

Thank you for purchasing Takeuchi Construction Machinery

INTRODUCTION

This owner's manual describes the correct handling, inspection, and adjustment methods for the machine.

Before using this machine, please be sure to read through this booklet. Even though you know well about construction machinery, please do so because there are several devices and handling methods that are unique to Takeuchi. This machine is subject to change in order to incorporate improvements in quality and efficiency or from safety points of view. In these cases, the description, photos, or illustrations included in this booklet may not be identical to the actual machine parts.

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This safety alert symbol indicates important safety instructions in this manual. When you see this symbol, be alert to the possibility of personal injury and carefully read the instructions that follow.



This stop symbol indicates important proper operation instructions in this manual. When you see this symbol, carefully read the instructions that follow.

Note: All data subject to change without notice.



1. Safety precautions

Always observe the following for safe operation:

- 1) For safety make sure that suitable work clothes are worn at all times.
Unsuitable clothes may get caught in the machine and cause accidents.
- 2) At the work site, inspect the area around the machine to make sure it is safe. Don't forget to inspect the machine itself.
- 3) Before starting work, be sure to warn people standing around, as they are in the most danger.

- 4) At work sites where adequate vision for operator can not be obtained, or the ground is unstable, assign a worker to guide the movement of the machine.
- 5) DO NOT:
 - Use the boom to drive in or pull anything out,
 - Use the boom as a crane,
 - Allow the backhoe to be bumped when unloading from a truck,
 - Turn the cab before the bucket is out of the ditch,
 - Use the side of the bucket for backfilling or punching,
 - Turn on steep slopes.



2. Handling of new machine

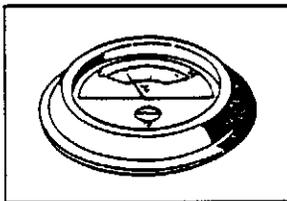
How a new machine is handled has a large influence on the durability and performance of the machine. Perform the break-in operation for the initial 50 hours, taking care to observe the following points:

- 1) Be sure to follow the starting checks.

Especially be sure to check the water and oil level.

- 2) Warming-up the engine.

Before starting work, warm-up the engine until the indicator of the cooling water temp. gauge rises to around the middle range of green zone.



- 3) Do not idle the engine at high speed unreasonably.
- 4) Avoid heavy load work and high speed operation.

During the initial 50 hours of use, use the machine with engine rpms at 80% of the max. R.P.M.

3. Starting checks

For the smooth and safe operation, it is necessary to keep the machine's condition at its best. Be sure to inspect the machine whenever it is used.



Cautions

- When any abnormal condition is found, take proper measures to fix it immediately.
- Check that any problems that had occurred during previous operations have been repaired and parts replaced as necessary.
- Conduct inspection on flat ground.
- Use the oil and grease specified

(Refer to page 29.)

3-1. Check items

1. Before starting engine

- 1) Check that engine oil level is sufficient.
- 2) Check that cooling water level in radiator is sufficient, and that the radiator cap is properly tightened.
- 3) Check that hydraulic oil level is sufficient.
- 4) Check that fuel oil level is sufficient.
- 5) Check that fan belt tension is suitable, and that there are no cracks.
- 6) Check that battery liquid level is sufficient.
- 7) Check that lamps and gauges function correctly.
(Turn the starter switch to "ON" for this check.)

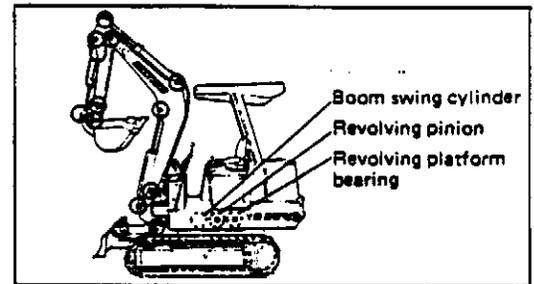
2. During warming-up operation

- 1) Check that there is no abnormal exhaust color, engine rpms, sounds, etc.
- 2) Check that all the lock devices work correctly.

- 3) Check that each operational lever works correctly.
- 4) Check that the revolving brake works correctly.

3. Feeding grease

Use: Lithium soap base (extreme pressure) multi purpose grease No. 2



Explanation of marks:

- Feed grease before operation.
- ⊙ Feed grease every 50 hrs.

{ Revolving pinion
{ Revolving platform bearing

Caution

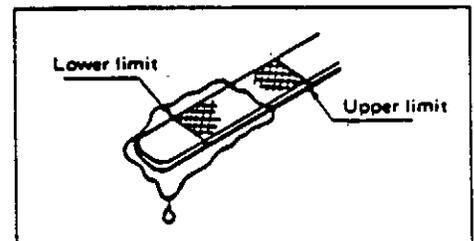
Whenever the machine is used in the rain, or it is washed, be sure to feed grease.

3-2. Checking method

For checking, bring the machine to flat ground.

1. Amount of engine oil

Check that oil level comes to the upper limit of the oil dipstick. If it is insufficient, re-supply oil.

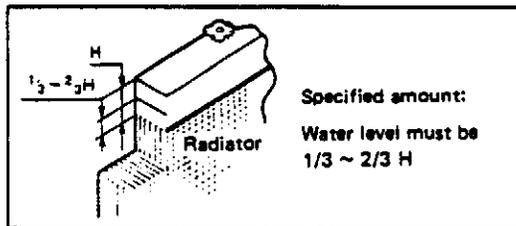




- ★ Even when the machine is used for a short time, it is safe to resupply oil when the level is below the middle of the upper and lower limits.
- ★ Do not supply oil more than the upper limit.
(Otherwise, oil is raised by the rotations of the crankshaft, resulting in oil-up.)
- ★ When the oil level is below the lower limit, engine seizure may occur especially on a slope.
- ★ Engine oil check must be done prior to the engine start.
- ★ For resupplying oil, use the oil specified by Takeuchi.

2. Amount of cooling water

After the engine has cooled, remove the radiator cap and check that the cooling water amount is sufficient. Resupply it when necessary.



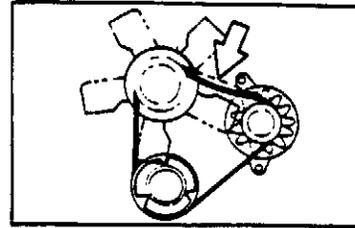
Cautions

- For resupplying cooling water, use tap water.
- If the radiator cap is removed while the engine is still heated, hot water may burst out causing injury.
Check the radiator after engine has cooled off.

(Specified amount : 5.5ℓ)

3. Fan belt tension

Push the middle of the fan belt using a finger to check the proper tension. At the same time, check that there is no crack or peeling-off of the belt.



- ★ Pushing load: ab. 10kg (98N)
- ★ Proper tension: 10 - 15mm deflection

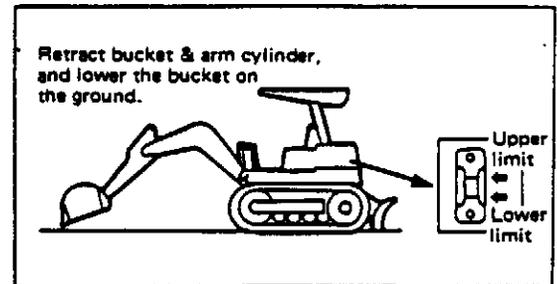


Caution.

Too tight tension of the fan belt puts excessive load on the bearing, which can result in a system failure. Be sure to adjust the tension properly.

4. Amount of hydraulic oil

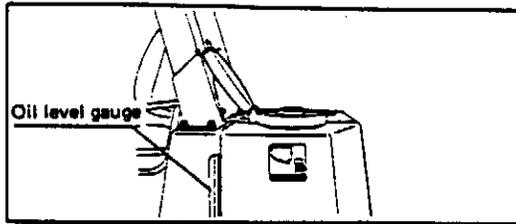
Check that the oil level comes between the upper and lower limits of the oil level gauge. If it is under the lower limit, resupply oil.



- ★ Place the machine as illustrated for checking the oil level.
- ★ For hydraulic oil, use the oil specified on page 29.
- ★ Hydraulic oil level varies according to oil temperature. When oil temperature varies by 10°C, oil level in the tank varies about 3 ~ 3.5 mm. Consider followings as standard when checking and resupplying.
 - When oil temperature is about ambient temperature (0 ~ 30°C), oil level comes between upper and lower limits of the level gauge.
 - When oil temperature is about normal operating temperature (50 ~ 80°C), oil level comes above the middle of the oil level gauge.
- ★ NOTE: See page 27 for instructions on changing hydraulic oil.

5. Fuel oil amount

Check the amount by the oil level gauge. If it is insufficient, resupply oil.



- ★ Be sure to feed oil to the full mark before starting operation.

To feed oil during operation takes a lot of time.

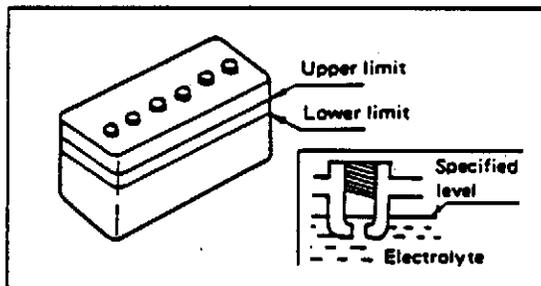


Caution

- Use no fire during inspection and resupplying oil.

6. Amount of battery liquid

Battery electrolyte decreases by evaporation. Electrolyte level must be between the upper and lower limits. When the amount of electrolyte is insufficient, add distilled water.

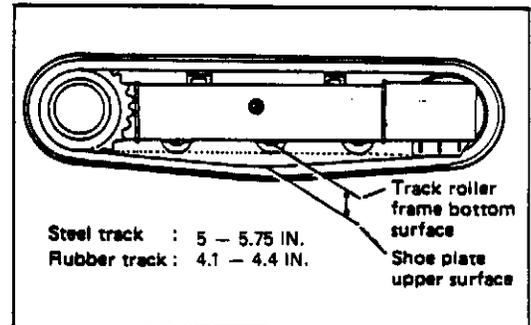


Cautions

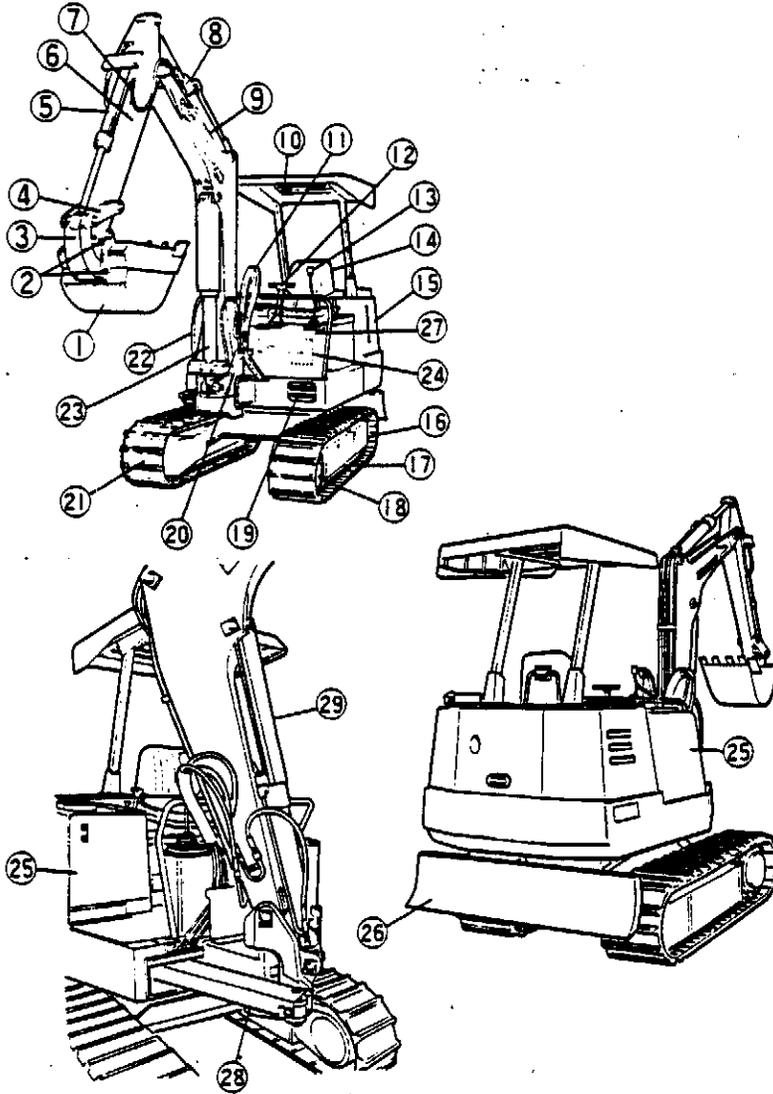
- If battery is used for a long time with the electrode plates exposed, the battery life is shortened.
- When handling the battery, use no fire.
- When hands and clothes are contaminated with battery liquid, wash them immediately.

7. Track tension

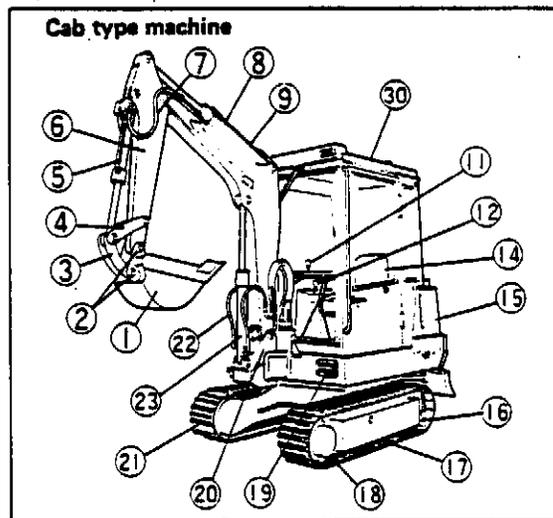
For inspecting the track tension, lift the track by using the boom. Check if the distance between the middle part of the track roller frame bottom surface and the upper surface of the shoe plate is as per the allowable length. If the distance deviates from the allowable length, adjust it.



4. Name of parts



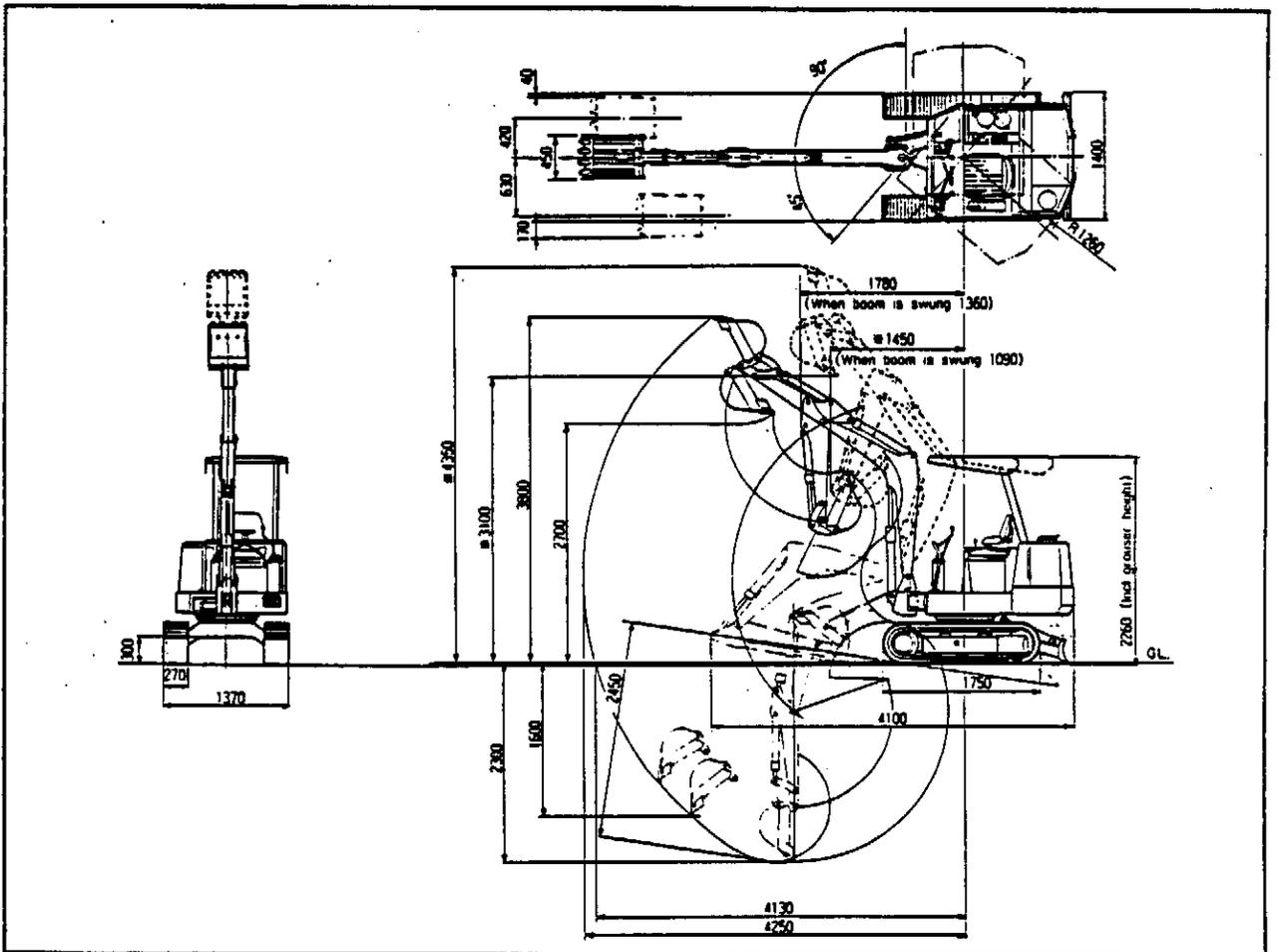
No.	Name of Parts
1	Bucket
2	Bucket pin
3	Bucket link
4	Bucket arm
5	Bucket cylinder
6	Arm
7	Hydraulic hose
8	Arm cylinder
9	Boom
10	Canopy
11	Operation lever (R)
12	Traveling lever
13	Operation lever (L)
14	Operator's seat
15	Fuel oil tank
16	Idler
17	Track roller
18	Sprocket
19	Headlight
20	Boom fulcrum
21	Track (steel or rubber)
22	Hydraulic hose
23	Boom cylinder
24	Battery
25	Hydraulic oil tank
26	Dozer blade
27	Front guard
28	Boom swing cylinder cover
29	Boom cylinder cover
30	Cab



■ SPECIFICATIONS

Model		TB21 (Steel track type)	TB21 (Rubber track type)
Engine model		YANMAR 3T75H-LTBS	
Engine type		Vertical, 3 cylinder, water-cooled diesel	
Rated engine output PS/rpm (kw/rpm)		20/2,400 (14.7/2,400)	
Bucket Capacity (std.)	SAE rating m ³	0.064	
	Japanese rating m ³	0.10	
Bucket width (std.) mm		450	
Max. digging depth (when dozer blade is used) mm		2,450	
Max. dumping height mm		3,100	
Max. reach at ground level mm		4,130	
Max. travel speed km/h		2.0	1.8
Revolving speed rpm		9	
Gradeability degree		30	
Ground contact pressure kg/cm ² (kPa)		0.289 (28.3)	0.232 (22.7)
Dimensions (Overall length x Overall width x Overall height) mm		4,100 x 1,400 x 2,260	
Operating mass		2,200	2,100

■ DIMENSIONS (TB21)



- 7 -

6	Starter switch	11	Wiper switch (Cab type machine)	17	Boom swing pedal
		12		18	Boom swing pedal lock

- 8 -

6-2 Handling of equipment

Starter switch



OFF: The position where the key is inserted or pulled out.

ON: The position where the engine is operated.

START: The position to start the engine. On releasing, the key automatically returns to "ON" position.

GLOW: Electric current flows to the thermostart circuit. Use this in cold climate.

Caution  While operating the machine, be sure to operate it at the "ON" position. If it is operated at the "OFF" position, the charging circuit will be damaged.

Hourmeter

Hourmeter works when the starter switch is turned "ON". Shows the total working hour of the machine. Figures in the white frame at the right denotes "1" on every 1/10 hour.

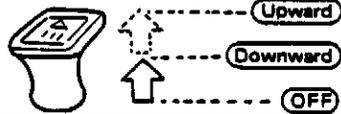
C. water temp. gauge

The gauge works when the starter switch is turned "ON" to indicate the cooling water temperature of the engine. When the temperature remains in red zone, engine will overheat, and overheat alarm will sound. Operate the engine with no load for a while, and stop the engine. Check the following points after engine has cooled off.

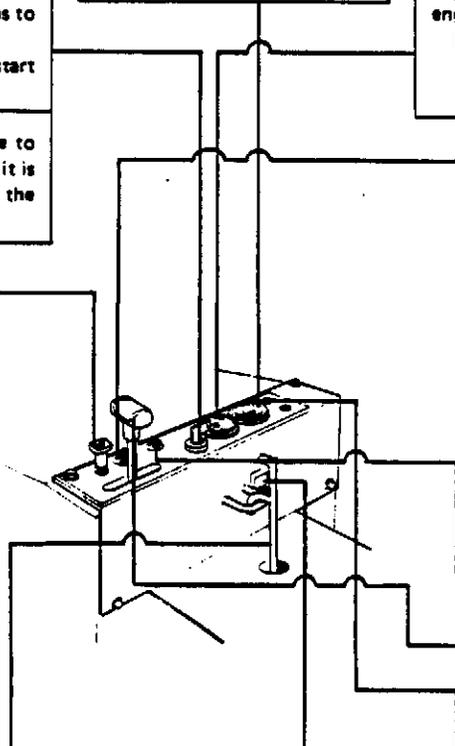
[Cooling water level, separation of the fan belt, fan belt tension, clogging of the radiator, etc.]

Light switch

While the starter switch is turned "ON", pulling the switch lights the lamp. The lights can be directed in two ways. When the switch is pulled one step the beam will be cast downward, while the switch is pulled two steps, it will be cast upward.



Caution  Do not light the lamp for a long time with the engine stopped. This will lower the battery capacity, making the engine starting improbable.



Charge pilot lamp

The lamp lights when there is a problem in the charging circuit during engine's operation. In normal conditions, the lamp lights when the starter switch is turned "ON", and goes out after the engine has started.

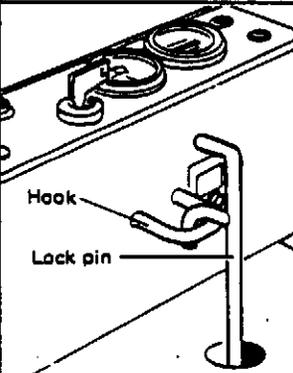
Caution  When the lamp does not go out even after the engine has started, the charging circuit is defective. Provide suitable adjustment.

Oil pilot lamp

When the lube oil system is defective while the engine is running, the lamp lights. In normal conditions, the lamp lights when the starter switch is turned "ON", and goes out after the engine has started.

Caution  If the lamp remains lit while the engine is running, check the engine oil level.

Revolving lock



To lock, pull lock pin upwards removing from the hook and insert it. To release lock, pull lock pin upwards and hang it on the hook.

Caution  This lock works only when the upper-structure and the track are parallel to each other. When revolving lock is released be sure to hang the lock pin on the hook securely.

Fuse box

This is provided to protect electric circuit from any abnormality.

Caution Check circuit if the electric components do not work due to blown fuse. Be sure to use fuse of specified capacity.

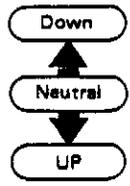
Wiper switch (cab type machine)

While the starter switch is turned "ON", the wiper works by pulling the switch.

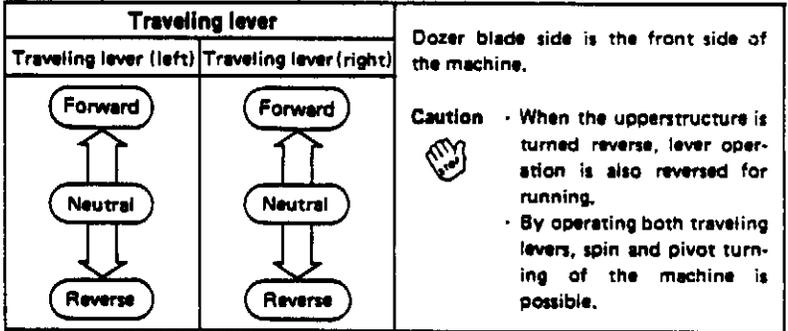
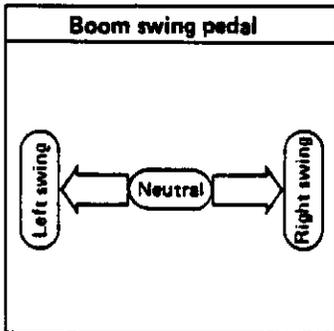
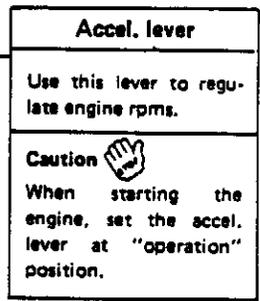
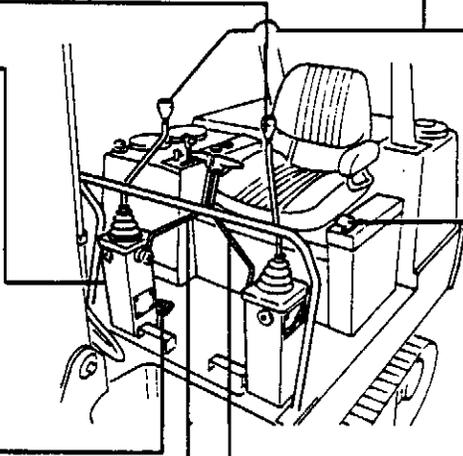
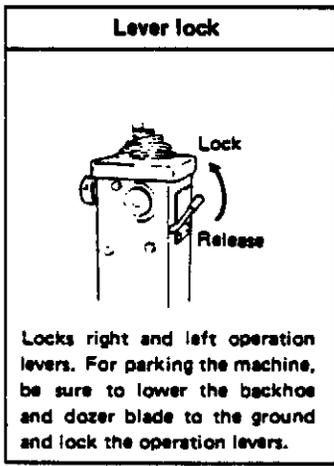
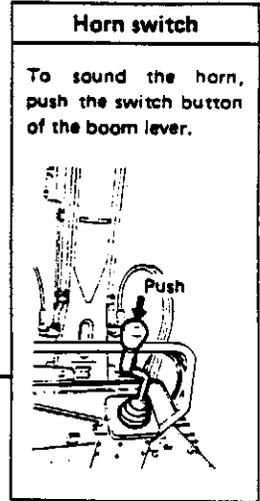
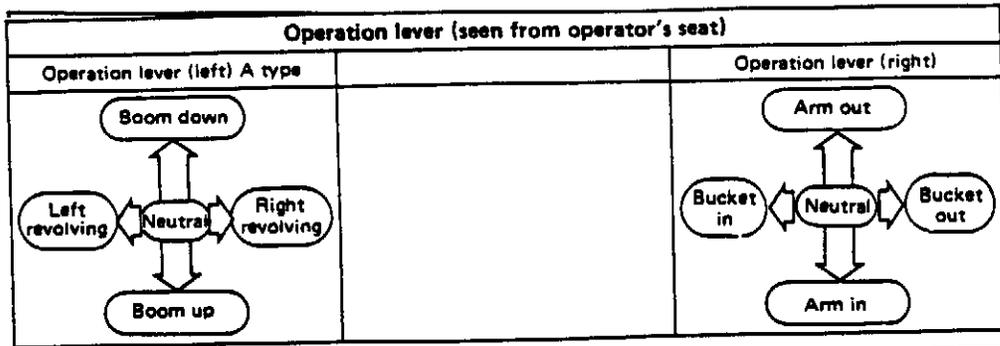
Caution 

- 1) To move the wiper when the glass surface is dry, causes scratches on the glass. Moisten the glass surface before moving the wiper.
- 2) In cold weather, the wiper and the blade may be frozen. Do not move the wiper forcibly since this will damage the wiper.

Dozer control lever



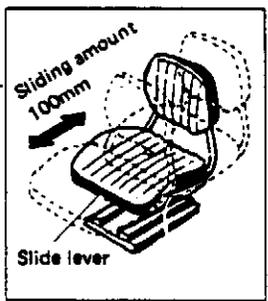
Use dozer blade when backfilling or to stabilize the machine when digging.



Operator's seat

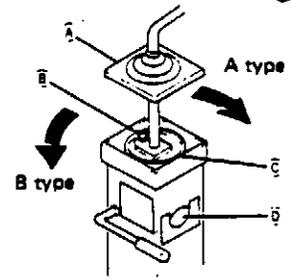
Adjust the seat so that the operator can handle operation levers easily.

- 1) Sliding the seat back and forth
Adjust by using the side lever provided under the seat.



Ⓞ Changing method of control arrangement

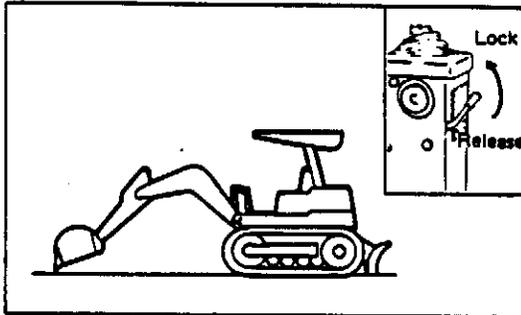
1. Pull rubber cover Ⓐ up.
2. Loosen bolt Ⓑ .
3. Rotate disk Ⓒ 90°.
When changing to A type Clockwise
When changing to B type Counterclockwise
4. Be sure to check the indication of arrangement type in the small window Ⓓ .



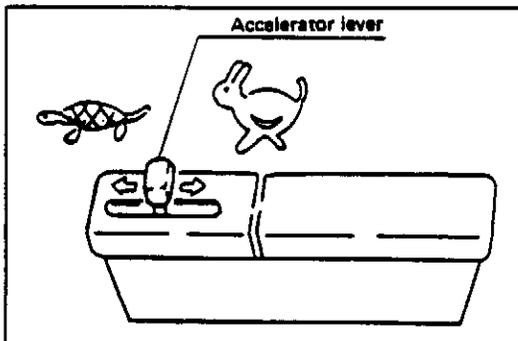
6-3. Starting and stopping the engine

■ Starting

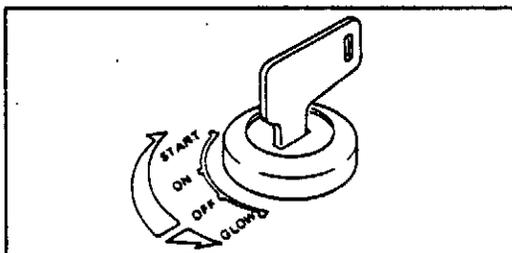
- 1) Before starting the engine, be sure to carry out the starting checks.
(Refer to the descriptions under starting checks and periodic checks.)
- 2) Place the backhoe and dozer blade on the ground.



- 3) Set both operation levers in the neutral position and lock the levers.
- 4) Set the accel. lever in the operational position.

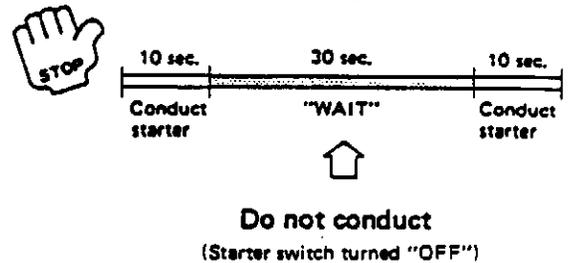


- 5) Turn the starter switch to the "START" position to run the engine.



- 6) When the engine starts, release your hand from the key immediately. (On releasing, the key automatically returns to the "ON" position.)
 - 7) After the engine has started, return the accel. lever to the idling position.
- ★ During engine operation, set the key in the "ON" position. Do not turn the key to "OFF", otherwise battery charging, gauges, and lamps do not work normally.
 - ★ For the protection of starter motor and the battery,
 - do not set the key in the "START" position for more than 10 seconds, and
 - if engine can not be started, turn off the switch and wait for about 30 seconds. Then turn on the switch.

Starter switch handling



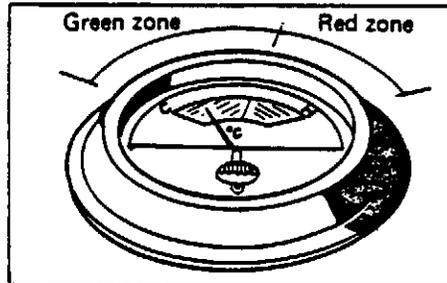
■ Warming-up operation

After the engine has started, do not start working operation, but warm-up the engine for a while.

- 1) Idle the engine for about 5 minutes.
- 2) Then set the engine rotation at medium speed (by shifting the accel. lever to the middle position), shift the bucket operation lever to "in" position, or "out" position, and let the hydraulic pump discharge at relief set pressure for about 5 seconds. Repeat this until you get proper temperature.

- 3) Operate the machine at low load until the indicator of the water temp. gauge comes to around a quarter of green zone.

Above operation is called warming-up operation.



Cautions

- Do not accelerate the engine before warming-up the engine.
- The proper temperature of hydraulic oil is 50°C – 80°C. Before starting the work, raise the temperature of hydraulic oil to about 20°C.

■ Stopping the engine

- 1) Operate the engine with no load for about 5 minutes idling the engine to cool it gradually.
- 2) Lower the backhoe bucket and the dozer blade to the ground.
- 3) Shift the accel. lever to the "STOP" position. Then the engine will stop.
- 4) Turn the starter switch to "OFF", and pull out the key.

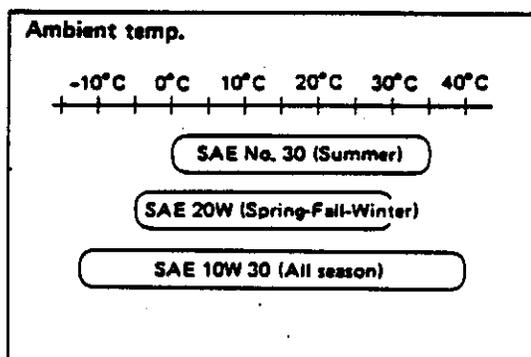


7. Cold weather handling

In cold temperatures, the starting of engine may be hard, and cooling water system may freeze. To avoid these difficulties take the following steps:

- Use the lube oil with low viscosity specified by Takeuchi.
- Use the fuel oil with a pour point 5°C lower than the ambient temperature.
- ★ In cold temperature, fluidity of oil is decreased. Replace oil according to the following table.

Relation between ambient temp. and oil used



- When temperature goes below 0°C, add antifreeze to cooling water to prevent freezing. The amount of antifreeze to be added increases according to the fall of the temperature.
(See oil and grease list)

■ Cautions to use antifreeze

- Use clean tap water.
- Extract water completely from the cooling water system; and remove fur and dirt by flushing with water. Then pour in anti-freeze mixture.
- For antifreeze, use anti-rust (and all-season) type.

⚠ Caution

Antifreeze is inflammable. Use no fire when handling antifreeze.

★ When it gets warm:

- Replace the existing lube oil with the oil of specified viscosity.
- Except all-season type antifreeze mixture, extract cooling water completely and clean the inside of the radiator. Then pour in clean tap water.

■ Cold weather start

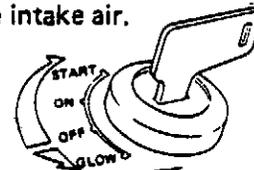
When the temperature goes below minus 5°C, engine start is made difficult. Start the engine according to the following instructions.

1. Shift the accel. lever to the "STOP" position (where no fuel injection is made.)

2. Turn the starter switch to the "START" position for about 5 seconds to idle the engine.

3. Shift the accel. lever to the "OPERATION" position.

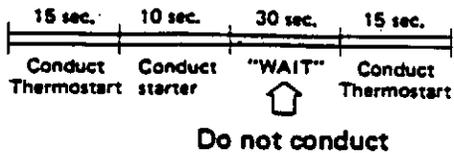
4. Set the starter switch to the "GLOW" position, and conduct current for about 10 – 15 seconds to warm the intake air.



5. Turn the starter switch to the "START" position to start the engine.

6. After the engine has started, return the accel. lever to the idling position to conduct warming-up operation.

Handling of starter switch

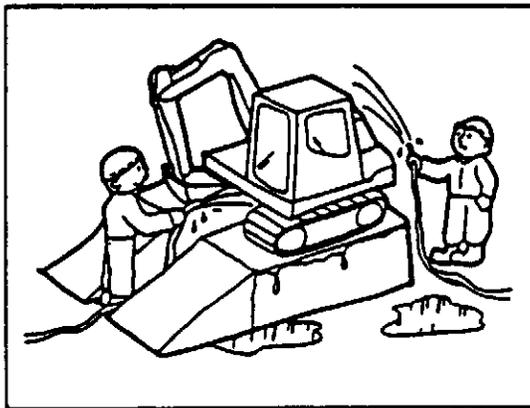


Caution

- Be sure to wait 30 seconds. If starter switch is used continuously, battery and starter motor will be damaged.

• Cautions after use in cold climate

- Clean all mud and water from the machine and park on a concrete or hard, dry surface (if unavailable, on wooden boards). Cover the machine with a sheet, etc. (To prevent freezing of undercarriage)
- Remove water drops deposited on the hydraulic cylinder rod completely, as the ice together with dirt may damage the seal.



- Remove water from the fuel system (F.O. tank and F.O. filter) to prevent freezing.
- Battery performance is reduced according to the drop of temperature. Also battery is easily frozen when the charge is insufficient. Cover the battery, or store it indoors by removing the battery.

• Battery specific gravity

Liquid temp.	20°C	0°C	-10°C	-20°C
Charging rate				
100%	1.28	1.29	1.30	1.31
90%	1.26	1.27	1.28	1.29
80%	1.24	1.25	1.26	1.27
75%	1.23	1.24	1.25	1.26

- ★ Battery's specific gravity varies according to the liquid temperature and charging condition.

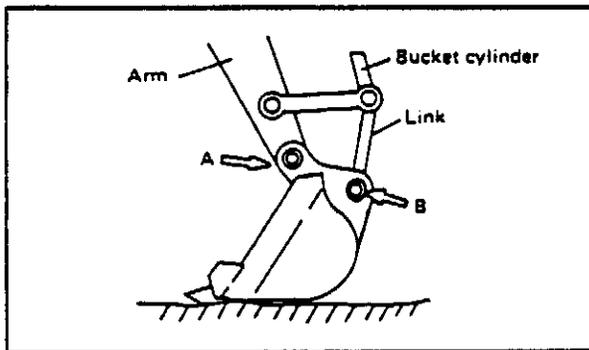
8. Replacement of bucket

For bucket replacement, follow the instruction below.

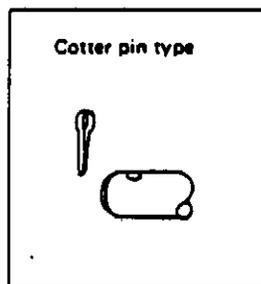
Perform bucket replacement at a place of good footing and pay much attention to prevention of accident.

Especially when two or more persons work together, decide signals and make sure contact with each other.

- 1) Bring the machine to flat and horizontal ground, and lower the bucket to the ground.
- 2) Clean around the bucket pin (to prevent foreign material from entering.)
- 3) Pull out A and B pins.



★ Fixing method of A and B pins is as follows.



Cautions

- Do not attach dirt and mud to the pin pulled out.
- When dust seals are used for both ends of the bushing, take care not to damage them.

- 4) Connect the arm to hole (A), and the link to hole (B).

Caution



- Before attaching the bucket, clean the pin hole of the arm, and apply grease to it.

- 5) Insert cotter pins to A and B pins.

- 6) Provide grease to each connection.

9. Transportation

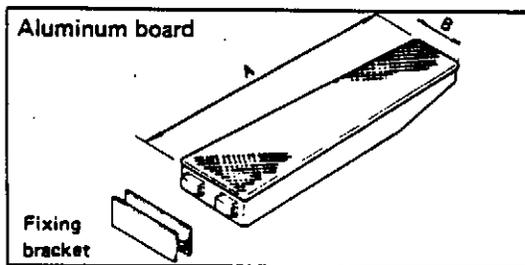
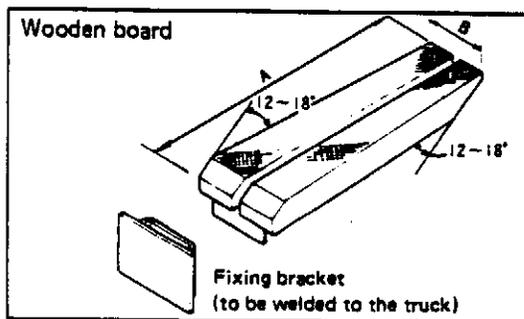
Loading and unloading the machine

For loading and unloading the machine to and from a truck, pay attention to safety and observe the following instructions.

1. Selection of footboard

- The length of the footboard must be long enough to make a tilt angle of 12° – 18° when attached on the truck.
- The width of footboard should be more than 1.2 times the track shoe width.
- Use boards that won't buckle under the weight of the machine. If thick boards are not available either reinforce with the angle or put a support in the middle of the board.
- Provide slopes on both ends of the boards, and attach fixing bracket to one end.

Sample



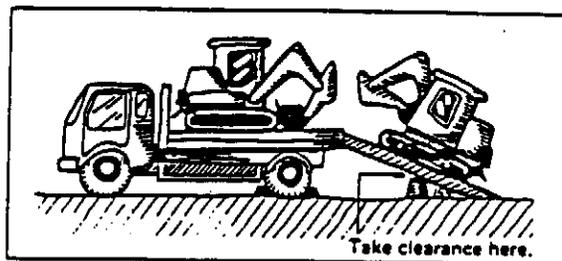
- ★ When the tilt angle of the footboard is within 18°, the length of the board must be:

1 ton truck	Over 2,300mm
2 – 3 ton truck	Over 3,400mm
4.5 ton truck	Over 3,700mm

- ★ The width of the footboard should be more than 1.2 times the track shoe width.

2. Loading on to a truck

- Put on the parking brake of the truck, and provide blocks to the wheels.
- Align equally the right and left board to the center of the truck rear body, and fix the boards firmly.
- Line the machine up with the boards and slowly mount the boards.

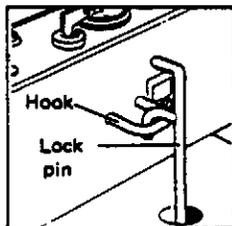
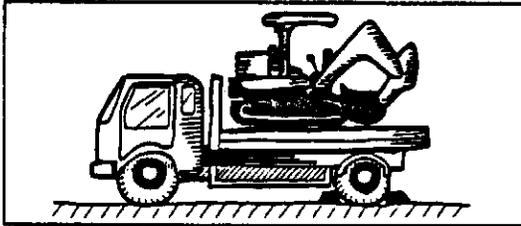


Caution

DO NOT change the driving direction on the footboards.

3. Transportation position

After the machine has been loaded on the truck, put on the locks for revolving, boom swing device, etc., and provide blocks to the track shoe, or tie the machine firmly on the truck rear body.



- Apply revolving lock after bringing upper-structure parallel to the track.

4. Cautions for unloading the machine

- Move slowly when bringing the machine from the truck to the footboards.
- When moving the machine from the truck to the footboards, bring the backhoe forward to use it as a support of the machine, however avoid strong shocks to the backhoe.

Caution

When bringing the backhoe forward, operate the backhoe after stopping the machine once.



10. Long term storage

When storing the machine for a long period, observe the following:

Before storing

- Clean each part of the machine completely.
- Grease all parts and replace oil.
- Smear antirust on exposed parts of the piston rod of the hydraulic cylinders.
- Add antifreeze to the cooling water if the temperature will fall below 0° C.
- Fill the battery with distilled water as far as the specified level. After it is sufficiently charged remove the terminals and cover the battery, or remove it and store in a cool, dry place.
- Put the starter switch in the OFF position and the accel. lever at stop.

Antirust

Especially when storing near the sea, or in a place exposed to sea winds, there will be rust. Therefore, apply antirust to all exposed parts of the piston rod and cover the machine with a polyethylene sheet or oil paper.

Some antirust solvent adversely affects rubber material.

Be sure to use the recommended antirust specified by Yanmar.

Storing

- Store the machine at a dry place indoors. Do not leave the machine outdoors.
- If the machine must be stored outside, park it on flat, wooden boards and cover it completely with a sheet.

Maintenance during storage

During storage provide the following maintenance to the machine:

- Move the machine once a month, and reapply oil to all parts to prevent the oil from drying out during long term storage.
- At the same time recharge the battery.
- * *For moving the backhoe*, be sure to wipe out antirust applied on the cylinder rod.

To use the machine again

To use the machine again after long periods of storage, observe the following:

- Drain water from the fuel tank, oil pan, and other cases by removing the plugs.
- Remove antirust from the hydraulic cylinder and piston rod.
- Grease fully the fulcrums of the backhoe and dozer blade.
- After starting the engine, perform warming-up operation for the machine.