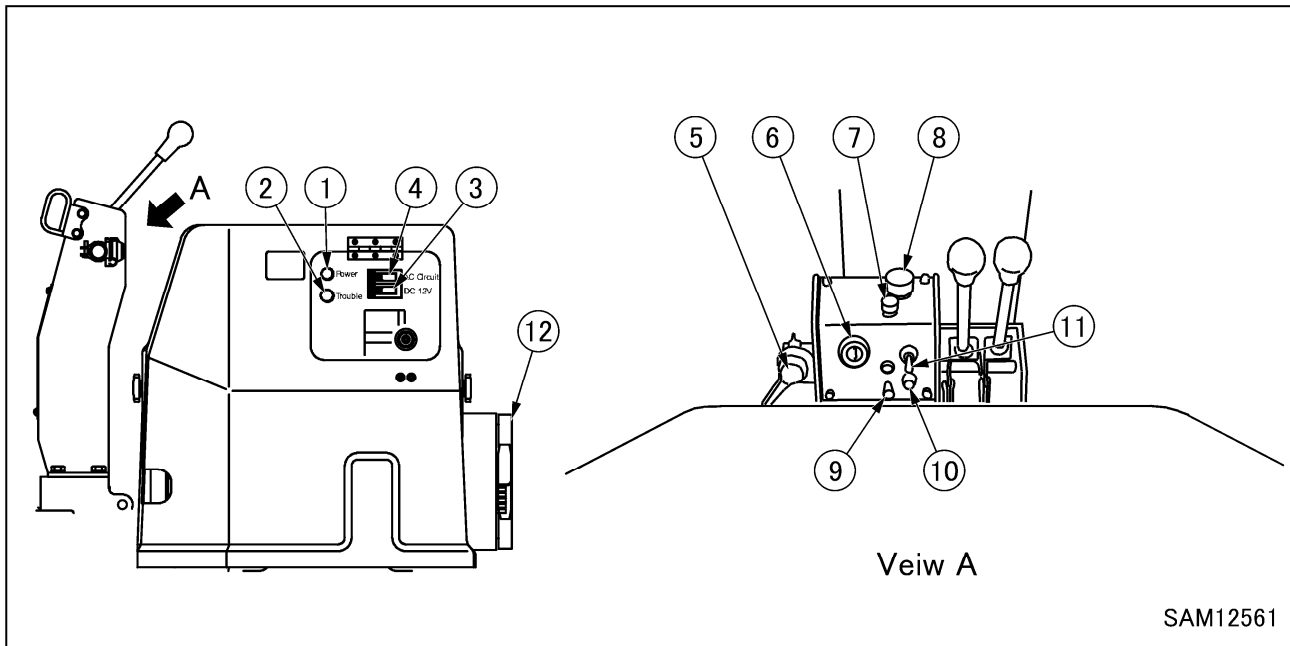
553-4267300

(4) Washing caution (350-4539700)



3. NAME OF EACH SECTION

3.1 TRAVELLING UNIT



- | | |
|---|---------------------------------------|
| (1) Power lamp (white) | (8) Emergency stop switch |
| (2) Trouble lamp (red) | (9) Headlight switch |
| (3) DC12V Power supply switch | (10) Fuse (10A) |
| (4) Alternating-current circuit power supply switch | (11) Engine and electric motor switch |
| (5) Accelerator lever | (12) Power supply box |
| (6) Main starter switch | |
| (7) Horn switch | |

CAUTION

This section describes only the switches and monitors that are available when the machine is powered by an electric motor.

- The switches and monitors described in this section are as follows (4 pieces).
Main starter switch (6), engine and electric motor switch (11), emergency stop switch (8), hour meter.
See "OPERATION 1.3 CRANE OPERATION UNITS" for details of other switches and monitors.

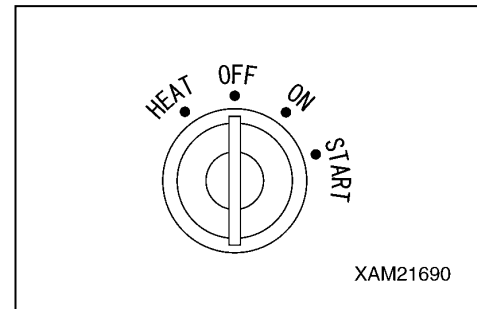
[1] MAIN STARTER SWITCH (6)

CAUTION

Always turn the main starter switch to the “OFF” position at the end of work.

Use this switch to start and stop the electric motor.

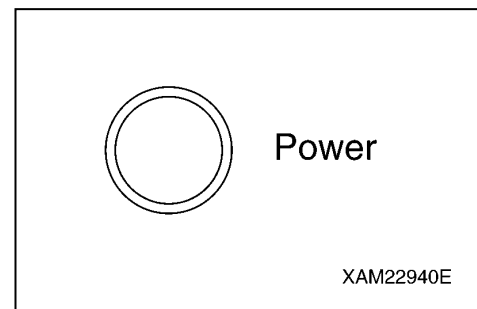
- HEAT (Preheat) : This position is not used.
- OFF : You can insert/remove the key at this position. All the switches in the electrical system are turned off and the electric motor stops.
- ON : Electricity runs into the Inverter unit.
- START : A position where the electric motor starts. When the electric motor has started, release your hand from the key. The key automatically returns to the “ON” position.



[2] ENGINE AND ELECTRIC MOTOR SWITCH (11)

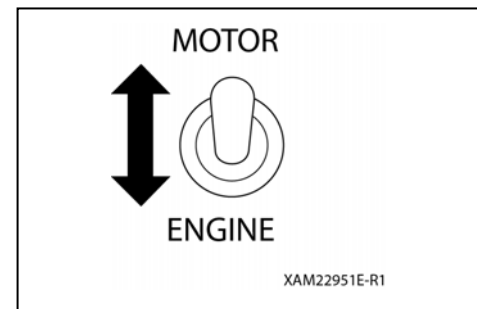
CAUTION

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.



Use this to switch the power output source of the machine.

- Engine : Push the switch down.
The engine is designated as a power output source.
- Electric motor : Push the switch up.
The electric motor is designated as a power output source.



[3] EMERGENCY STOP SWITCH (8)

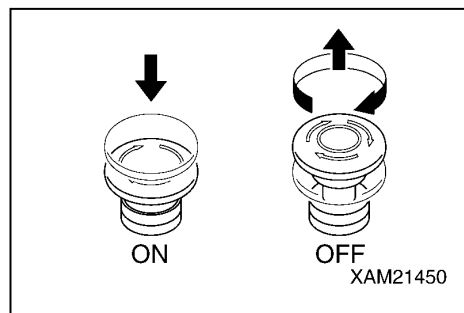
Use this switch in case of an error with the machine and the need to stop the electric motor immediately.

- ON : Press the switch. The electric motor stops.
- OFF : Turn the switch clockwise (direction of the arrow in the right figure), or pull the switch toward you.

The switch returns to the original position.

NOTES

When restarting the electric motor after an emergency stop, be sure to turn the emergency stop switch to the "OFF" position before starting the electric motor.



[4] HOUR METER

The hour meter is located inside the monitor display and shows the total running hours of the machine.

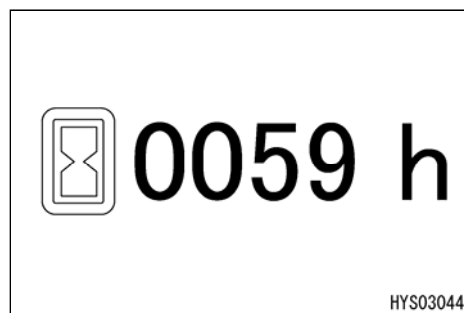
Use this value as a reference for periodical check intervals.

With the power lamp of the Inverter unit ON, the meter gives continuous readings when the electric motor operates upon switching the engine and electric motor switch to "Electric Motor" and turning the starter switch to the "START" position.

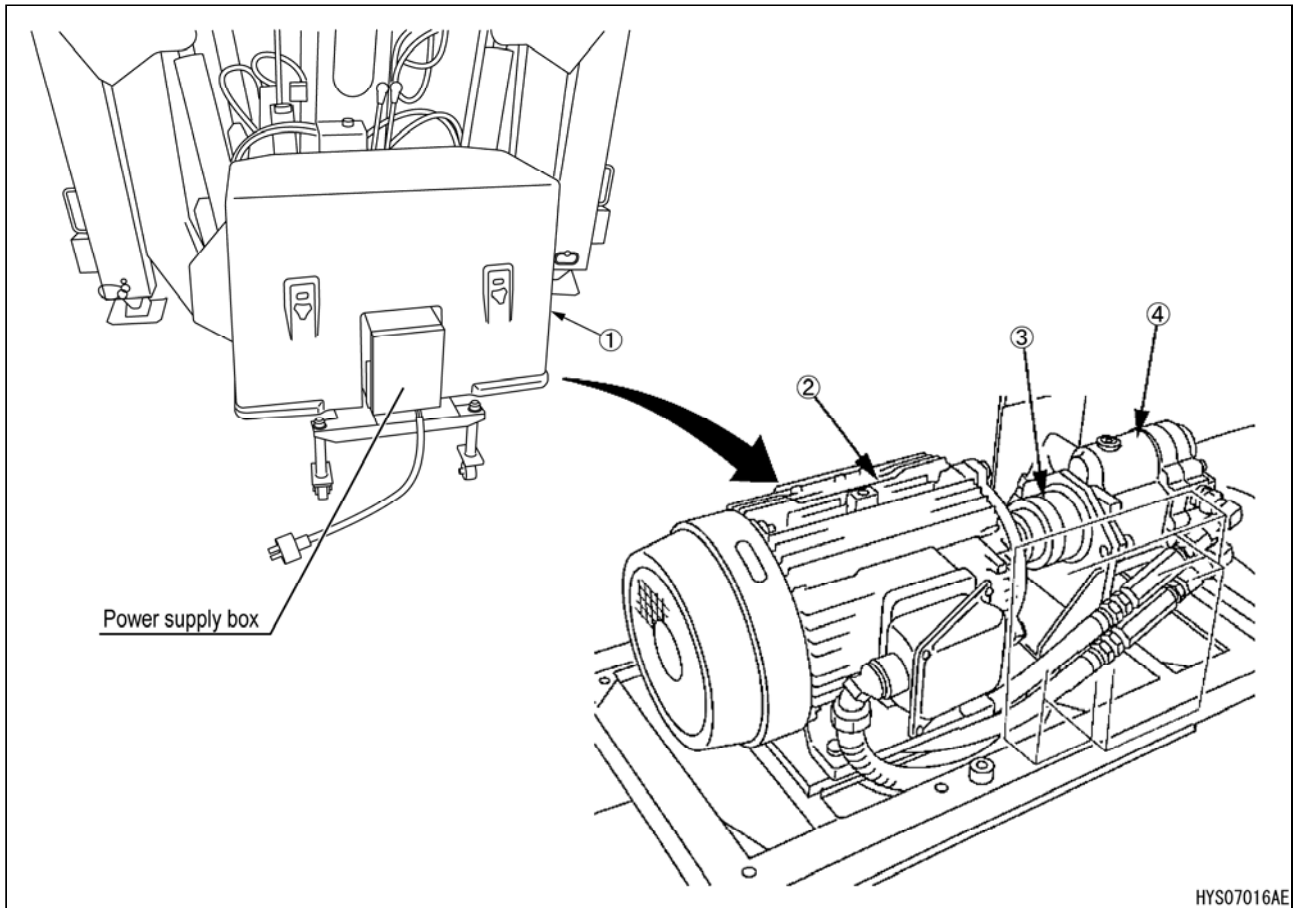
The meter indication advances "1" when the machine has been running for 1 hour regardless of the engine rotation speed.

NOTES

The hour meter indication advances regardless of whether the electric motor or the engine is selected as a power of the machine.

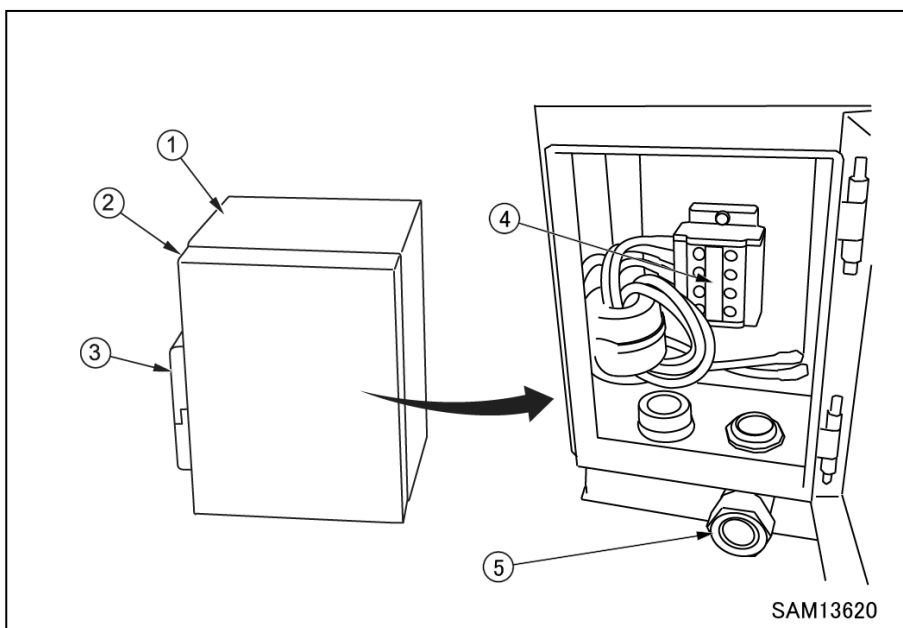


3.2 POWER UNIT



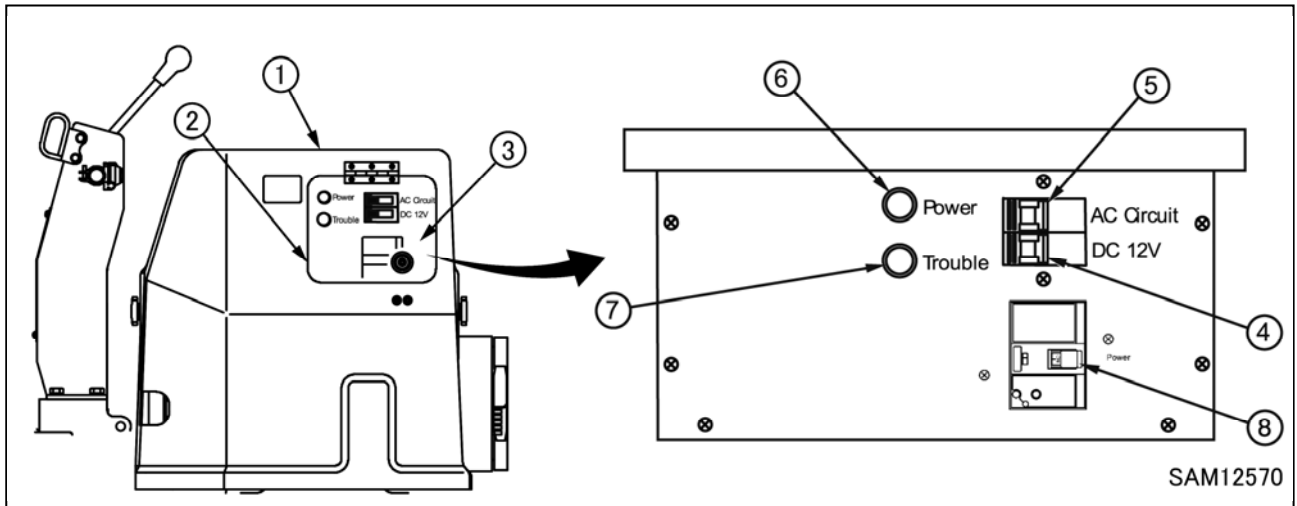
- (1) Power unit cover
- (2) Electric motor
- (3) Coupling
- (4) Hydraulic pump

3.3 POWER SUPPLY BOX



- (1) Power supply box
- (2) Power supply box door
- (3) Door handle
- (4) Terminal block
- (5) Cable insert hole

3.4 INVERTER UNIT



- (1) Power unit cover
- (2) Protective cover
- (3) Inverter unit
- (4) DC12V Power supply switch
- (5) Alternating-current circuit power supply switch
- (6) Power lamp (white)
- (7) Trouble lamp (red)
- (8) Main breaker (with a leak detector)

[1] MAIN BREAKER (WITH A LEAK DETECTOR) (8)

⚠ WARNING

- Make sure the breaker is “OFF” when this machine is not receiving power from the power supply equipment or when the operation is completed.
- Abnormal conditions such as a short circuit 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 the smell of burning and faulty parts. Promptly contact us or our sales service agency to request an inspection or repair.
- Inspections and repairs must be completed before turning “ON” the breaker to re-supply power. Potential fire or machine failure may occur if disregarded.

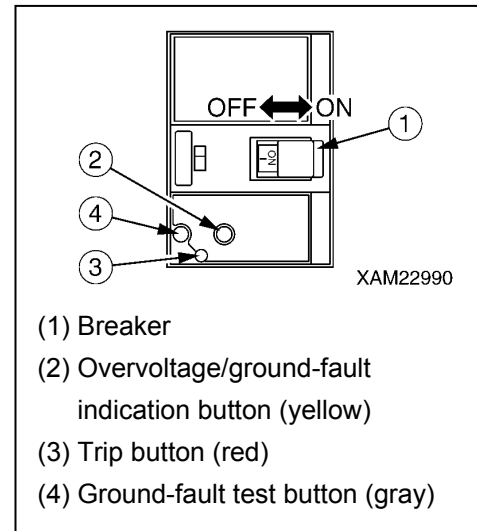
The main breaker is composed of the parts shown in the figure to the right.

- The breaker (1) is designed to provide automatic shut-off of the power that is supplied from the Inverter unit to the electric motor to prevent fire and machine failure in the event of an error including over-current and over-voltage.

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 over-voltage/ground-fault indication button (2) on the cover is designed to eject in the event of an over-voltage or ground fault. To reset, switch the breaker to ON again.
- The trip button (3) is designed to mechanically trip the breaker as an 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 over-voltage/ground-fault indication button (2) on the cover ejects.



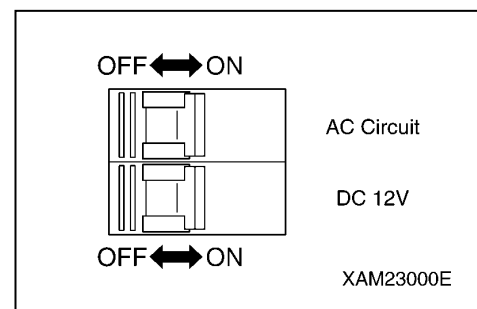
CAUTION

Periodic (annual) ground fault test is recommended. The test button should be controlled at intervals of 10 seconds or longer. Do not press the test button more than required. If an indication of a ground fault remains on after the over-voltage/ground-fault indication button (2) is reset, contact us or our sales service agency to request inspection or repair.

[2] DC12VPOWER SUPPLY SWITCH (4)

Used to switch the DC power output source for the crane operation system.

- ON : Power is supplied to the crane operation system.
- OFF : No power is supplied to the crane operation system.



[3] AC CIRCUIT POWER SUPPLY SWITCH (5)

Used to switch the AC power output source for the Inverter unit and inverter cooling fan.

- 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.

NOTES

- No safety hazard is posed even if the 12V DC power switch and AC circuit power switch remain "ON".
- The AC circuit power supply switch is illustrated in the upper figure to the right. The DC12V power supply switch is illustrated in the lower figure to the right.

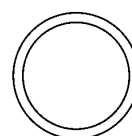
[4] POWER LAMP (WHITE) (6)

The power lamp is designed to indicate the presence/absence of energization to this machine from power supply equipment.

- ON : Indicates that this machine is receiving power from power supply equipment.
- OFF : Indicates that this machine is not receiving power from power supply equipment.

NOTES

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.



Power

XAM22940E

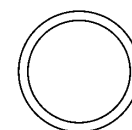
[5] TROUBLE LAMP (RED) (7)

⚠ WARNING

The Trouble lamp will turn ON when an error occurs in the Inverter unit.
Contact us or our sales service agency to request inspection or repair in this event.

The trouble lamp is designed to indicate the presence/absence of an error in the Inverter unit.

- ON : Indicates that an error is detected in the Inverter unit.
- OFF : Indicates that the Inverter unit is in normal operation.



Trouble

XAM23010E

4. OPERATION

4.1 PRE-OPERATION INSPECTION

4.1.1 INSPECTION BEFORE STARTING ELECTRIC MOTOR (VISIBLE CHECKS)

WARNING

For details of visible checks, see “OPERATION 2.1.1 VISIBLE CHECKS”.

As to the machine conforming to electric motor, potential fire in the machine may occur if flammable materials and oil leaks are present around the hot sections such as the Inverter unit, power supply box, and power unit.

Carefully check around these areas. If there is any abnormality, be sure to fix it or contact us or our sales service agency.

4.1.2 INSPECTION BEFORE STARTING ELECTRIC MOTOR

CAUTION

For details of inspection before starting the electric motor, see “OPERATION 2.1.2 INSPECTION BEFORE STARTING ENGINE”.

4.1.3 INSPECTION AFTER STARTING ELECTRIC MOTOR

CAUTION

For details of inspection after starting the electric motor, see “OPERATION 2.1.3 INSPECTION AFTER STARTING ENGINE”.

4.2 POWER SUPPLY CONNECTION

⚠ WARNING

Omitting to follow these precautions may result in serious accidents.

- Installation work using this machine must comply with laws and regulations of your country. Contact us or our sales service agency if no laws or regulations are applied.
- Only an electrical chief engineer under the voluntary security system based on the Electric Utility Industry Law or a registered electrician based on the Electricians Act is allowed to establish power connection of the power supply equipment or inspect and repair the electric system. Contact us or our sales service agency if there is no person having the above qualification.
- Be sure to supply the machine specifications-compliant power to this machine.

Power supply voltage (V)	Power current (A)	Power supply frequency (Hz)
380, 400	11.5	50

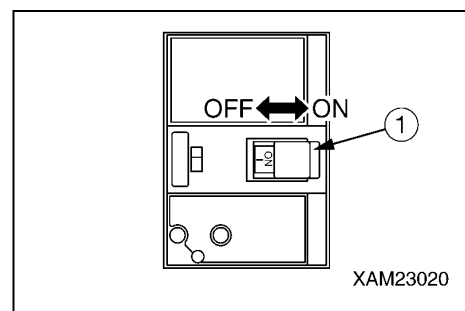
- A cabtyre cable must adhere to the specifications of this machine (380, 400V AC).

Motor voltage (V)	Cable spec. (sq)	Cable length (m)
380, 400	3.5	20
	5.5	40

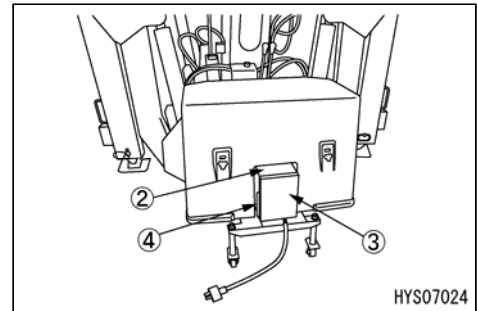
- Always use a dry cabtyre cable.
Potential electric shocks may occur if the cabtyre cable terminal is wet or power connection is performed with moist hands.
- Always turn “OFF” the main breakers of power supply equipment and this machine before connecting the cabtyre cable to this machine.
- Keep the cabtyre cable free of flaws and bends.
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 a protrusion and become 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 and 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.

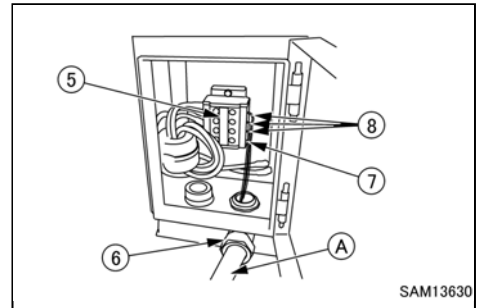
1. Make sure the breakers of power supply equipment and the breaker (1) of Inverter unit are “OFF”.



2. Unlock the door (3) of the power supply box (2) by pulling the handle (4) toward you to open it.



3. Draw the machine specifications-compliant cabtyre cable (A) through the cable insertion hole (6) at the bottom of the power supply box to connect it to the terminal block (5).



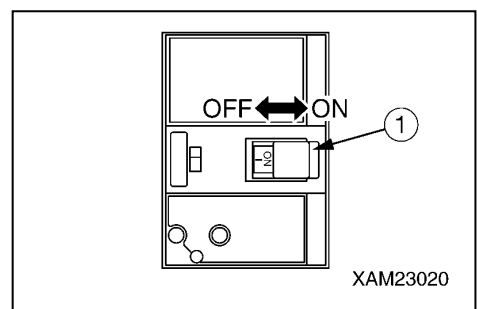
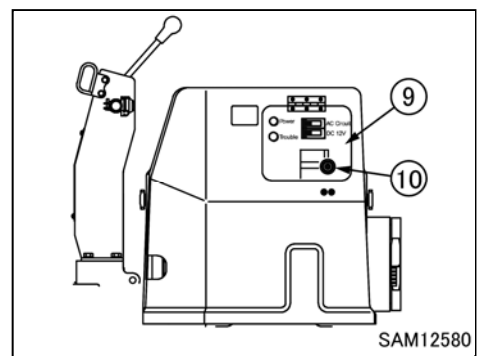
CAUTION

- The length of a cabtyre cable varies with cable specifications. Any cable length should conform to values listed below.

Motor voltage (V)	Cable spec. (sq)	Cable length (m)
380, 400	3.5	20
	5.5	40

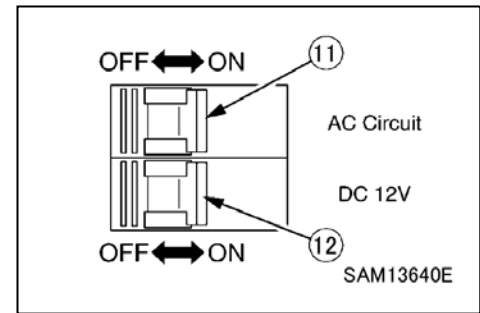
- The ground cable (7) of the cabtyre cable must be properly connected to the “PE terminal” on the terminal block.
Inverter-driven cables (8) (3 cables) other than the ground cable are capable of being connected to any of “L1, L2, and L3 terminals”.

4. Close the door (3) of the power supply box (2) after completing the connection of the cabtyre cable (A) on the power supply box side.
5. Move and connect the cable terminal block to the power supply equipment breaker without undue strain on the cabtyre cable (A).
6. Open the key (10), lift the cover (9) of the Inverter unit and turn “ON” the Inverter unit breaker (1) and power supply equipment breaker.



7. Turn "ON" the AC circuit power supply switch (11) and 12V DC power supply switch (12).

NOTES
No safety hazard is posed even if the AC circuit power switch (11) and 12V DC power switch (12) remain "ON".



8. Lower the cover (9) of the Inverter unit and close the key (10).

4.3 OPERATION AND CHECKING AFTER POWER CONNECTION

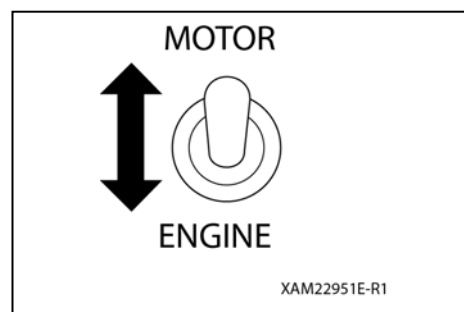
⚠ WARNING

- Before starting the electric motor, make sure no personnel or impediments are close to the machine and sound the horn.
- Always perform the warm-up operation. The motor needs adequate warm-up time especially in cold climates.
Failure to warm the motor may result in a serious accident on account of slow reaction of the travelling gear and crane from the operating lever.
- Ensure that no abnormal noise, odor, 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, surrounding items and electric wiring for burning smells or damaged parts. Promptly contact us or our sales service agency to request inspection or repair.
- Crane operational check is necessary after motor warm-up.
Keep the hook block away from the boom to avoid interference or collision.
- Exercise caution to avoid contact between the boom, the operator and any personnel whilst slewing it.
- If crane operational check detects an abnormal event, make an emergency stop promptly and repair any relevant part.
A potential serious accident may occur if disregarded.
- Exercise caution not to drive on or entangle the cabtyre cable during crane travelling.
A member of staff should guide the way as necessary and follow their lead.
- Keep the Inverter unit cover and its surroundings away from flammable materials.
The inside of the Inverter unit will rise in temperature and that could lead to fire if disregarded.

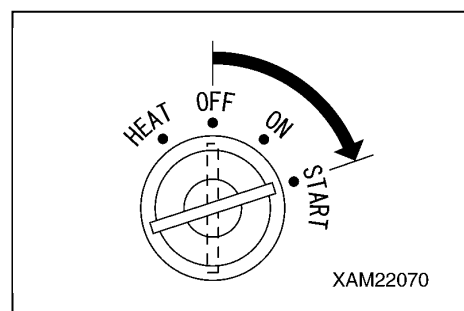
CAUTION

- Normal temperature of the hydraulic oil is: 45 to 80°C.
The hydraulic oil minimum temperature should be around 20°C regardless of the operational environment such as low-temperature operation.
- Check that the emergency stop switch of the remote controller transmitter is in the “ON” position.

1. Set the engine and electric motor switch to the “MOTOR” position.

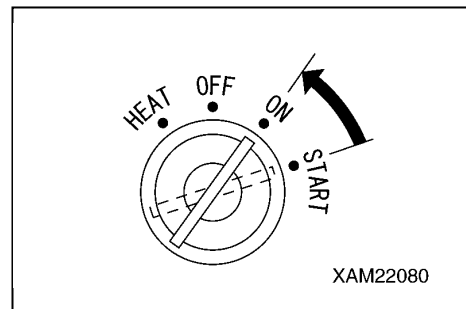


2. Insert the key into the starter switch and turn the key to the “START” position.



3. Release your hand from the key once the electric motor has started.

The key automatically returns to the "ON" position.

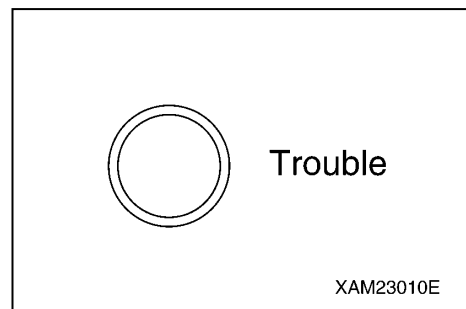


4. Conduct a 5-minute warm-up after the electric motor has started.

5. Visually check through the cover (9) of the Inverter unit to check that the trouble lamp remains OFF.

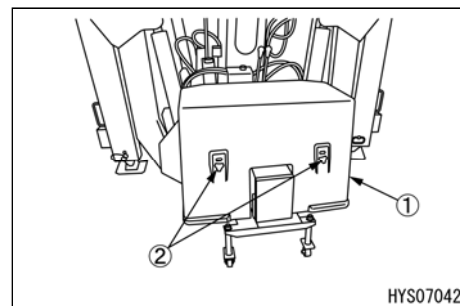
CAUTION

**An error occurs in the Inverter unit, which causes the trouble lamp (red) to light up.
Contact us or our sales service agency to request inspection or repair in the above event.**



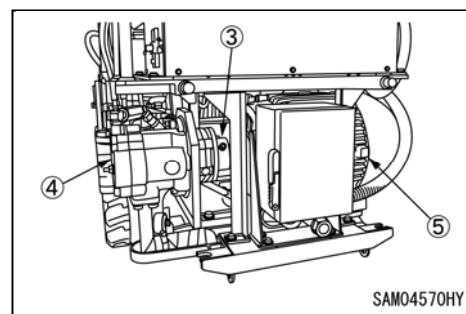
6. Use the following procedure for checking the power unit if an abnormal noise, odor, or vibration is present in and around the power unit.

- (1) Turn the starter switch key to the "OFF" position to stop the electric motor.
- (2) Remove mounting bolts (2) (4 bolts) on the side of the power unit cover (1) and remove the power unit cover (1).



- (3) Check the mounting bolts securing the electric motor (5) and hydraulic pump (4) for loose or missing bolts and check the coupling (3) for looseness.

If checks find loose bolts, retighten the bolts to the specified torque value.



- (4) Keep the area around the power unit free of dead leaves, paper waste, and dust etc.

Remove any dead leaves, paper, or dust etc.

- (5) Install the power unit cover (1) in reverse order of removal upon completion of inspection and cleaning.

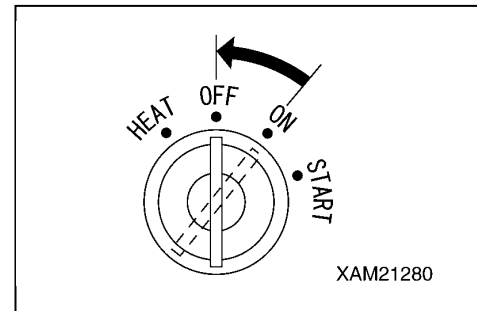
4.4 MACHINE OPERATION

CAUTION

Perform crane operation referring to “OPERATION 2.5 MACHINE TRAVELLING POSTURE” up to “OPERATION 2.24 PROHIBITED OPERATIONS DURING CRANE WORK” after motor warm-up is completed.

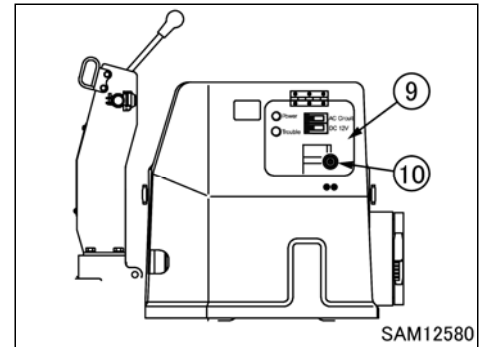
4.5 MACHINE STOP AND CHECKS AFTER STOPPING MACHINE

1. Turn the main starter switch key to the “OFF” position.
The electric motor stops.
2. Remove the main starter switch key.
3. Visually 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 area around the inverter unit free of dead leaves and paper waste. A potential fire could occur if disregarded.

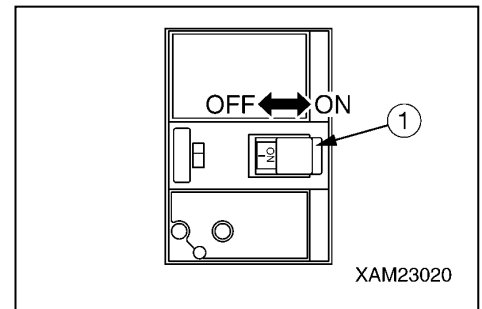


4.6 POWER SUPPLY SEPARATION

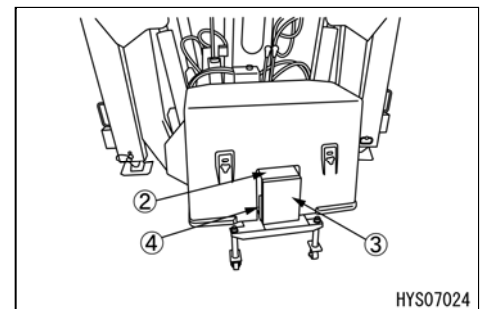
1. Turn “OFF” the power supply equipment breaker.
2. Open the key (10) and lift the cover (9) of the Inverter unit.



3. Turn “OFF” the main breaker (1).
4. Replace the cover (9) of the Inverter unit to its original position and close the key (10).



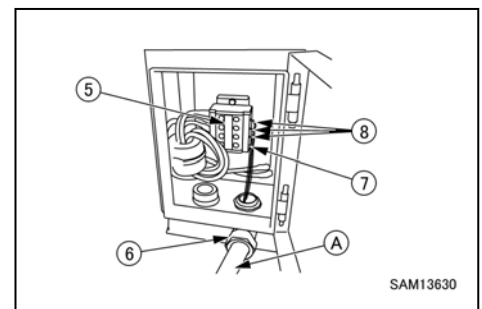
5. Unlock the door (3) of the power supply box (2) by pulling the handle (4) toward you to open it.



6. Disconnect each cable (7) and (8) (3 cables) of the cabtyre cable (A) from the terminal block (5).

CAUTION

- Clean off the cabtyre cable and check it for damage or bends.
If check finds any damage, replace the cable with a new one.
- Always return the cabtyre cable to a designated place after performing inspection and cleaning.



7. Close the door (3) of the power supply box (2).

5. LONG-TERM STORAGE

CAUTION

- For details of long-term storage, see “OPERATION 7. LONG-TERM STORAGE”.
- This section describes only the long-term storage method that is not defined in standard specifications.

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.

CAUTION

- During long-term storage, an insulation resistance test of the electric motor wiring should be performed quarterly.
Contact us or our sales service agency to request inspection in the above event.
- Insulation resistance test of the electric motor wiring is required before resuming use of the machine after long-term storage.
Contact us or our sales service agency to request inspection in the above event.

6. ELECTRIC MOTOR TROUBLESHOOTING

- Make sure that you contact us or our sales service agency for the actions marked with ★ in the Actions fields.
- Ask us or our sales service agency for repair if you suspect any other abnormalities or causes other than those given below.

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 are turned "OFF". • A break in stator winding 	<ul style="list-style-type: none"> • Check wiring according to "Engine & Electric Motor Spec. Operation". • 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 a 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 • Loose fixing bolts on the motor and pump. • Loose coupling fixing bolts • 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 according to "Engine & Electric Motor Spec. Operation". ★ 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 • Poor ventilation • Considerable voltage drop • Overload • High number of starts 	<ul style="list-style-type: none"> • Make sure the power unit is complying with the environmental specifications. • Perform inspection and cleaning according to "Engine & Electric Motor Spec. Operation". • 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 • Poor grounding • A break in stator winding 	<ul style="list-style-type: none"> • Make sure the power unit is complying with the environmental specifications. • Attach the cover properly. • Adhere to grounding 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
It trips.	Degradation of battery	<ul style="list-style-type: none"> ★ Inspection, repair, replacement

7. METHOD OF REMOVING AND INSTALLING POWER UNIT

Overall length can be made no more than 3000 mm by removing the power unit. This is most suitable to a field site where a shorter overall length is desirable such as when transporting in an elevator.

WARNING

- When two persons perform removal/installation operation of the power unit, they must fully check the work content mutually and perform the operation based on the designated signals. If the signals are insufficient, they may contact a moving part, which can cause a serious accident.
- Perform removal/installation operation or movement operation of the power unit on level and firm ground so that the balance is stable. If the above operation is performed on inclined or undulating ground, the power unit may fall.
- Only use a sling (e.g. wire rope and shackles) which is approved and capable of lifting the mass (weight) of the power unit.
- When lifting the power unit, be sure to securely insert shackles (3 shackles) into the lifting brackets.
- Securely hang the power unit on the fall prevention hook on the frame of the main body. If the power unit is disengaged from the hook, it may fall, causing a serious accident.
- Fit the casters into the correct position and securely fix them with nuts. If the casters come off, the power unit may fall, causing a serious accident.

Necessary tools

- Width across flat 10 mm Spanner or socket, socket wrench
- Width across flat 13 mm Spanner or socket, socket wrench
- Width across flat 17 mm Spanner or socket, socket wrench
- Width across flat 24 mm Spanner × 2
- Wire rope (3 ropes): Recommended size At least equivalent to JIS 13 rope
φ6 mm × length 1200 mm

Necessary parts (standard specification, equipment)

- Short connector
- Cover (product number: 200-4645900)
- Bolt (product number: 01024-81020) 4 bolts

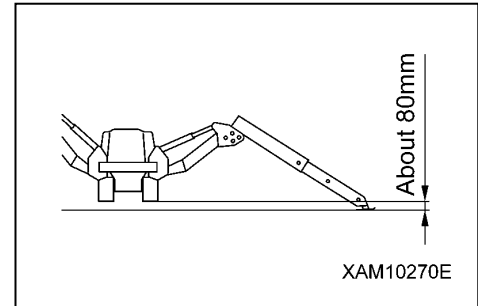
Power unit weight: 170 kg (excluding power unit cover)

7.1 REMOVAL OF POWER UNIT

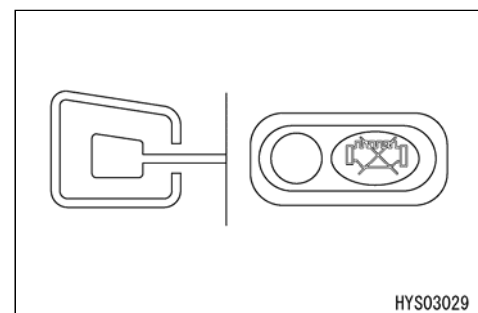
WARNING

To remove the power unit, get under the machine and remove the connectors.
If the Machine is unstable and sways, insert support platforms (height increasers) below the front and rear parts of the Machine frame to stabilize the Machine.

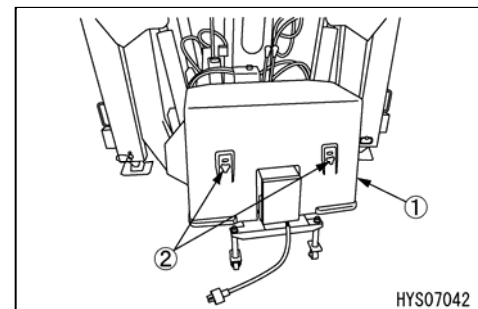
1. See "OPERATION 2.12 OUTRIGGER SETUP OPERATION" to set outriggers and raise the machine about 80 mm above the ground.



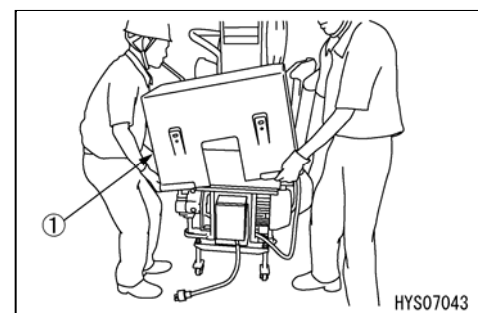
2. See "OPERATION 2.9 STOPPING ENGINE" to stop the engine.



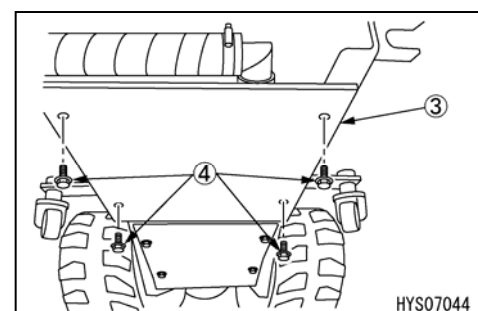
3. Remove fixing bolts (2) (4 bolts) of the power unit cover (1).



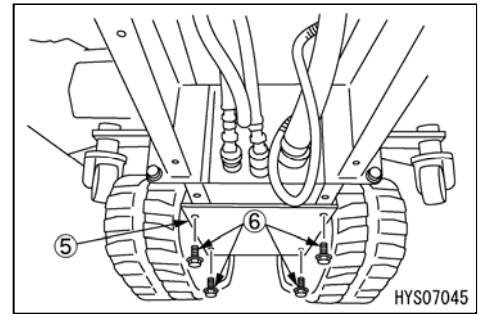
4. Remove the power unit cover (1).



5. Remove the fixing bolts (4) (4 bolts) of the cover (3) under the power unit and remove the cover (3).



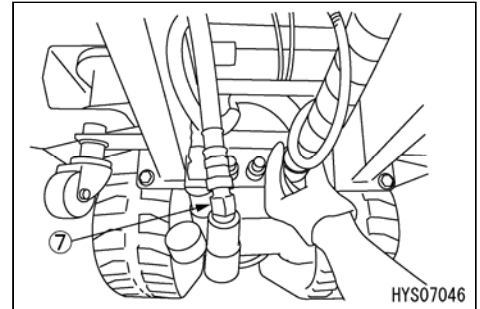
6. Remove the fixing bolts (6) (4 bolts) of the cover (5) under the frame on the main body side and remove the cover (5).



7. Remove the hydraulic hose (7) (3 hoses) from the coupler part.

NOTES

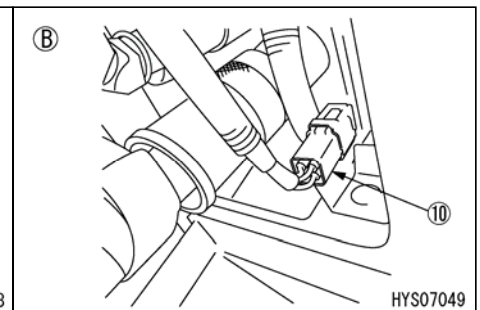
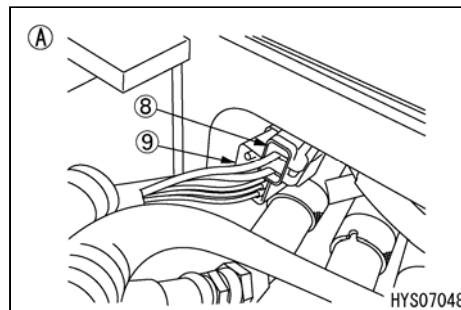
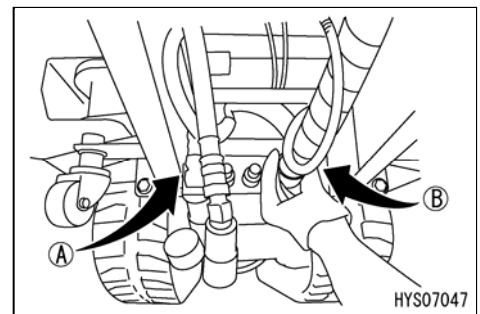
The coupler part can be pulled out only when the groove position is aligned with the ball position. Check for their positions.
Attach a coupler cap to removed couplers, respectively, so that dust or water droplets are not adhered to the couplers.



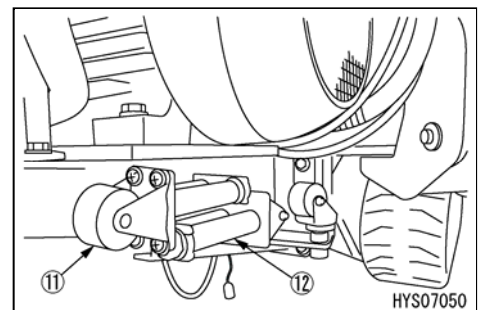
8. Remove connectors (8), (9) and (10).

NOTES

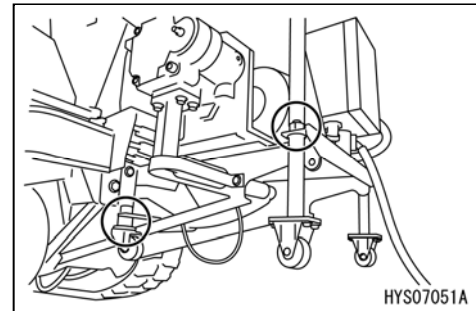
Attach a short connector to removed connectors on the machine side.
If the short connector is not attached, the engine does not start.



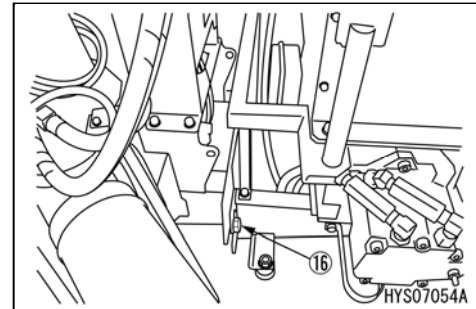
9. Loosen nuts of the casters (11) (12) (2 each) and remove the casters.



10. Fit the removed casters into respective locations on the right figure and fix them with nuts.
Face all the casters downward when fitting them.



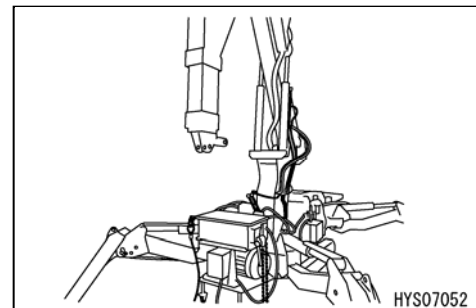
11. Remove the bolts (16) (4 bolts) which connect the power unit to the Machine.



12. See "OPERATION 2. OPERATION " to operate the hook so that it is positioned just above the power unit.

CAUTION

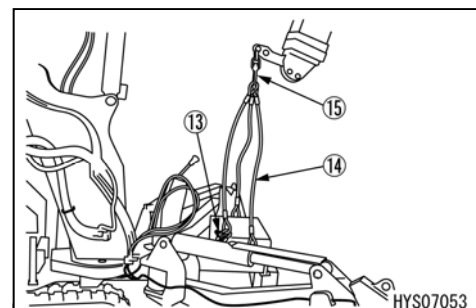
Perform work taking care not to allow the jib to be less than -90°. (It stops automatically.)



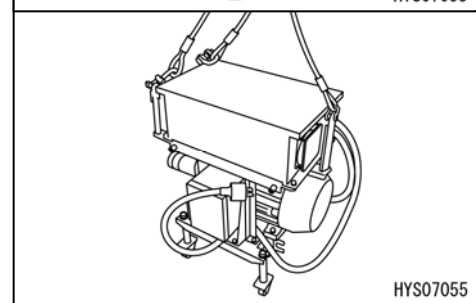
13. Attach the shackle (13) to the hole (3 locations) of the lifting brackets, hang a sling (14) on the hook (15) and hoist it up.

NOTES

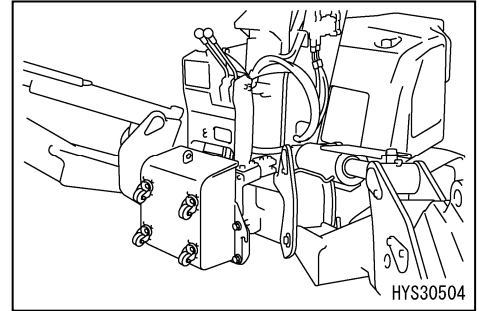
Use shackles (13) which are attached to both the front and rear ends of the machine.



14. Extend the main boom and then slowly lower the power unit to the ground.



15. If crane is used without power unit being installed, the counterweight must be mounted instead.
See “OPERATION 10.2 MOUNTING THE COUNTERWEIGHT” for how to mount the counterweight.



7.2 INSTALLATION OF POWER UNIT

1. Install the power unit in the reverse order of removal.

CAUTION

When fixing the Machine and power unit with bolts, align the bolt positions carefully.

8. PRINCIPLE SPECIFICATION LIST

Equipment/Item		MK1033CE-1 [MK1033CWE-1]	
Weight and dimensions	Machine mass	2270 kg [2370 kg]	
	Overall length × width × height	3200 mm ×750 mm ×1955 mm [3225 mm × 750 mm × 1990 mm]	
	Distance between center idler and sprocket	975 mm	
	Track gauge	550 mm	
	Width of crawler	200 mm	
	Minimum ground height	130 mm	
Performance	Maximum rated total load × working radius	0.995 t × 1.3m (main boom 2nd stage 80°/jib 1st stage 60°)	
	Maximum working radius	9.9 m	
	Maximum lifting height above ground	11.3 m	
[Winch system]	Type	Swash plate axial piston motor, epicycle reduction gear, friction disc type brake	
	Hook hoist speed	37.8 m/min (5layer1part of line)	
	Hoist wire rope	IWRC 6 × WS (26) 0/0 B type φ8 × 73 m	
Main boom	Telescoping system	Type	Telescoping hydraulic cylinder1 + wire rope telescoping systems1
		Type of boom	Fully automatic 3-section pentagonal telescope 2 and 3 stages simultaneous telescoping
		Boom length 1st stage	2,590 mm
		Boom length 2nd stage	4,310 mm
		Boom length 3rd stage	6,030 mm
		Boom extending speed	3.44 m/15.5 sec
	Derricking System	Derricking type	Hydraulic double acting cylinder, direct acting type × 2
		Boom derrick angle/time	0° to 80°/36.4 sec (main boom 1st stage/jib 1st stage)
Jib	Telescoping system	Jib type	Telescoping hydraulic cylinder × 2
		Jib type	automatic hydraulic 3-section pentagonal telescopic
		Jib length 1st stage	1,876 mm
		Jib length 2nd stage	3,006 mm
		Jib length 3rd stage	4,111 mm
		Jib telescoping speed	2.235 m/22.4 sec
	Derricking System	Derricking type	Hydraulic double acting cylinder, direct acting type × 1 + link mechanism
		Jib derrick angle/time	-100 to 80°/26.4 sec (main boom 80°/jib 1st stage)
Slewing system	Type	Swing bearing support, hydraulic motor driven, worm, spur gear reduction, worm self-lock	
	Slewing angle/ speed	360° (continuous)/ 70 sec	
Outrigger system	Type	1st stage with flexible stay damper, 2nd stage manual pullout, hydraulic cylinder direct acting type	
	Max extended width	(Right/left) 4580 mm × (Rear) 4530 mm × (Front) 3810 mm	
Travelling system	Type	Hydraulic motor driven, Step-less speed changer	
	Travel speed	0-2.0 km/h	
	Grade ability	15°	
	Ground pressure	53.3 kPa (0.537 kgf/cm ²)	
Hydraulic system	Hydraulic pump	Variable piston pump (6 cc/rev × 2)	
	Rated pressure	20.6 MPa (210 kgf/ cm ²)	
	Hydraulic oil tank capacity	20 L	

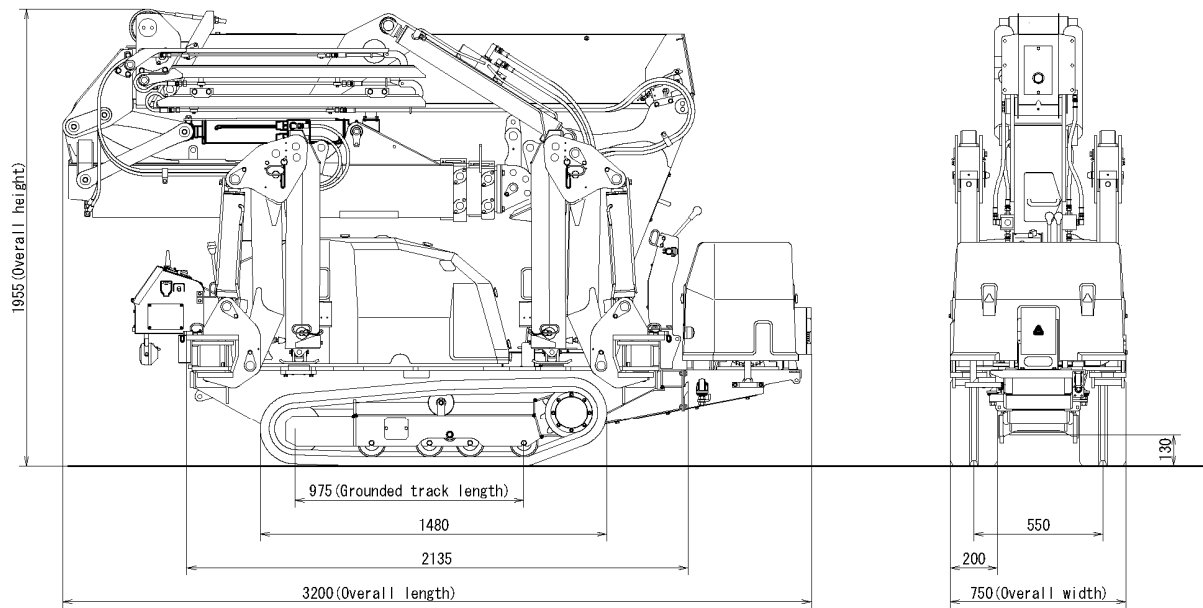
[Winch specification]

Equipment/Item		MK1033CE-1 [MK1033CWE-1]
Engine	Model	Yanmar 2TNV70-NMBA
	Type	4 cycle, vertical type, water cooled in-line 2-cylinder, precombustion chamber type
	Displacement	0.569 L (569 cc)
	Rated output (continuous)	7.4 kW/2500 min ⁻¹ (10.1PS/2500 rpm)
	Fuel used/fuel tank capacity	12 L
Battery	Model	55B24R
Electric motor	Motor specifications	Three-phase induction motor 5.5 kW 4P 380V 50 Hz
	Starting method	Inverter-controlled (30 Hz to 60 Hz)
Safety device	[Over hoist detector], [over un-winding detector], moment limiter, alarm buzzer, hydraulic safety valve, automatic hydraulic lock device, wire rope latch, levelling instrument, machine body inclination alarm, tri-colour lights, crane outrigger interlock device, outrigger un-set lamp, slewing direction limiter, main boom and jib stowage and extension interlock	

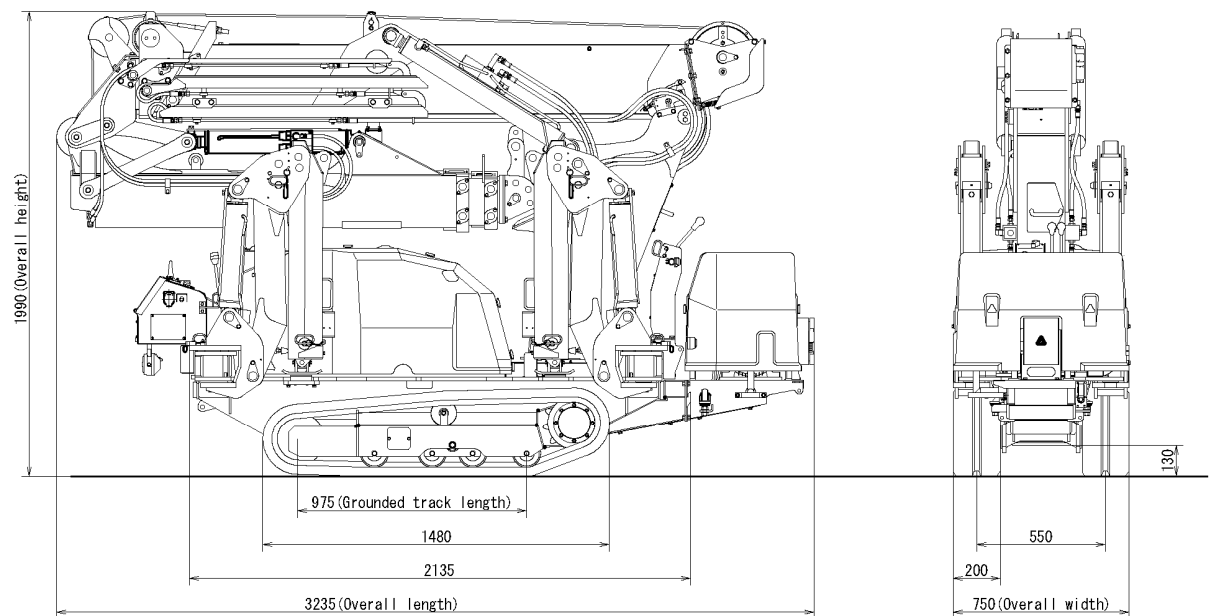
[Winch specification]

9. SPECIFICATION DIMENSIONAL DRAWING

Electric Motor Specifications



Electric Motor Specifications with winch attached



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WINCH

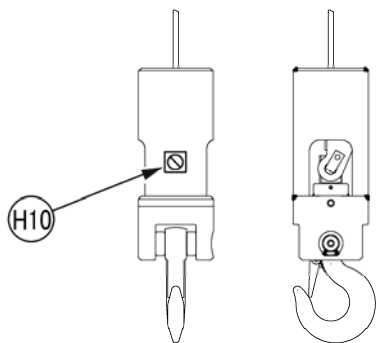
1. SAFETY LABEL LOCATIONS	8- 2
2. WINCH PARTS	8- 5
3. OPERATION	8-11
4. SPECIFICATIONS	8-26

1. SAFETY LABEL LOCATIONS

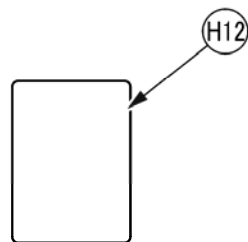
Keep safety labels clean and visible at all times.

If lost, replace immediately or apply for a new one.

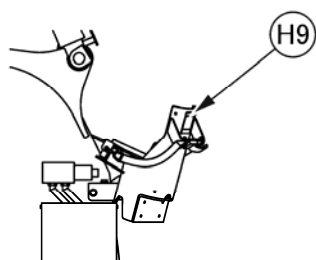
There are also labels other than safety labels shown below, treat them in the same manner.



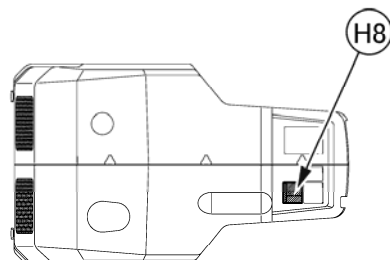
HOOK BLOCK



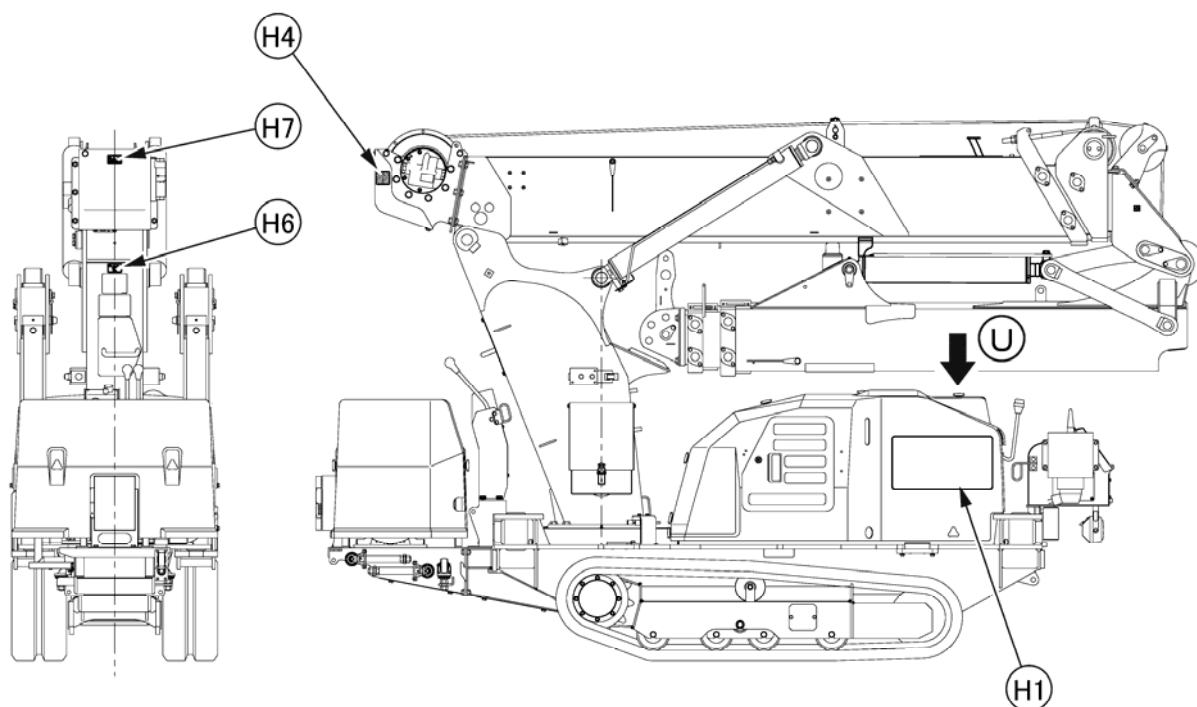
ACCESSORY



STOW BRACKET

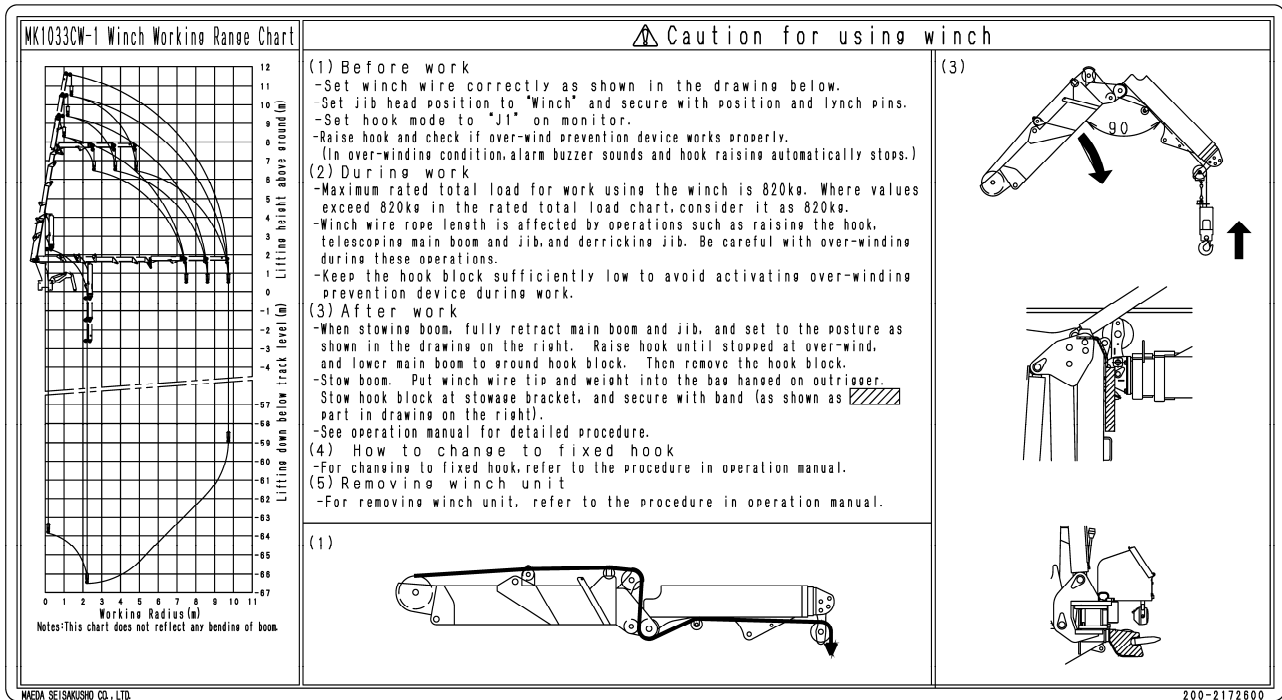


View U



SAM17590

(H1) Caution for using winch (200-2172600)



(H4) Trapping danger (553-4267500) (2 places)



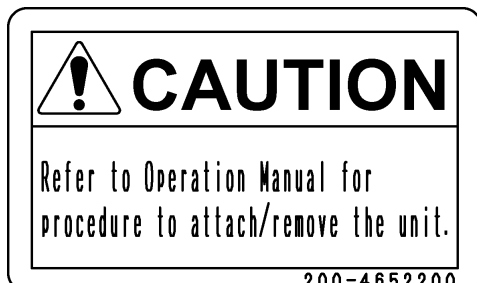
553-4267500

(H6) Danger overhead (200-4651200)



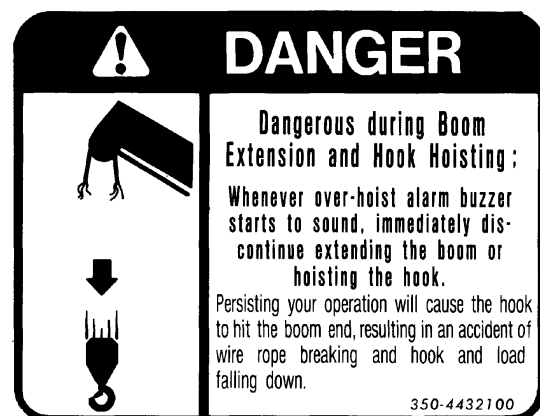
200-4651200

(H7) Separation method (200-4652200)



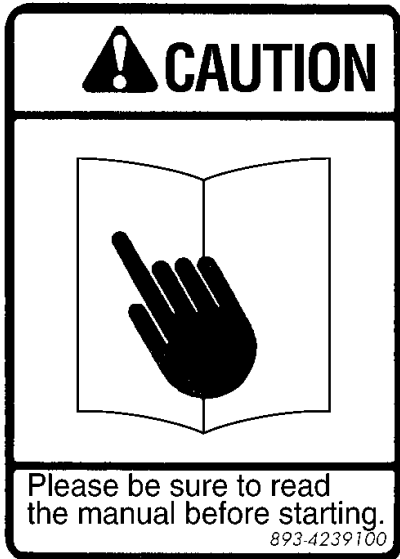
200-4652200

(H8) Over-hoisting danger (350-4432100)



350-4432100

(H9) Caution when stowing hook (893-4239100)



(H10) Hook hanging by handle prohibited (200-4713700)



(H12) Crane extension/stowage (200-2188700)

(Quick Guide) MK1033CW-I Crane Setting Procedure (with single fall hook)

WARNING
When setting crane, operate carefully in micro speed to avoid accident such as falling section caused by hook block or wire rope and unexpected contact of body. This is a quick guide. Please refer to the operation manual for detailed procedure and safety cautions.

<p>(Step 1) Place outriggers. Then push "crane mode button" on monitor and shift to crane mode.</p> <p>Make sure hook block mode is set to single fall hook.</p>	<p>(Step 4) Raise the jib up to around -90 degrees.</p>
<p>(Step 2) Loosen hand ① which is holding hook block, then remove metal fitting ②. Put the removed metal fitting ② on metal fitting holder ③.</p>	<p>(Step 5) Hold handle ④ of hook block, and slowly extend boom. Then take out the hook block from stowing bracket ⑤.</p>
<p>(Step 3) Hold the over hoist detection weight ⑥ by hand, and fully derrick up the boom.</p>	<p>(Step 6) Pay attention so that the hook block will not hit crane and raise jib. Now setting is completed.</p>

(Quick Guide) MK1033CW-I Crane Stowing Procedure (with single fall hook)

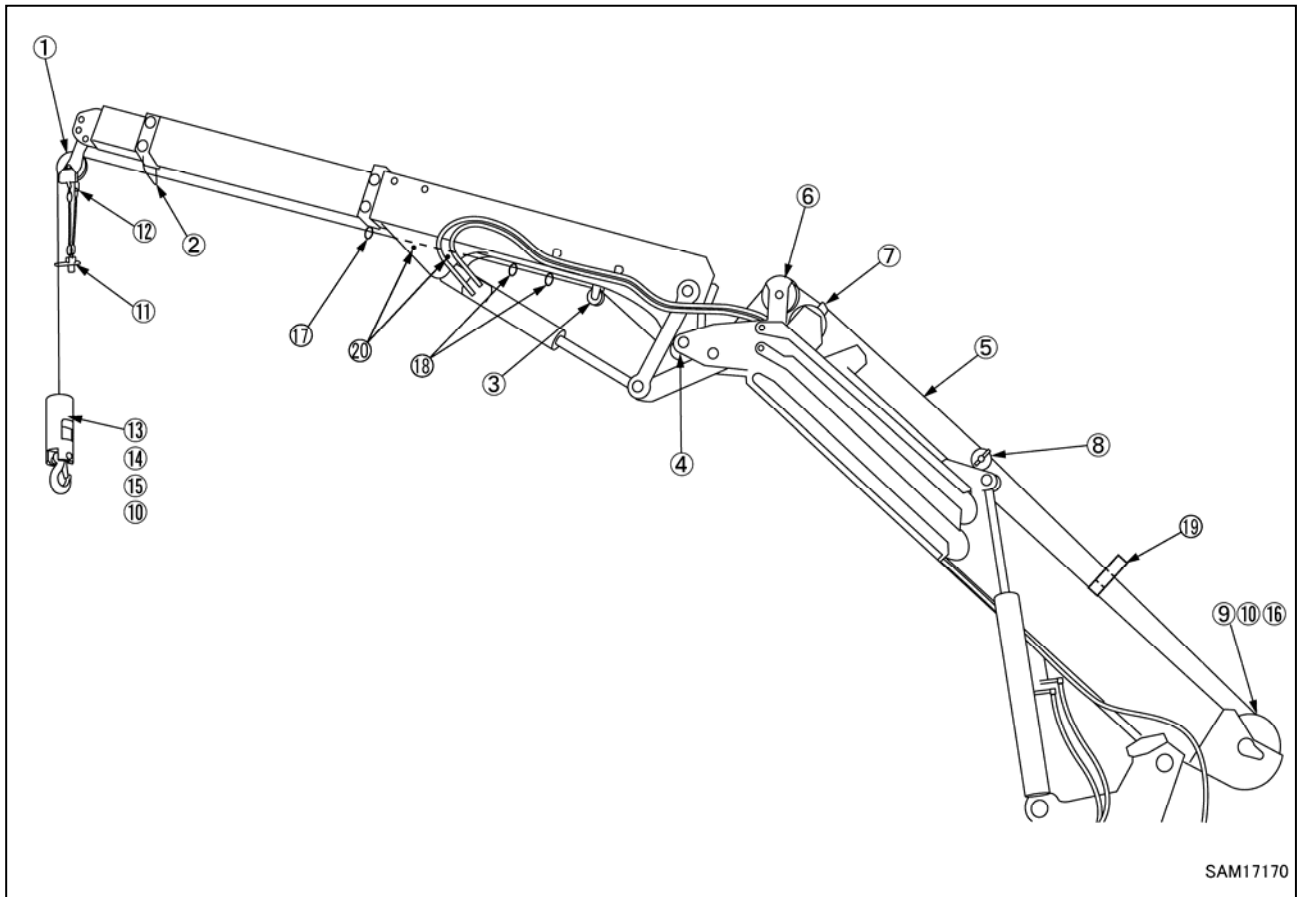
WARNING
When stowing crane, operate carefully in micro speed to avoid accident such as falling section caused by hook block or wire rope and unexpected contact of body. This is a quick guide. Please refer to the operation manual for detailed procedure and safety cautions.

<p>(Step 1) Derrick boom to the highest angle, and telescopic the boom until the mark ① appears like shown in the picture.</p>	<p>(Step 4) By holding the over hoist detection weight ⑥, derrick down the jib to the end.</p>
<p>(Step 2) Fully retract the jib, and derrick down to around -90 degrees. Then raise hook with winch until it hits to the over hoist detection weight ⑥.</p>	<p>(Step 5) By holding the over hoist detection weight ⑥, fully lower the boom. Then place the over hoist detection weight ⑥ on the hook block.</p>
<p>(Step 3) By holding the handle ④ of hook block, slowly retract boom up to the most retracted position. Then stow the hook block into the stowing bracket ⑤.</p>	<p>(Step 6) Put the metal fitting ② which was rest on the metal fitting holder ③, to the over hoist detection weight ⑥. Tighten the hook ⑦ last, and stowing is completed.</p>

200-2188700

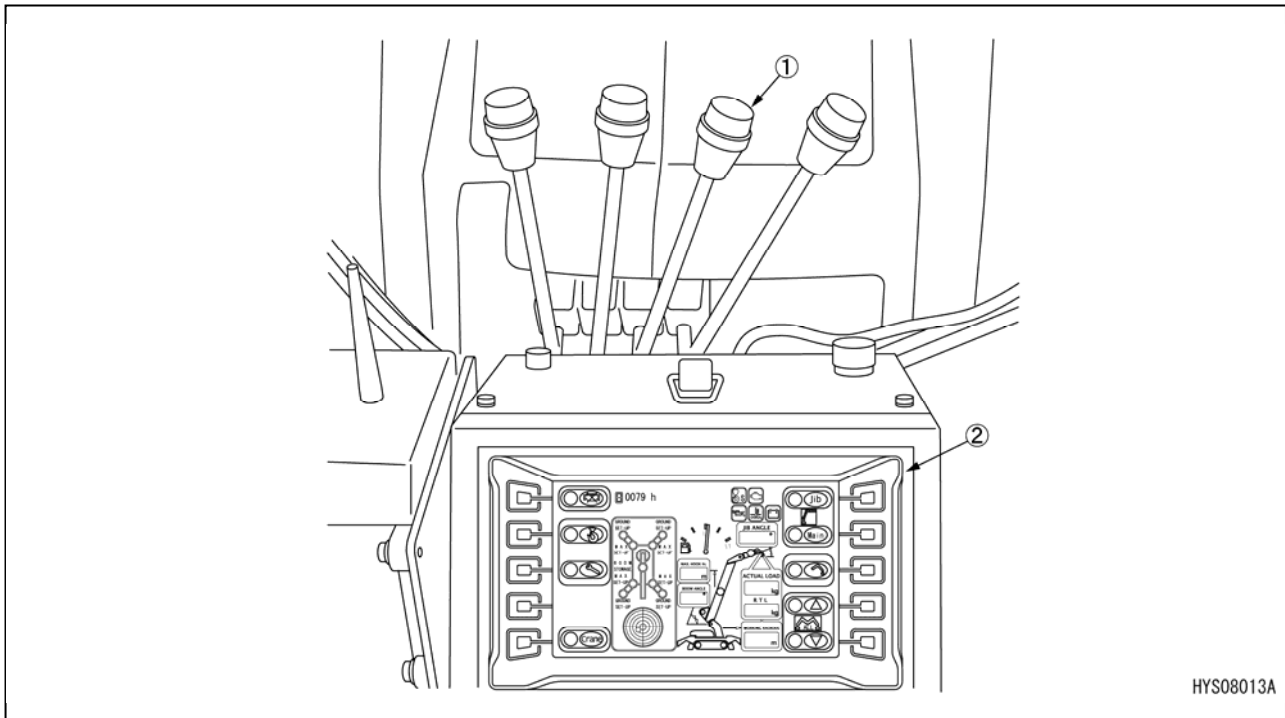
2. WINCH PARTS

2.1 WINCH MACHINE PARTS



- | | |
|-----------------------------|---|
| (1) Load sheave of jib tip | (11) Weight for detecting over-hoisting prevention |
| (2) Wire guide of jib | (12) Wire rope for detecting over-hoisting prevention |
| (3) Guide sheave of jib | (13) Hook block (single fall hook) |
| (4) Idler sheave of jib | (14) Wedge socket |
| (5) Wire rope | (15) Wire clip |
| (6) Load sheave of boom tip | (16) Winch guard |
| (7) Guide sheave 2 of boom | (17) Wire guide 1 |
| (8) Guide sheave 1 of boom | (18) Wire guide 2 |
| (9) Winch drum | (19) Wire guard |
| (10) Rope wedge | (20) Wire guard pin |

2.2 WINCH OPERATION PARTS



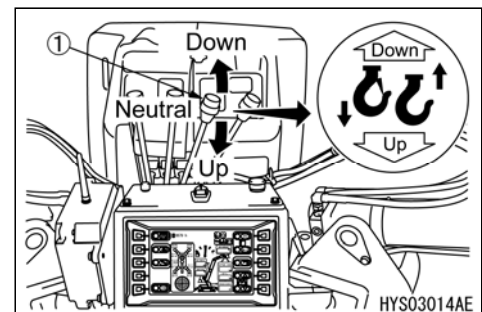
(1) Winch lever

(2) Monitor

[1] WINCH LEVER (1)

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

- Down : Push the lever forward (lower).
- Neutral : Release your hand from the lever.
The lever returns to the “Neutral” position and the brake is automatically applied. Thus, up and down of the hook block will stop.
- Up : Pull the lever toward you (raise).



[2] MONITOR (2)

When the main starter switch is turned “ON”, the monitor screen is displayed.

Set “Wire single fall (J1)” with the hook selector button on the monitor screen.

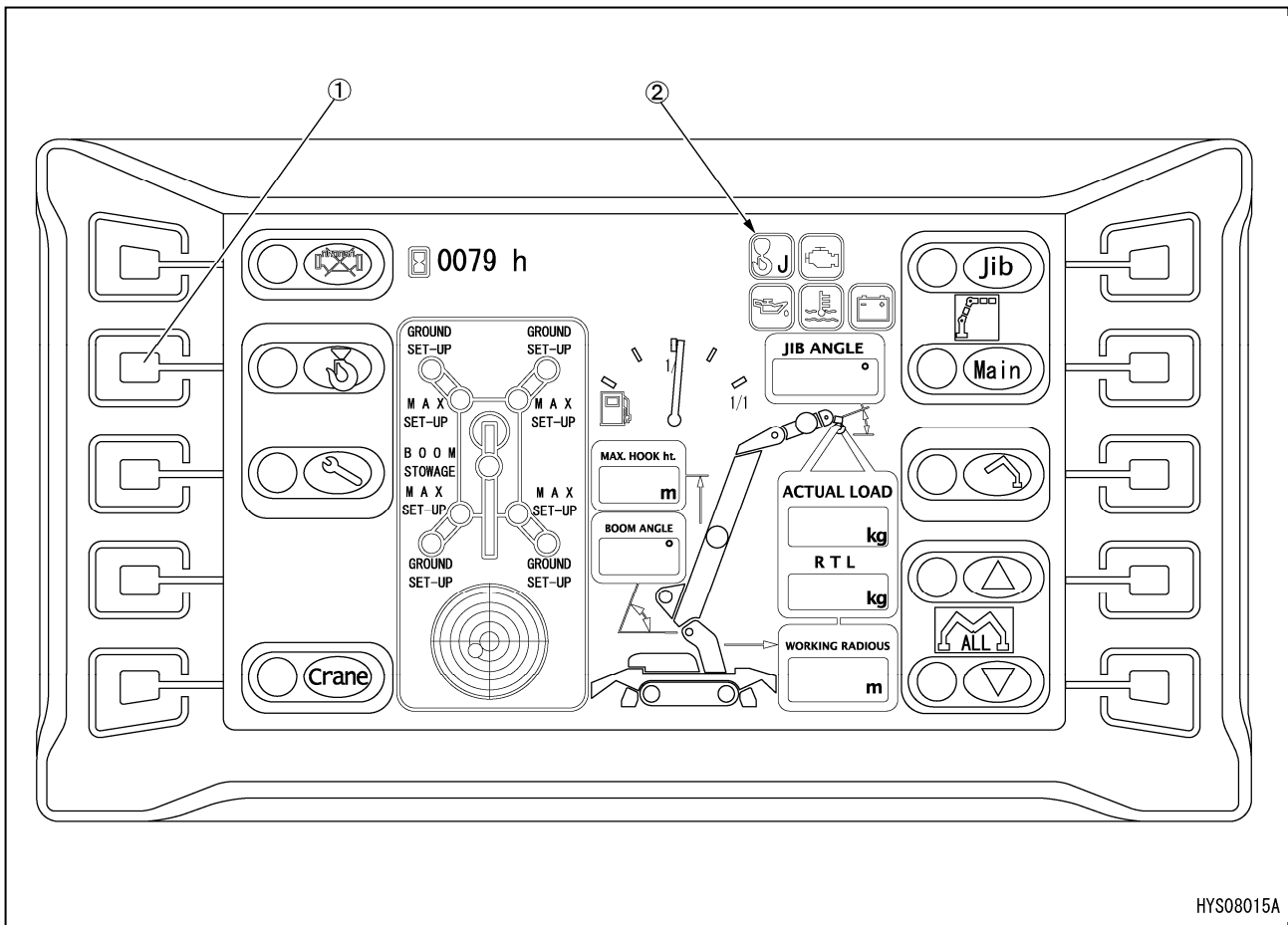
Make settings on the monitor 3 (hook screen) screen.

2.3 MONITOR

2.3.1 MONITOR DISPLAY PARTS

[1] MONITOR 1: HOME SCREEN

When the main starter switch is turned “ON”, the following screen is displayed on the monitor.



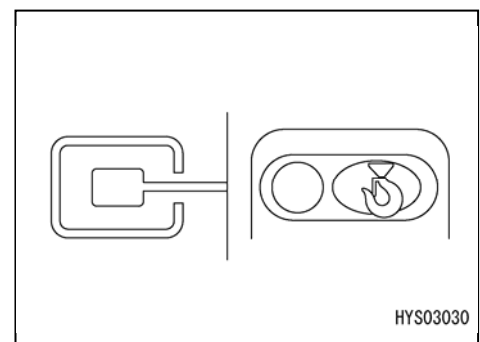
(1) Winch setting screen selector button

(2) Hook mode display

(1) Winch setting screen selector button

This is used to switch to the screen to set a winch condition (fixed hook or single fall hook).

Refer to “OPERATOIN 1.5.1 [3] MONITOR 3:HOOK SELECTOR SCREEN ” for setting contents.



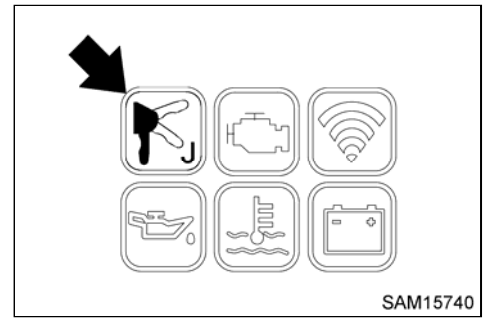
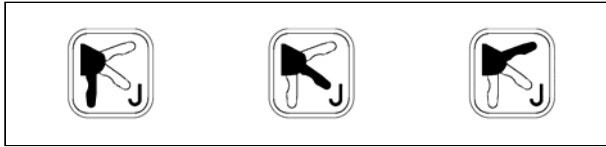
(2) Hook mode display

The hook condition (fixed hook or single fall hook) is displayed.

J : The condition is set to the fixed hook specification.

Display changes in 3 patterns depending on fixed hook position.

To change the setting, use the hook selector button on the monitor 3 (hook screen) screen.



J1 : The condition is set to the wire single fall specification.

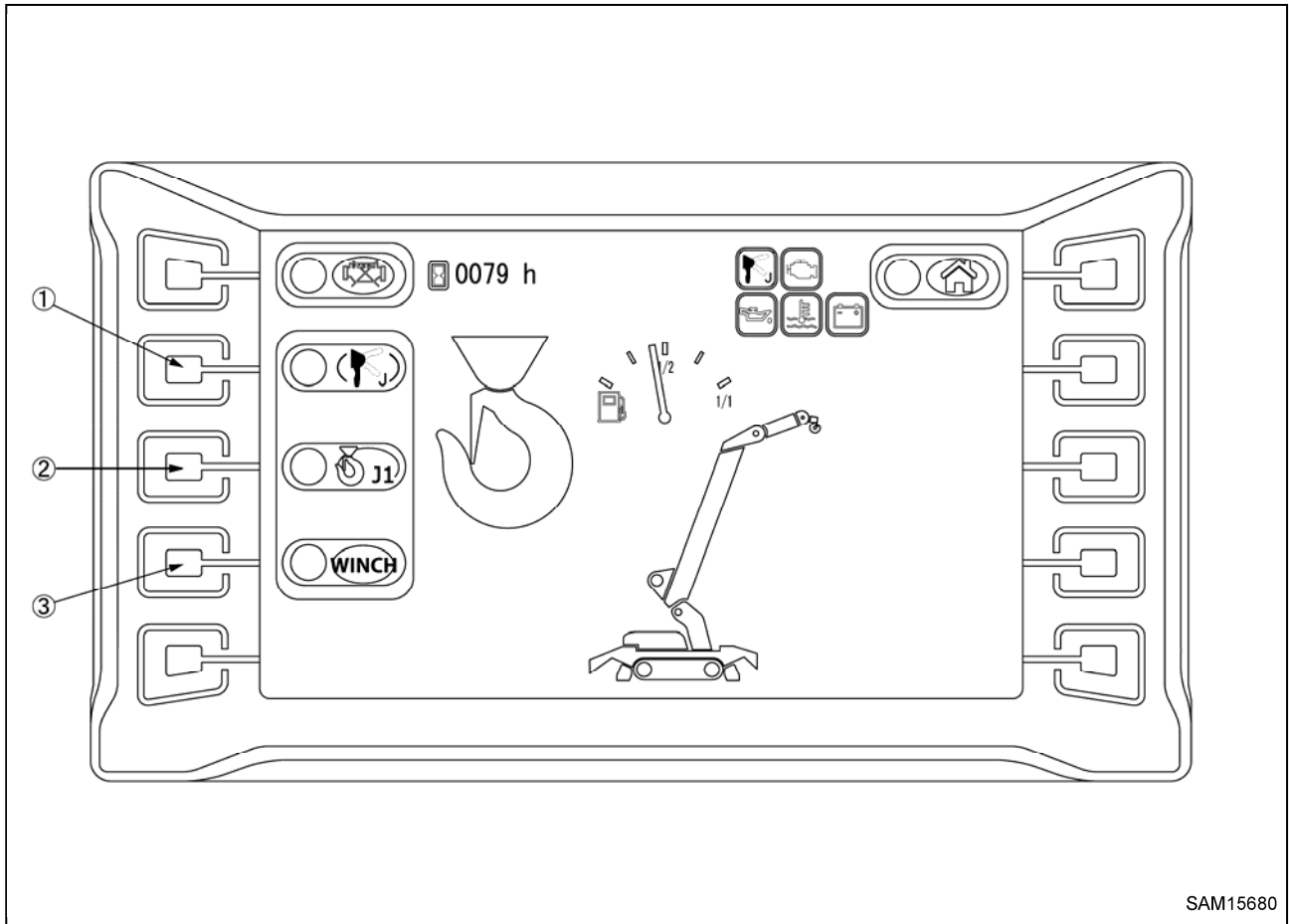
To change the setting, use the hook selector button on the monitor 3 (hook screen) screen.



[2] Monitor 3: Hook selector screen

When “Winch setting screen selector button” on the monitor1screen is pressed, the winch selector screen (the figure below) is displayed.

When the home button on the upper right is pressed, the screen returns to the monitor1 screen (home screen).



- (1) Fixed hook selector button
- (3) Winch installation selector button

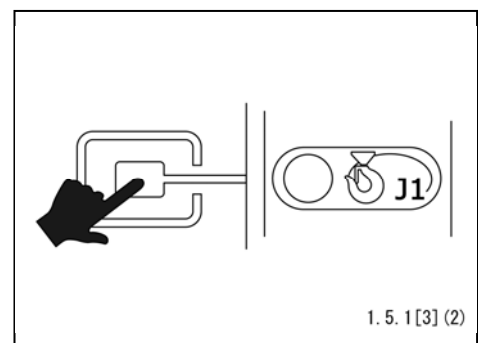
- (2) Wire single fall selector button

(2) Wire single fall selector button

When “Wire single fall selector switch” is pressed, the wire single fall specification is set.

“Winch installation selector button” is also automatically selected and winch operation becomes possible.

When the setting is completed, press the home button to return to the monitor 1 (home screen) screen.



2.4 OVER HOIST DETECTOR

CAUTION

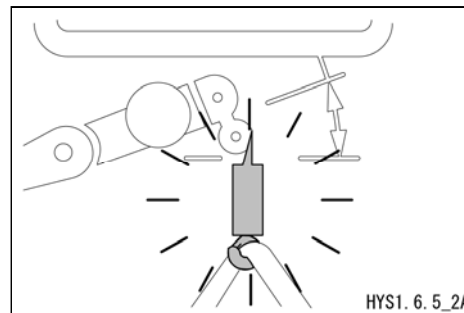
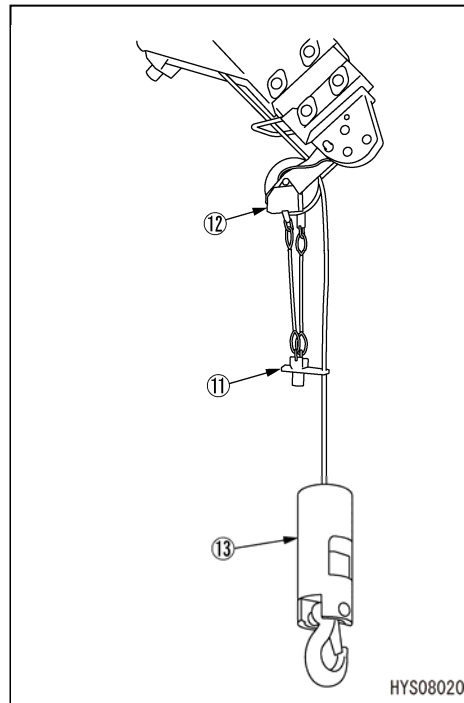
When raising the hook block, be careful of clearance between the hook block and jib. Also, the hook block can be raised when the main boom and jib are extended. Perform main boom and jib extension operation whilst always checking the hook block height.

- (11) Weight
- (12) Over hoist detector
- (13) Hook block

When the hook block (13) approaches the tip of the jib and pushes up the weight (11), over-hoisting will stop and the detector sounds an alarm buzzer, warning of over hoisting, and the moment when monitor display of the over-hoist detector flashes in red, the following operations stop automatically.

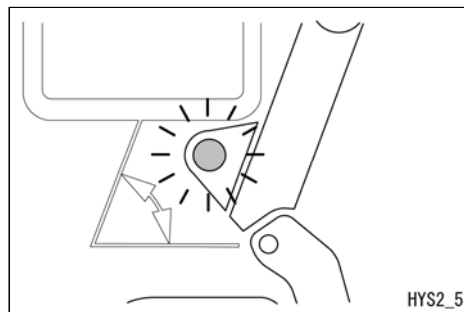
- Winding up of winch
- Main boom and jib extension
- Jib hoist-up

When the alarm buzzer sounds, immediately move the winch lever, the main boom/jib telescoping lever, and the main boom/jib derricking lever to the “Neutral” position to stop the operation and operate the winch lever toward “Down”. Alternatively, with the monitor, set the mode to main boom operation and place the main boom/jib telescoping lever toward “Contract”.



2.5 EXCESSIVE UNWIND DETECTOR

- When the hook is lowered and an amount of wire rope on the winch drum becomes small, the dead turns lamp is displayed on the monitor.
 - When hook lowering operation is performed, the alarm issues a continuous sound “peep”.
 - The hook lowering action is automatically stopped.
- When lowering operation is automatically stopped, perform recovery operation promptly. To perform recovery operation, perform hook winding up operation.



3. OPERATION

3.1 PRE-OPERATION INSPECTION

3.1.1 VISIBLE CHECKS

[1] INSPECTION OF WIRE ROPE

Check wire ropes for damage, deformation, wear, twist, kink & corrosion, etc. and if any abnormality is found, replace.

Inspect the fixed part of the rope end, wound condition and contact between ropes and if any abnormality is found, replace.

★ See "OPERATION 4. HANDLING WIRE ROPES" for details.

[2] INSPECTION OF GUIDE SHEAVE

Check guide sheaves for uneven wear, faulty rotation, reduction in diameter, etc. and replace if any abnormality is found.

[3] INSPECTION OF OVER HOIST DETECTOR

Check wire ropes of over hoist weight for damage and if any abnormality is found, replace.

[4] INSPECTION OF WINCH MOTOR

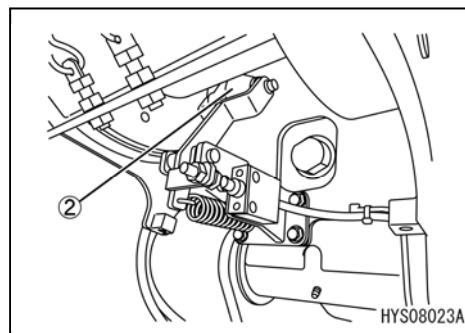
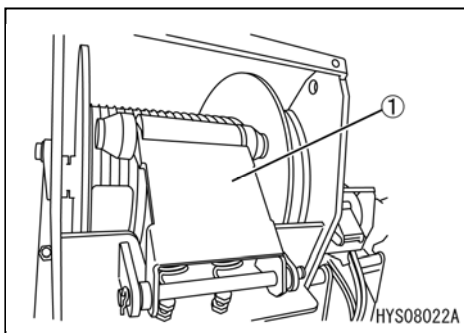
Check pipe connections for looseness, oil leaks and installation parts for looseness, and if any abnormality is found, repair.

[5] INSPECTION OF WINCH DRUM

Check drum parts for cracks, bend and damage, and if any abnormality is found, repair.

Check wire ropes for irregular winding and if any abnormality is found, repair.

Check the irregular winding prevention roller (1) and detection roller (2) of over lowering prevention for deformation and abnormality.



[6] INSPECTION OF HOOK BLOCK

Check hook parts and sheaves for cracks, bend and damage, and if any abnormality is found, repair.

Check the rotation condition of hook parts and sheaves, and if any abnormality is found, repair.

[7] INSPECTION OF EACH OPERATION LEVER

Operate each lever and check if they move smoothly, return to the neutral position, and see if there is difference of operational feeling among levers. If any abnormality is found, repair.

3.1.2 CHECKING BEFORE STARTING ENGINE

Inspections described in this section should be conducted before the first engine start-up of the day.

[1] CHECK DEFORMATION, DAMAGE OR WEAR OF WIRE ROPE

Inspect the fixed part of the rope end, wound condition and contact between ropes. For the check and inspection of wire rope during winch and boom telescoping, see "OPERATION 4. HANDLING WIRE ROPES".

3.1.3 CHECKING AFTER STARTING ENGINE

Check the following in this section after starting the engine and before starting work every day.

[1] CHECKING CRANE OPERATIONS

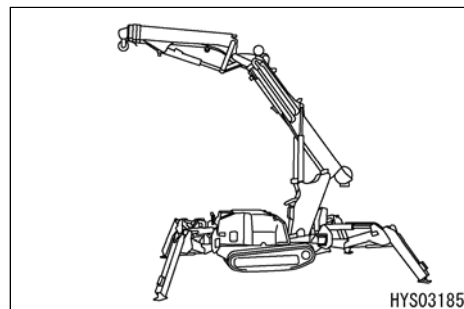
WARNING

- When performing an operation check of the crane, see "OPERATION 2.12 OUTRIGGER SETUP OPERATION" to set the outriggers to maximum.
- When performing an operation check of the crane, see from "OPERATION 2.13 PRECAUTIONS BEFORE CRANE WORK" to "OPERATION 2.20 CRANE STOWAGE OPERATION (FIXED HOOK SPECIFICATION)", and observe the procedure and precautions.

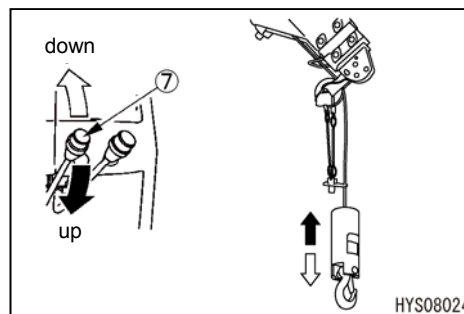
CAUTION

When a winch is installed, remove the fixed part of the wedge socket before performing raising operation.
Be careful not to allow the winch wire to be wound irregularly during raising operation.

1. Use the main starter switch on the machine side to start the engine.
2. See "WINCH 2.13 PRECAUTIONS BEFORE CRANE WORK" and "OPERATION 2.14 CRANE OPERATION POSTURE" and configure the Crane as shown in the figure on the right.



3. Verify that the hook is wound down smoothly when the winch lever (7) is operated to "DOWN" (pushed forward).
 2. Verify that the hook is wound up smoothly when the winch lever (7) is operated to "UP" (pushed toward you).Also check if the hook block immediately stops when the winch lever returns to the "NEUTRAL" position, the winch drum does not wind in mess, each sheave rotates smoothly, and each sheave is not worn.



At this time, check if abnormal noise is generated from various parts of the boom and winch motor.

Repair if any abnormality is found.

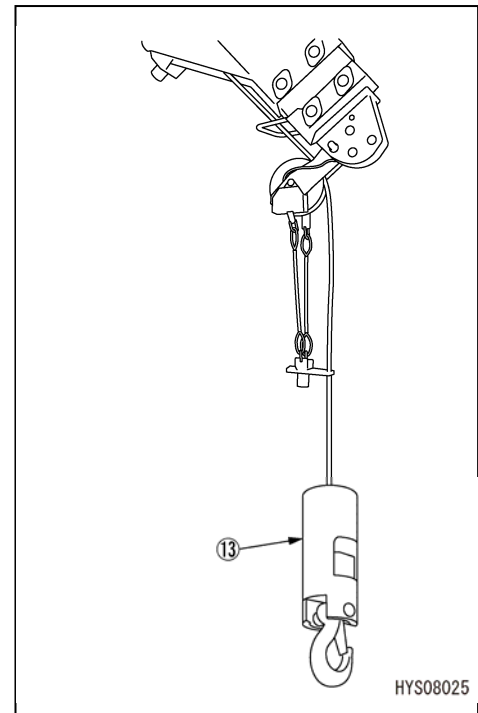
[2] INSPECTION OF OVER HOIST DETECTOR

When performing winch raising and main boom extension operation, jib extension operation and jib hoist-up operation, respectively, with the hook block (13) set to an over-hoist state, check that the alarm buzzer sounds, and winch raising and main boom extension operation, jib extension operation and jib hoist-up operation stop.

If the above does not occur, the over hoist detector may be faulty.

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

Ask us or our sales service agency for repair.

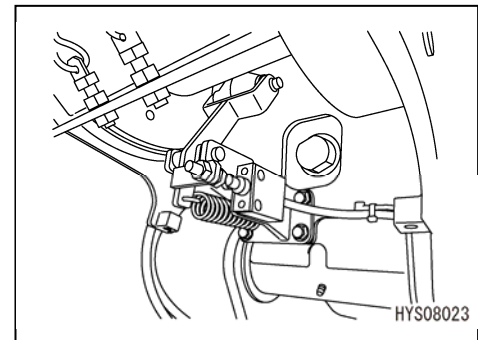


[3] INSPECTION OF EXCESSIVE UNWIND DETECTOR

When the hook is lowered and 3 loops or less of wire rope is left on the winch drum, check if the alarm sounds “peep” continuously and hook lowering action stops automatically.

If lowering operation does not stop automatically, the excessive unwind detector may be faulty or the circuit may be open.

Ask us or our sales service agency for repair.



CAUTION

Always put on thick leather work gloves when performing wire rope operation.

When paying out wire rope, perform lowering operation while pulling the wire by hand to prevent it from slackening.

3.2 OPERATIONS BEFORE CRANE WORK

⚠ WARNING

Be sure to operate the overhanging work of the crane at a very slow speed. If work is conducted with sudden operation or fast operation, hook block (single fall hook) will hit the machine body and it may be damaged.

Also, there is a risk of causing serious accidents such as hitting people, or trapping of hands or fingers.

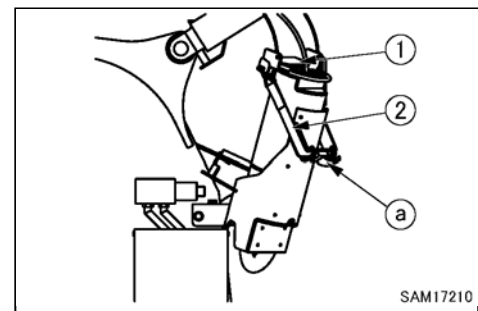
CAUTION

- Do not allow the hook block (single fall hook) to contact the ground. The wire rope becomes too slack, causing irregular winding of the winch drum.
- One-person operation is possible using the radio controller to control the crane.
- When you work with the radio controller, switching operation of monitor jib/boom select button is unnecessary.

1. Loosen part (a) of the band (2) fixing the stored hook block and remove the fixing bracket (1).

⚠ WARNING

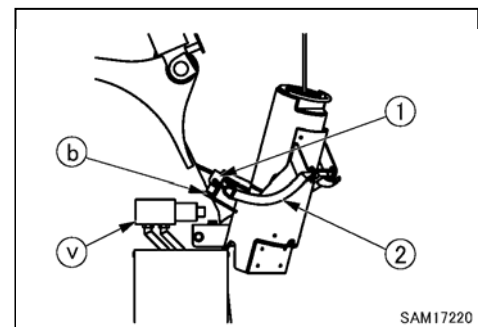
Doing the following work without removing the fixing bracket (1) and the band (2) may cause the winch wire or the machine to be damaged.



2. Hook the removed fixing bracket (1) to part (b) and store it. At this time, do not remove the band (2), but store it together with it attached to the fixing bracket (1).

⚠ WARNING

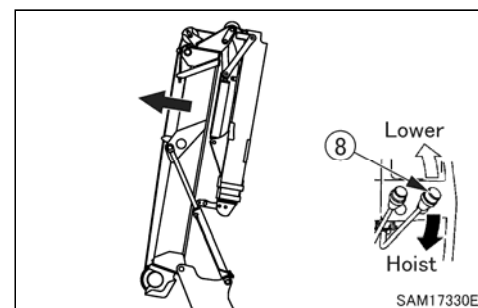
- Be careful not to let the fixing bracket (1) touch the switching valve (v) when storing. This may cause a malfunction.
- If you do not store the fixing bracket (1) and the band (2), there is a risk of them getting caught on the travelling lever during turning and may cause serious accidents due to damage or malfunction of the machine.



3. Press the main boom selector button of the monitor to select the main boom. (The circle on the left side of "Boom" is displayed in green)
Operate the derricking lever (8) to "HOIST" side to raise the main boom fully.

⚠ WARNING

Guide by hand so that the over-hoisting detection weight does not get caught on the surroundings. If you proceed with the work without guiding, the over-hoisting detector and machine body may be damaged.



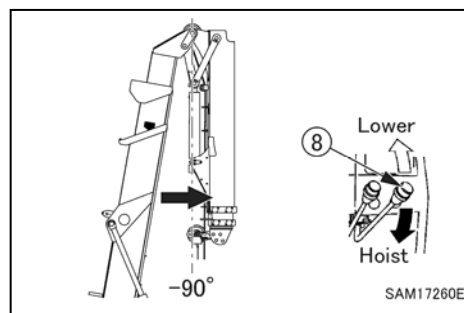
NOTES

When storing the jib, if the main boom is not raised more than 40 degrees, the safety device operates to prevent interference and the machine cannot be put into operation posture.

4. Press the jib selector button of the monitor to select the jib.
(The circle on the left side of "Jib" is displayed in green)
Operate the hoisting lever (8) to the "HOIST" side and slowly raise so that the angle of the jib comes near -90 degrees.

⚠ WARNING

If the angle of the jib is raised too much, the stowed hook block jumps out suddenly and it is dangerous. Be sure to stop at the specified conditions and then perform the next procedure.



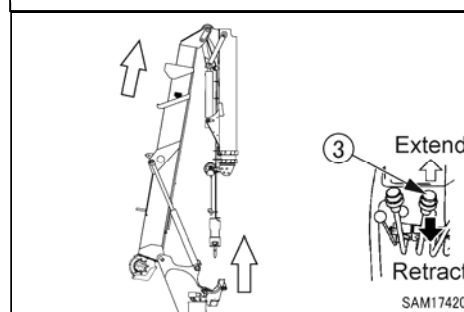
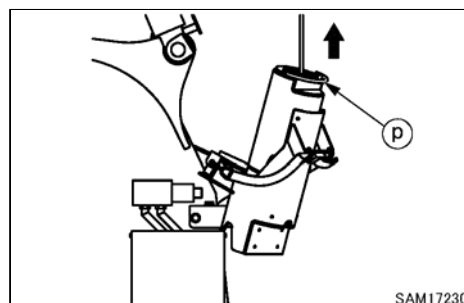
CAUTION

If the angle of the jib is less than -90 degrees, the machine is in the inoperable range and work cannot be done. In that case, raise the jib a little.

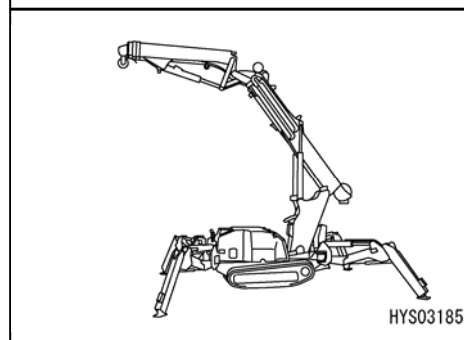
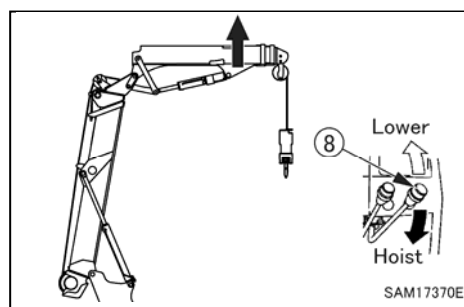
5. Press the main boom selector button of the monitor to select the main boom. (The circle on the left side of "Boom" is displayed in green)
Hold the handle (p) of the hook block and operate the telescoping lever (3) to the "EXTEND" side while supporting it and slowly extend until the hook block comes out of the hook storage bracket.

⚠ WARNING

If you do not guide by holding the handle (p) of the hook block when taking out the hook block, the hook block may hit the surroundings or get caught, which may cause damage to the machine body or hit people causing a serious accident.



6. Press the jib selector button of the monitor to select the jib.
(The circle on the left side of "Jib" is displayed in green)
Operate the derricking lever (8) to the "HOIST" side and bring it up to where the hook block does not interfere with the machine body.



3.3 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 is over hoisted, an over hoist warning buzzer will sound. When the buzzer sounds, immediately operate the winch lever to the “NEUTRAL” position to stop raising the hook block.
- When lowering the hook for long distance for underground works, be sure to leave more than 3 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.

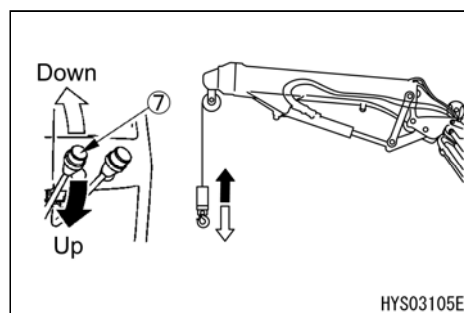
Press the winch selector button on the monitor panel to display the winch selector screen, select J1 (single fall hook) and Winch (winch unit installation) (circles on the left of J1 and Winch are displayed in green), and press the home button to return to Monitor 1 (home screen).

Operate the winch lever (7) as follows.

- Lowering : 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.

- Raising : Pull the lever toward you “UP”.



NOTES

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

3.4 CRANE STOWAGE OPERATION

⚠ WARNING

Be sure to operate the overhanging work of the crane at a very slow speed. If work is conducted with sudden operation or fast operation, hook block (single fall hook) will hit the machine body and it may be damaged.

Also, there is a risk of causing serious accidents such as hitting people, or trapping of hands or fingers.

CAUTION

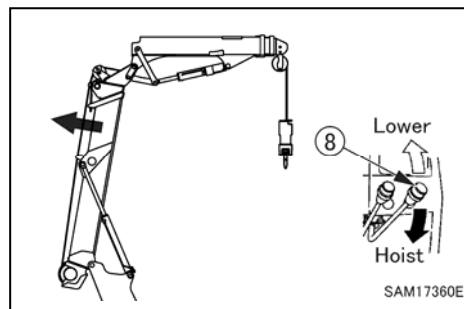
- The main boom and jib retracting operation will lower the hook block (single fall hook). The lowering operation of the boom also causes the hook block (single fall hook) to move downward.

Raise the hook at the same time so that the hook block (single fall hook) will not touch the ground or interfere with the machine.

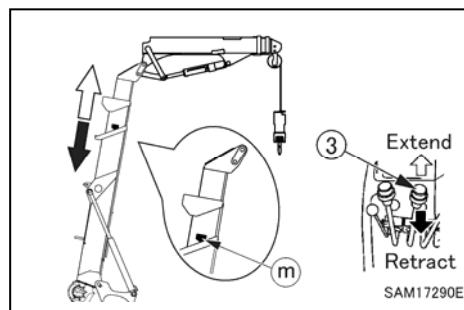
- When lowering the jib, be careful not to allow the jib to hit the machine.
- One-person operation is possible using the radio controller to control the crane.
- When you work with the radio controller, switching operation of monitor jib/boom select button is unnecessary.

1. Press the main boom selector button of the monitor to select the main boom. (The circle on the left side of “Boom” is displayed in green)

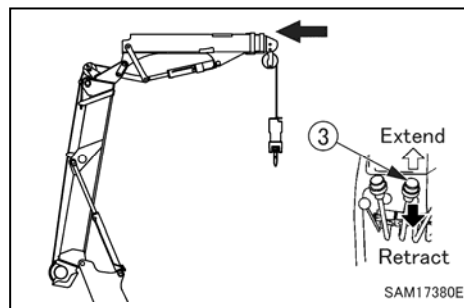
Operate the derricking lever (8) to “HOIST” side to raise the main boom fully.



2. Move the telescoping lever (3) to the “RETRACT” or “EXTEND” side to match the position of mark (m) on the right side of the main boom.



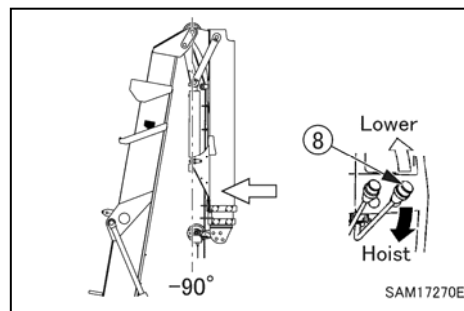
3. Press the jib selector button of the monitor to select the jib. (The circle on the left side of “Jib” is displayed in green)
Operate the telescoping lever (3) to the “RETRACT” side and shorten the jib to the fully retracted condition.



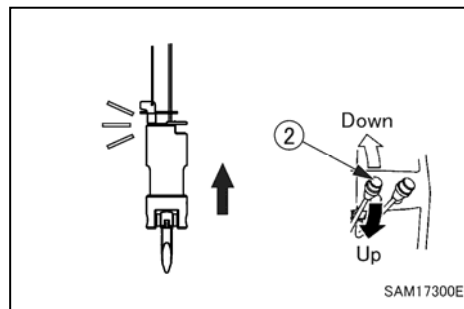
4. Operate the hoisting lever (8) to the "LOWER" side and slowly lower so that the angle of the jib comes near -90 degrees.

CAUTION

- If the angle of the jib is less than -90 degrees, the machine is in the inoperable range and work cannot be done. In that case, raise the jib a little.
- As the hook block may interfere with the machine, work as you wind up as necessary.



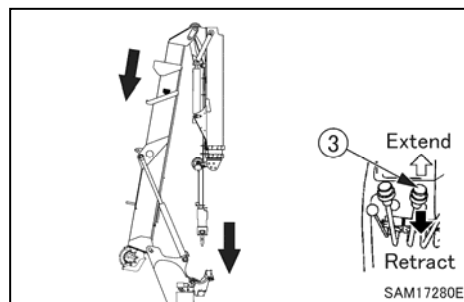
5. Operate the winch lever (2) to the "UPPER" side and slowly wind up the hook block until the over-hoisting prevention device stops the operation.



6. Press the main boom selector button of the monitor to select the main boom. (The circle on the left side of "Boom" is displayed in green)

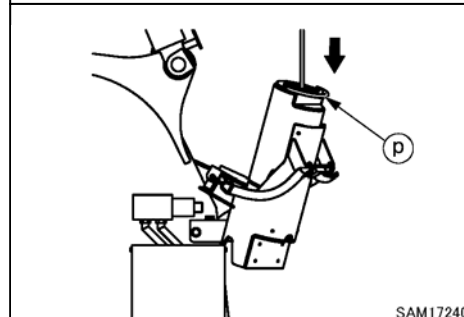
Operate the telescoping lever (3) to the "RETRACT" side and slowly shrink the main boom.

At this time, hold and support the handle (p) of the hook block and operate the telescoping lever (3) to the "RETRACT" side and move the hook block handle (p) to the position shown on the right to the hook storage bracket.



! WARNING

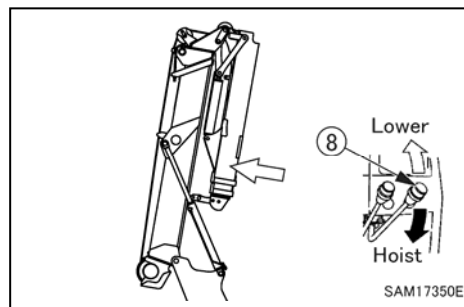
- Do not store hook blocks by unwinding them. The slack of the wire rope may become large, damaging the machine or the parts.
- When you put the hook block in the hook storage bracket, carefully work with slow operation so as not to trap your hands and fingers.



7. Press the jib selector button of the monitor to select the jib. (The circle on the left side of "Jib" is displayed in green)
Operate the derricking lever (8) to the "LOWER" side and shorten the jib to the fully lowered condition.

! WARNING

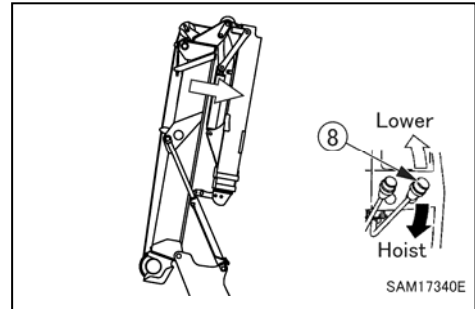
When the derricking lever (8) is operated to the "HOIST" side, the stored hook block will jump out and it is dangerous, so be sure to check the operating direction before lever operation.



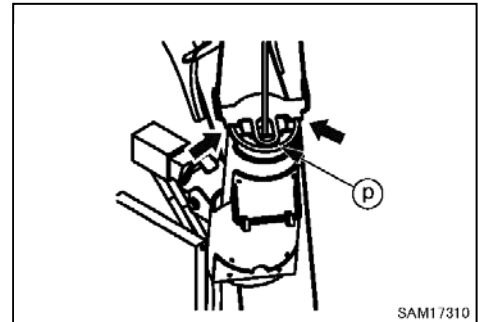
8. Press the main boom selector button of the monitor to select the main boom. (The circle on the left side of “Boom” is displayed in green)
Operate the derricking lever (8) to the “LOWER” side and shorten the main boom to the fully lowered condition.

CAUTION

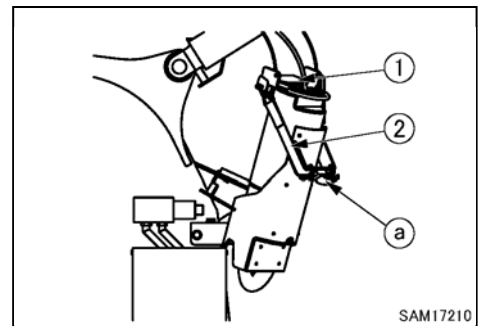
When lowering the main boom, hold the weight for detection of over-hoisting prevention. If conducted as is, there is a possibility of damaging the machine body or trapping of parts.



9. Store the weight for detection of over-hoisting prevention on the hook block.
At this time, ensure that the weight for detection of over-hoisting prevention hits both ends of the handle (p) of the hook block.



10. Tighten the stored hook block and the weight for detection of over-hoisting prevention with the fixing bracket (1) and part (a) of the band (2).



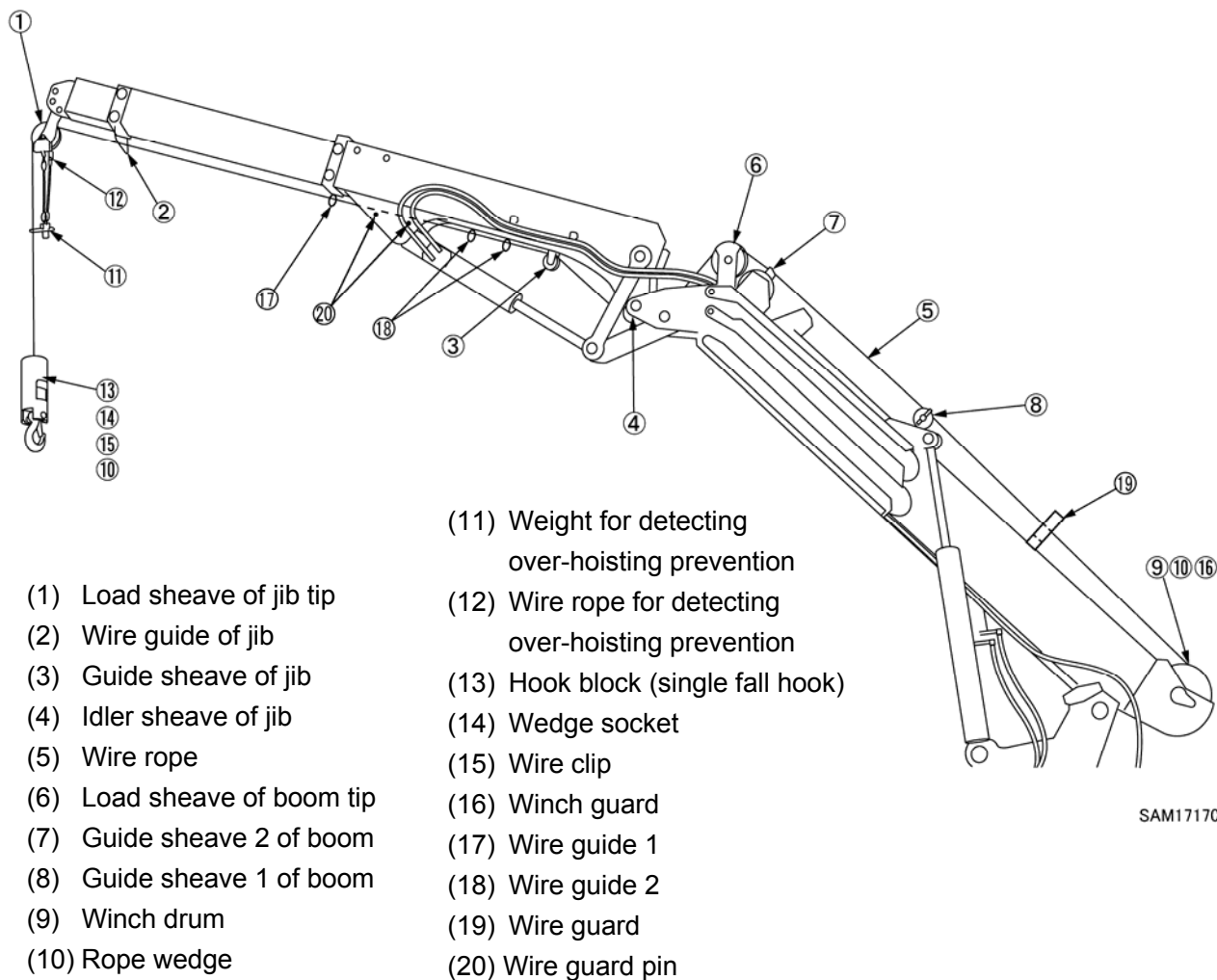
3.5 WHEN CHANGING TO HOOK BLOCK (SINGLE FALL HOOK)

⚠ WARNING

- Be sure to attach the rope wedge properly to secure the wire rope. Serious accidents may occur if the wire rope is detached during crane operations.
- Be sure to wear thick leather work gloves when handling wire ropes.

CAUTION

- The procedure in this section assumes that the winch and winch related parts are installed and the wire rope is wound on the winch drum.
- Hook block (single fall hook) cannot be used with fixed hook.

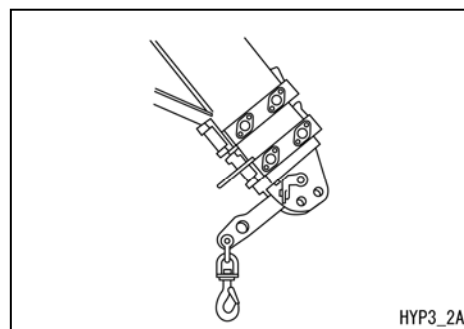


1. See "OPERATION 2.14 CRANE OPERATION POSTURE", put the crane into the work posture and put the main boom and jib into horizontal position.

NOTES

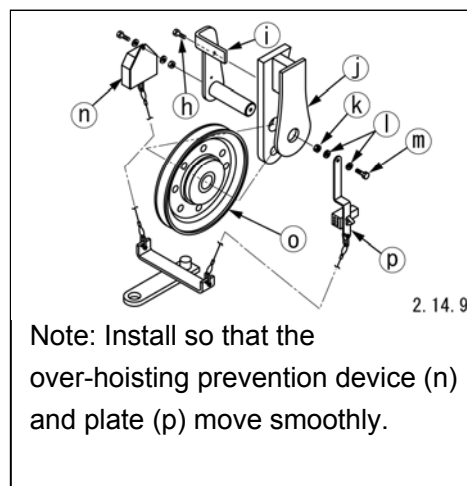
Lower the jib as necessary to facilitate the work.

2. Remove the hook and shackle if fixed hook is attached.



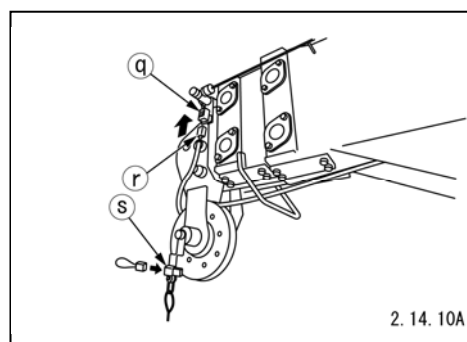
3. As shown in the figure on the right, attach the load sheave part and over-hoisting prevention device to the tip of the jib.

- (h) Bolt
- (i) Pin
- (j) Head
- (k) Nut
- (l) Plain washer
- (m) Bolt
- (n) Over-hoisting prevention device
- (o) Load sheave (with double-sided width adjustment collar)
- (p) Plate

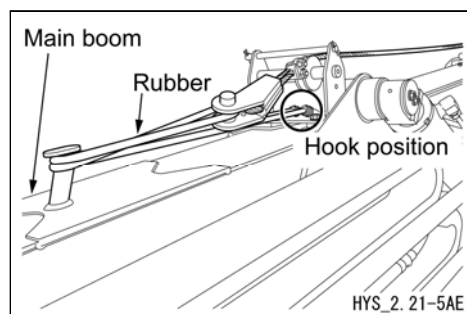


4. Remove the dummy connector attached to the connector (q) at the end of the jib and install the connector (r) of the over-hoisting prevention device instead.

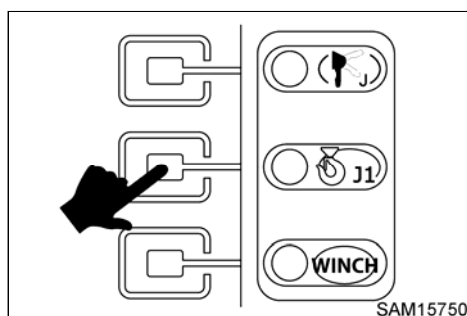
Insert the removed dummy connector into the connector holder (s).



5. Remove the rubber securing the wedge socket to the top face of the No. 1 boom and remove the wedge socket from the wire rope. For details on removing the wedge socket, see "INSPECTION AND MAINTENANCE 8.5 [4] REPLACEMENT OF WINCH WIRE ROPE (WINCH SPECIFICATION)".

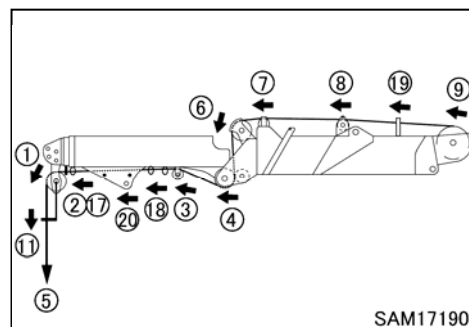
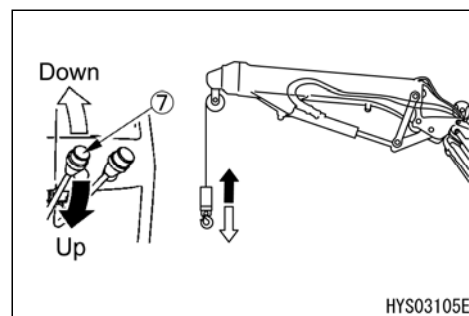


6. Press the winch selection button on the monitor to display the winch selection screen, select "J1: single fall hook" and "winch (winch installation)" (J1, the circle on the left side of the winch is displayed in green), and press the home button to return to the home screen of the monitor.



7. Pull the wire rope (5) so that it is not wound irregularly, operate the winch lever to the “DOWN” side, and thread the wire rope in the following order.

- Wire guard (19)
- Guide sheave 1 of boom (8)
- Guide sheave 2 of boom (7)
- Load sheave of boom tip (6)
- Idler sheave of jib (4)
- Guide sheave of jib (3)
- Wire guide 2 (18)
- Wire guard pin (20)
- Wire guide 1 (17)
- Wire guide of jib (2)
- Load sheave of jib tip (1)
- Weight for detecting over-hoisting prevention (11)

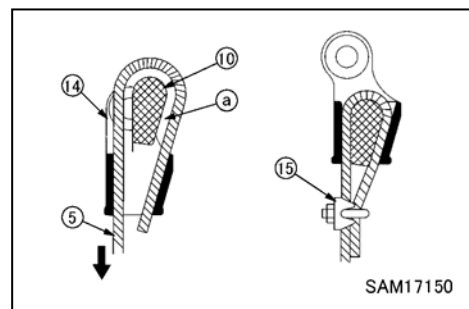


CAUTION

When passing through the wire rope (5), you can do the work efficiently by first pulling 10 m of wire rope (5) from the winch drum (9).

8. Secure the end of the wire rope (5) to the wedge socket (14), following the procedure provided below.

- (1) Draw the wire rope (5) through the wedge socket (14) as shown in the diagram to the right.
- (2) Put the rope wedge (10) in position (a), and yank the wire rope (5) in the direction indicated by the arrow.

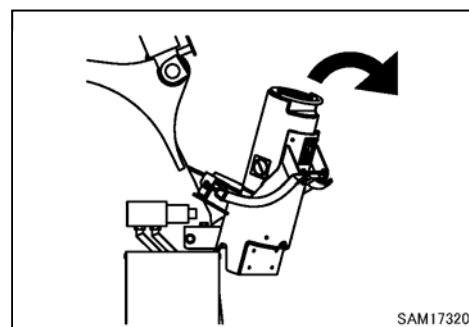


9. If the hook block is stowed in the storage bracket, remove it from the storage bracket.

WARNING

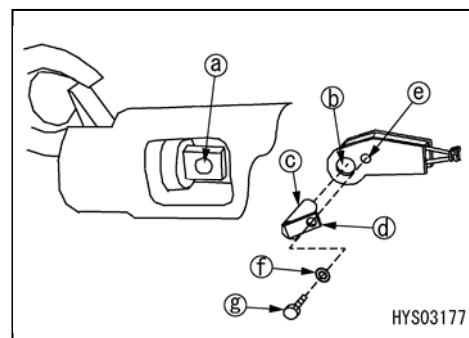
Be sure to store the fixing bracket and band that fixed the hook block. If you perform a slewing operation without stowing them, they may be caught on the travelling lever and cause malfunction.

See “OPERATION 2.4 CRANE OPERATION POSTURE” for the storage method of the fixing bracket and band.



10. Hold the wedge socket and insert it so that hole (b) of the wedge socket is aligned with hole (a) of the pin inside the hook block.

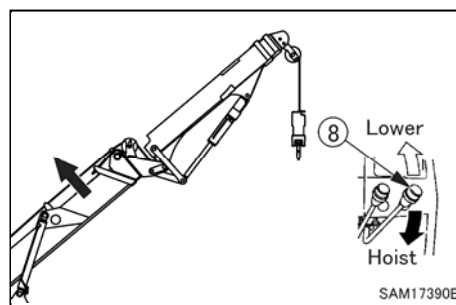
Insert the wedge socket pin (c) into the aligned hole and align the wedge socket pin hole (d) with the wedge socket hole (e) so that they are fixed by the spring washer (f) and bolt (g).



11. Select the main boom on the monitor and operate the hoisting lever (8) to “HOIST” side and lift up the hook block.

NOTES

Winch operation is allowed only after the hook block is raised. Operating the winch in a state with no load may cause irregular winding.

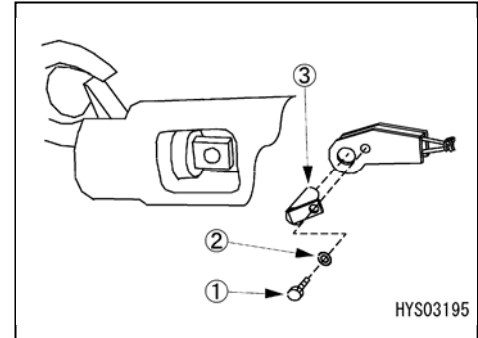


3.6 WHEN CHANGING TO FIXED HOOK

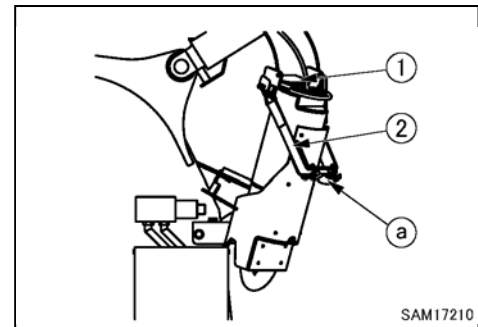
CAUTION

Fixed hooks cannot be used in combination with winch hook blocks (single fall hook).

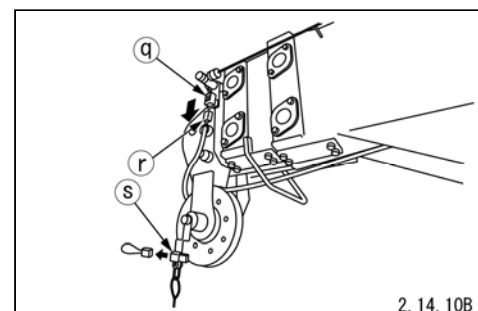
1. If a hook block is installed, refer to steps 1 to 6 of "WINCH 3.4 CRANE STOWAGE OPERATION" and stow the hook block in the stowage bracket.
2. Remove the wedge socket pin (3) by removing the bolt (1) and the spring washer (2) inside the stored hook block.



3. Tighten the stored hook block and the weight for detection of over-hoisting prevention with the fixing bracket (1) and part (a) of the band (2).

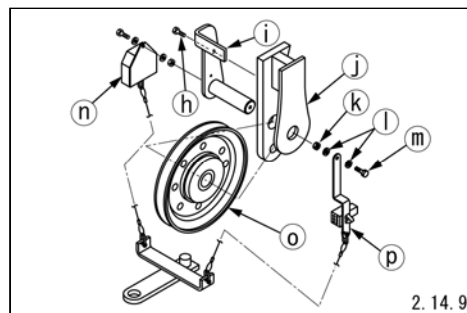


4. Remove the wedge socket from the wire rope.
For details on removing the wedge socket, see "INSPECTION AND MAINTENANCE 8.5 [4] REPLACEMENT OF WINCH WIRE ROPE (WINCH SPECIFICATION)".
5. Remove the connector (r) of the over-hoisting prevention device attached to the connector (q) at the jib tip and install the dummy connector inserted into the connector holder (s) instead.



6. Remove the load sheave part at the tip of the jib and the over-hoisting prevention device as shown on the right.

- (h) Bolt
- (i) Pin
- (j) Head
- (k) Nut
- (l) Plain washer
- (m) Bolt
- (n) Over-hoisting prevention device
- (o) Load sheave (with double-sided width adjustment collar)
- (p) Plate



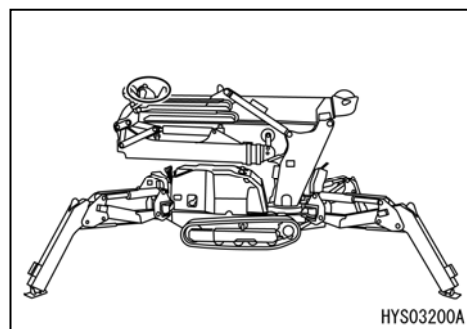
7. Wind in the wire tip until it comes to the top of the No. 1 main boom.

⚠ WARNING

Guide the wire by supporting it with your hand to prevent irregular winding of the wire. Be careful not to allow your hand to be entangled with the wire and sheave.

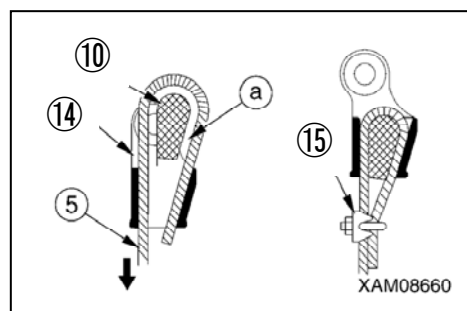
CAUTION

Work can be done in the work posture other than storage posture.



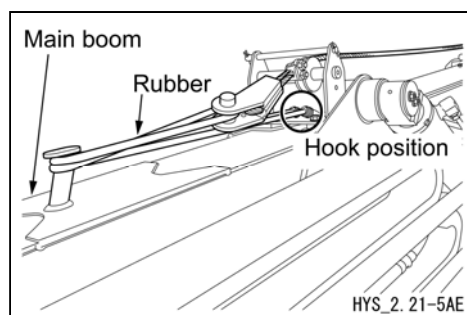
8. Secure the end of the wire rope (5) to the wedge socket (14), following the procedure provided below.

- (1) Draw the wire rope (5) through the wedge socket (14) as shown in the diagram to the right.
- (2) Put the rope wedge (10) in position (a), and yank the wire rope (5) in the direction indicated by the arrow.
- (3) Fasten the wire by tightening the wire clip (15).

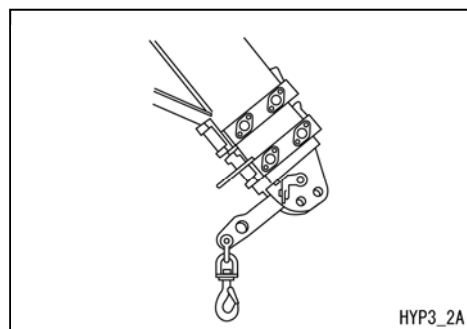


9. Stow the wire rope.

As shown in the figure on the right, pull the wedge socket by hooking the rubber and winding the wire until there is no slack.



10. Attach the fixed hook and shackle to the tip of the jib.



4. SPECIFICATIONS

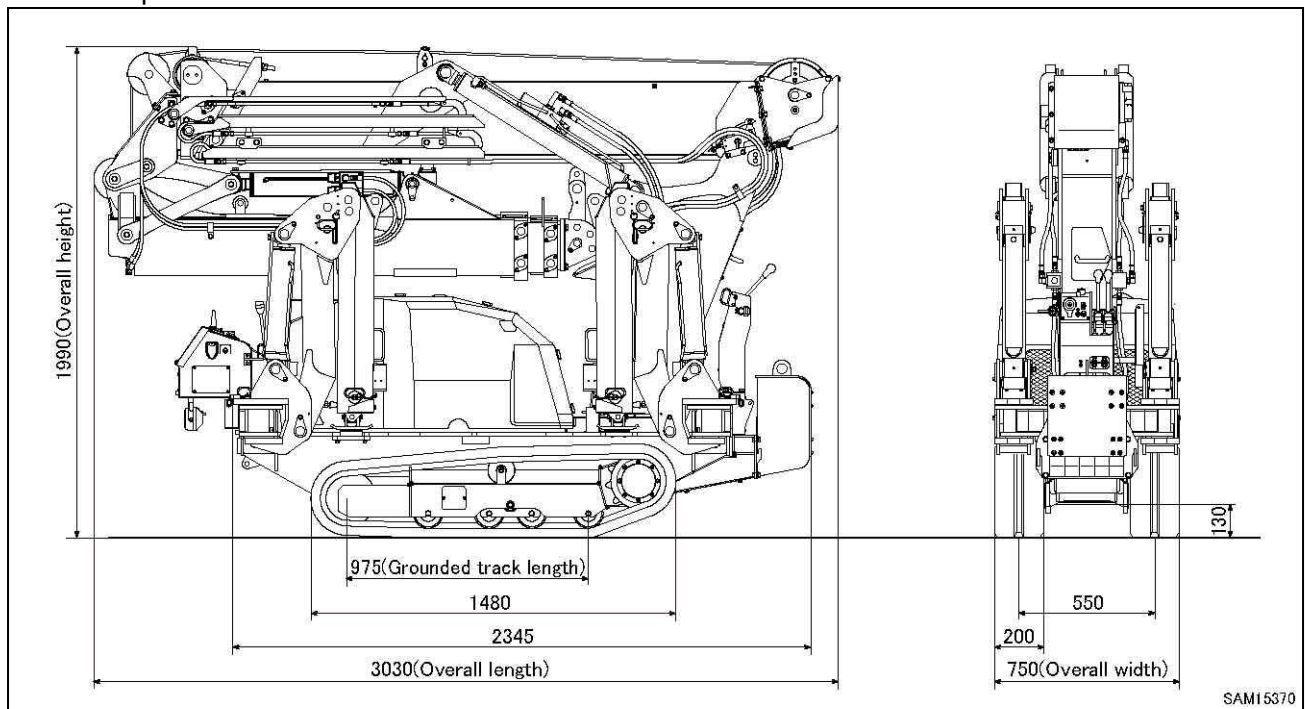
4.1 SPECIFICATIONS

Equipment/Item		MK1033CWH-1 [MK1033CWHE-1]
Weight and dimensions	Machine mass	2390 kg [2370 kg]
	Overall length × width × height	3030 mm × 750 mm × 1990 mm [3235 mm × 750 mm × 1990 mm]
Performance	Maximum rated total load × working radius	0.82 t × 2.3 m (main boom 2nd stage 65°/jib 1st stage 65°)
	Maximum working radius	9.73 m
	Maximum lifting height above ground	10.47 m
Winch system	Type	Swash plate axial piston motor differential planetary gear type, friction disc type brake
	Hook hoist speed	37.8 m/min (drum 5 layers, hook single fall)
	Hoist wire rope	IWRC 6 × WS (26) 0/0 B type Φ8 × 73 m
	Rated pressure	20.6 MPa (210 kgf/cm ²)
Safety device	Over hoist detector, over un-winding detector, alarm buzzer, hydraulic safety valve, wire rope latch, tri-colour lights	

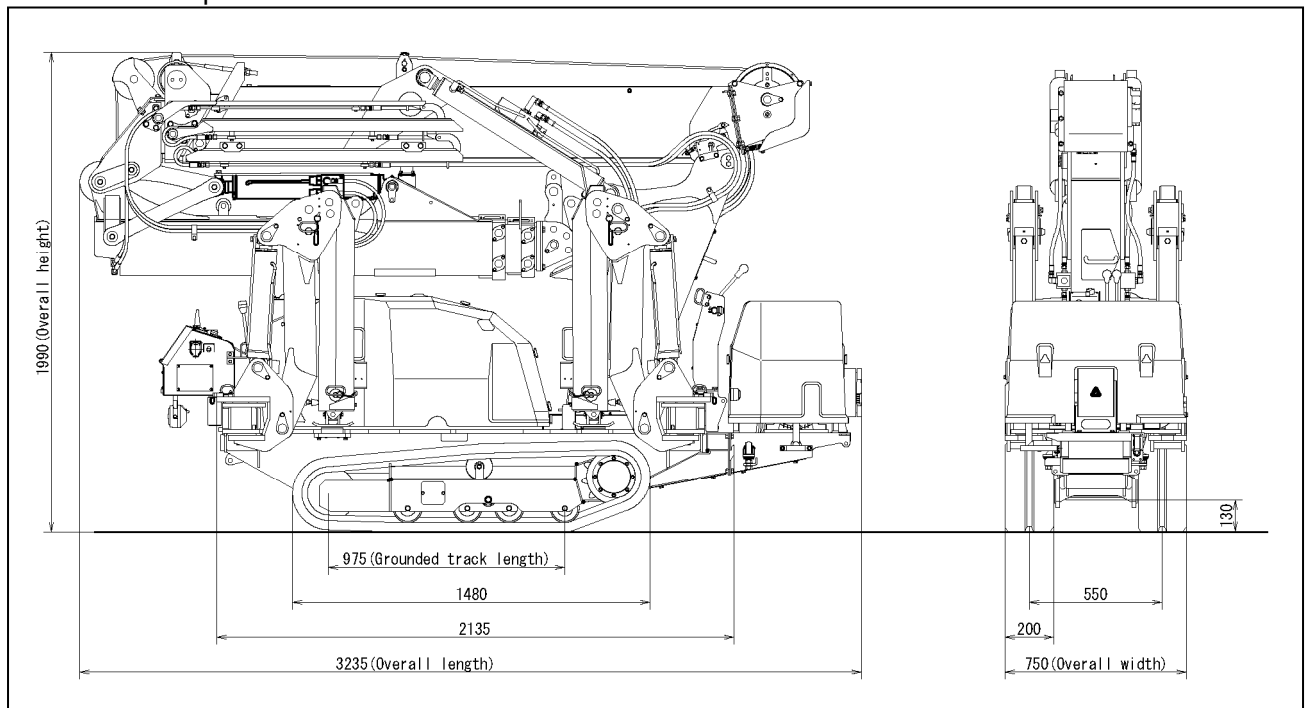
[Electric Motor Specification]

4.2 MAIN DIMENSIONAL DRAWING

Standard specification



Electric Motor Specifications



4.3 WORKING RADIUS AND RATED TOTAL LOAD

⚠ WARNING

- The working radius/lifting height shows relationship between working radius, boom angle and lifting height above ground of this machine with no load hoisted, and deflection of the boom is not included.
- When using a winch with single fall, be sure to set J1 : Single wire fall specification with “Hook selector screen” on the monitor.
- The maximum rated total load of the winch is 820 kg.

4.3.1 RATED TOTAL LOAD CHART

Outrigger Position : MAX

Main Boom (1) (kg)				Jib Stage		
				First	Second	Third
Main Boom Angle	80°	Jib Angle	90°	820		
			80°	820	820	820
			60°	820	675	535
			40°	795	600	475
			0°	700	530	420
	55°	Jib Angle	90°	820		
			55°	820	665	525
			40°	795	600	475
			0°	700	530	420
	0°	0°	0°	700	530	420

Outrigger Position : MIN

Main Boom (1) (kg)				Jib Stage		
				First	Second	Third
Main Boom Angle	80°	Jib Angle	90°	820		
			80°	820	820	820
			60°	820	675	535
			40°	795	600	475
			0°	700	530	420
	55°	Jib Angle	90°	820		
			55°	820	665	525
			40°	795	600	475
			0°	700	530	380
	0°	0°	0°	485	315	235

Main Boom (2) (kg)				Jib Stage		
				First	Second	Third
Main Boom Angle	80°	Jib Angle	90°	820		
			80°	820	820	820
			60°	820	675	535
			40°	795	600	475
			0°	700	530	420
	65°	Jib Angle	90°	820		
			65°	820	680	540
			50°	805	620	460
			35°	725	565	450
			0°	630	490	380
	45°	Jib Angle	90°	640		
			45°	640	545	440
			30°	605	500	400
			0°	570	465	375
	0°	0°	0°	545	395	320

Main Boom (2) (kg)				Jib Stage		
				First	Second	Third
Main Boom Angle	80°	Jib Angle	90°	820		
			80°	820	820	820
			60°	820	675	535
			40°	795	600	475
			0°	700	530	420
	65°	Jib Angle	90°	820		
			65°	820	680	540
			50°	805	620	460
			35°	725	565	395
			0°	630	425	320
	45°	Jib Angle	90°	515		
			45°	470	345	290
			30°	440	305	235
			0°	370	250	190
	0°	0°	0°	170	115	85

Main Boom (2.5) (kg)				Jib Stage		
				First	Second	Third
Main Boom Angle	80°	Jib Angle	90°	820		
			80°	820	820	700
			60°	745	555	440
			40°	645	475	370
			0°	520	390	290
	65°	Jib Angle	90°	645		
			65°	645	520	415
			50°	575	455	360
			35°	515	400	320
			0°	450	350	270
	45°	Jib Angle	90°	440		
			45°	440	375	300
			30°	415	340	275
			0°	390	320	260
	0°	0°	0°	335	280	225

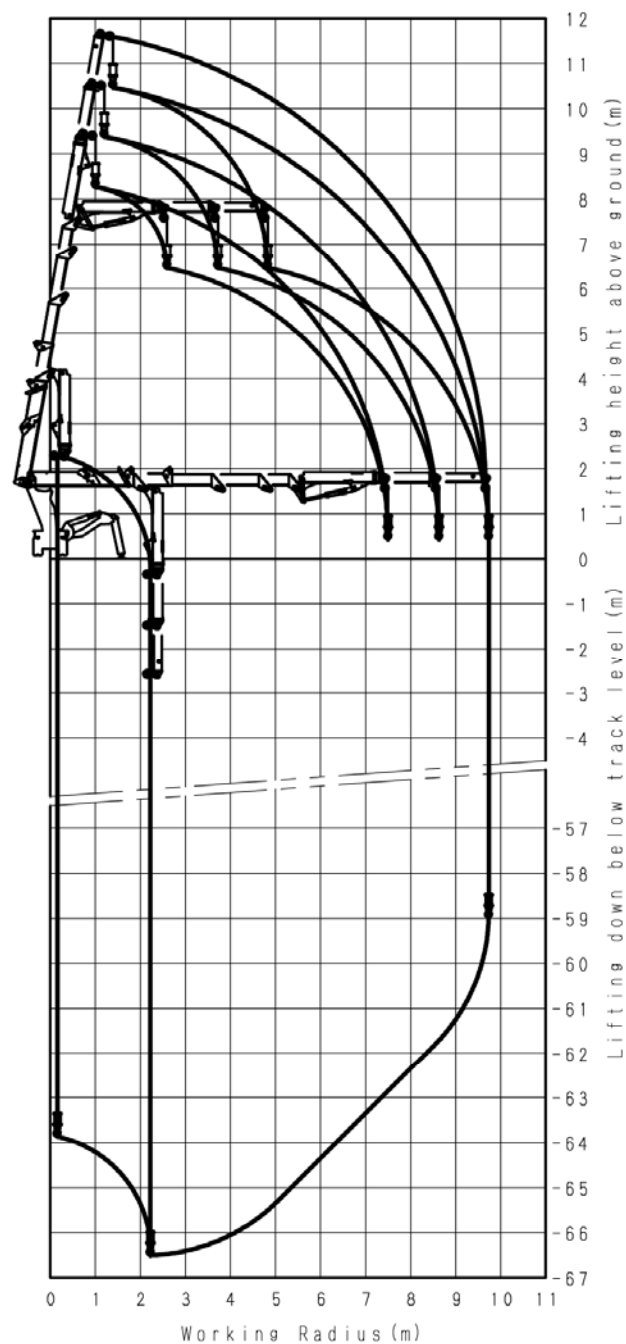
Main Boom (2.5) (kg)				Jib Stage		
				First	Second	Third
Main Boom Angle	80°	Jib Angle	90°	820		
			80°	820	820	700
			60°	745	555	440
			40°	645	475	370
			0°	520	390	290
	65°	Jib Angle	90°	645		
			65°	645	520	415
			50°	575	455	360
			35°	515	400	320
			0°	450	330	270
	45°	Jib Angle	90°	325		
			45°	300	230	185
			30°	265	200	155
			0°	245	165	125
	0°	0°	0°	75	40	30

Main Boom (3) (kg)				Jib Stage		
				First	Second	Third
Main Boom Angle	80°	Jib Angle	90°	820		
			80°	820	760	605
			60°	645	480	380
			40°	560	410	320
			0°	450	340	250
	65°	Jib Angle	90°	545		
			65°	545	440	350
			50°	485	385	305
			35°	435	340	270
			0°	380	295	230
	45°	Jib Angle	90°	365		
			45°	365	310	250
			30°	345	285	230
			0°	325	265	215
	0°	0°	0°	220	215	180

Main Boom (3) (kg)				Jib Stage		
				First	Second	Third
Main Boom Angle	80°	Jib Angle	90°	820		
			80°	820	760	605
			60°	645	480	380
			40°	560	410	320
			0°	450	340	250
	65°	Jib Angle	90°	545		
			65°	545	440	350
			50°	485	385	305
			35°	435	340	270
			0°	380	295	230
	45°	Jib Angle	90°	245		
			45°	225	180	140
			30°	215	150	120
			0°	185	125	95
	0°	0°	0°	30	0	0

4.3.2 WORKING RANGE/LIFTING HEIGHT OF SINGLE FALL WINCH

MK1033CW-1 Winch Working Range Chart



Notes: This chart does not reflect any bending of boom.

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