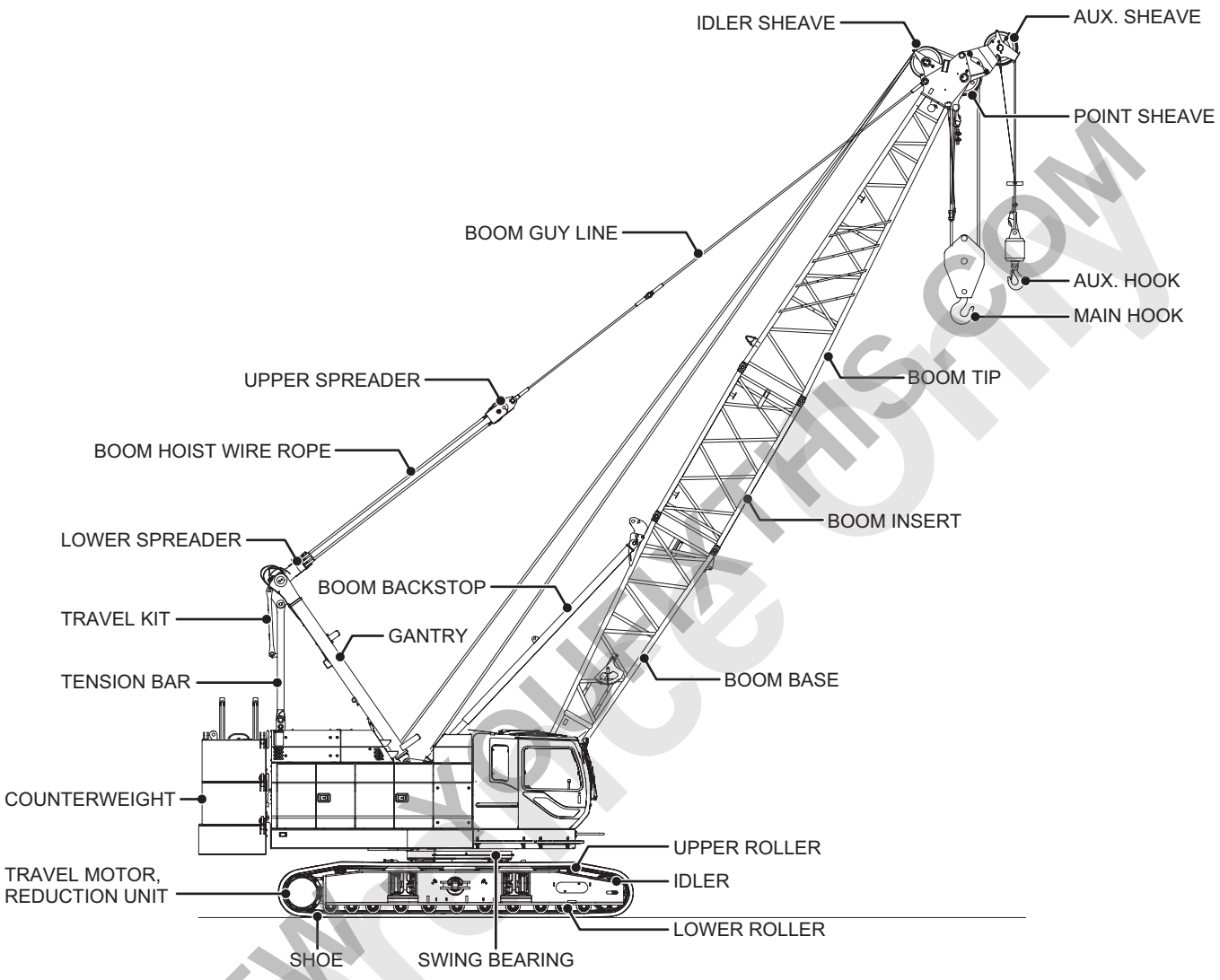
2. OPERATION

2.1 TERMINOLOGY OF MACHINE EACH PART



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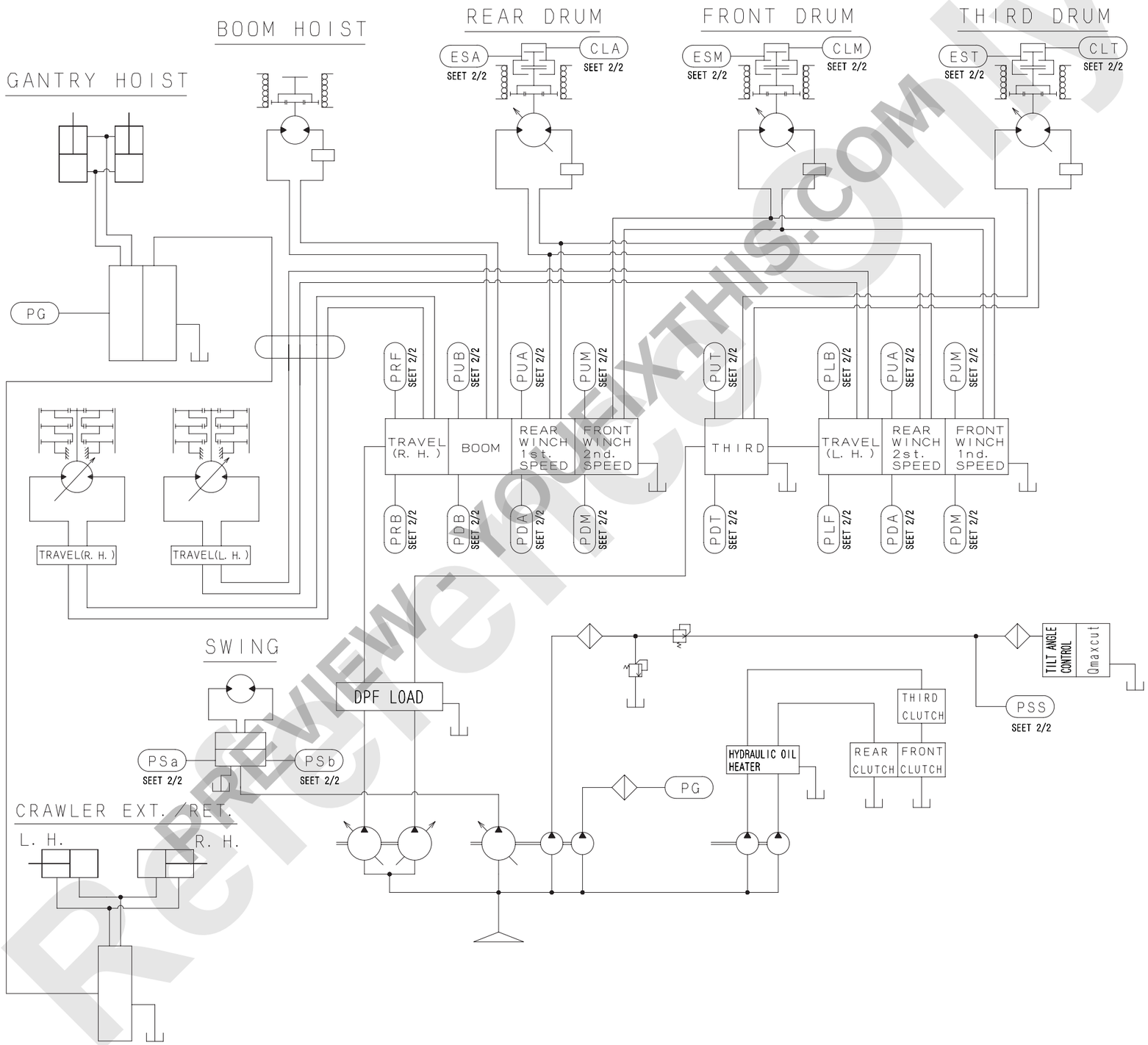
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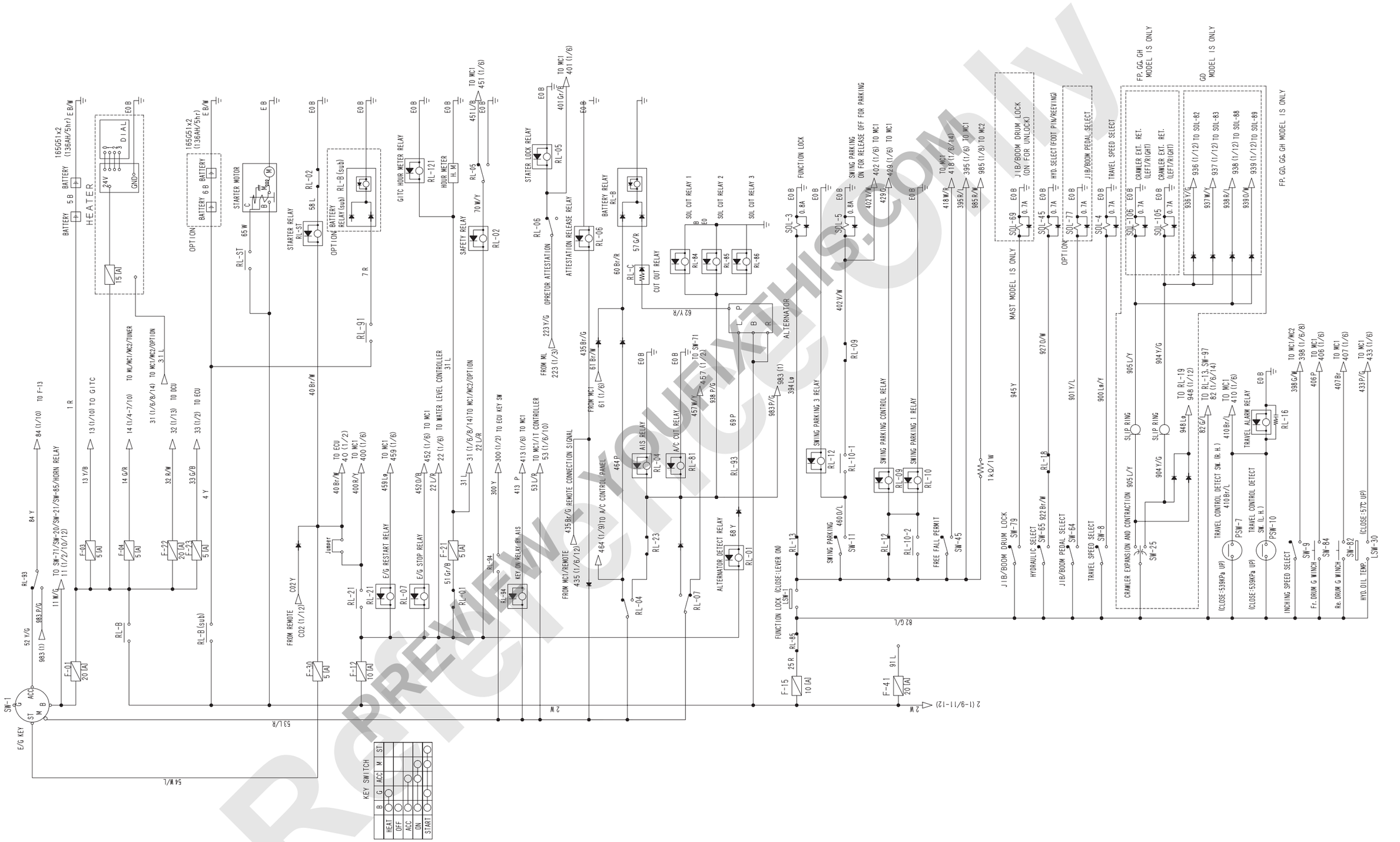
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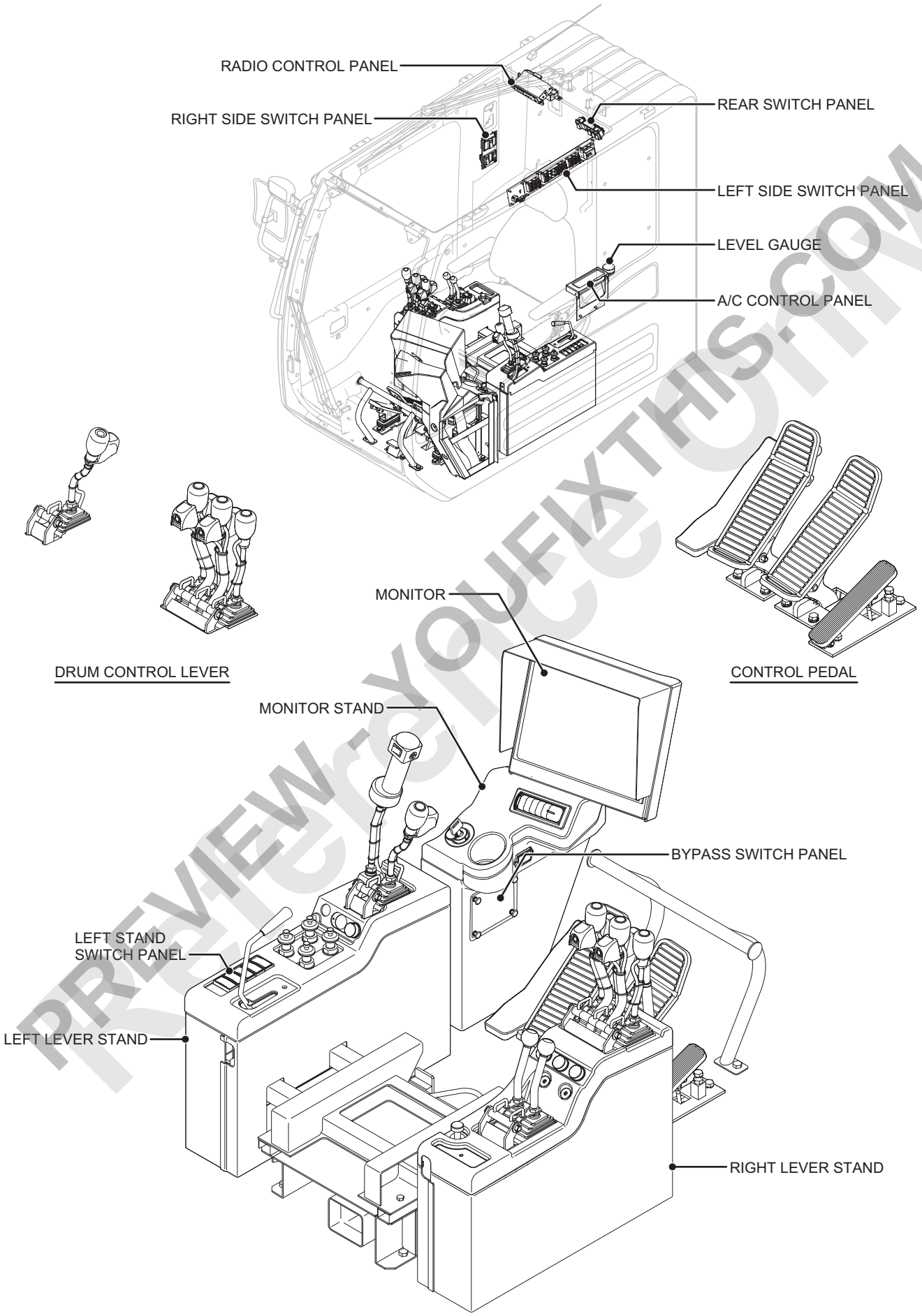


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1. SAFETY

1.1 SAFETY INFORMATION

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

⚠ DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in a loss of life or serious injuries.
⚠ WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in a loss of life or serious injuries.
⚠ CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in a minor or moderate injuries. It may also be used to alert against possible damage to the machine and its components.
Note	Supplementary explanation.

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

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IMPORTANT INFORMATION

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2. OPERATION

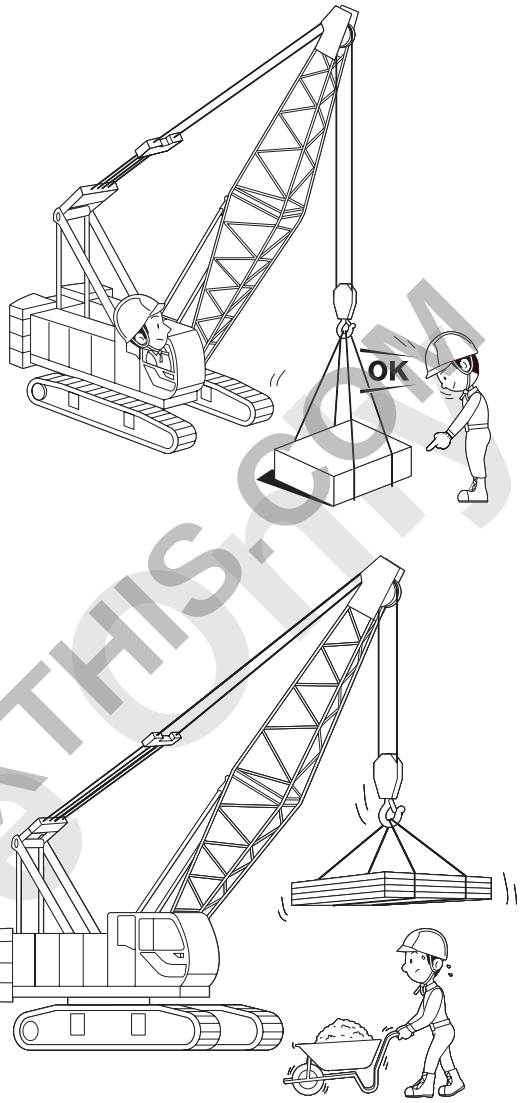
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30. The operator or person in charge should see that :

- Loads are well secured before being lifted.
- Slings are not kinked or damaged.
  The load is well balanced, and the hook block is adequate for the load to be lifted.
  Slings are properly arranged on the hook.
- Sudden stops and starts are avoided.
- The hoist line is vertical before starting the lift.
- The crane hook is equipped with a properly functioning retainer latch.
- Crane loads, grapples, or buckets do not pass over the heads of workmen nor in any way endanger their safety.
  All loose objects must be removed from the load.
  Non-operating personnel should be warned, or told to leave the immediate area, when making crane lifts.



31. Always replace protective guards and panels before operating the machine whenever they become dirty or damaged.



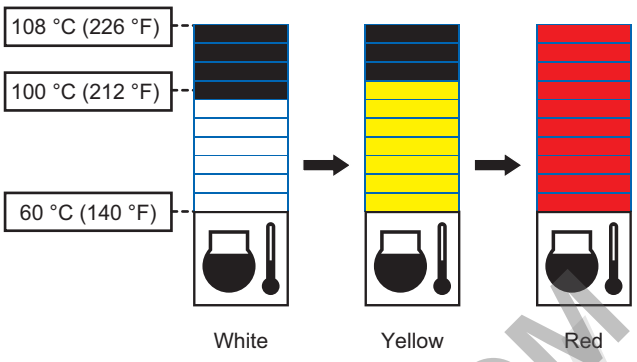
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74. ENGINE COOLANT TEMPERATURE GAUGE

This indicates the engine cooling water temperature.
The scale indicates is divided into 10.

White	6 blocks or less	60 °C (140 °F) or higher to less than 100 °C (212 °F)
Yellow	7 to 9 blocks	100 °C (212 °F) or higher to less than 108 °C (226 °F)
Red	10 blocks	108 °C (226 °F)

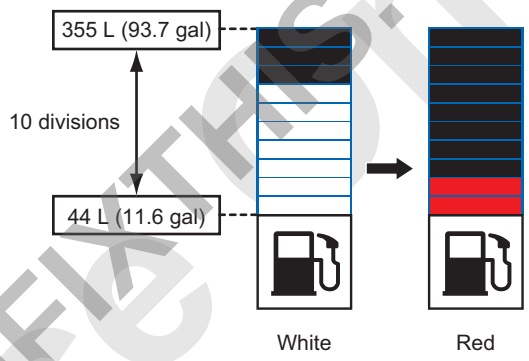


75. FUEL BAR GAUGE

This indicates the fuel level.
The scale indicates is divided into 10.

Max. Indication	355 L (93.7 gal)
Min. Indication	44 L (11.6 gal) or less

The bar gauge color changes from white to red at lowest two blocks.

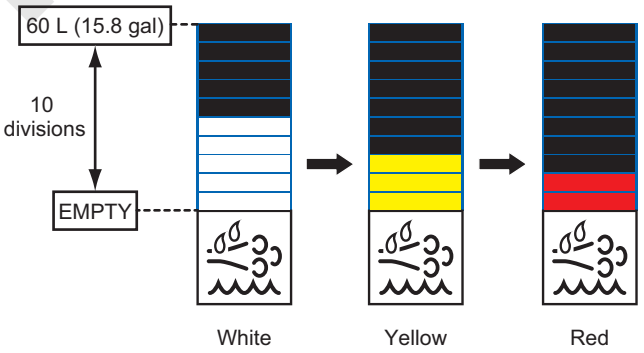


76. DEF/AdBlue® BAR GAUGE

This indicates the urea solution level
The scale indicates is divided into 10.

Max. Indication	60 L (15.8 gal)
Min. Indication	EMPTY

The bar gauge color changes from white to yellow when reaches to 3 blocks and changes to red when 2 blocks or less.



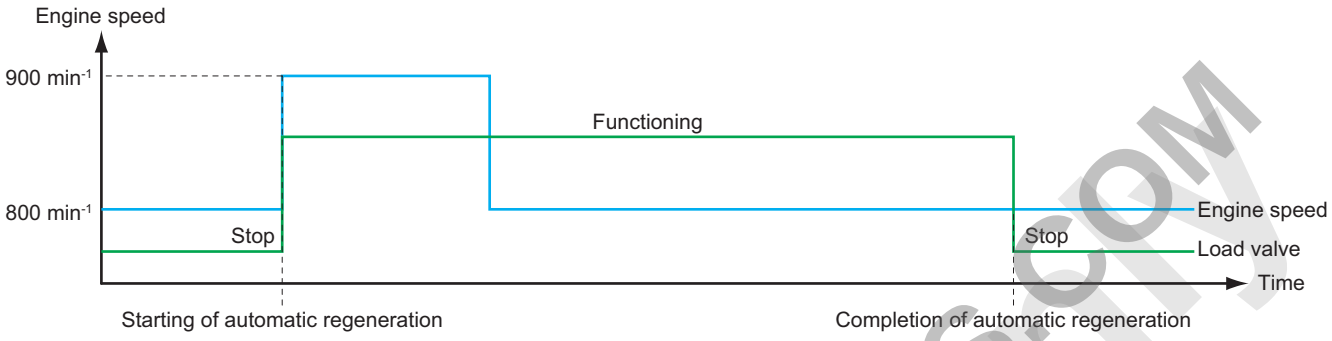
Note

The warning and engine output limitation will be issued depending on the remaining amount of the DEF/AdBlue® when the level reaches lowest three blocks.
As to the detail of output limitation, refer to "2.3.4 EMISSION CONTROL DEVICE".

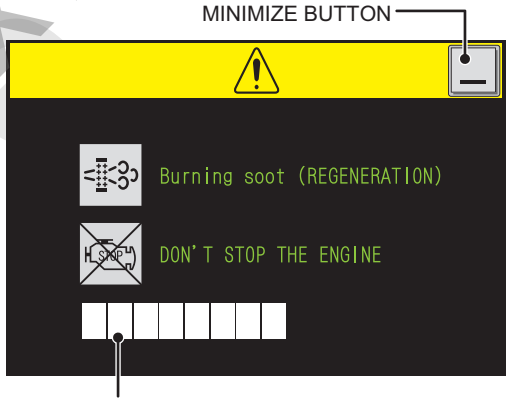
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(2) Control 2 (Quick up control)
This control is that the automatically increase the engine speed and while the burning (regeneration) of soot automatically the engine speed decrease.



(A) When automatic regeneration is started, after the alarm sound is issued, increase the engine speed up to 900 min^{-1} quickly and start the load valve function.
(B) Rise the exhaust temperature and perform the soot burning (regeneration) (Approx. 10 to 20 minutes)
(C) Under the automatic regeneration, display time bar gauge which shows the estimate time to completion.
(D) When burning (regeneration) of soot is proceeding, after the alarm sound is issued, automatically the engine speed decrease to 800 min^{-1} quickly.
(E) The burning (regeneration) of soot is completed, stop the load valve function and returns to normal operation.



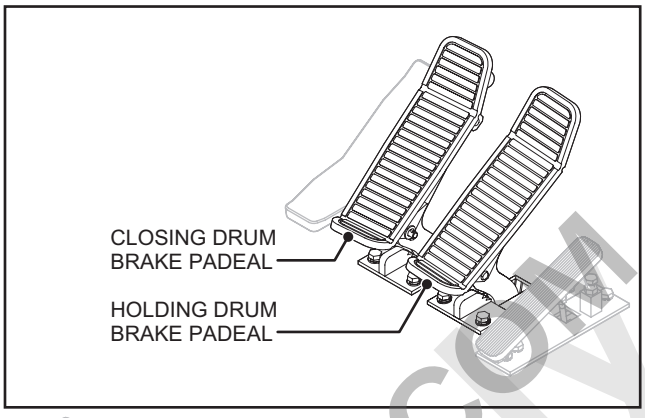
AUTOMATIC REGENERATION SCREEN

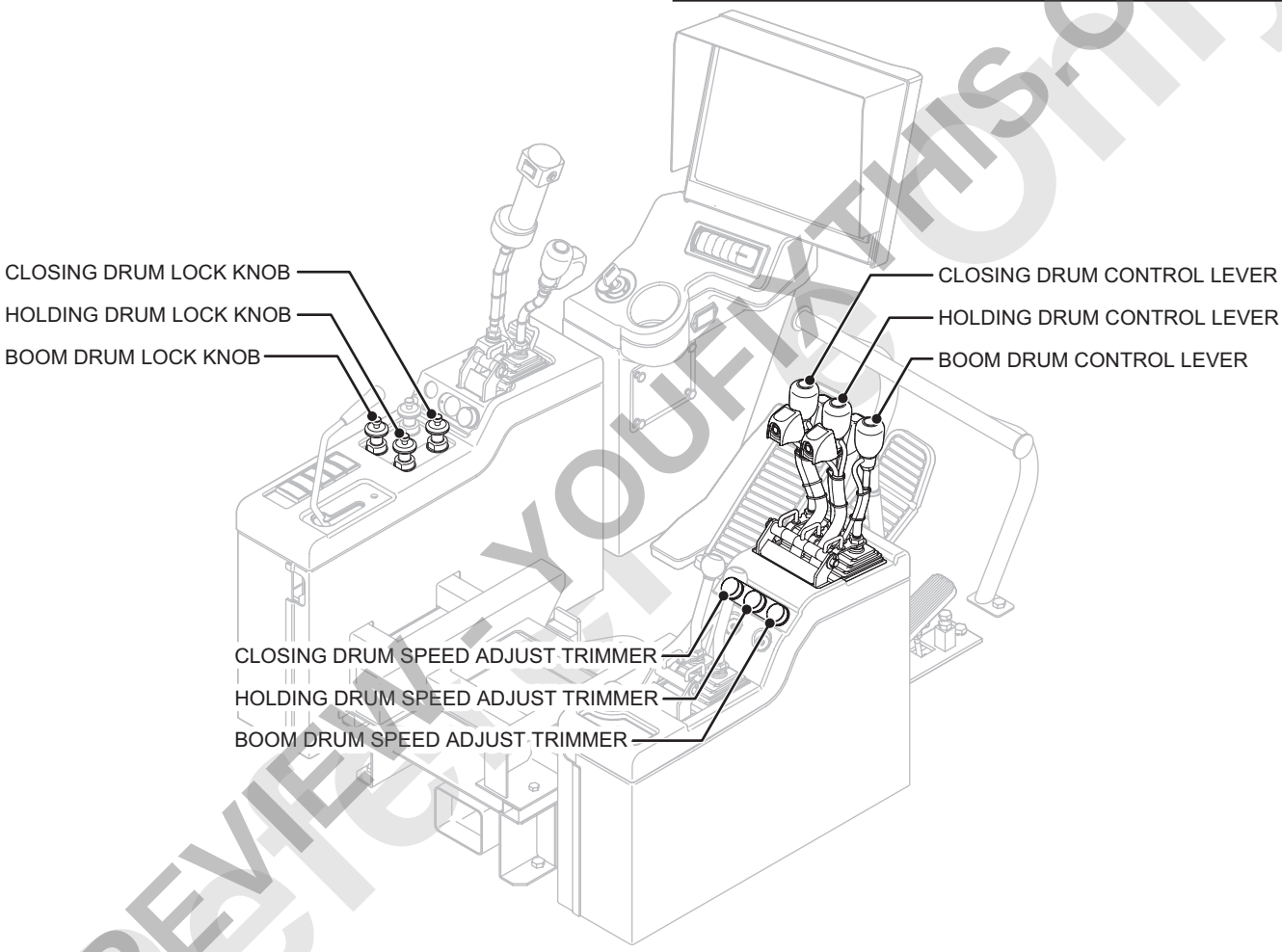
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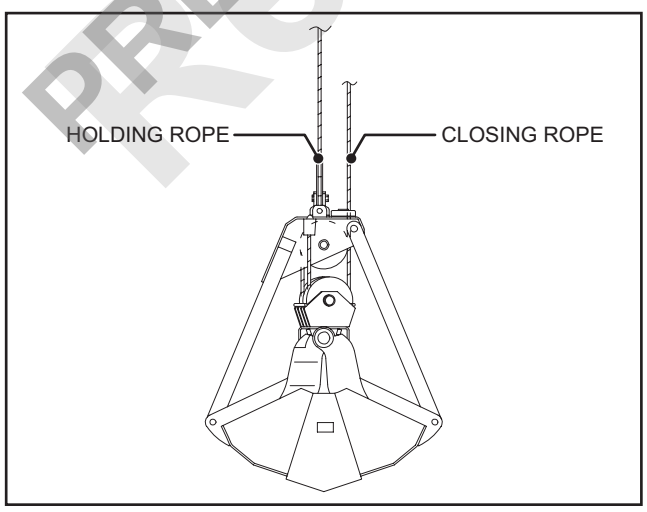
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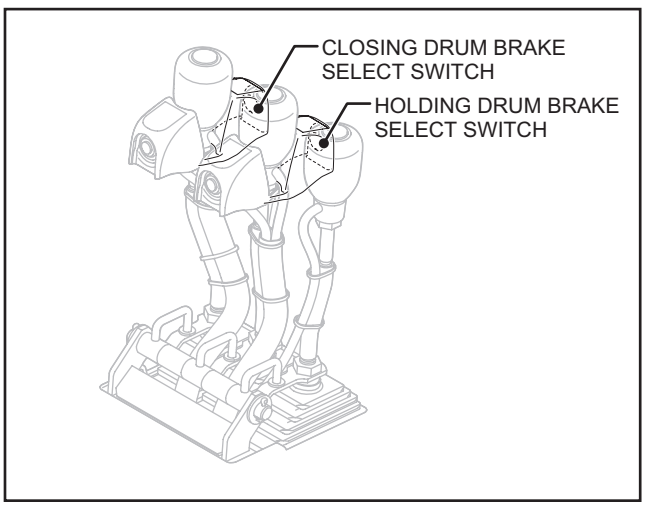
2.5 CLAMSHELL OPERATION

In clamshell operation, the control levers and brake pedals are called with the designations shown in the following figure.
The basic control is as same as the crane operation.









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3.5 OPERATING PROCEDURE OF MONITOR

Referring to the setting items (following), perform necessary setting.

Setting item	Set timing category		
	Daily operation	Operation after changing attachment	Operation at initial erection
(1) Setting of crane configuration	×	○	○
(2) Selection of front/rear drum lifting	□	○	○
(3) Setting of working area limit value	□	□	□

○ : Necessary × : Unnecessary □ : If necessary

The Input data are memorized and retained in the controller even by stopping the engine or turning the power off.

1. Turning power on

   When the key switch is turned to the ON position, power will be supplied to the monitor.
   If power is not supplied to the monitor, check the fuse.

⚠ CAUTION

It may take several seconds to boot-up the monitor and display.
Do not operate the crane while this period.

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ERROR CODE (ERROR MESSAGE) LIST

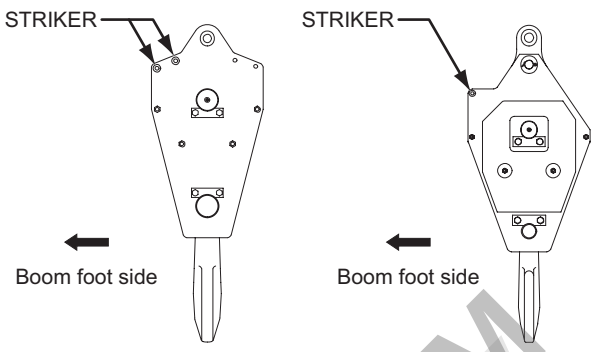
Code	Message
P041D	EGR gas temperature sensor - out of range (Out of range high)
P0420	Catalyst located downstream of PM filter
P0489	EGR solenoid 1 malfunction
P0490	EGR solenoid 1 malfunction
P0500	Vehicle speed sensor - low
P0501	Vehicle speed sensor - high
P0504	Brake switch correlation
P0510	Idle SW malfunction.
P0519	Idle speed control system
P0524	Engine oil pressure Too Low
P0540	Preheat circuit malfunction
P0545	Exhaust temp. sensor failure (Upper stream) (Low)
P0546	Exhaust temp. sensor failure (Upper stream) (High)
P0562	Sensor supply voltage - out of range (out of range low)
P0563	Sensor supply voltage - out of range (out of range high)
P05F1	Crankcase ventilation system abnormal
P0605	ECU failure
P0606	ECU failure
P0607	ECU failure
P0610	VIN data error
P0611	ECU failure
P0617	Starter switch - rationality
P0628	Suction control valve for fuel supply pump - circuit (Circuit low)
P0629	Suction control valve for fuel supply pump - circuit (Circuit high)
P0642	ECU sensor supply 1 failure (Low)
P0643	ECU sensor supply 1 failure (High)
P064C	Glow control unit malfunction
P0652	ECU sensor supply 2 failure (Low)
P0653	ECU sensor supply 2 failure (High)
P0671	Glow plug 1 failure.
P0672	Glow plug 2 failure.
P0673	Glow plug 5 failure.
P0674	Glow Plug 6 failure.
P0683	Glow controller - Battery for glow controller open, GND short glow controller - glow control signal glow controller - Diagnosis signal
P0686	Main relay malfunction
P06D3	Air flow sensor power supply failure short to GND
P06D4	Air flow sensor power supply failure (High)
P0704	Clutch SW malfunction
P073D	Information abnormal from transmission ECU.
P081A	Starter disable circuit Low

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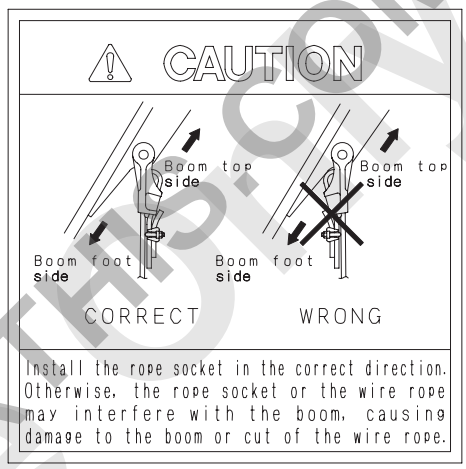
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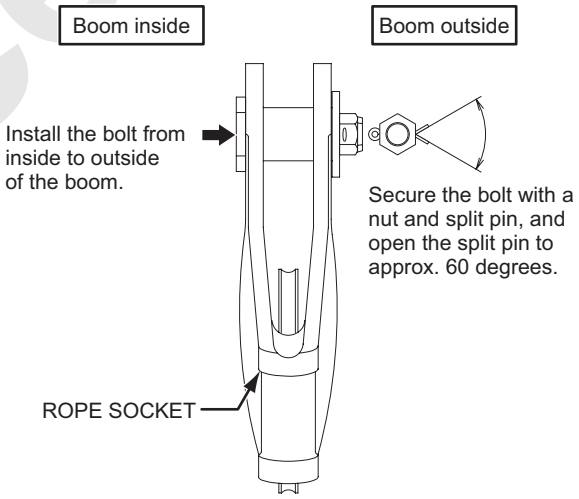
HOOK INSTALLING DIRECTION

When passing the hoist wire rope to the hook, face the striker (hook side weight catch) contacting the hook overhoist limit switch weight to the boom foot side.



When installing the rope socket to the boom point, pay attention to the direction of rope socket.
Be sure to pass the wire rope through the hook overhoist limit switch weight.





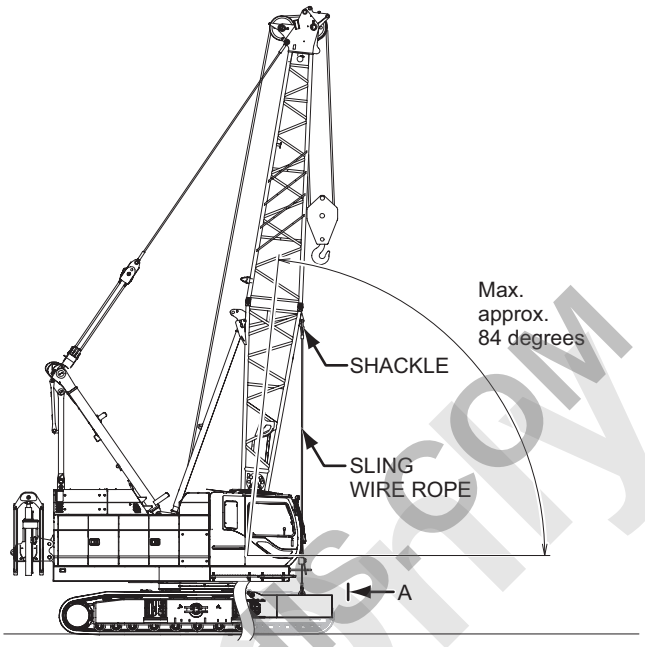
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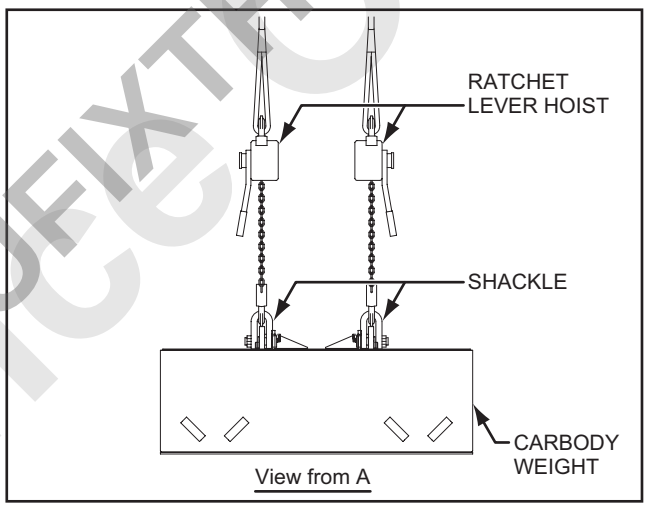
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(3) When installing/removing the carbody weight, prepare the tools as listed below.

TOOL

- Attached tool set
- Sling wire rope
  28 mm dia. (1-3/32″ dia.) × 5 m (17′) × 2
- Shackle 5 t (11,025 lbs) × 4
- Ratchet lever hoist 6.3 t (13,890 lbs) × 2





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(2) Before installing the carbody weight, check that the machine is in the following conditions.

- Gantry : Work position
- Ground : Firm and level
- Crawlers : Extended

⚠ WARNING

As to the stability in swing and traveling to avoid the machine turnover, refer to the article "4.1 SWING AND TRAVEL STABILITY".
Failure to observe this precaution may result in a serious injury or loss of life.

(3) When installing or removing the carbody weight, prepare the tools as listed below.

TOOL

- Attached tool set
- Assist crane 25 t (55,120 lbs) capacity
- Sling wire rope
  25 mm dia. (2-15/16″ dia.) × 8 m (26′) × 2
- Shackle 10 t (22,050 lbs) × 2

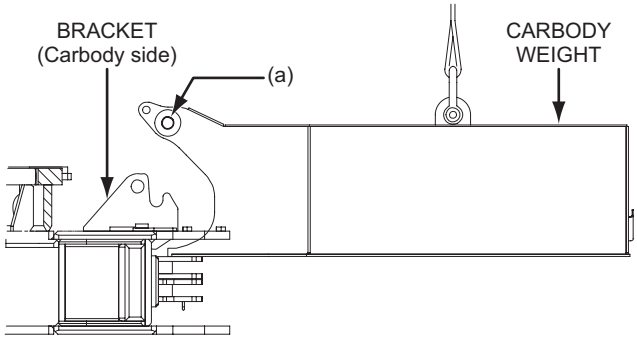
2. Carbody weight installation

(1) Attach the shackles to the lifting brackets of the weight(1) and lift up with the assist crane.

⚠ DANGER

Do not enter under the weight or stand between the weight and surrounding object.
Failure to observe this precaution may result in a serious injury or loss of life.

(2) Bring the carbody weight (a) portion to right above the carbody side hanging bracket and rest it on the bracket.

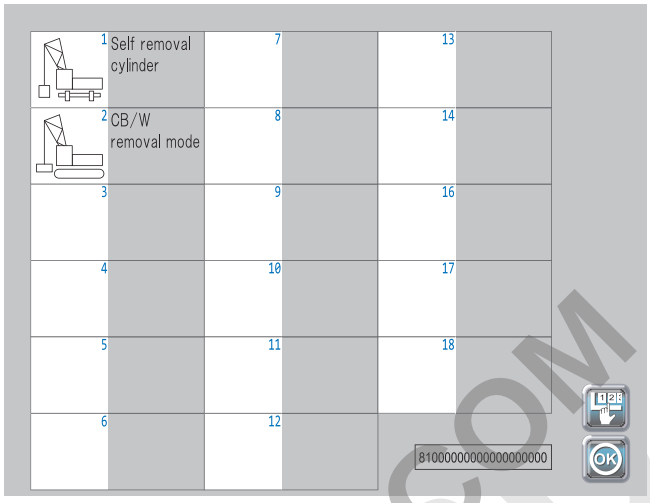


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(7) After data is loaded, the result of selection is displayed.
Check if the selected items are correct.

- If correct, press [OK].
  The screen returns to the main screen.
- If not correct, press [1 2 3] to restart the input.



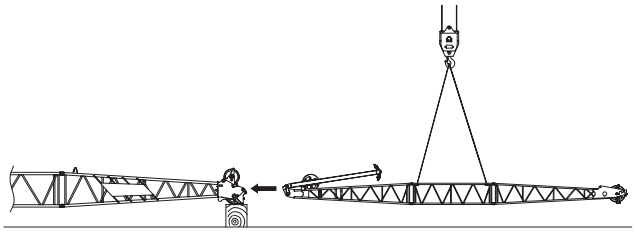
Note

In case the selection is limited to only one choice, select screen is to be neglected and indicates only the result.

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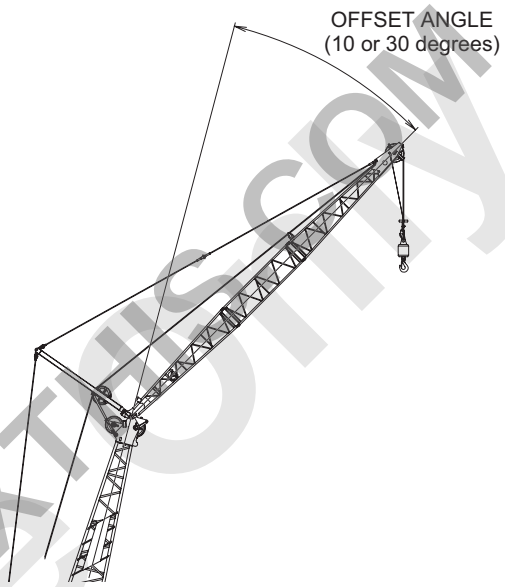
2. Lift up the pre-assembled jib with an assist crane and connect it to the boom point.



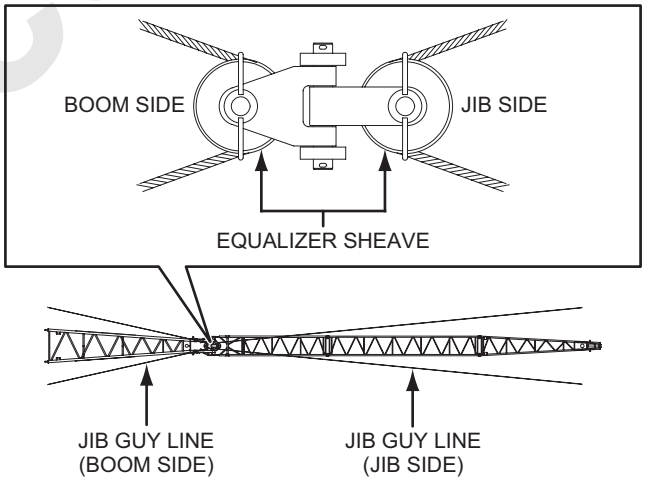
3. Prepare the jib guy lines.
   (The jib side and boom side)

   Insert the guy line connecting pins from outside.

- The length of the jib guy line of the jib side varies according to the jib length.
- The length of the jib guy line of the boom side varies according to the jib offset angle (10 degrees or 30 degrees).



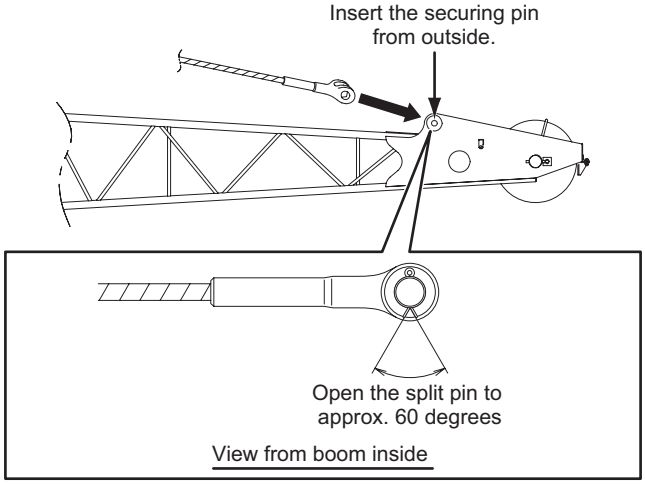
4. Temporarily remove the equalizer sheave of the jib strut, and put the jib guy line through the sheave.
   Reinstall the sheave back to the original position.
   (Keep the strut down.)



Note

Do this work by two persons.

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



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7. MAINTENANCE

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

⚠ WARNING

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

1. Precautions when perform an inspection and maintenance

- Carry out the inspection and maintenance with a suitable working closes on.
- Be sure to set the machine on a firm and level ground, and post a notice board showing “Under Check and Inspection”.
- The inspection and maintenance in an elevated place be sure use a working scaffold and safety harness.
- When working to perform the inspection and maintenance, determine the fixed signals, and move the machine following the signals.
- When perform the inspection and maintenance of hydraulic components, be careful to prevent dust and dirt from entering.

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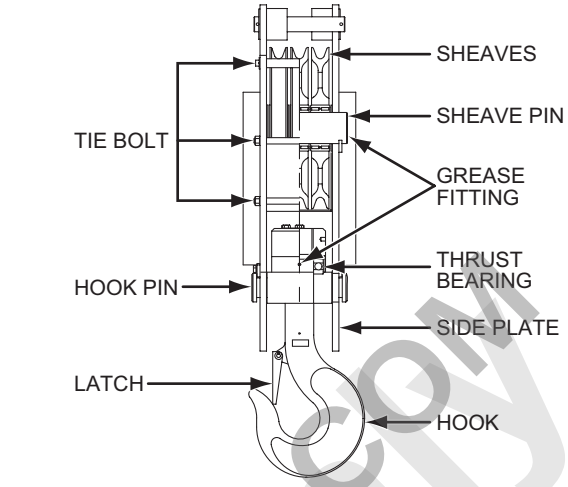
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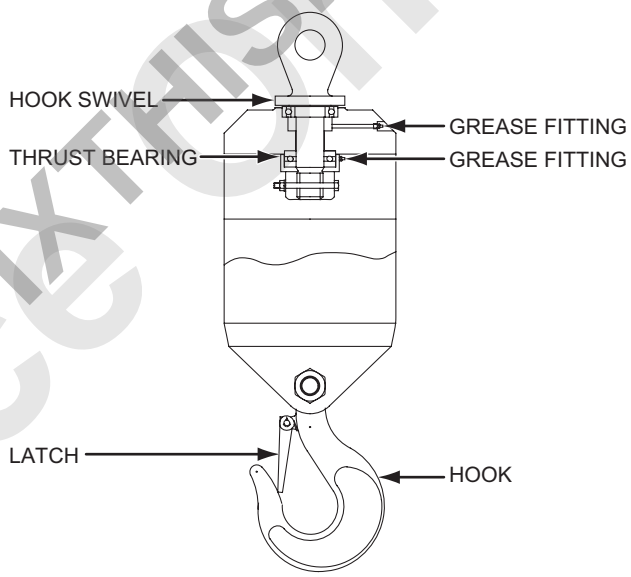
[HOOK AND SHACKLE MAINTENANCE STANDARD]

The operating condition of main and aux. hook can change daily with use; therefore, they must be inspected daily (at start of each shift) and observed during operation for any defects which could affect their safe operation.
Correct all defects before using the hook block or ball hook.

Daily inspection and maintenance will include the following points.

(1) Clean the hook block or the ball hook.
(2) Lubricate the sheaves (if fittings provided), the hook swivel, and any other part equipped with a grease fitting at the intervals specified in the "7.3.4 INSPECTION, GREASING (WATER SUPPLY) ON EACH POINT".
(3) Tighten the loosen tie-bolts, capscrew and set screws.
Check that all cotter pins are installed and opened.
(4) Check the sheaves for uneven wear in the grooves and on the flanges.
Check for loose or wobbly sheaves.
These conditions indicate faulty bearings or bushings.
(5) Check the fit of the wire rope in the groove of each sheave.
An oversize wire rope can crack the lip of the sheave flange causing rapid wear of the wire rope and sheave.
The groove must be larger than the wire rope, and the groove must be free of rough edges and burrs.





⚠ CAUTION

Rope groove dia. shall be about 10% larger than rope nominal dia.
Take extra care since, larger or smaller dia. groove may cause premature damage of the rope.
Failure to observe this precaution may lead to damage the parts.

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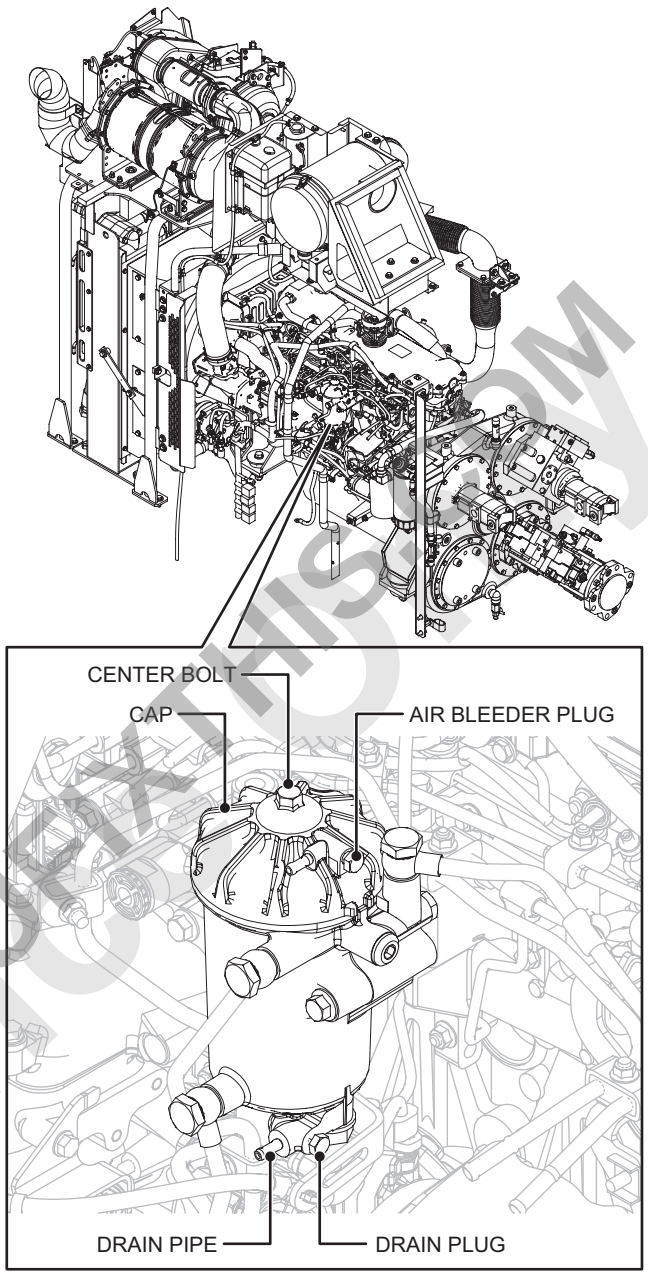
15. REPLACING FUEL FILTER (ON ENGINE)

The fuel filter is an element type.
Its purpose is to remove moisture and fine dirt particles from the fuel, the element is made from resin and paper.

- **Draining of fuel**

(1) Clean the area around the fuel filter before the start of work.
Otherwise dirt may enter.
(2) Provide a waste oil container under the fuel filter.
(3) After loosening the drain plug, loosen the air bleeder plug and drain the fuel from the drain pipe.
Use a drain hose (fuel) which is provided as an attached tool.

* At this time, drain all fuel from the filter.
When the element is replaced without draining all of the fuel, unfiltered fuel may remain inside the filter and later flow to the engine.



⚠ WARNING

- **Carefully wipe off any fuel splashed on to the engine or its parts.**
  Otherwise it may cause of fire.
  Failure to observe this precaution may result in a serious accident.
- **Keep away flammable from the fuel to prevent an ignition and explosion.**
  Failure to observe this precaution may result in serious injuries, property damage or loss of life.
- **Place the container under the drain port and collect all of drained oil for safety and not to pollute the ground.**

(4) Confirm that no more fuel flows from the drain pipe and then tighten the drain plug.

Tightening torque

Drain plug	4.9 to 8.9 N·m (3.6 to 6.6 ft·lbs)

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8. REFERENCE MATERIALS

Note

Actual lengths of boom section, wire rope are metric.
The values in ( ) are approximate conversion to feet.

8.1 SPECIFICATION

This crane is designed for normal work of lifting hook.
Classification of this crane is as follows.
(ISO 4301/2, FEM 1.001)
Class of utilization : U1
State of loading : Q2
Group Classification as crane : A1
In case of severer work condition such as bucket etc, components life may be lowered.
In case of severer work condition, perform work referring to manufacture's recommended condition.
As for Front or Rear winch, calculate service life of component referring to article "7.14. MEASURES REQUIRED FOR WINCH MONITORING" and perform maintenance work under appropriate interval.

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