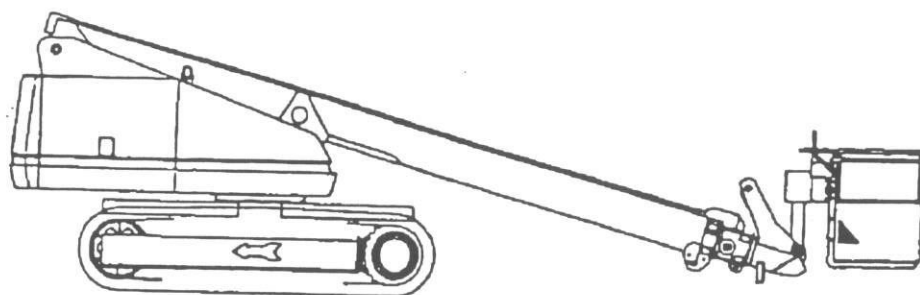


FS-273S

**OPERATION MANUAL
SELF PROPELLED AERIAL PLATFORM
MODEL SR210/ISR700**

Applied to specification: E1(CE), F1



* Important : Please read this manual before operating the machine.

///NACHI
CORPORATION

1152 RYOKE, AGE0, SAITAMA, JAPAN

Introduction

Thank you very much for making your purchase from Aichi Corporation.

This manual describes the correct operation and handling procedures for the self propelled aerial platform (SR210/ISR700). Reading and reference to this manual will ensure the maximum operational efficiency of this machine.

Operation of this machine not in accordance with the instructions in this manual may lead to problems, resulting in damage and increasing risk of danger. Please, be sure to read and understand this manual before using this machine.

- * Always keep this manual and the record of Aichi pre-delivery functional tests with the machine.
- * When you transfer the use or ownership of the machine, please attach this manual to the machine for the next user.
- * For any doubts you may have about handling, inspection or spare parts, please do not hesitate to contact our business offices or the authorized service shop nearest to you. In this case, you are requested to quote the model, serial number, manufactured date marked on the serial number plate.
- * Use only the spare parts approved by the manufacturer, particularly for load-supporting and safety-related components.
- * Do not make any modifications to the machine without obtaining the manufacturer's approval. The design check, the manufacturing check as well as the practical tests should be conducted by the approved agent, if a modification which would affect the stability, strength or performance of the machine is made. Detail of major alterations or repairs must be recorded in the service manual.
- * The user of this machine shall obtain the guidance and approval of the manufacturer, in the event of any special working method or conditions which are outside those specified by the manufacturer.
- * Your attention is called on certain changes in illustration or contents which may be made without notice.

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I Qualification of Operator

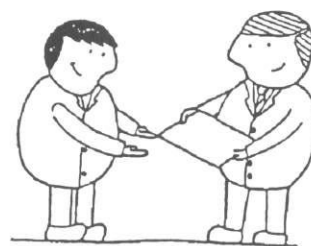
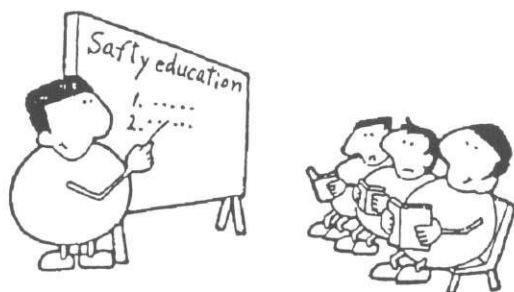
The operator of this machine must receive safety training to ensure safe operation.

Safety training

Incorrect use of the machine may cause serious danger.

All personnel who operate this machine are requested to receive safety training, and only the trained and authorized personnel are allowed to operate this machine.

(For safety training, use this manual.)



Certificate of training course completion

Let's implement safety education!

II Specifications

1. Main specifications

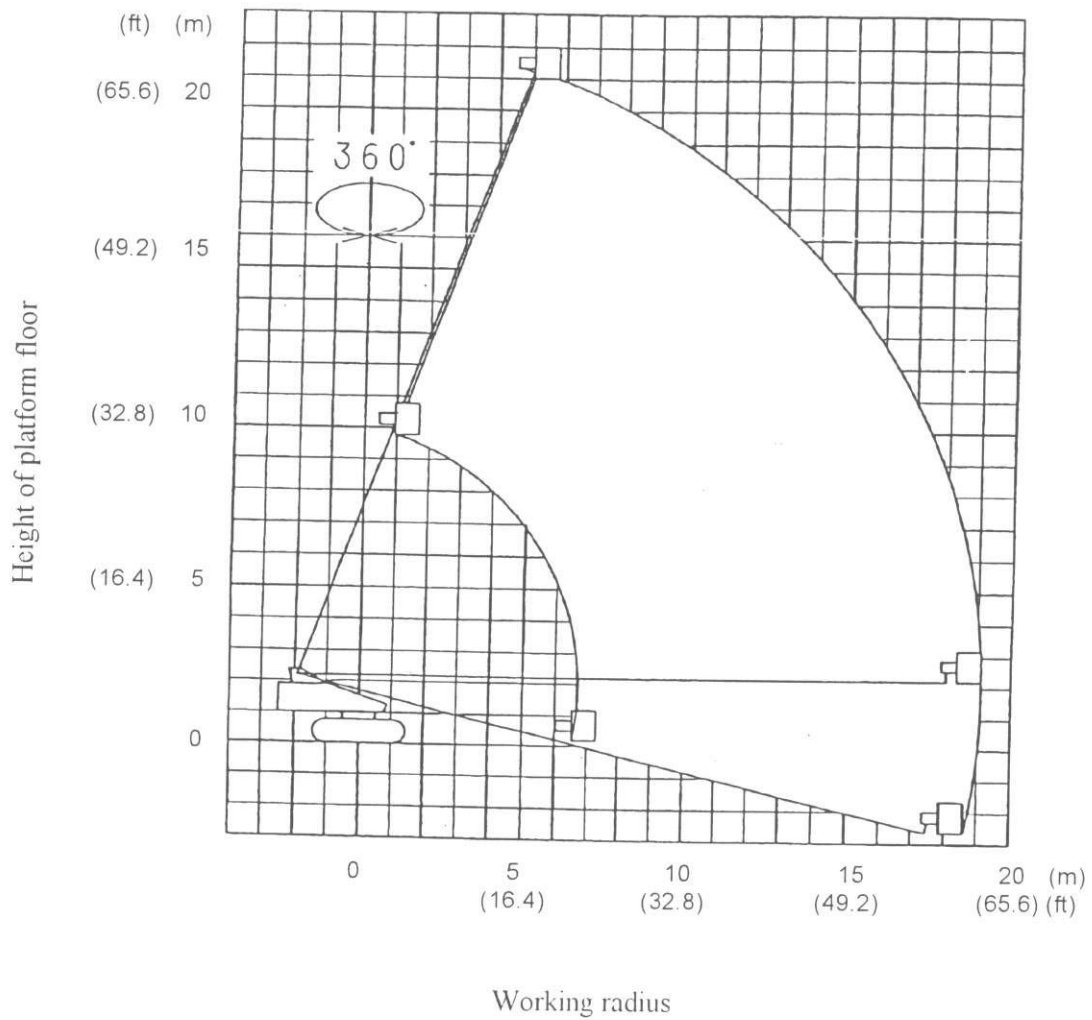
Model		SR-210 / ISR700	
Name		Crawler type aerial platform	
Dimension	Length	9,745 mm	32ft
	Height	2,570 mm	8ft 5in
	Width	2,460 mm	8ft 1in
	Turntable turning radius	2,440 mm	8ft
	Minimum ground clearance	400 mm	15.7 in
Weight of machine		15,400 kg	33,950 lbs
Engine	Model	Isuzu A-4BG1T-PB04	
	Maximum output	100 ps/2,000 rpm	73.6 kw/2,000 rpm
	Maximum torque	36.5 kgf-m/1,400rpm	264 ft-lb/1,400 rpm
	Total engine displacement	4,329 cc	264 in ³
Battery voltage		24 V	
Platform	Rated load	200 kg or 2 persons and tools (40 kg)	440 lbs or 2 persons and tools (88 lbs)
	Maximum allowable manual side force	41kgf (400N)	90 lbs
	Maximum height from the ground	20.8 m	68ft 9in
	Maximum working radius	19 m	62ft 4in
	Rotation angle	Left 90° ~ right 90°	
Maximum allowable tilt angle		5°	
Maximum allowable wind speed		12.5 m/second	28 MPH
Maximum ground contact pressure		0.91 kgf/cm ²	13 PSI
Gradeability		22° (40%)	

Boom	Boom angle		$-20^{\circ} \sim +70^{\circ}$	
	Boom length		8.28 ~ 19.96 m	27ft 2in ~ 65ft 6in
	Extension/retraction stroke		11.68 m	38ft 4in
	Rotation angle		360° continuously	
Operation speed	Extension	Extension (OUT)	45 seconds	
		Retraction (IN)	40 seconds	
	Elevation	Raising (Up)	50 seconds	
		Lowering (Down)	55 seconds	
	Rotation		75 seconds	
	Travelling	High speed	2.2 km/h	1.37 MPH
		Mid speed	1.5 km/h	0.93 MPH
		Low speed	0.7 km/h	0.43 MPH
Hydraulic system	Rated hydraulic pressure		210 kgf/cm ² and 140 kgf/cm ²	3,000 PSI and 2,000 PSI
	Hydraulic pump		Gear type	

- * Operational speed shows the speed when “Accelerator switch” is set at “Auto” position.
- * Airborne noise emissions do not exceed a sound pressure level, at the operating positions of 85 dB(A).
- * The vibration emitted by the machine does not exceed 0.5m/s² (19.7 in/s²) on “Work platform.”
- * This machine is designed for both indoor and outdoor use.

2. Working range

Platform rated load is 200 kg (440 lbs).

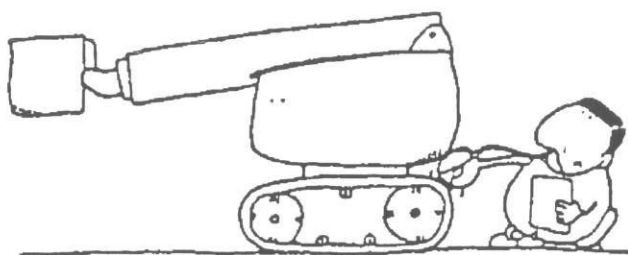


1. In the above working range, boom deflection is not taken into account.
2. The working range is the same in any direction within 360°.
3. In the working range shown, it is assumed that the machine is on firm level ground, and that the wind velocity is less than 12.5 m/sec (28 MPH).

III Regular Inspection

To ensure safe operation, conduct the inspection regularly.

LET'S CONDUCT
OUR REGULAR
INSPECTION !

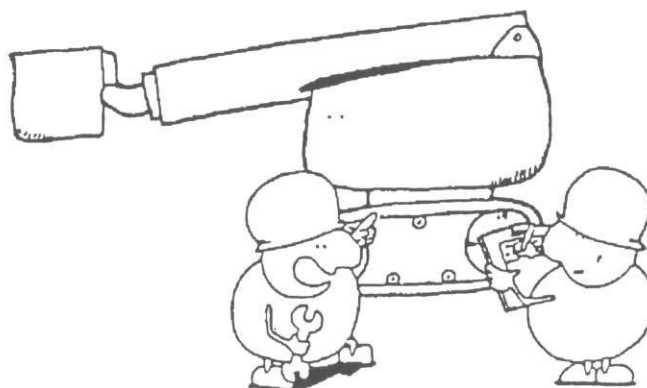


Conduct the monthly and yearly inspection and keep all the records for three years.

Note: Use the service manual for recording the inspection results.

Note: For inspection, consult our office or service shop.

RECORD
INSPECTION
RESULTS !



Caution: When the inspection is conducted under the boom and the platform, use safety support to prevent the platform and boom from unexpected descent.

IV For Safety Purpose

1. Before starting operation

- (1) Only the trained and authorized personnel are allowed to operate the machine.

ONLY SOMEONE WHO HAS
COMPLETED A SPECIALIZED
TRAINING COURSE SHOULD
OPERATE THE MACHINE !



- (2) Always wear safety gears e.g. helmet, safety shoes, safety belt, etc.

WEAR HELMET AND
SAFETY SHOES !



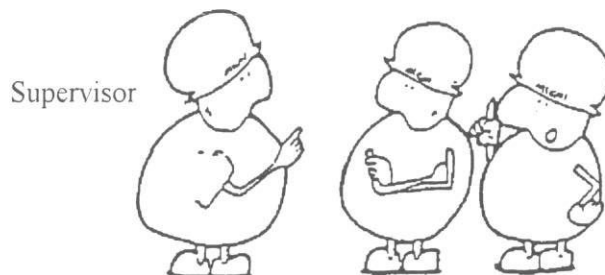
- (3) Wear neat and fitting clothes to avoid snagging.

OPERATE WITH
RIGHT CLOTHES !



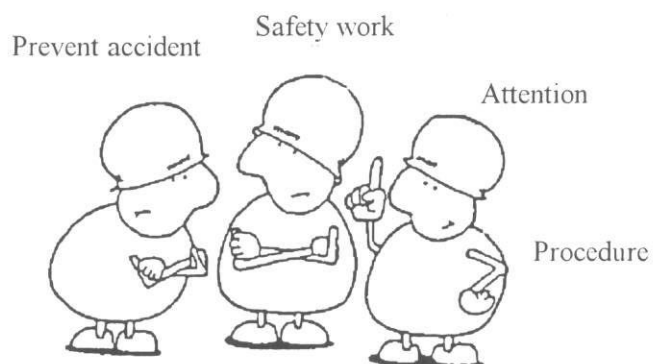
- (4) Nominate a supervisor and operate the machine according to his/her instruction.

FOLLOW THE
SUPERVISOR'S
INSTRUCTIONS !



- (5) Observe the guidelines for safe operation and follow them. Always follow the correct procedures and safety rules outlined in this manual, and also by your supervisor.

OBSERVE THE
RULE !



- (6) Be sure to heed the matters regulated by the law.

OBSERVE THE
LAW !

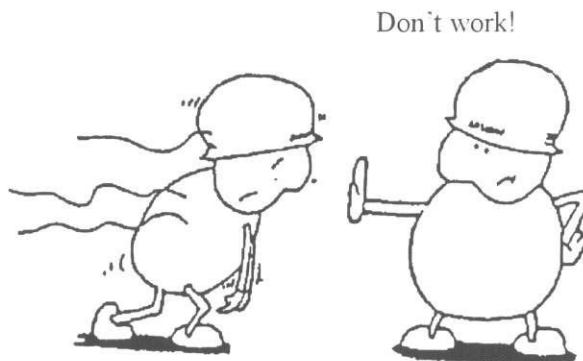


Hum ...
Hum ...

- (7) Keep inflammable substances (fuel, oil, etc.) away from fire.



- (8) Do not operate the machine when you are intoxicated or exhausted.



Warning: In the interest of your own health and safety, exercise care when operating this machine.

- (9) Stop operation in bad weather.

STOP OPERATION
IN BAD WEATHER !



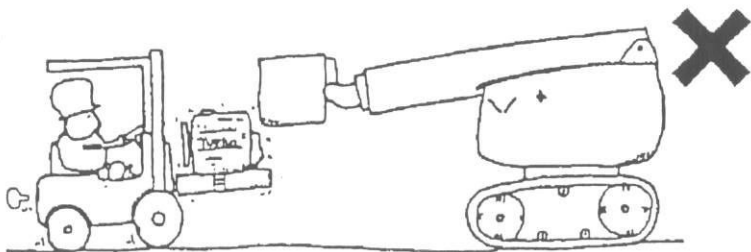
Note: Standard of bad weather beyond which operation should cease.

- Strong wind When average wind velocity per 10 minutes is over 12.5 m/sec (28 MPH)
- Heavy rain When rainfall is over 50 mm (2.0 in)
- Heavy snow When settled snow is over 25 cm (9.8 in) deep
- Thunder
- It is advisable to operate the machine in the atmospheric temperature range:
-20° ~ +40°.

Warning: Even in conditions less than the standards outlined above, follow the instructions of your supervisor.

- (10) Do not make any modifications to the machine without obtaining the manufacturer's approval.

MODIFICATION IS
PROHIBITED.



Do not add anything to the machine which could increase the wind load e.g. "Notice boards" on the platform.

(11) Do not wash the electric components of the machine.

(In particular, do not use pressurized water)

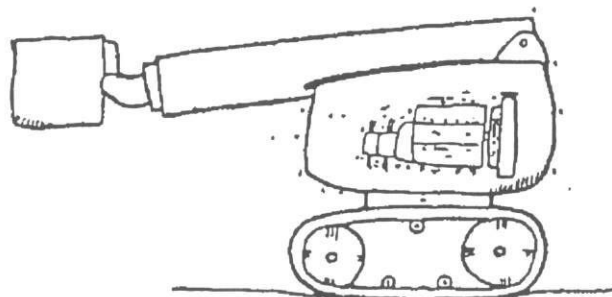


Note: Wipe off dirt with a dry cloth, etc.

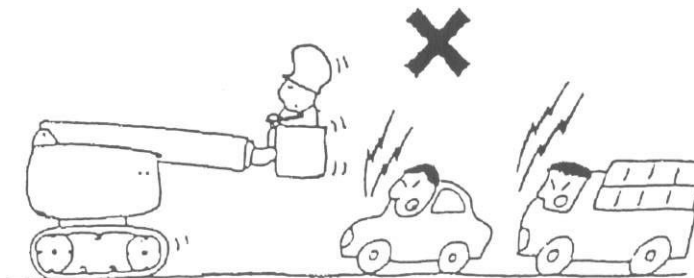
2. During operation

(1) After starting the engine, warm up the machine without loading the engine.

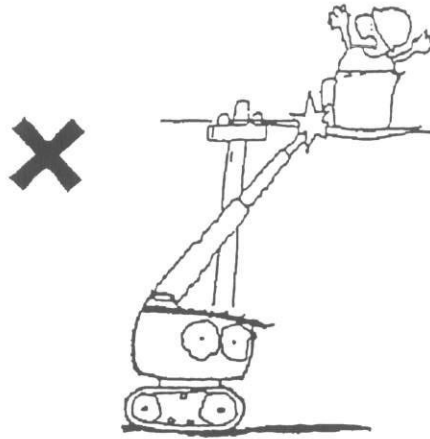
**WARM UP BEFORE
OPERATION!**



(2) This machine is not allowed to travel on the public highway.



(3) Do not use the machine near electrical conductors.

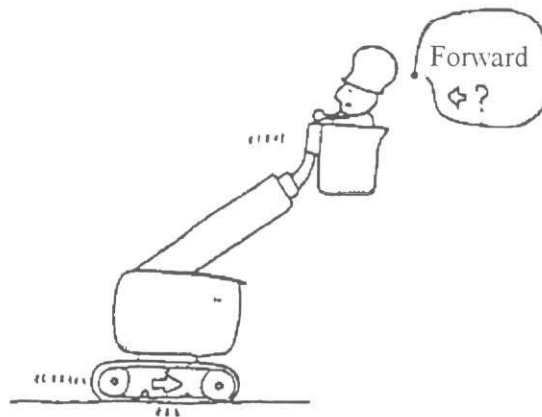


- Warning:**
- This machine is not insulated. Do not approach or make contact with power lines.
 - Keep a safe distance from electric conductors. Failure to do so may result in death or serious injury.

For safe distance, check the national or local regulations. If no national or local regulation is available, use the table below.

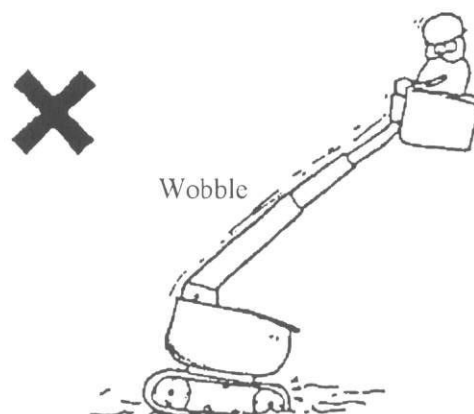
Voltage range		Minimum safe approach distance
Low voltage	0 – 600 V	1 meter (3ft 3in)
High voltage	600 – 7,000 V	1.2 meter (4ft)
Extremely high voltage	7,000 – 60,000 V	2 meters (6ft 7in)
	Over 60,000 V	Additional 0.2 meter (7.9 in) distance for each additional 10,000 V

- (4) Before starting travelling operation, make sure the travelling direction of the machine by checking the arrow marks attached on the chassis.



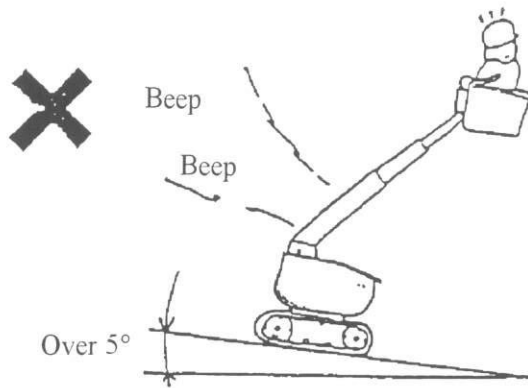
Note: The travelling direction is indicated by the arrow marks.

- (5) Do not elevate the platform on soft or uneven ground.
The maximum ground contact pressure of this machine is 0.91 kgf/cm^2 (13 PSI).



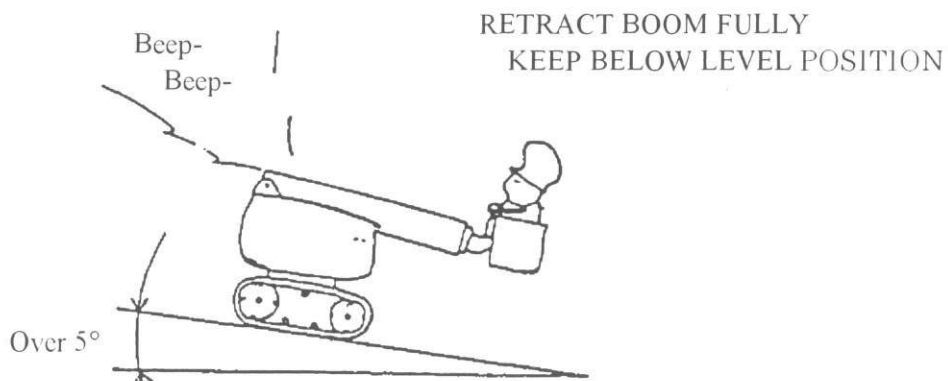
Warning: The machine may tip over on soft or uneven ground.

- (6) Do not elevate the platform on a slope which exceeds 5°.



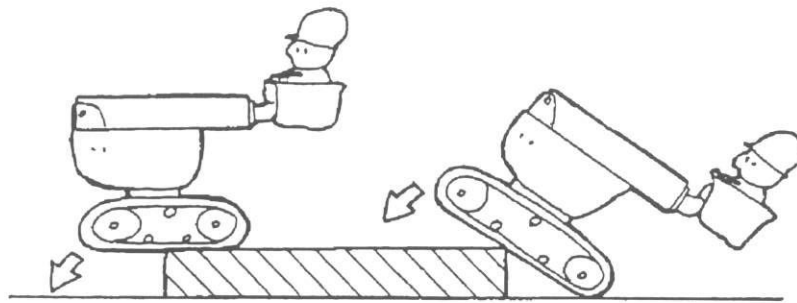
Warning: The tilt warning buzzer sounds, if the machine tilts over 5 degrees. Lower the platform immediately, if the warning buzzer sounds.

- (7) When you are obliged to travel on the slope of more than 5° for the purpose of transportation, be sure to retract the boom fully and set the boom under the horizontal.

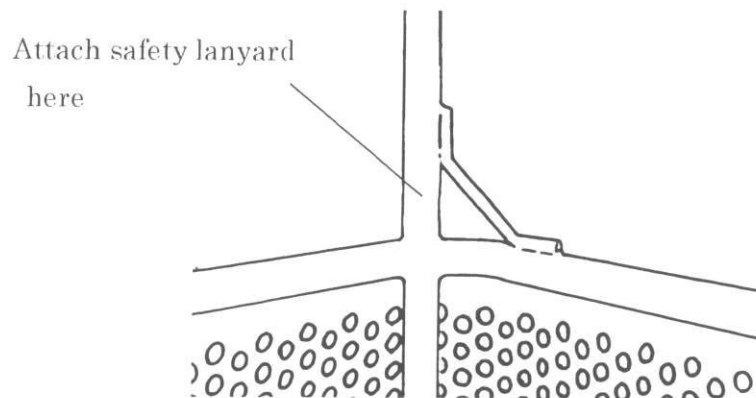


Warning: Do not attempt to travel on the steep slope which exceeds the gradeability (22 degrees or 40%).

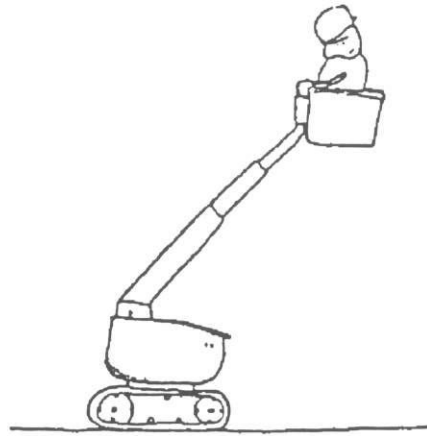
- (8) When travelling over a curb, retract the boom fully and set it under the horizontal, then move the machine very slowly. When the machine's center of gravity passes over the curb, the machine will incline suddenly. So, it is important to conduct this type of operation slowly and carefully.



- (9) Be sure to wear a safety belt, and fasten it to the specified position of the platform.



- (10) Check the surroundings before travelling, and make sure that no obstacle is around the machine.

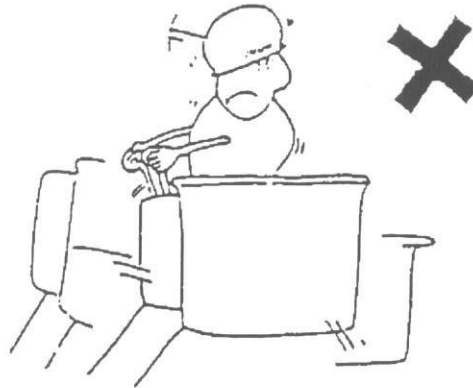


- (11) Check the surroundings before operating the boom, and make sure that no obstacle is around you nor around the machine.



- Warning:**
- Make sure that no obstacle is around the turntable before rotating the boom.
 - Be careful not to put your hand between platform handrail and any other obstacles.

- (12) Do not operate control levers or switches roughly.

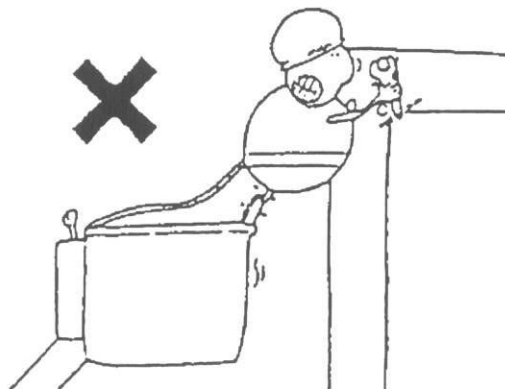


Note: When you reverse the operating direction, bring the machine to a stand-still, and start again.

- (13) If any malfunction is in the platform levelling system, stop using immediately and check the machine.

Warning: Do not use the machine, if there is a fault in the platform levelling system.

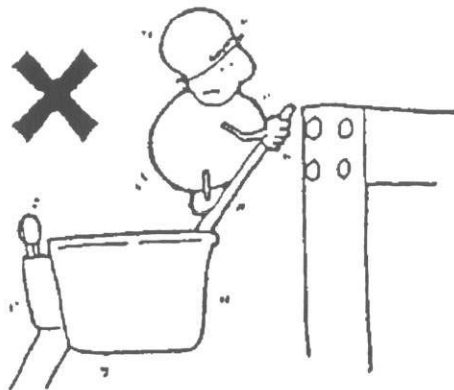
- (14) Do not reach out of the platform.



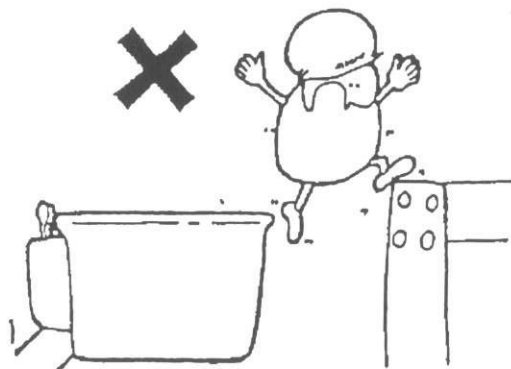
Danger:

- Always keep your feet firmly on the platform floor and conduct operation with stable posture.
- Do not step on the handrail.

(15) Do not use a ladder or step on the platform.



(16) Do not jump from the platform onto any other structures.

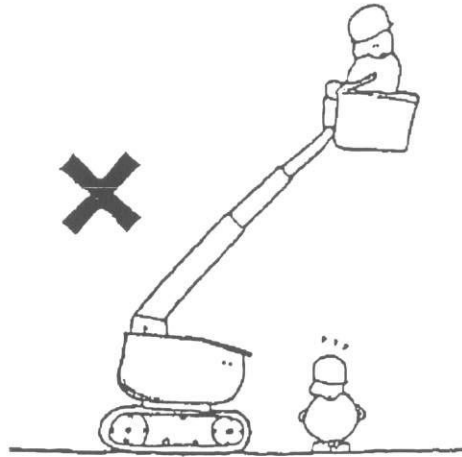


(17) Do not drop any objects from the platform.



- (18) Do not allow any person to enter the area under the boom and the platform.

KEEP OUT OF
WORKING AREA !



- (19) Do not use fire in the platform.



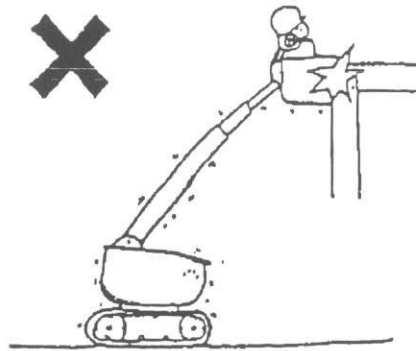
Warning: Do not put any combustible material in the platform.

- (20) When gas cutting or arc welding is conducted, cover the machine so that any loose fragments do not hit the machine especially the batteries and the hydraulic hoses.

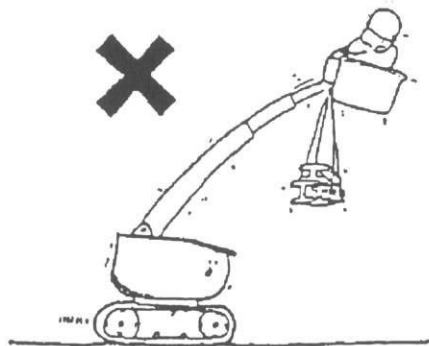
Warning: If a spark enters the machine, it may cause a fire.

(21) Do not conduct the following operations, which may cause the tipping over or serious damage to the machine.

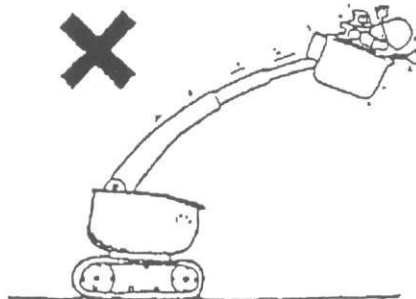
(a) Do not hit any structure or moving object by driving the machine and/or moving the platform.



(b) Do not hoist any object with a hook or a rope fixed to the boom and the platform.

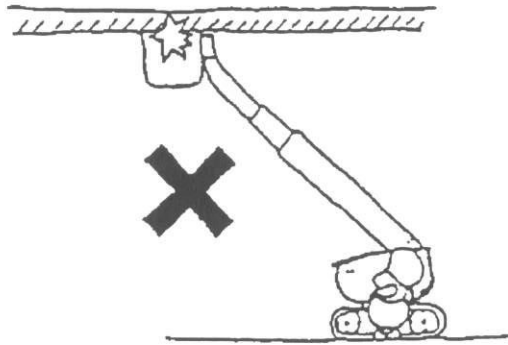


(c) Do not overload the platform. The specific working load is marked on the platform.

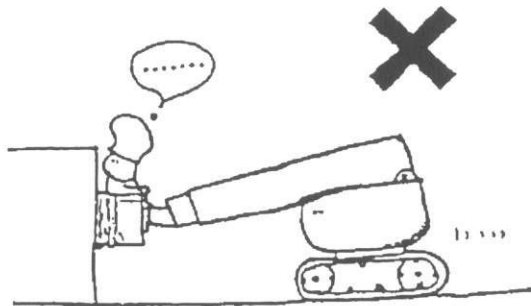


(22) In order to avoid damaging the platform levelling system, observe the following warnings.

(a) Do not press the platform against any overhead structure by elevating the platform.

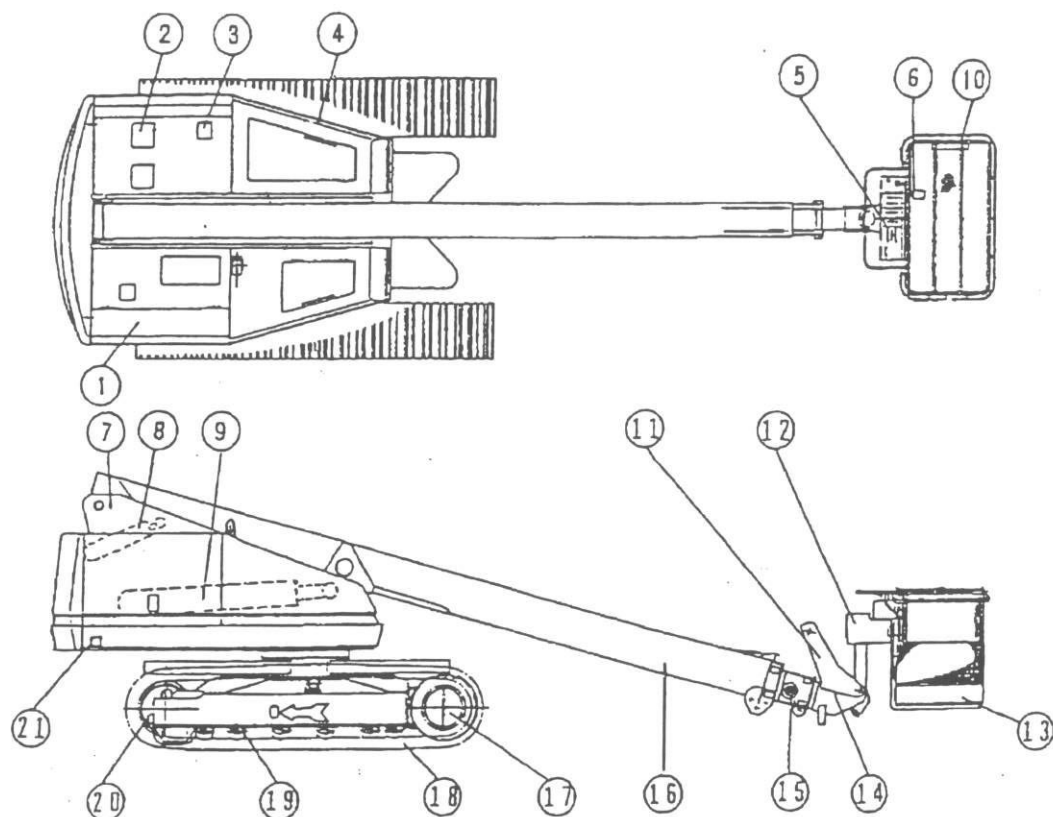


(b) Do not hit the platform while travelling.



Caution: If either of the situations shown above occur, stop using and check the machine.
If not, it could result in a serious accident.

V Name of Each Part

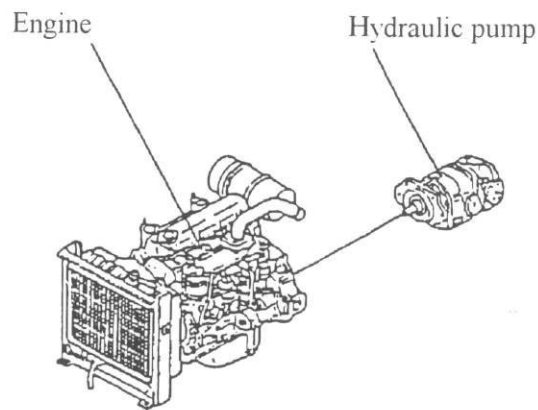


No.	Name	No.	Name
1	Engine room	12	Platform rotation device
2	Hydraulic oil tank	13	Platform
3	Fuel tank	14	3rd boom
4	Lower control	15	2nd boom
5	Upper control	16	1st boom
6	Foot switch	17	Driving sprocket
7	Turntable	18	Track
8	Platform levelling cylinder (Lower)	19	Chassis
9	Elevation cylinder	20	Idler wheel
10	Instruction manual storage	21	Serial number plate
11	Platform levelling cylinder (Upper)	—	—

VI Components

1. Hydraulic pressure generating device

The hydraulic pressure generating device consists of such major components as the engine and the hydraulic pump. When the engine starts, the pump is driven and generates hydraulic pressure.

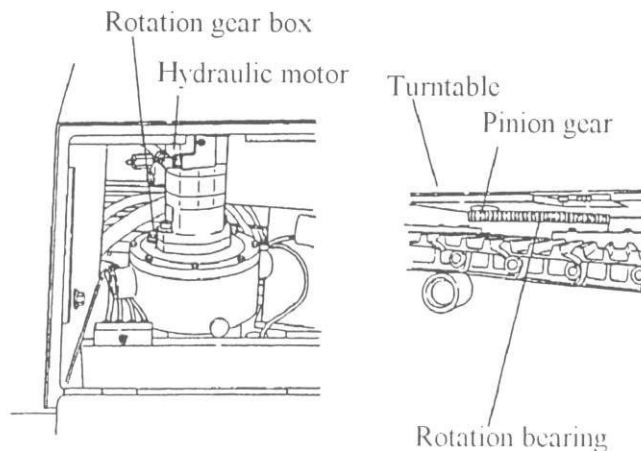


2. Boom rotation device

The boom rotation device consists of the hydraulic motor, the rotation gear box, the rotation bearing and the turntable.

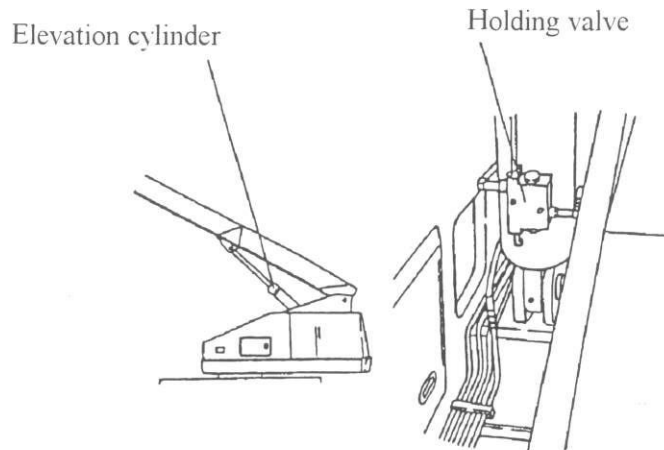
The hydraulic motor is driven by the hydraulic pressure from the hydraulic pump, and drives the rotation gear box.

The rotation gear box decreases the hydraulic motor revolution and rotates the turntable through the rotation bearing.



3. Boom elevation device

The elevation cylinder is connected to the 1st boom and the turntable at both ends and is extended or retracted by hydraulic pressure in order to raise or lower the boom. The holding valve prevents the boom descent when the hydraulic hose is damaged.

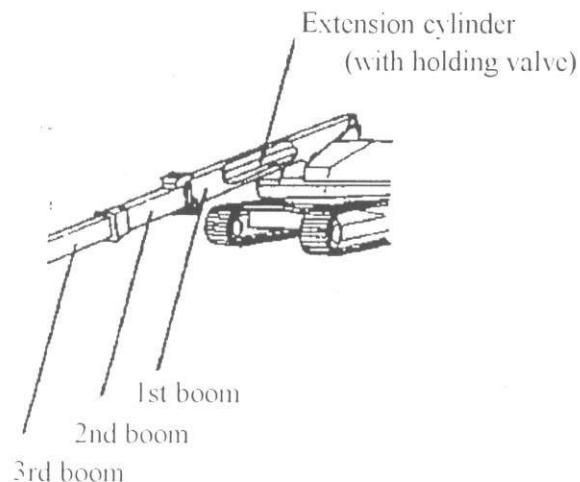


4. Boom extension device

The boom extension device consists of the extension cylinder, the holding valve, four wire ropes and the three stage boom.

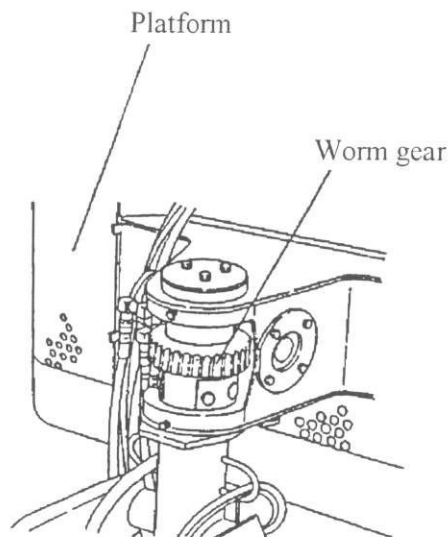
The extension cylinder is connected between the 1st and the 2nd booms at both ends, and the 2nd boom extends with hydraulic pressure, while the 3rd boom extends simultaneously with the 2nd boom by means of the wire ropes.

The holding valve prevents the boom from being naturally extended or retracted when the hydraulic hose is damaged.



5. Platform rotation device

The platform rotation device consists of the hydraulic motor and the worm gear, and it rotates the platform 180° to both the left and right.

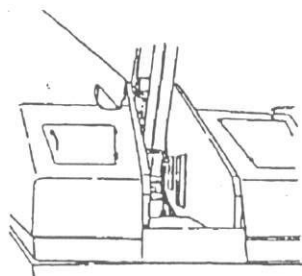


6. Platform levelling device

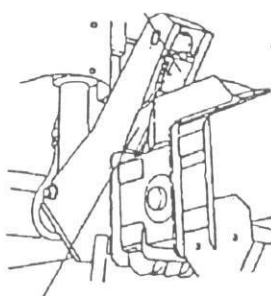
The levelling device consists of the lower levelling cylinder which is installed between the 1st boom and the turntable, and the upper levelling cylinder with the double pilot check valve which is installed between the 3rd boom and the platform. and the hydraulic hoses which are connected between both of the cylinders.

The double pilot check valve installed on the upper levelling cylinder prevents the platform from tipping when the hydraulic hose is damaged.

Lower levelling cylinder



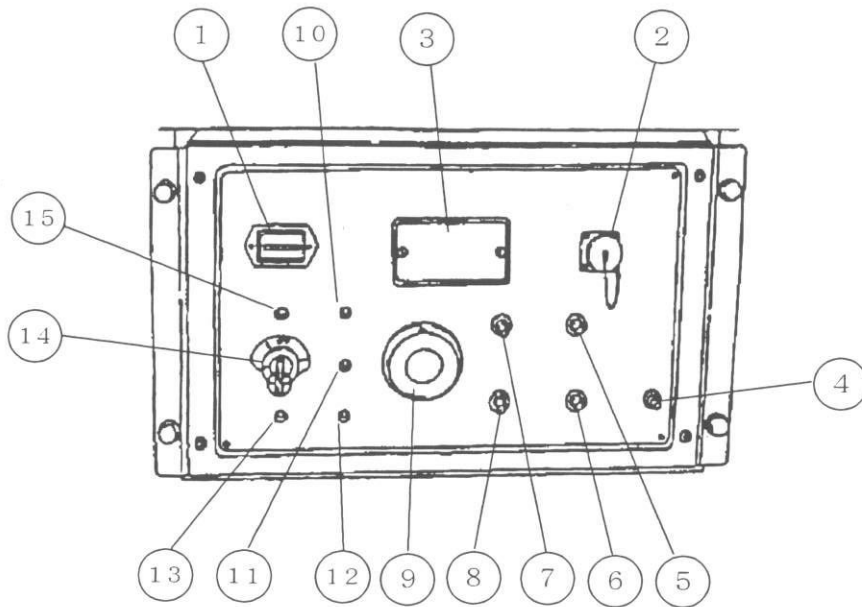
Double pilot check valve



Upper levelling cylinder

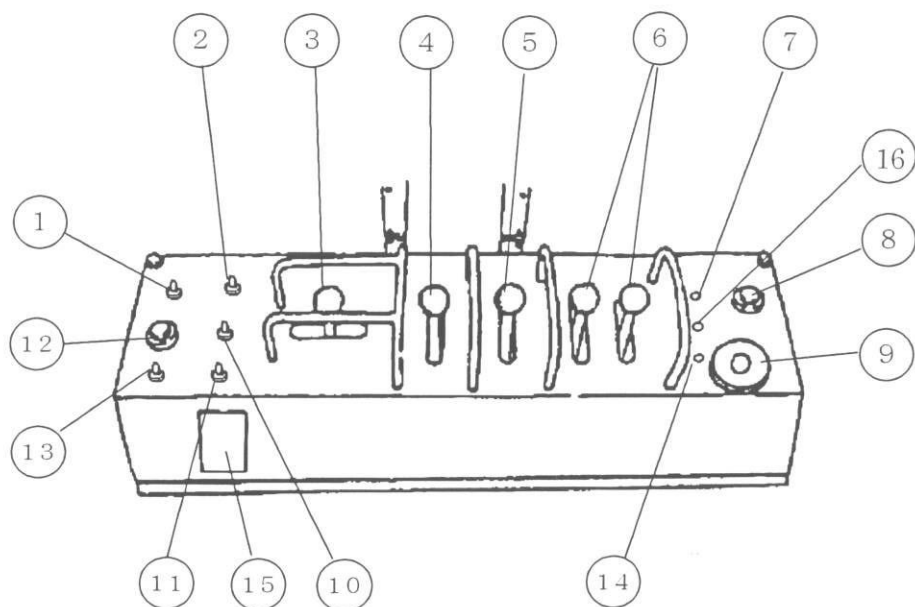
VII Control Panel

1. Lower control panel



No.	Name
1	Hour meter
2	Remote control socket for optional travel control box
3	Fuse holder
4	Boom elevation switch
5	Emergency pump switch
6	Boom extension switch
7	Accelerator switch
8	Boom rotation switch
9	Emergency stop switch
10	Charge warning lamp
11	Overheat warning lamp
12	Engine oil pressure warning lamp
13	Preheating indicator lamp
14	Engine key switch
15	Power indicator lamp

2. Upper control panel



No.	Name
1	Work light switch
2	Accelerator switch
3	Boom rotation control lever
4	Boom extension control lever
5	Boom elevation control lever
6	Travel control lever
7	Power indicator lamp
8	Engine start switch
9	Emergency stop switch
10	Platform rotation switch
11	Emergency pump switch
12	Horn switch
13	Platform level adjusting switch
14	Tilt warning lamp
15	Fuse holder
16	Fuel level warning lamp

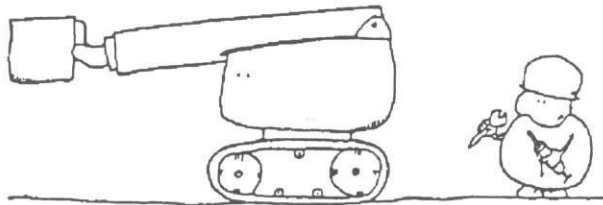
VIII Pre-start Inspection

Always conduct the pre-start inspection before using the machine.

This inspection must be conducted before operating the machine which:

- has been stored for a long time.
- is a new machine.
- has been serviced or repaired.

**CARRY OUT PRE-START
INSPECTION !**



Inspection should be conducted on firm level ground. Check thoroughly the following points, and do not use the machine, if any defect is found out.

Caution: When inspecting the machine under the platform or boom, use safety support to prevent the platform and boom from unexpected descent.

Warning: Use only the AICHI genuine parts for repairs.

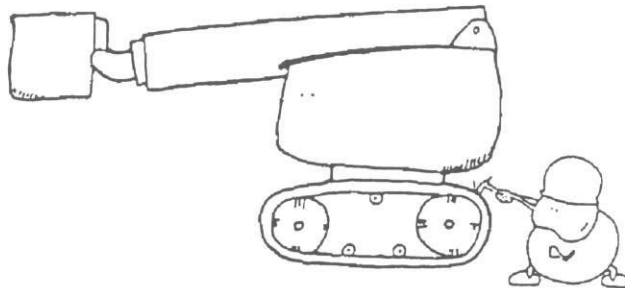
(1) Check engine oil, cooling water and hydraulic oil and refill, if necessary.

**SUPPLEMENT ANY
SHORTAGE IMMEDIATELY !**



- (2) Check the boom, the platform and the chassis for cracks, deformation. Also check each bolt and nut for looseness.

CHECK EACH PART !



- (3) Check that the greasing points are lubricated sufficiently.

Grease!



- (4) Check that all of the decals are readable.

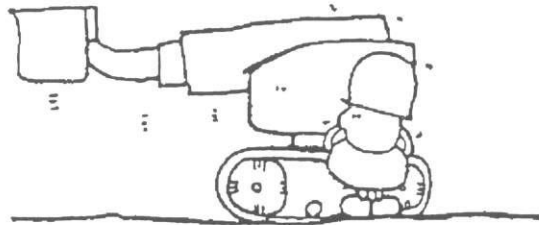
CHECK DECALS !



Warning: The damaged decals should be replaced.

- (5) After starting and warming up the engine, operate the machine thoroughly and make sure that all of the movements are smooth without any abnormal noise.

AFTER WARMING UP,
CHECK OPERATION
WITHOUT LOAD !



Note: Check the movements by operating the machine from the lower control first, then from the upper control.

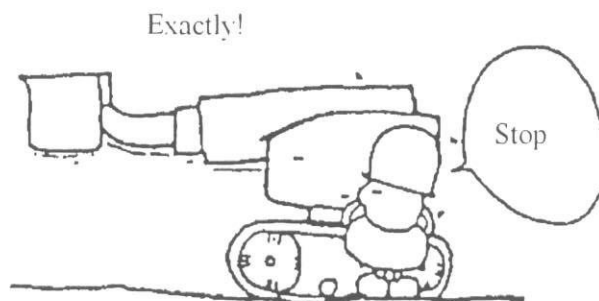
- (6) Rotate the platform and make sure that the platform rotates smoothly without excessive free play.

CHECK PLATFORM
ROTATION !



- (7) Check the safety devices and make sure that all of the safety devices are working normally.

CHECK SAFETY DEVICE !

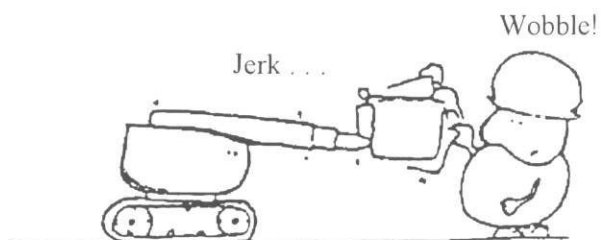


- (8) Check the hydraulic components, hoses and pipes for oil leakage.

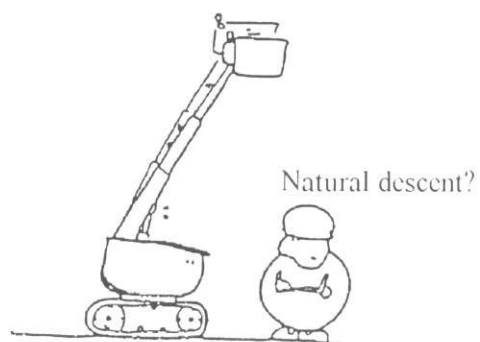


- (9) Check the boom extension wire ropes for any damage.

- (a) Is there any pause while extending or retracting the boom?
- (b) Is there any damage in the wire rope terminal ends?



- (10) Elevate the platform, then make sure that the platform does not descend naturally.



IX Safety Device

Safety devices are fitted for safe operation and for protecting the machine from damages.

Safety device	Function
Relief valve	Protects the hydraulic components by relieving abnormally high pressure in the hydraulic system.
Boom elevating safety device (Holding valve)	Prevents the natural descent of the boom when the hydraulic hose is damaged.
Boom extension safety device (Holding valve)	Prevents the boom from natural retraction or extension when the hydraulic hose is damaged.
Platform levelling safety device (Pilot check valve)	Keeps the platform level when the hydraulic hose is damaged.
Motion alarm buzzer	The motion alarm buzzer sounds while the machine is in motion.
Foot switch	The boom, travelling and platform rotating operations from the platform is disabled unless the foot switch is pressed.
Emergency stop switch	Stops all of the movements of the machine when this switch is pressed.
Tilt warning buzzer	When the machine tilts more than 5°, the tilt warning buzzer sounds.
Emergency pump	Auxiliary hydraulic pump driven by the battery is used in an emergency, e.g. engine failure.
Alarm horn	Before starting operation, sound the alarm horn to warn the personnel near the working area.
Travelling and boom simultaneous operation protection device (for CE only)	Travelling and boom operations cannot be operated simultaneously. If both of the operations are attempted simultaneously, both of the movements stop.
Travel speed limit device	The high speed travelling is disabled, if the boom is extended or set over the horizontal.
Boom wire rope failure detecting device (for CE only)	Stops the boom extending movements in the event of the wire rope failure.
Engine protection device	Stops the engine automatically, if the engine oil pressure is abnormally low.
Elevation speed control device	The boom rising and lowering speed decreases automatically as the boom length increases.
Rotation speed control device	The boom rotation speed decreases automatically as the work radius of the platform increases.
Travel speed control device	The travelling speed decreases automatically as the work radius of the platform increases.

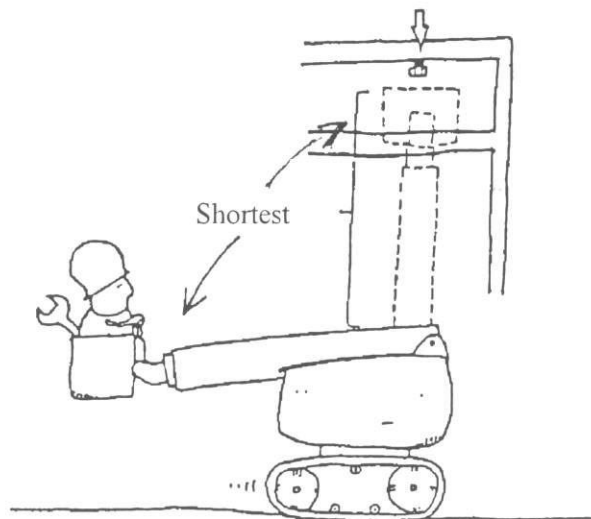
X Positioning of Machine

- (1) Set the machine on firm level ground.

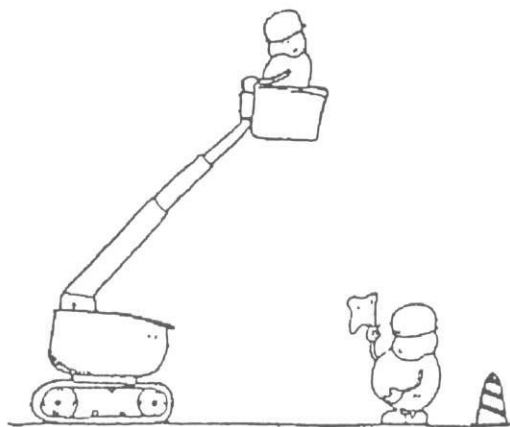
Warning: Do not elevate the platform on soft or uneven ground, as the machine may tip over.

Note: The maximum ground contact pressure of this machine is 0.91 kgf/cm^2 (13 PSI).

- (2) Place the machine near the working target.



- (3) Do not obstruct the transit of other vehicles and passers-by, and do not permit any unauthorized person to enter the working area.



Note: Place warning signs to warn personnel of the working area.

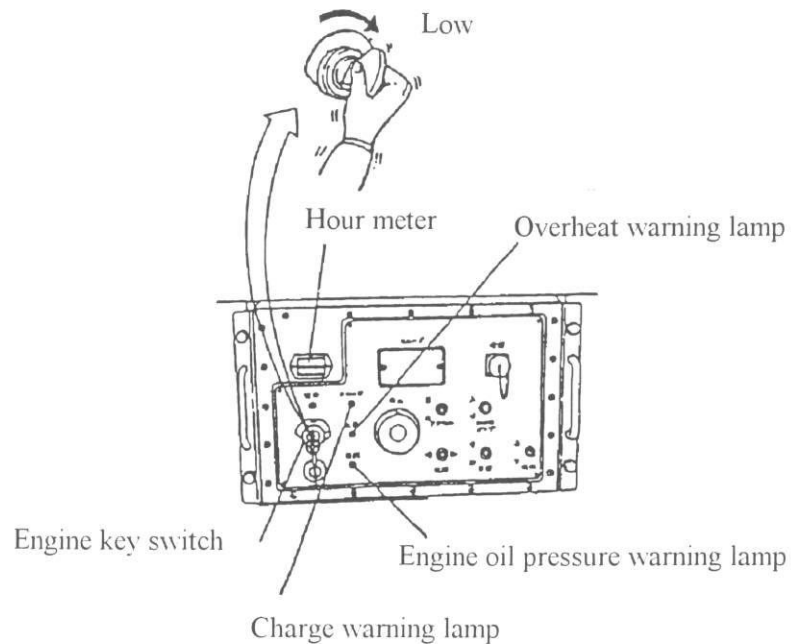
XI Operation Method

1. Engine start operation

1.1 Engine start operation from lower control

Start the engine from the lower control as follows.

- (1) Turn the engine key switch of the lower control to "LOW" position. Then, make sure that both of the engine oil pressure warning and the charge warning lamps turn on.



(1.1) Engine oil pressure warning lamp

After the engine is started, the lamp turns off. If the lamp turns on during the engine is in motion, it indicates the failure in the engine lubrication system such as low oil level, oil leakage or filter blockage.

(1.2) Overheat warning lamp

If this lamp turns on during operation, it indicates the failure in the engine cooling system such as shortage of cooling water and damaged fan belt.

Danger: When the engine is heated, do not remove the radiator cap. The heated water may splash out and cause danger.

Note: This lamp turns on only when the cooling water temperature is abnormally high.

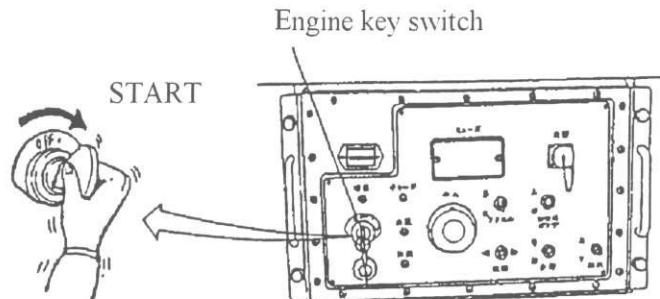
(1.3) Charge warning lamp

After starting engine, this lamp turns off. If the lamp turns on during the engine is in motion, it indicates the failure in the charging system.

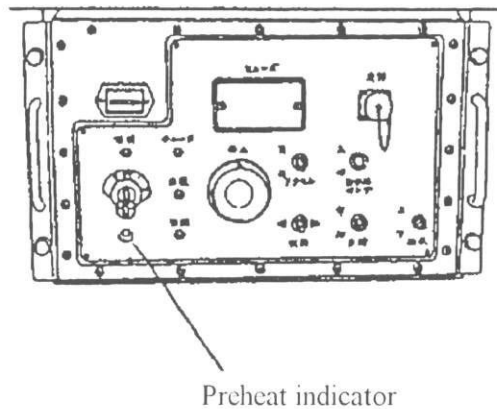
(1.4) Hour meter

The hour meter works only when the engine is in motion.

- (2) Turn the engine key switch to "START" position to start the engine.



Caution: Once the engine is started, immediately release the key from the start position. Do not hold the key in the start position for more than 10 seconds continuously, as this may cause the damaged starter motor.



Note: When you start the engine for the first time for the day, or when the engine has been stopped for a long period of time, turn the engine key switch to "GLOW," then start the engine. (This is especially important in winter.)

- (3) After starting the engine, warm up the engine for about 5 minutes without loading.

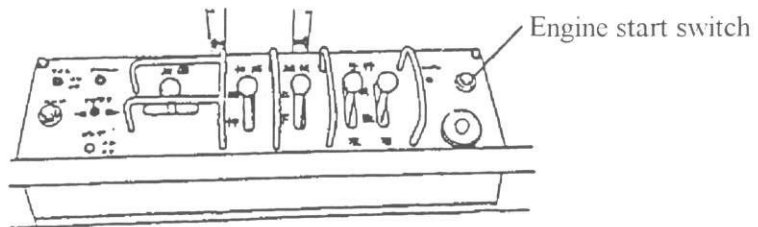
1.2 Engine start operation from upper control

- (1) Turn the engine key switch to "UP" position.

UP OFF LOW



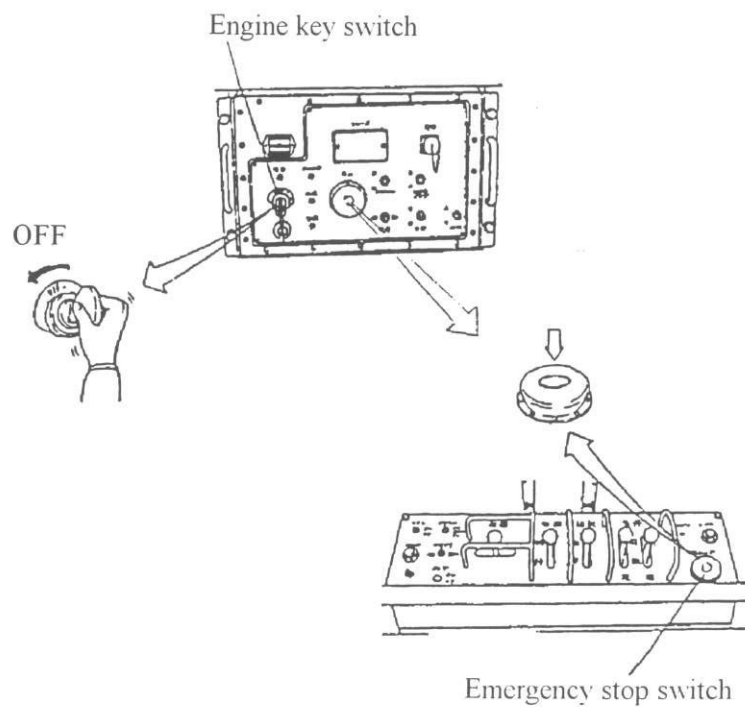
- (2) Step on the platform, then press the engine start switch without pressing down the foot switch.



2. Engine stop operation

To stop the engine from the lower control, either press the emergency stop switch or turn the engine key switch to "OFF" position.

When stopping the engine from the upper control, press the emergency stop switch.



3. Lower control (operation from ground)

Be sure to set the engine key switch in LOW position to operate the machine from the lower control.

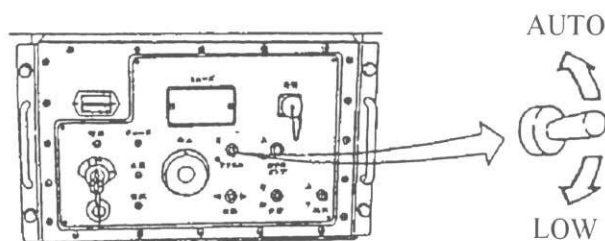
UP OFF LOW



3.1 Accelerator operation

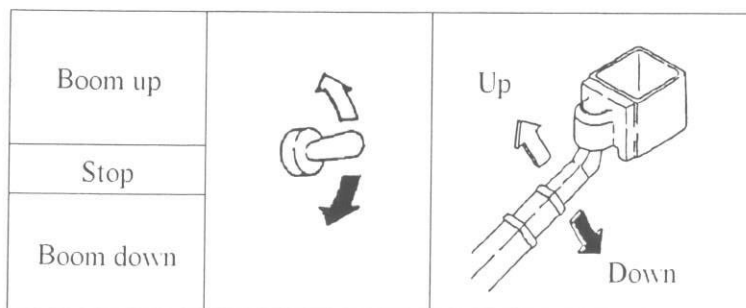
The engine rpm is controlled by the Accelerator switch as follows.

- If the switch is set in LOW position, the engine rpm is always maintained at LOW speed (1,200rpm).
- If the switch is set in AUTO position, the engine rpm is automatically increases from LOW speed (1,200 rpm) to High speed (2,300rpm), when Elevation, Rotation, Extension or Travelling operations is conducted.



3.2 Boom elevating operation

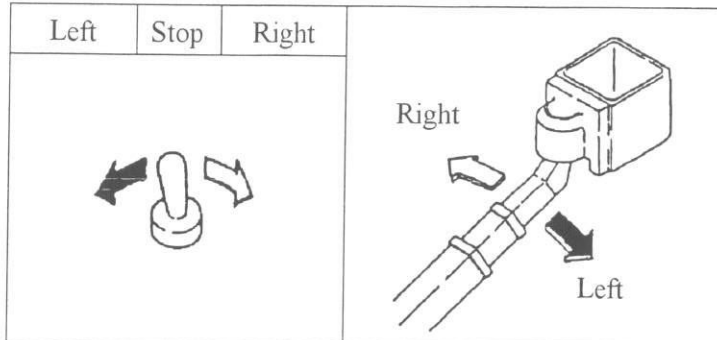
Use the boom elevation switch.



Warning: Do not press the boom against ground by lowering the boom.

3.3 Boom rotation operation

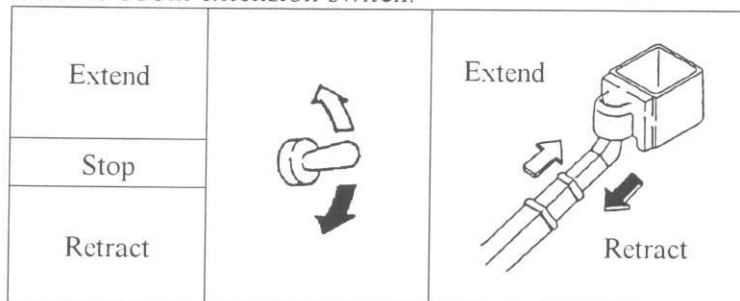
Use the boom rotation switch.



Warning: Before starting this operation, make sure that no personnel or obstacles are around the turntable.

3.4 Boom extension operation

Use the boom extension switch.



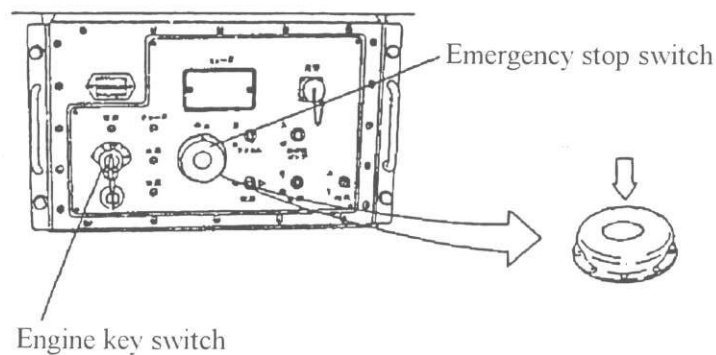
3.5 Emergency stop operation

Use the emergency stop switch.

By pressing the emergency stop switch, the upper and lower power indicator lamps turn off, and the engine stops, making all of the operations unavailable.

Use the emergency stop switch in the following cases.

- (1) When stopping the engine.
- (2) When a person on the ground judges that the operation from the platform is dangerous.
- (3) When the machine is uncontrollable.



Note: To reset the main power, pull the emergency stop switch, and make sure the power indicator lamp turns on.

Danger: If the boom descends gradually even with the emergency stop switch pressed, this may indicate cylinder natural descent.

In this case, lower the platform using the following procedures:

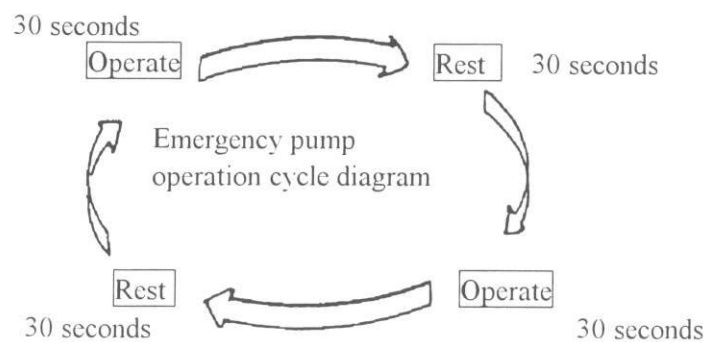
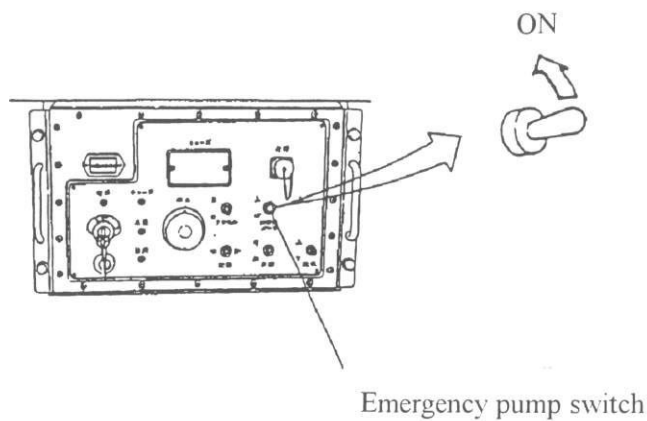
- Pull the emergency stop switch and make sure the power indicator lamp turns on.
- Start the engine with the engine key switch.
- Operate the machine to prevent the boom and the platform from coming into contact with the obstacles.
- Lower the platform down to the ground and stop operation.

Warning: When an emergency stop operation has been conducted due to malfunction, stop using the machine immediately and contact our designated service shop for inspection.

3.6 Emergency pump operation

Use the emergency pump switch.

If the machine does not work due to engine or main pump failure, use the emergency pump to lower the platform. The emergency pump is driven only when the emergency pump switch is operated.



- Caution:**
- Operate the emergency pump every other 30 seconds, and take interval of 30 seconds until the next operation. Continuous operation in excess of 30 seconds may cause damage to the emergency pump.
 - Do not attempt travelling by operating the emergency pump.

Note: If the emergency stop switch has been pressed at the upper control with no operator on the platform, the boom can be lowered by operating the emergency pump switch and the boom control switches simultaneously from the lower control.

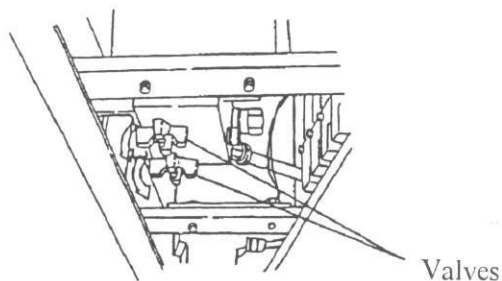
3.7 Platform level adjustment method

If the platform is inclined, adjust the platform level by following the procedures outlined below.

- (1) Place the machine on firm level ground, set the boom horizontally, then retract the boom fully.

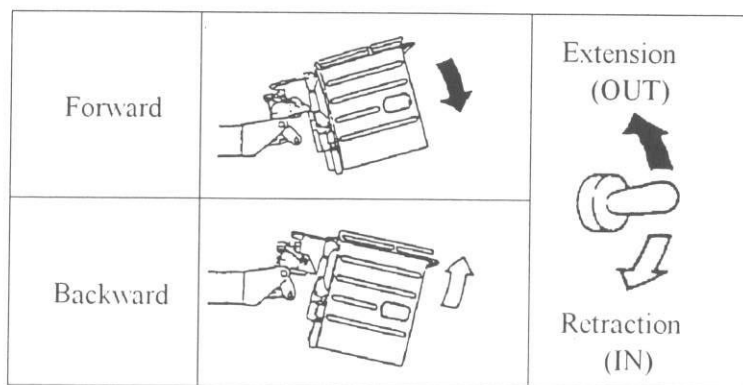
Warning: Do not adjust the platform level with any person or object loaded on the platform.

- (2) Turn the two valves located under the turntable C.C.W. and open both of the valves.



- (3) Operate the boom extension switch to adjust the platform level.

To tilt the platform forward, operate the boom extension switch to "OUT".
To tilt the platform backward, operate the boom extension switch to "IN".



- (4) After adjusting the platform level, turn both of the valves C.W. and close them securely.
- (5) Raise and lower the boom several times and make sure that the platform stays level.

3.8 Air bleeding method from platform levelling system

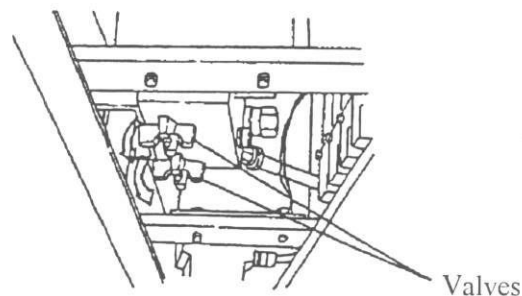
If the platform does not stay level even after adjustment, air may have entered the platform levelling system. In this case, bleed air following the procedures outlined below.

- (1) Place the machine on firm level ground, and set the boom horizontally, then retract the boom fully.

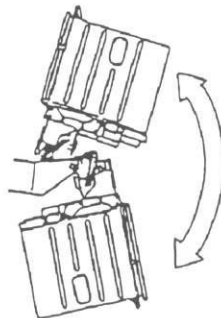
Note: When bleeding air, operate the machine from the lower control.

Warning: Do not bleed air with any person or object loaded on the platform.

- (2) Turn the two valves located under the turntable C.C.W. and open both of the valves fully.



- (3) Operate the boom extension switch to tilt the platform backward and forward fully.



Note: Repeat the above procedure three to four times.

- (4) After adjusting the platform level, turn both of the valves C.W. and close them securely.
- (5) Repeat the boom raising and lowering operations several times and confirm that the platform stays level.

4. Upper control (operation from platform)

Prior to operating the machine from the platform, set the key switch in UP position and remove the key. (This will activate the upper control.)

UP OFF LOW

The operator must take this key with him/her.

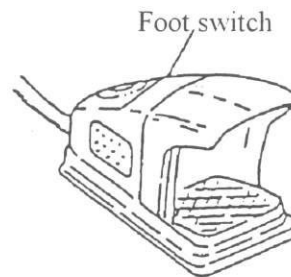
The spare key should be kept by an authorized person on the ground.



4.1 Foot switch

The only operations which are available without pressing the foot switch are:

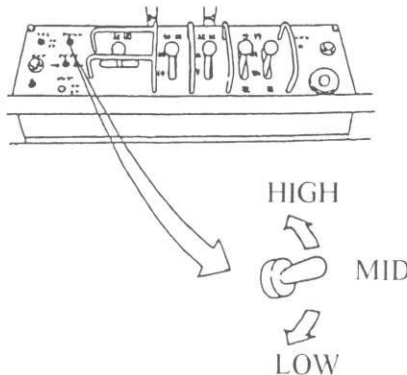
- Engine start operation
- Emergency stop operation
- Horn operation
- Work light operation



4.2 Accelerator operation

The engine rpm is controlled by the Accelerator switch as follows.

- If the switch is set in LOW position, the engine rpm always stays in LOW speed (1,200rpm).
- If the switch is set in MID or HIGH position, the engine rpm automatically increases to MID speed (1,800 rpm) when the boom is operated or to HIGH speed (2,300rpm) when the Travelling is operated.



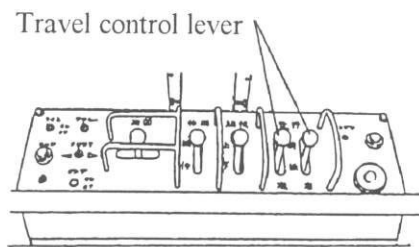
4.3 Travelling operation

Use the two travel control levers.

If the boom is fully retracted and is lowered under the horizontal, three travelling speeds (LOW, MID and HIGH) are available by setting the accelerator switch to LOW, MID or HIGH position.

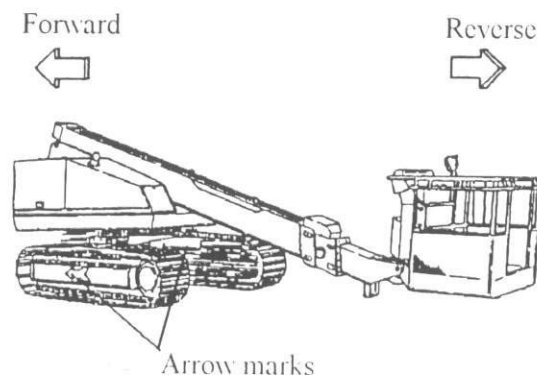
However, the machine travels only in LOW speed regardless of the accelerator switch position, if the boom is extended or raised over the horizontal.

Caution: The turning is sometimes not available when travelling in HIGH speed, because the traction of the travel motor is not high enough in high speed travelling. Set the accelerator switch to MID or LOW position when turning.



4.3.1 Matters that demand special attention

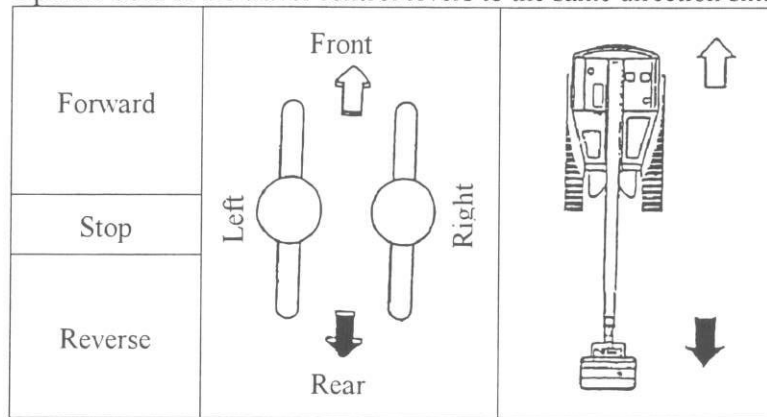
- (1) Check the surroundings and make sure that no person is in the travelling direction.
- (2) If travelling on the slope greater than 5 degrees, retract the boom fully and set the boom under the horizontal.
- (3) When commencing travelling, be sure to operate the travel control levers gradually and start slowly.
- (4) To increase the speed, incline the travel control levers more. To adjust the speed, accordingly adjust the control levers.
- (5) When the turntable has been rotated 180°, the travelling direction becomes the opposite of the control lever direction. Before travelling, make sure the travelling direction by checking the arrow marks attached on the chassis.



4.3.2 Operation method

(1) Straight forward or reverse travelling

Operate both of the travel control levers to the same direction simultaneously.

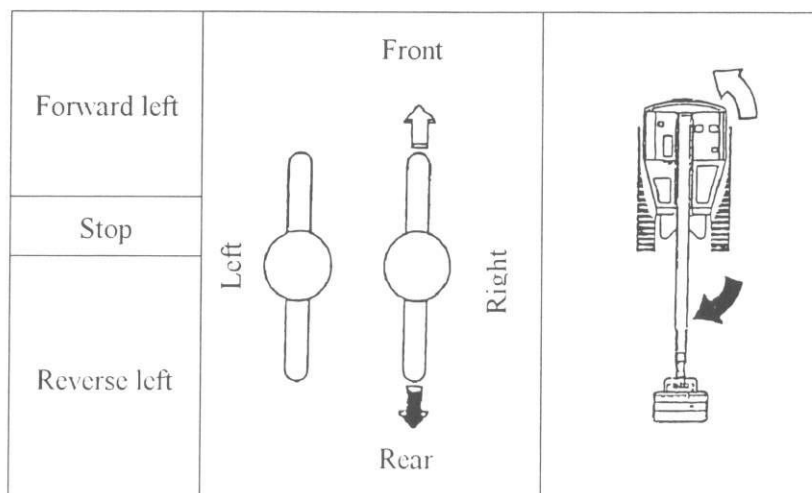


Note: Before travelling, check the travelling direction by the arrow marks attached on the chassis.

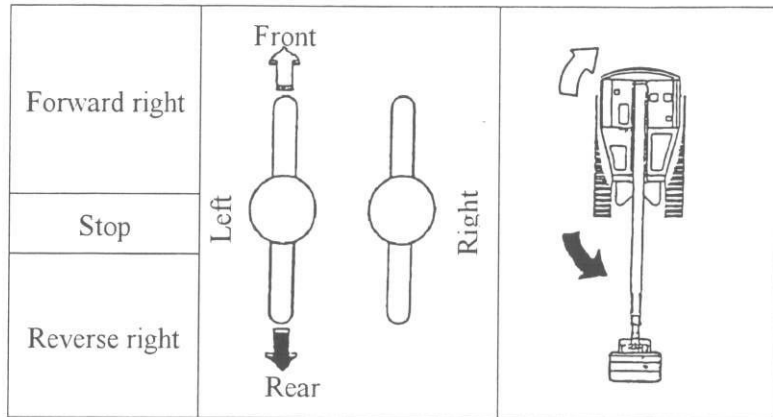
(2) Turning operation

1) Turning from stationary position (Pivot turn)

(a) Forward/Reverse turn to the left



(b) Forward/Reverse turn to the right

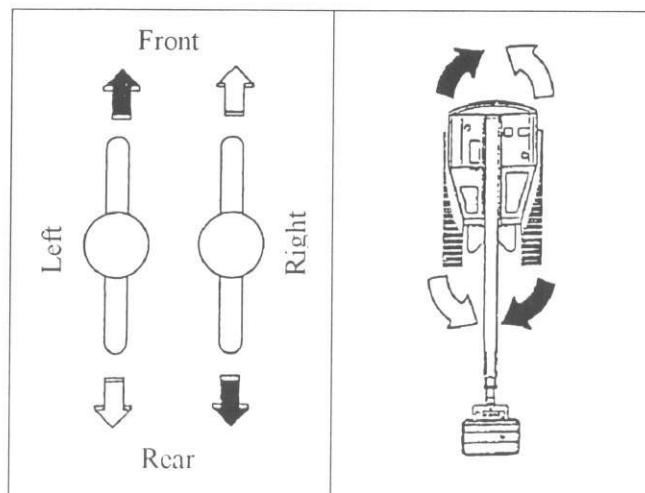


2) Turning while travelling

Left turn . . . Return only the left travel control lever to the neutral position.

Right turn . . . Return only the right travel control lever to the neutral position.

3) Turning with the minimum radius (Spin turn)

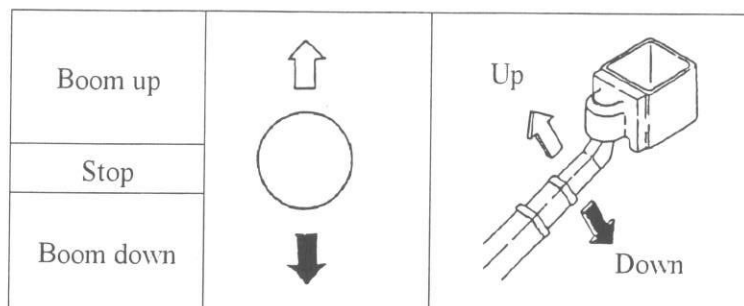


. . . Spin turn: CCW
 . . . Spin turn: CW

Caution: Spin turn should only be conducted after stopping the machine.

4.4 Boom elevating operation

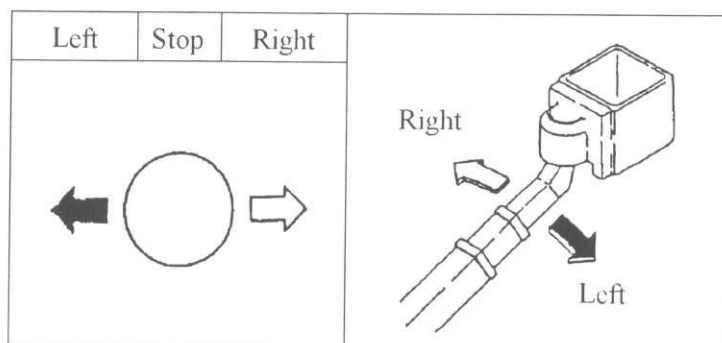
Use the boom elevation control lever.



Danger: Do not press the boom or the platform against the ground by lowering the boom.

4.5 Boom rotation operation

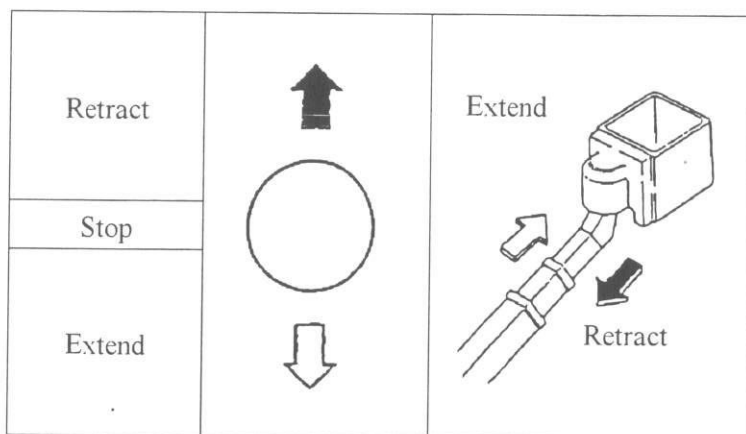
Use the boom rotation control lever.



Danger: Make sure that no obstacle is around the turntable.

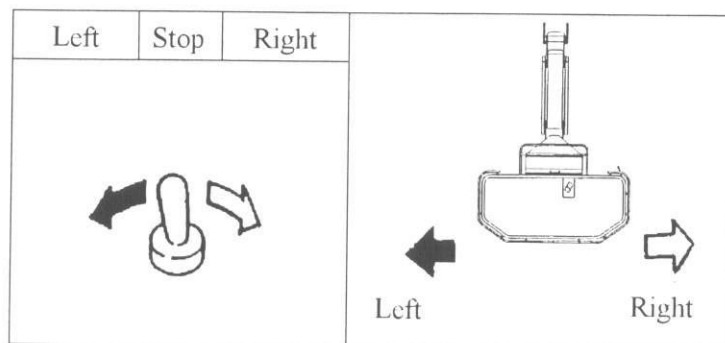
4.6 Boom extension operation

Use the boom extension control lever.



4.7 Platform rotation operation

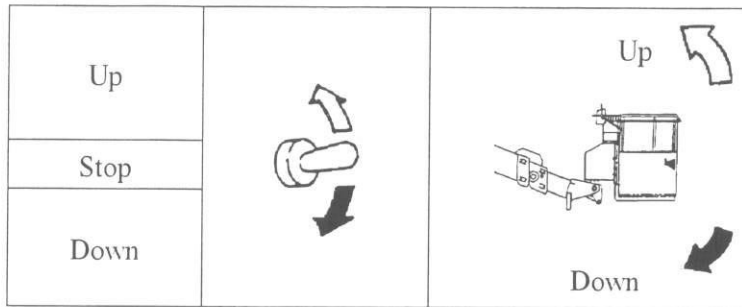
Use the platform rotation switch.



Caution: When travelling, rotate the platform to the central position.

4.8 Platform level adjusting operation

Use the platform level adjusting switch to adjust the platform level.

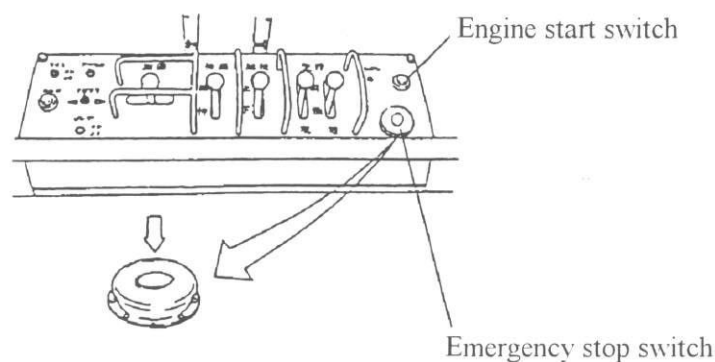


4.9 Emergency stop operation

Use the emergency stop switch.

By pressing the emergency stop switch, the power indicator lamp turns off, and the engine stops, making all of the operations unavailable. The emergency stop switch should be pressed in any of the following situations.

- (1) When stopping the engine.
- (2) When the operator on the platform wants to stop operation, and avoid danger.
- (3) When the functions of any control levers or switches become abnormal.



Note: To reset the power, pull the emergency stop switch, and make sure the power indicator lamp turns on.

Danger: If the boom descends gradually even with the emergency stop switch pressed, this may indicate cylinder natural descent.

In this case, lower the platform using the following procedures:

- Pull the emergency stop switch and make sure the power indicator lamp turns on.
- Start the engine by the engine start switch.
- Operate the boom to prevent the boom and the platform from coming into contact with obstacles.
- Lower the platform down to the ground and stop operation.

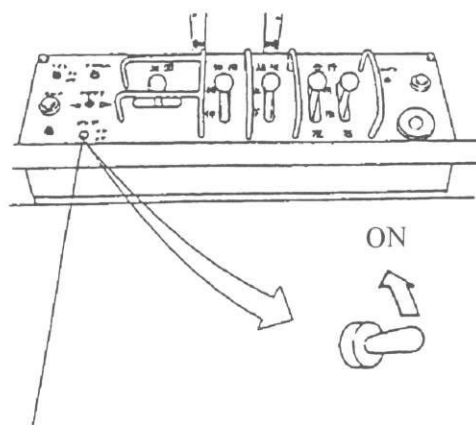
Warning: When an emergency stop operation has been carried out due to malfunction, stop using the machine immediately and contact our designated service shop for inspections.

4.10 Emergency pump operation

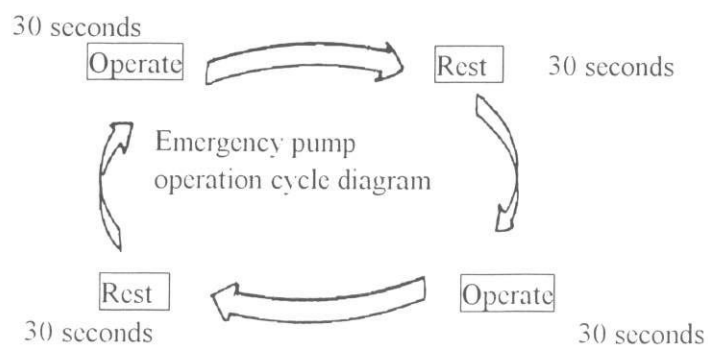
Use the emergency pump switch.

If operation fails due to the main pump or the engine failure, use the emergency pump to lower the platform.

Emergency pump is driven only when the emergency pump switch is operated.



Emergency pump switch

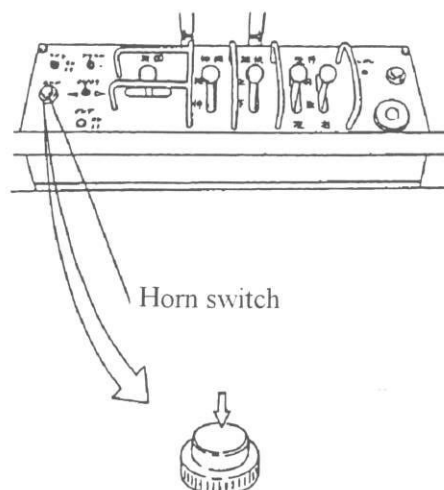


- Caution:**
- Operate the emergency pump every other 30 seconds, and take interval of 30 seconds until the next operation. Continuous operation longer than 30 seconds may cause damage to the emergency pump.
 - Do not attempt travelling by operating the emergency pump.

4.11 Alarm horn operation

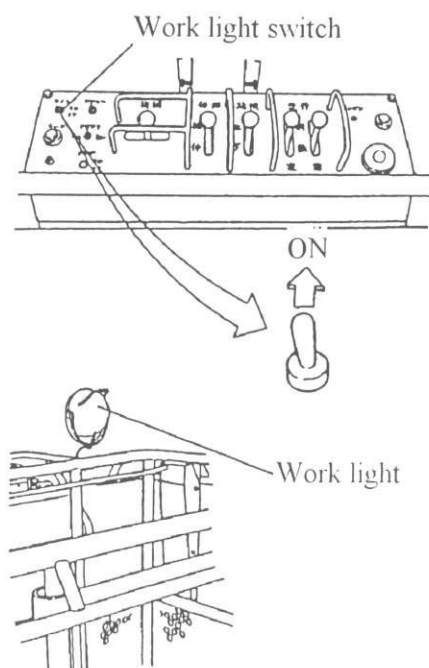
Use the horn switch.

An alarm horn sounds, when the switch is pressed. Sound the alarm horn before starting operation to warn personnel in working area.



4.12 Work light operation

Use the work light switch to turn on the light.

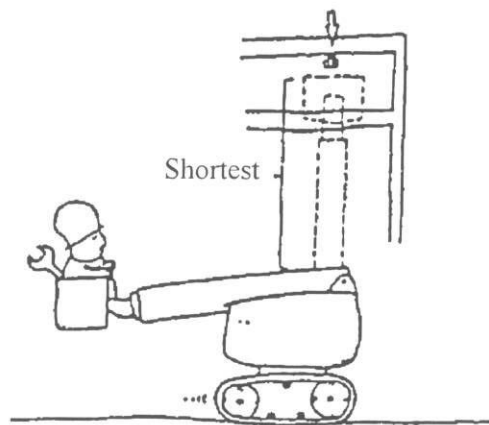


XII Operation Points

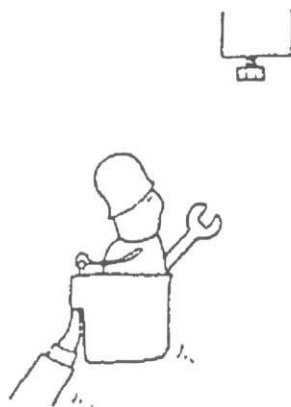
Park the machine on firm level ground before elevating the platform. The machine may tip over, if parked on soft or uneven ground.

* The maximum ground contact pressure of this machine is 0.91 kg/cm (13 PSI).

- (1) Set up the machine close to the working target.



- (2) Rotate, and elevate the boom until the working target is in line with the boom extending direction.



- (3) Extend the boom till the working target is within a comfortable working range.



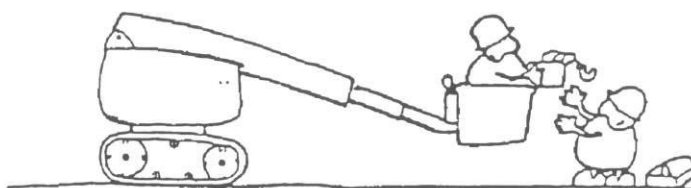
Note: Rotate the platform, if necessary.

- (4) After finishing the work, reverse the above procedures to lower the platform.

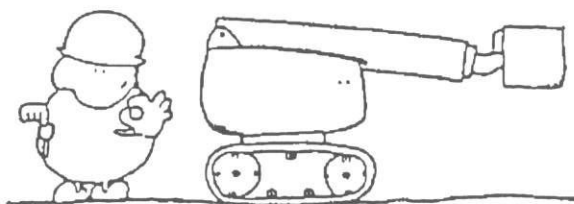
XIII Caution After Finishing Work

1. When the work is finished

- (1) Take all tools and materials out of the platform.



- (2) Retract and lower the boom fully and rotate the platform to the central position.
- (3) Stop the engine by turning the engine key switch to "OFF."



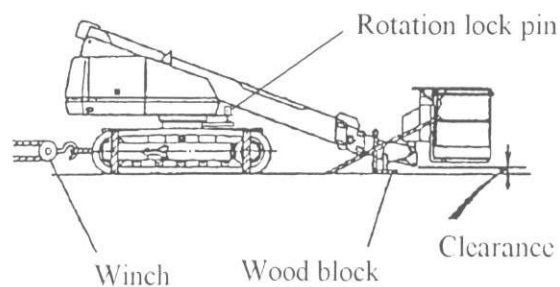
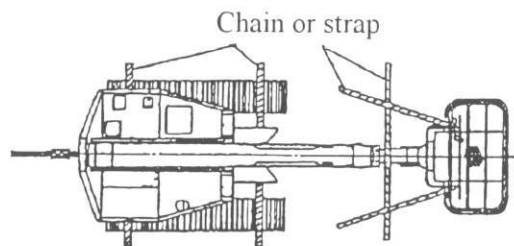
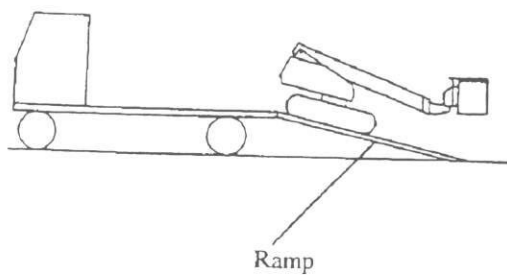
Caution: Remove the key to prevent any possible danger caused by unauthorized use.

2. Transportation

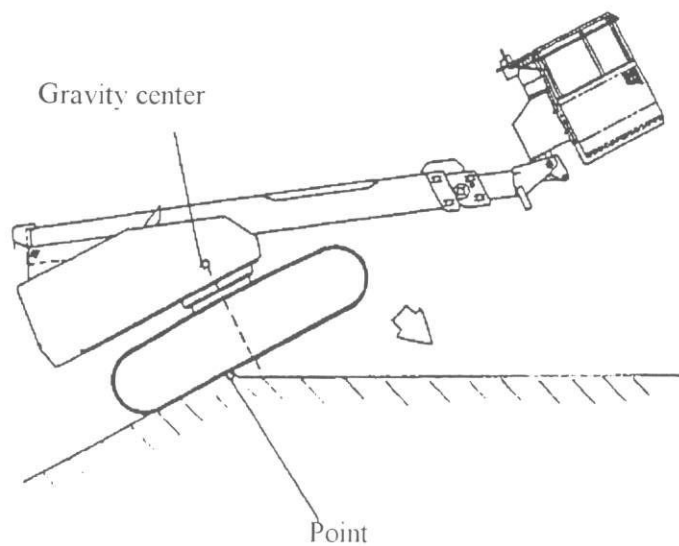
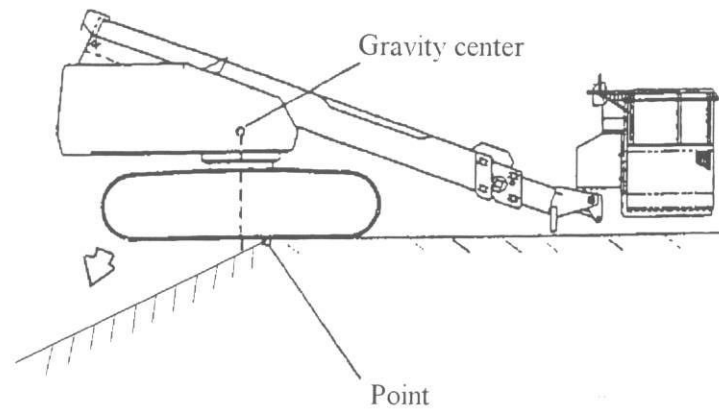
To ensure safe transportation of the machine by transport vehicle, follow these procedures.

- (1) Lower the platform to ground and remove all tools and materials from the platform.
- (2) Make sure the machine is in line with the loading ramp of the transport vehicle.
- (3) Drive the machine slowly with the boom fully retracted when climbing up the loading ramp.
- (4) After loading, engage the rotation lock pin, then tie down the machine on the vehicle bed securely as shown in the figure below.

Note: To unload the machine from the transport vehicle, reverse the above procedures.



Caution: When passing the point shown in the figure below the machine will incline suddenly. For this reason it is important that the machine is moved very slowly and cautiously with the boom fully retracted.



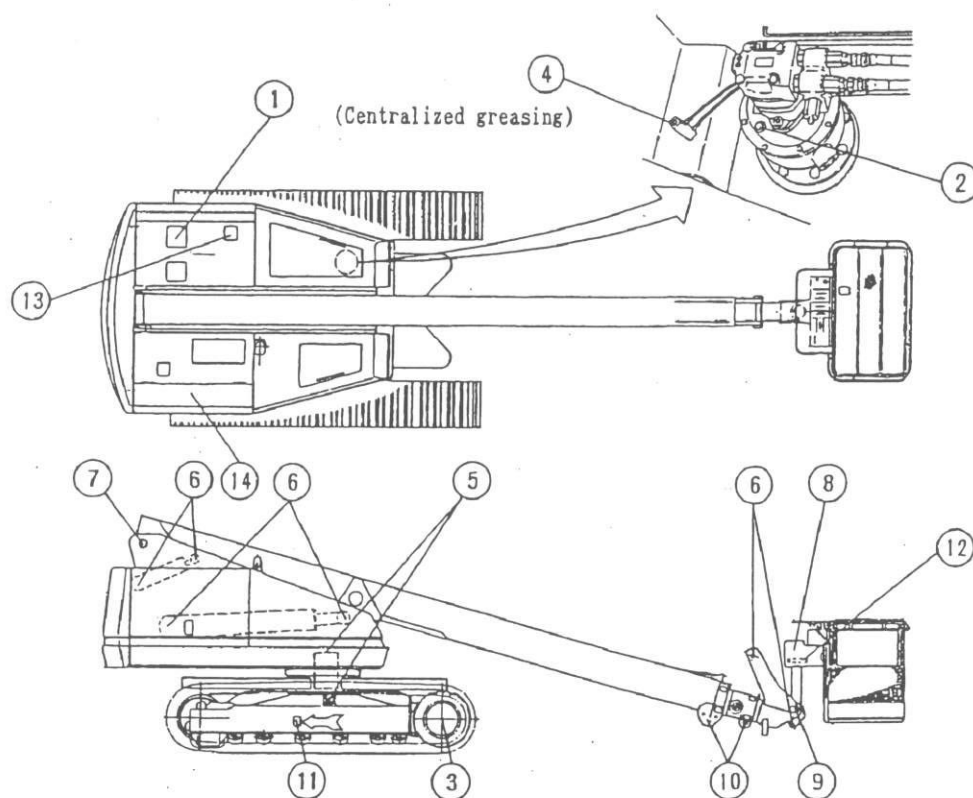
XIV Lubrication

1. List of recommended lubricants

Manu- facturers	Hydraulic oil		Gear oil		Grease		
	General purpose	For cold region	Rotation gear box	Travel gear box	General	Gear compound	Molyb- denum
Shell oil	Tellus oil 32 or k32	Tellus oil T15	Omala oil 460	Spirax EP 90	Alvania EP grease 2	Cardium compound A or D	Retinax AM
Esso oil	Nuto H32	—	Spartal EP460	Standard gear oil 90 Esso gear oil GP80	Lithtan EP2 Beacon EP2 Nidok EP2	JWS2563 Spartal EP2200	Beacon Q2
Mobil oil	DTE 24	—	Gear 634	Pegasus gear oil 90 Mobilube GX90	Mobilux EP2	Mobiltac QQ	Mobil grease special
Nippon oil	Super highland 32	Highland wide 15	Bon knock AX460	Gearlube SP 90	Epiknock AP2	Cranoc compound 1	New molynick
Idemitsu kosan	Daphne super hydraulic oil 32	Daphne super hydro WR15	Daphne super gear oil 460	Apoloil gear HE 90	Daphne coronex grease EP No.2	Daphne open gear oil No.1	Daphne grease M No.2
Cosmo oil	Cosmo hydro AW32	—	Cosmo gear SE460	Cosmo gear GL-4 90	Cosmo grease diner Max EP No.2	Cosmo gear compound No.2	Cosmo molybdenu m grease No.2
Japan energy	Hydrax 32	—	Reductus 460	Gear 4-90	Resonics grease EP-2	Gear compound No.2	Resonics grease M-2
Mitsubishi oil	Hydro fluid EP32	—	Super gearlub SP460	Diamond hypoid gear oil 90	Diamond multipurpos e EP grease 2	Mitsubishi gear compound 2	Diamond multipurpose M grease 2
General oil	Panol 32	—	SP gearol 460	G-gear 4-90	Gemico grease ME-2	General gear compound 2	Gemico grease AD-1

1. Supply proper amount of machine oil to the hinges.

2. Lubrication chart and interval



No.	Name	Name of oil and grease	Oil change or greasing interval			
			30 hrs or 1 week	100 hrs or 1 month	800 hrs or 6 months	1200 hrs or 12 months
1	Hydraulic oil tank	Hydraulic oil		△		◎
2	Rotation gear box	Gear oil		△		◎
3	Travel gear box			△		◎
4	Rotation bearing	Grease (general)	○			
5	Swivel joint				*○	
6	Anchor pin for hydraulic cylinder		○			
7	Boom pivot pin		○			
8	Platform bracket		○			
9	Platform pivot pin		○			
10	Boom roller				○	
11	Grease cylinder	Grease (general)	Ref. to XV article 9			
12	Worm gear for platform rotation	Grease (molybdenum)			○	
13	Fuel tank	Gas oil	Fill when required.			
14	Engine		Refer to engine manufacture's manual			
○ Greasing ◎ Change △ Change for new unit						

*Supply grease 2-3 shots by hand pump.

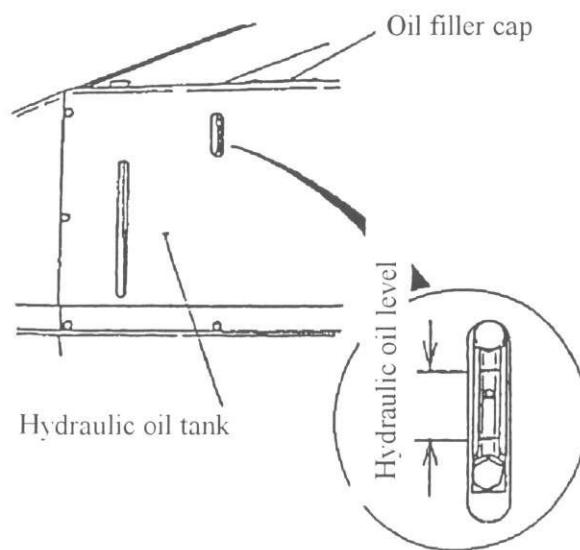
XV Daily Care

Various materials are used in the construction of this machine and these materials wear or deteriorate gradually. Some parts may be difficult to check for safety, so those parts should be replaced periodically according to the predetermined serviceable life time.

1. Hydraulic oil

1.1 When replenishing

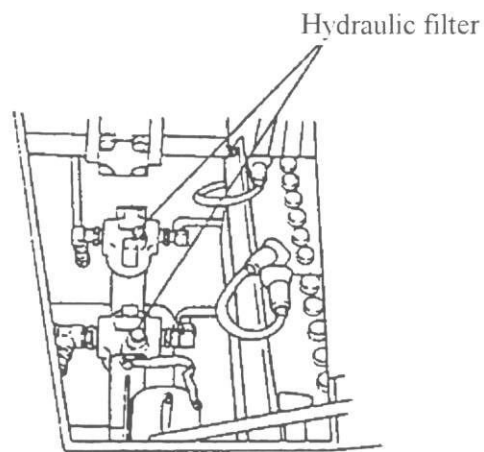
Check oil level with the oil level gauge equipped on the hydraulic oil tank, and refill to the level through the oil filler cap.



Note: Retract and lower the boom fully, before checking the oil level.

1.2 Hydraulic oil change (once a year)

- (1) Lower and retract the boom fully.
- (2) Remove the oil drain plug installed on the bottom of the tank and drain the hydraulic oil thoroughly, then reinstall the oil drain plug.
- (3) Refill the tank with new hydraulic oil with checking the oil level.
- (4) Replace the hydraulic oil filters at the same time.



- Note:**
- Hydraulic oil tank capacity: 250 liters (66 gallons)
 - When changing hydraulic oil, contact our designated service shop.

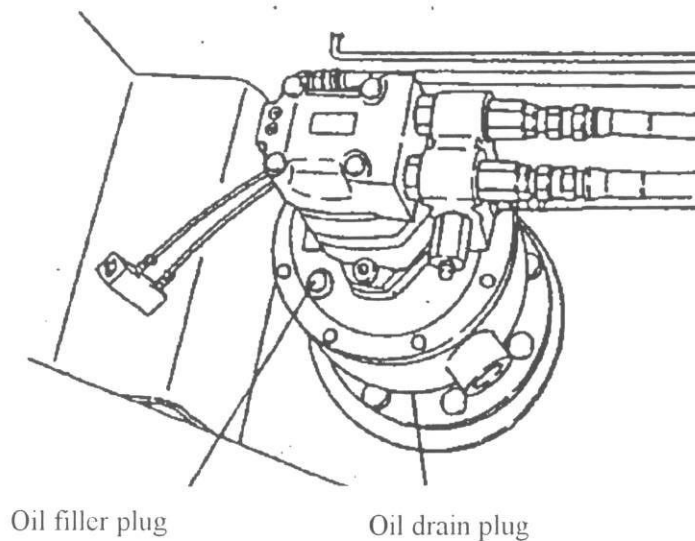
2. Gear oil for “Rotation gear box”

2.1 Inspection

Check the gear box for oil leakage.

2.2 Gear oil change (once a year)

- (1) Remove both of the oil drain and filler plugs and drain gear oil thoroughly.
- (2) Reinstall the oil drain plug, and refill the gear box with new gear oil.
Oil capacity: 1.1 liters (0.3 gallons).
- (3) Reinstall the oil filler plug.



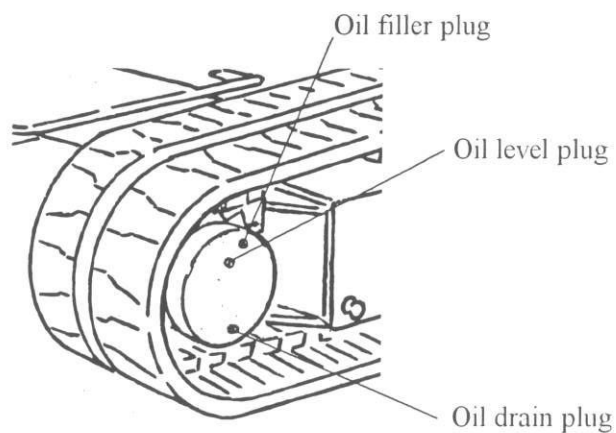
- Note:**
- Oil capacity: 1.1 liters (0.3 gals)
 - For oil change procedures, contact our designated service shop.

3. Gear oil for "Travel gear box"

Change gear oil by following these steps.

- (1) Set the oil filler, level and drain plugs as shown in the figure below.
- (2) Remove all of the plugs, and drain the oil thoroughly.
- (3) Reinstall the oil drain plug.
- (5) Refill the gear box with new gear oil from the oil filler port till the oil level reaches the oil level port.
- (6) Reinstall the oil level and filler plugs.

Note: Oil capacity: 4.7 liters (1.2 gallons) for one side

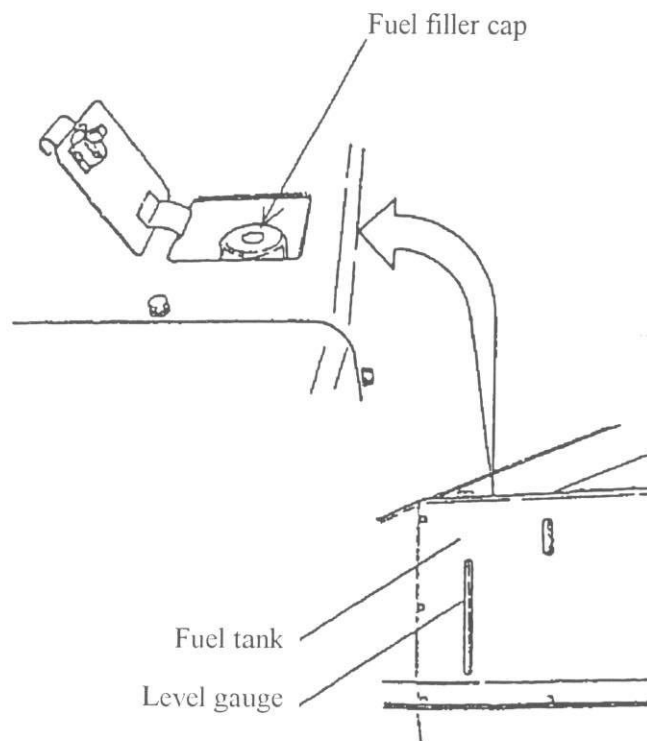


4. Fuel

Use gas oil as a fuel.

Check fuel level with the fuel level gauge, and refill to level.

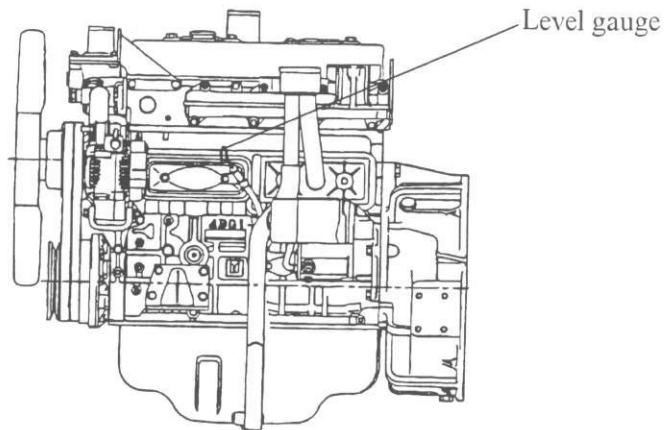
Note: Tank capacity: 230 liters (60.8 gallons).



5. Engine

(1) Engine oil

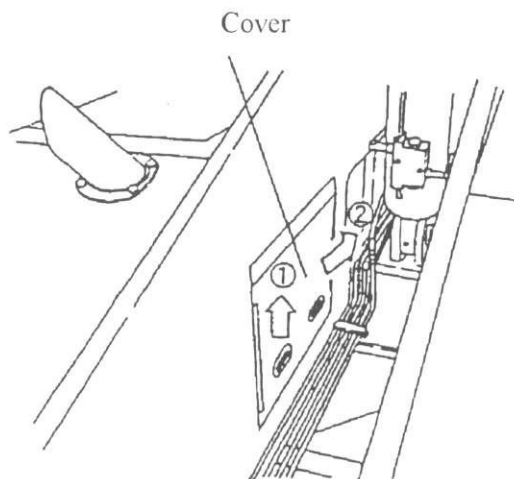
Check oil level with the oil level gauge, and refill to the level.



Note: • Keep the oil level in between the two lines on the dip stick.

- (2) For engine oil change procedures and other engine related maintenance, refer to engine manufacturer's manual.

Caution: To replace engine oil filter, remove the cover on the turntable.

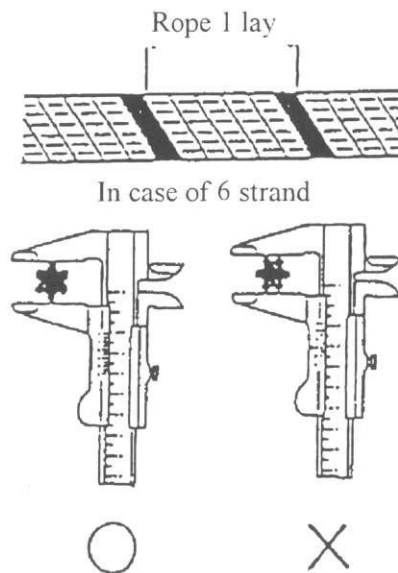


6. Wire rope

Replace the wire rope, when any defects listed below are observed.

- (1) Kinked rope.
- (2) Stretched or corroded rope.
- (3) Cut rope.
- (4) If the decrease of the rope diameter exceeds 3% of the nominal diameter. See the figure below to check the rope diameter.

Note: For replacement procedure, contact our designated service shop.

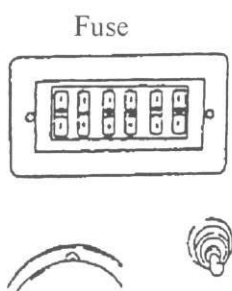


7. Fuse

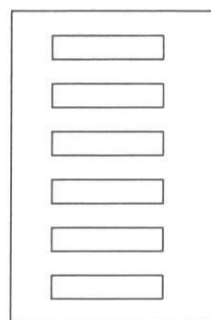
Fuse holders are located in both the lower and upper control boxes.

If the machine does not work, the fuse may have been blown.

Lower control box



Upper control box



30A	Engine stop
5A	Accelerator
10A	Limit switch
10A	Emergency pump
20A	Power supply
10A	Engine start

10A	Spares
5A	Work light
3A	Accelerator
10A	Platform rotation & level Emergency pump
3A	Engine start
10A	Horn

Warning: When replacing fuse, be sure to set the engine key switch in "OFF" position.

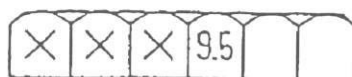
8. Hydraulic hose

If oil leaks from the hydraulic hose, stop using the machine immediately and contact our designated service shop.

When ordering parts, please let us know the following:

- (1) Classification of hose: rubber or nylon
- (2) Location on the machine
- (3) Length of hydraulic hose: the dimension between the tips of both hose fittings.

Note: The length is indicated on the "hose fitting" as shown in the figure below.
(Rubber hose only)

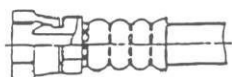


Length

Example: 9.5 → 950 mm (37.4 in)
12 → 1,200 mm (47.2 in)

- (4) Classification of "Hose fittings"

Hose fitting (male)

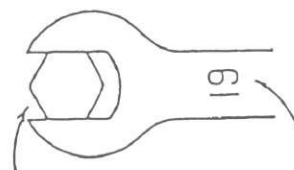


Hose fitting (female)



- (5) Size of hydraulic hose

Please let us know wrench size to be used.

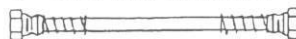


Wrench size
19, 22, 27

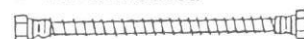
Hydraulic hose fitting

- (6) Existence of armour

① Both side armoured



② All armoured



③ Non armoured

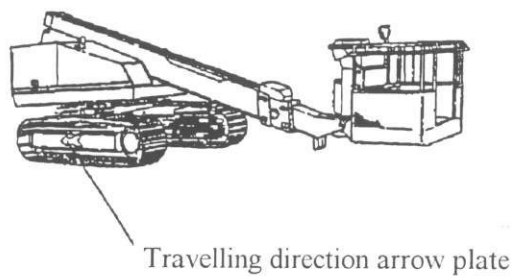


9. Crawler

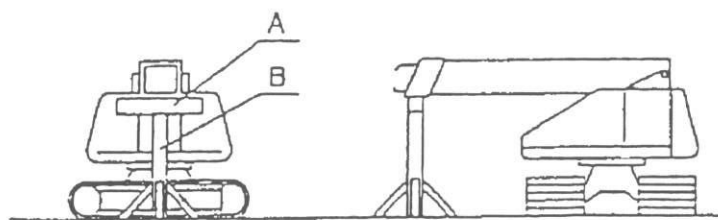
Sagging may occur on the tracks due to wear, so you are requested to adjust the track tension periodically. If the tension is not appropriate, the track risks detachment.

9.1 Adjustment method

- (1) Remove the travelling direction arrow plates from both sides of the chassis. The grease fitting for the track tension adjustment will appear inside.



- (2) Retract the boom fully, then rotate the boom and set it to right or left side of the machine as shown in the figure below.
- (3) Set "Boom stand B" and "Wood block A" under the top of the 1st boom as shown in the figure below.



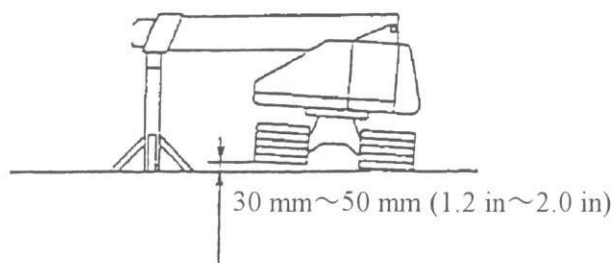
A : □ 90 mm (3.5 in) × 600 mm (23.6 in) (wood block)

B : □ 90 mm (3.5 in) × 1400 mm (55.1 in) (stand)

Caution: "Wood block A" shall be longer than the width of the 1st boom apex, and arrange it so that the boom comes to the center of the wood block.

Warning: In the interest of safety, make sure the stand is stable.

- (4) Press the boom against the wood block by lowering the boom slowly, and allow the clearance 30~50 mm (1.2~2.0 in) between the track and the ground.



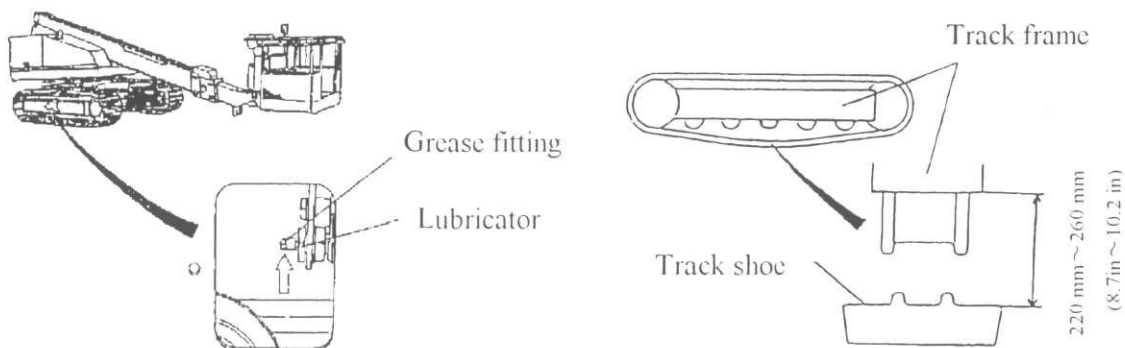
- Danger:**
- Be sure to conduct the boom operation from the “Lower control.”
 - Do not lift up the track more than 50 mm (2.0 in) above the ground. If the track is lifted up beyond what is necessary, the machine may become unstable.

- (5) Supply grease to the “Grease cylinder” through the “Grease fitting” to apply more tension to the track.

Adjust the dimension between the track shoe and the track frame to 220~260 mm (8.7~10.2 in).

If the track is too tight, unscrew the “Lubricator” part away till the grease exudes.

- Warning:**
- Do not loosen the grease fitting as it may pop out resulting in serious injury.
 - Do not unscrew the “Lubricator” more than one full turn as it may pop out resulting in serious injury.



(6) After adjusting one side, rotate the boom 180°, and adjust the other side in the same manner.

Note: It is important to adjust the tension of left and right tracks equally.

9.2 Adjustment interval

Adjust the track tension at the intervals mentioned below.

	Interval
First time on new machine	After 10 ~ 20 hours
Thereafter	Every 800 hours

XVI Caution for Long Term Storage

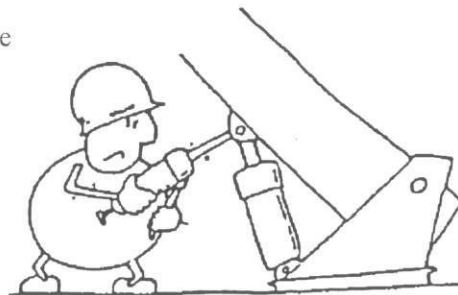
- (1) Clean up the machine.

WASH BEFORE STORAGE !



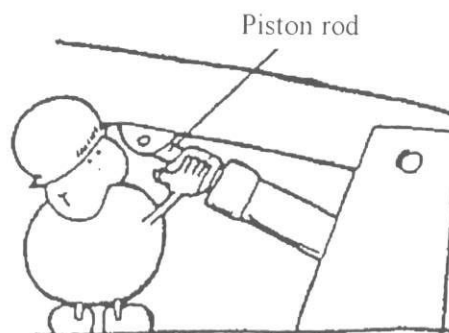
- (2) Lubricate each part as referring "Lubrication chart and table."

Apply grease



- (3) Apply sufficient rust prevention oil to the piston rod of the hydraulic cylinder.

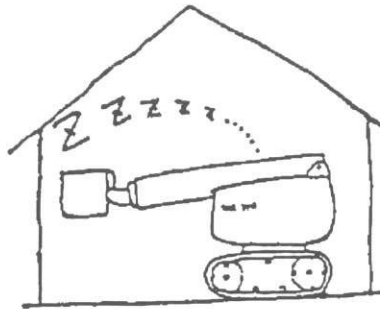
APPLY RUST
PREVENTION OIL !



- (4) Store in a dry room

If storage outside is unavoidable, park the machine on firm level ground and cover with a water proof sheet.

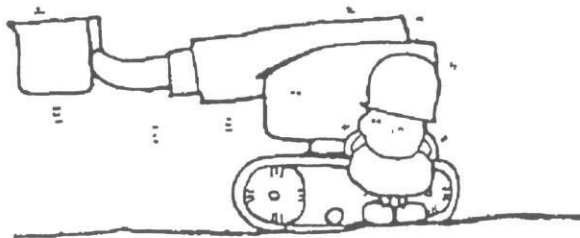
STORE INDOORS !



- (5) During long term storage, conduct the following operation periodically.

- Operate the boom to prevent corrosion of lubricated portion.
- Drive the machine regularly to prevent rust forming on the track links.

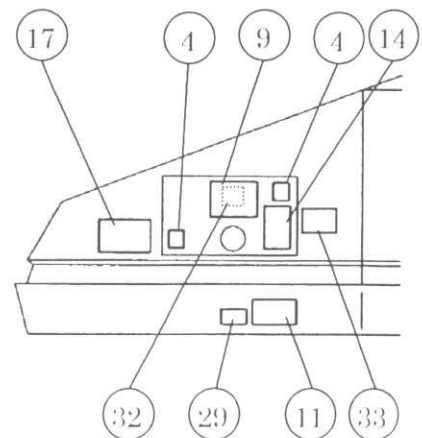
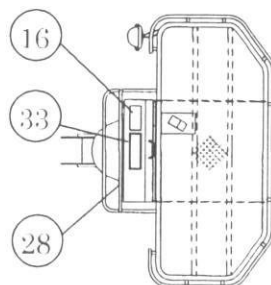
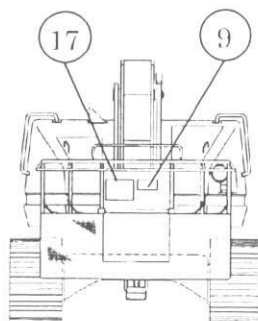
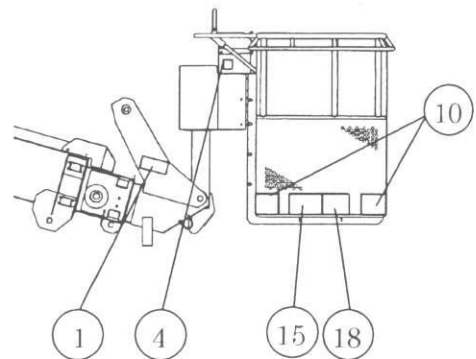
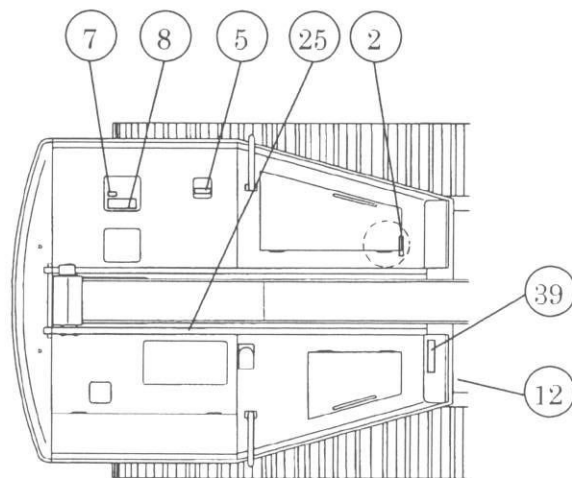
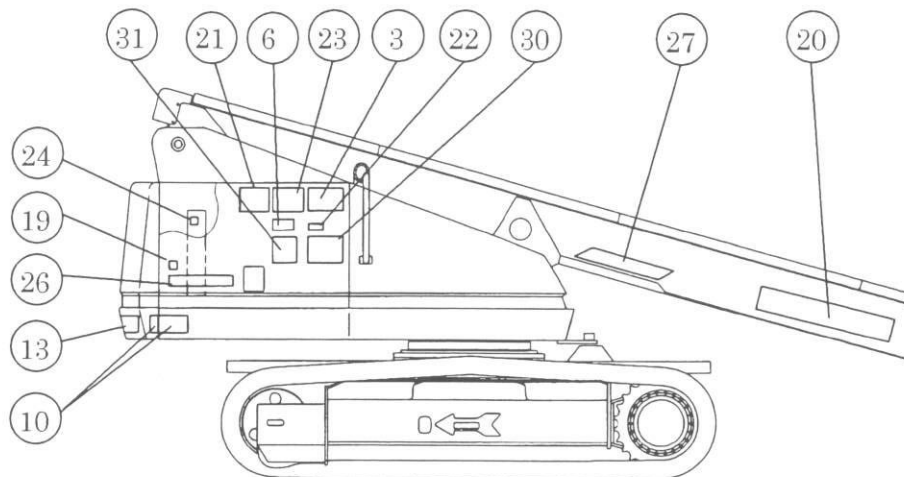
CARRY OUT RUST
PREVENTION
OPERATION !



Note: Wipe off the rust prevention oil applied on the cylinder rod before operating the boom.

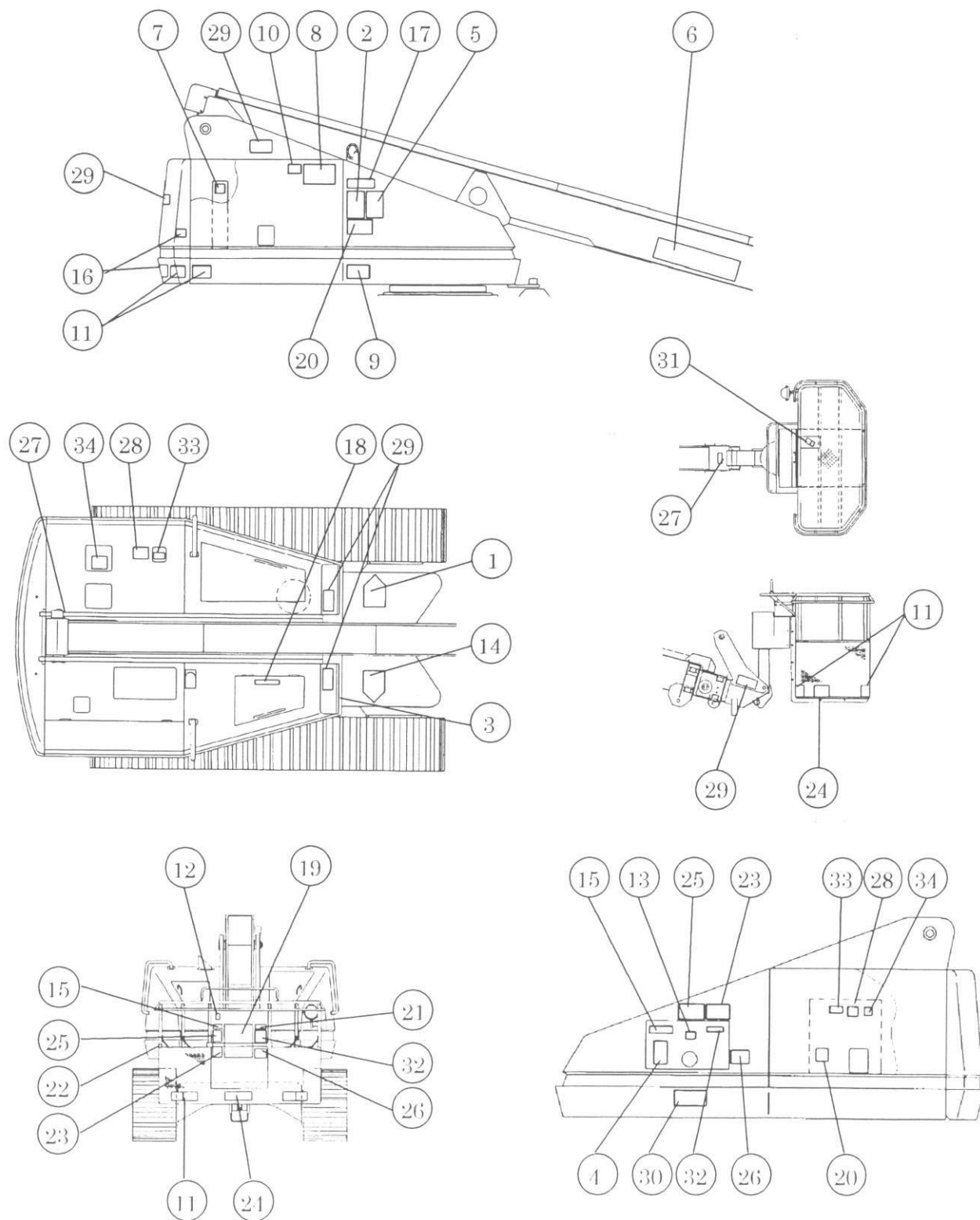
XVII Decals

(1) For E1



No.	Part number	Description	Q'ty
1	491-04689	N.P. CAUTION	4
2	494-01497	PLATE, OIL	1
3	R18-Y6043	N.P, LUBRICAT	1
4	491-04088	N.P, CAUTION	4
5	494-01936	N.P, FUEL	1
6	P21-Y6026	PLATE, NAME	1
7	494-01937	N.P, OIL	1
8	494-02876	N.P, OIL	1
9	491-04793	N.P, CAUTION	2
10	494-04735	PLATE, NAME	8
11	494-04789	N.P, CAUTION	1
12	493-04675	PLATE, NAME	1
13	491-00848	N.P, CAUTION	1
14	R21-Y6013	N.P, WORKING D.G	1
15	494-04728	N.P, LOAD	2
16	491-04649	N.P, CAUTION PL	1
17	491-04788	N.P, CAUTION	2
18	494-04433	N.P, LOAD	2
19	494-04720	N.P, CE	1
20	182-01004	PLATE, NAME	2
21	R18-Y6046	N.P, CAUTION	1
22	494-04621	N.P, OIL	1
23	491-00844	N.P, CAUTION	1
24	491-00891	N.P, COOLANT	1
25	494-04603	PLATE, NAME	1
26	S49-32138	PLATE, NAME	2
27	494-03507	PLATE, NAME	2
28	R12-Y6021	N.P, FUSE.U	1
29	R18-Y6042	PLATE, NAME	1
30	R18-Y6045	PLATE, NAME	1
31	R18-Y6048	PLATE, NAME	1
32	R21-Y6023	N.P, FUSE.L	1
33	R21-Y6012	N.P, CAUTION	2

(2) For F1



No.	Part number	Description	Q'ty
1	491-0000176	N.P, DIRECTION	2
2	491-0000164	N.P, CAUTION	1
3	493-04675	PLATE, NAME	1
4	R18-Y6013	N.P, WORKING D.G	1
5	491-0000168	N.P, CAUTION	1
6	182-01004	PLATE, NAME	2
7	491-00891	N.P, COOLANT	11
8	R18-Y6045	PLATE, NAME	1
9	R18-Y6048	PLATE, NAME	2
10	P21-Y6026	PLATE, NAME	1
11	494-04735	PLATE, NAME	10
12	R12-Y6156	N.P, FUSE. U	1
13	R12-Y6157	N.P, FUSE. L	1
14	491-0000175	N.P, DIRECTION	2
15	491-0000163	N.P, CAUTION	2
16	491-0000165	N.P, CAUTION	3
17	491-0000166	N.P, CAUTION	1
18	491-0000167	N.P, CAUTION	1
19	491-0000150	N.P, CAUTION	1
20	491-0000162	N.P, CAUTION	2
21	491-0000148	N.P, CAUTION	1
22	491-0000149	N.P, CAUTION	4
23	491-0000151	N.P, CAUTION	2
24	491-0000147	N.P, LOAD	3
25	491-0000156	N.P, CAUTION	2
26	491-0000157	N.P, CAUTION	2
27	491-0000158	N.P, CAUTION	2
28	491-0000155	N.P, CAUTION	2
29	491-0000154	N.P, CAUTION	7
30	491-0000153	N.P, CAUTION	21
31	491-0000152	N.P, CAUTION	121
32	491-0000159	N.P, CAUTION	12
33	491-0000160	N.P, CAUTION	22
34	491-0000161	N.P, CAUTION	2