

# Operation & Maintenance Manual

**KOMATSU**

# PC20,30-6

## HYDRAULIC EXCAVATOR


SERIAL NUMBERS

**PC20-29360**

**PC30-13022** and up

## FOREWORD

This manual describes procedures for operation, handling, lubrication, maintenance, checking, and adjustment. It will help the operator or anyone realize peak performance through effective, economical and safe machine operation and maintenance.

- Please read this manual carefully BEFORE operating the machine.
- Please continue studying this manual until proper operation is completely reinforced into personal habit.
- This manual describes the basic techniques. Skill is performed as the operator or anyone get the correct knowledge and performance of the machine.
- Operation, inspection, and maintenance should be carefully carried out, and the safety must be given the first priority. Safety precautions are indicated with  marks and technical precautions with ★ marks in this manual. The safety information contained in this manual is intended only to supplement safety codes, insurance requirements, local laws, rules and regulations.
- Some photographs and illustration pictures are different from your machine as technical improvement is continuously reflected on it. Revision to up-to-date manual's content is performed in later editions.
- This operation & maintenance manual may contain attachments and optional equipment that are not available in your area. Please consult your local Komatsu distributor for those items you may require. Materials and specifications are subject to change without notice.

## BREAKING IN YOUR NEW MACHINE

Each machine is carefully adjusted and tested before shipment. However, a new machine requires careful operation during the first 100 hours to break in the various parts.

If a machine is subjected to unreasonably hard use at the initial operation stage, the potential of performance will prematurely deteriorate and the service life will be reduced. A new machine must be operated with care, particularly with regard to the following items.

- After starting, let the engine idle for 5 minutes to allow proper engine warm-up prior to actual operation.
- Avoid operation with heavy loads or at high speeds.
- Sudden starting or acceleration, unnecessarily abrupt braking and sharp turning should be avoided.
- At the first 50 hours of operation, the machine should be maintained in the following manner in addition to usual 50 hours service.
  - 1) Replacement of hydraulic oil filter element
  - 2) Cleaning of hydraulic tank strainer
- At the first 250 hours of operation, the machine should be maintained in the following manner in addition to usual 250 hours service:
  - 1) Checking and adjustment of engine valve clearance
  - 2) Changing of engine oil pan oil, final drive case and swing machinery case oil
- ★ When replacing oil filter elements (cartridges), check their interiors for dirt and dust. If heavily collected, check for possible cause before starting operation.
- ★ Hours of operation are indicated by the service meter.

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## GENERAL LOCATIONS AND SPECIFICATIONS

- |                    |                  |
|--------------------|------------------|
| 1. Bucket          | 6. Boom cylinder |
| 2. Bucket cylinder | 7. Sprocket      |
| 3. Arm             | 8. Track frame   |
| 4. Arm cylinder    | 9. Track shoe    |
| 5. Boom            | 10. Front blade  |

### PC20-6

( ): PC30-6

### Operating Weight

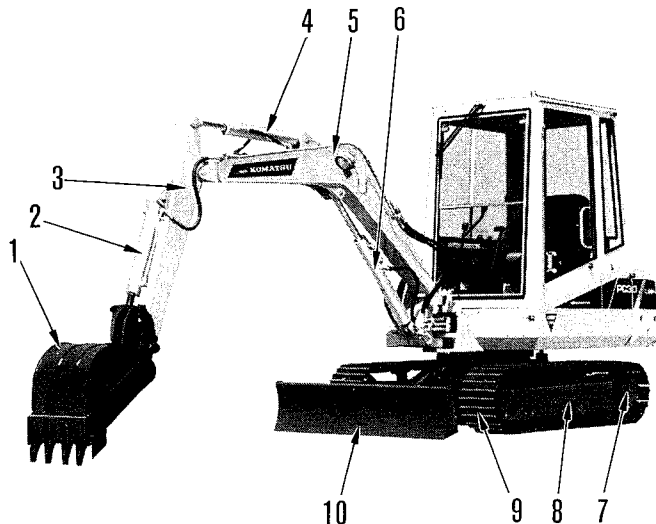
With canopy	2835 kg (3235 kg)
With ROPS cab	2935 kg (3335 kg)

### Performance

Bucket capacity	(SAE)	0.08 m <sup>3</sup> (0.10 m <sup>3</sup> )
	(CECE)	0.07 m <sup>3</sup> (0.09 m <sup>3</sup> )
Travel speed		2.4 km/h (High: 3.6 km/h)
		Low: 2.1 km/h)
Swing speed		10 rpm (11 rpm)

### Engine

Model	Komatsu 3D84-1F Diesel Engine (Komatsu 3D84-1G Diesel Engine)
Flywheel horsepower/Rated rpm	25.6 HP/2600 rpm (29.6 HP/2700 rpm)



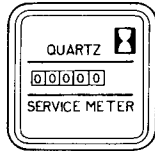
With cab

NOTE: Specifications are subject to change without notice.

# INSTRUMENTS AND CONTROLS

## METERS AND LAMPS

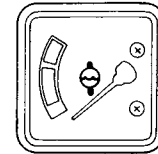
### 1. SERVICE METER



This meter shows the total operation hours of the machine. The service meter advances while the engine is running — even if the machine is not traveling.

Refer to the section "SERVICE METER".

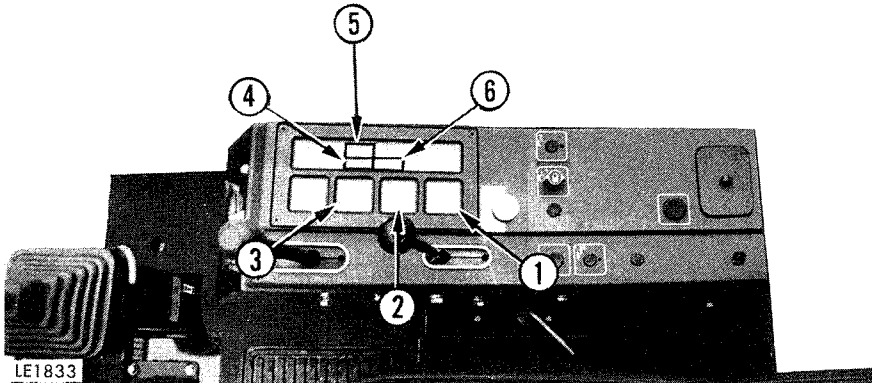
### 2. ENGINE WATER TEMPERATURE GAUGE



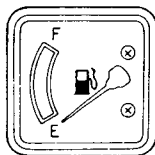
When indicator is in the green range during operation, water temperature is normal.

After engine start-up, warm up the engine until indicator moves into green range.

If indicator moves from green into red range during operation, run the engine at low idling speed until indicator returns green range.



### 3. FUEL GAUGE



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

### 4. CHARGING LAMP



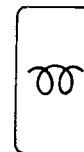
Normally this lamp comes on when the starting switch is turned to the ON position and gradually goes out as the engine speed increases.

### 5. ENGINE OIL PRESSURE WARNING LAMP



Normally this lamp is out during operation. If it comes on during operation, the oil pressure has dropped. In such a case, immediately stop the engine and check the cause of the trouble.

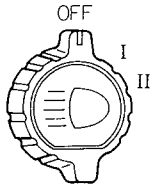
### 6. THERMOSTART SIGNAL LAMP



When the starting switch is turned to HEAT, thermostart signal lamp will come on, thus indicating thermostart is heated. The lamp will go off in approx. 18 seconds.

## SWITCHES

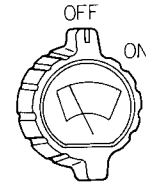
### 1. LAMP SWITCH



With lamp switch in position I, panel lamps will light.

With lamp switch in position II, head lamp and working lamp will also light.

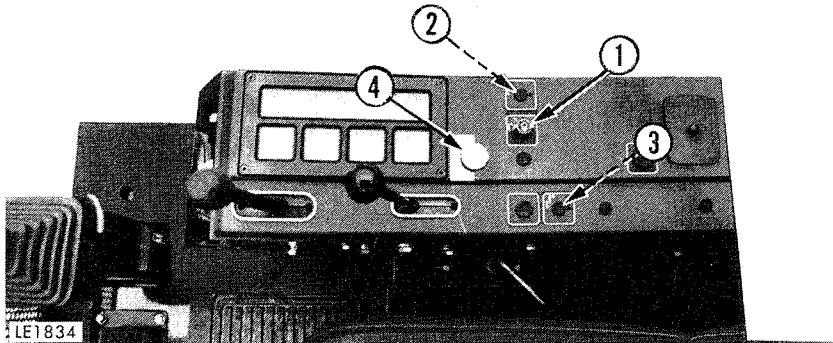
### 2. WIPER SWITCH



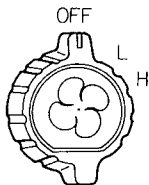
This switch is used to turn on the front windshield wiper.

ON: For operation

- ★ When turning the switch ON, free the wiper blade from the sash.
- ★ If the wiper does not work when the switch is turned ON, check the wiper motor breaker.



### 3. CAB HEATER SWITCH



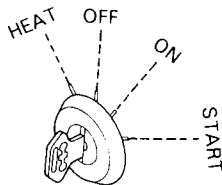
This switch is used to heat the operator's cab. The flow of warm air can be adjusted in 2 steps:

H: Strong

L: Weak

- ★ The cab is heated by means of warm water from the engine. Accordingly, heating can not take place while the engine cooling water is warming up.

### 4. STARTING SWITCH



#### OFF

Key insertion-withdrawal position. None of electrical circuits activate.

#### ON

Charging and lamp circuits activate. Keep key at ON after starting.

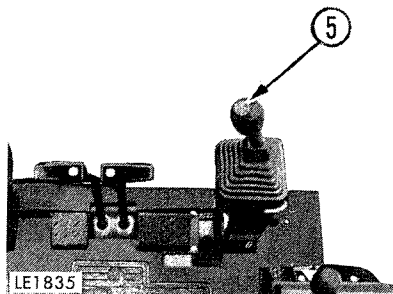
#### START

At this key position, the starting motor will crank the engine. Release key immediately after starting.

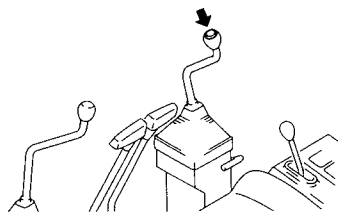
#### HEAT

Use this position when starting in cold weather.

Release the key to allow it to return automatically to OFF and then, without delay, turn it to START.

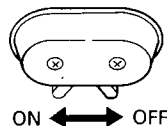


## 5. HORN SWITCH



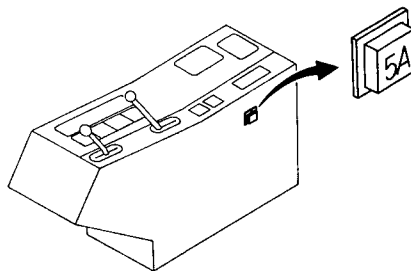
When this switch is pressed, the horn will sound.

## 6. ROOM LAMP SWITCH



When this switch is moved to ON position, room lamp will light.

## 7. WIPER MOTOR BREAKER



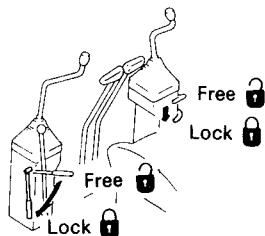
This prevents excessive current from flowing in the wiper motor operation circuit.

- ON: The wiper is actuated when the wiper switch is turned ON.
- OFF: The wiper is not actuated even if the wiper switch is turned ON.

- ★ The cause of the breaker going OFF is that the wiper switch is left ON with the wiper blade fixed in the sash.
- ★ The breaker cannot be switched ON again immediately after it has gone OFF. Wait for approx. 60 seconds before turning it ON again.

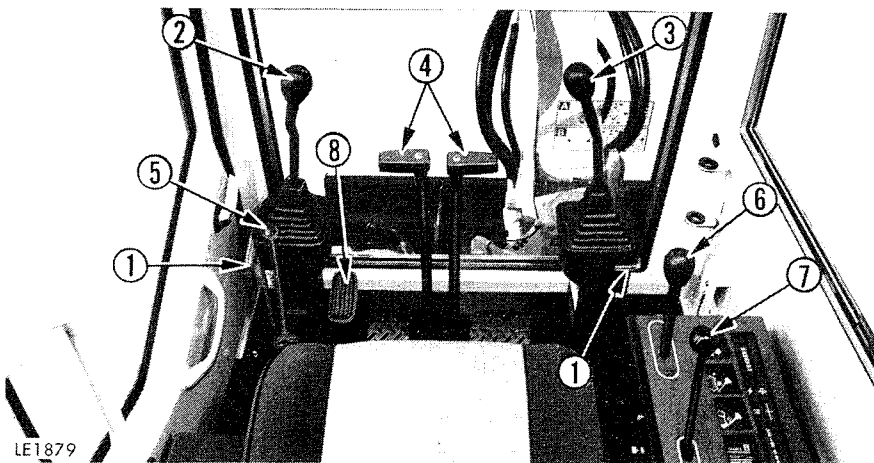
## LEVERS AND PEDALS

### 1. SAFETY LEVERS (for work equipment levers)

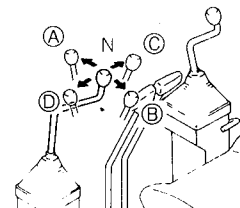


The safety levers are used to lock the work equipment levers.

**!** When stopping the machine or leaving the machine, be sure to lower the bucket to the ground, then operate the levers to lock the left and right work equipment levers.



### 2. LEFT WORK EQUIPMENT LEVER (arm/swing control lever)



**(N) Neutral:**  
When the lever in this position, the upper works and the arm will be retained in the position in which they stop.

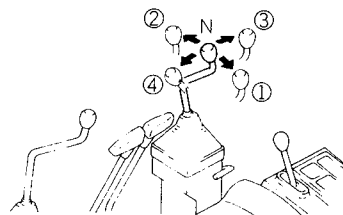
#### Arm operation

- (A)** Arm moves out.
- (B)** Arm moves in.

#### Swing operation

- (C)** Upper works swings to the right.
- (D)** Upper works swings to the left.

### 3. RIGHT WORK EQUIPMENT LEVER (boom/bucket control lever)



If the swing/boom swing selector lever is in the boom swing position.

#### Boom operation

- Ⓒ Boom swings to the right.
- Ⓓ Boom swings to the left.

- Ⓔ Neutral:  
When the lever in this position, the boom and the bucket will be retained in the position in which they stop.

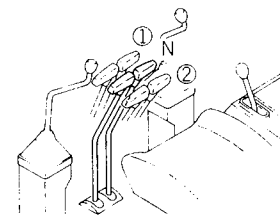
#### Boom operation

- ① Boom raises.
- ② Boom lowers.

#### Bucket operation

- ③ Bucket dumps.
- ④ Bucket curls.

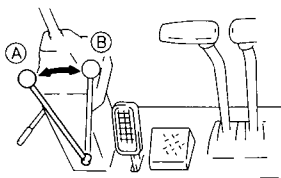
### 4. TRAVELING AND STEERING LEVERS



The traveling and steering levers are used to operate the left and right travel motors.

- ① Forward:  
Push the levers forward.
- ② Reverse:  
Pull the levers backward.
- Ⓔ Neutral:  
Parking brake is applied and the machine stops.

## 5. SWING/BOOM SWING SELECTOR LEVER

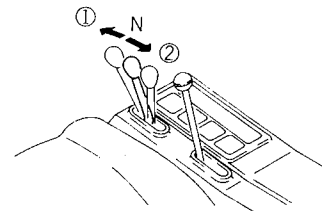


When switching this lever, the left work equipment control lever is used to swing the boom and the upper works.

Ⓐ: Boom swing operation.

Ⓑ: Swing operation.

## 6. BLADE CONTROL LEVER



Lever position

① : LOWER

② : RAISE

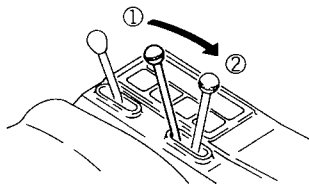
Ⓝ : NEUTRAL

Blade is stopped and held in this position.

**!** If the track frame is facing backwards, operate the traveling and steering levers in the reverse manner to that when the track frame is facing forward.

**!** Before operating the traveling and steering levers, check whether the track frame is facing forward or backward. Assuming the machine is in a position to advance by means of being the sprocket at the rear.

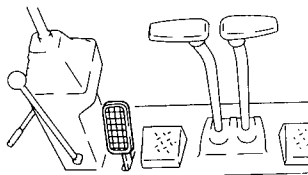
## 7. FUEL CONTROL LEVER



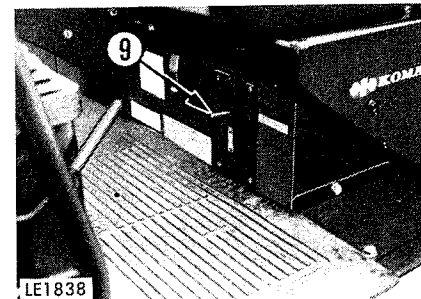
This lever is used to control the engine speed and output.

- ① Low idling position:  
Push the lever fully.
- ② High idling position:  
Pull the lever fully.

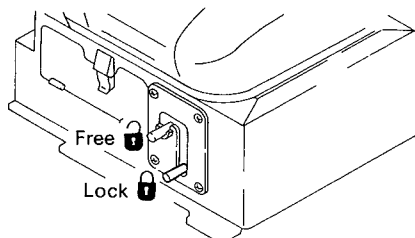
## 8. TRAVELING ACCELERATOR PEDAL (Only for PC30)



If the pedal is depressed, the machine speed will increase.



## 9. SWING LOCK LEVER

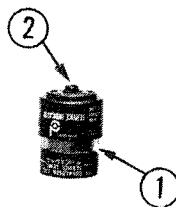


When this lever is placed to the lock position, the upper works is locked.

- ★ Swing lock lever must be in lock position during traveling of machine.
- ★ This lever must be in the lock position after the upper works is parallel with the track frame.

**!** Do not attempt to rotate the upper works, when the swing lock lever is in the lock position.

## DUST INDICATOR



T8774

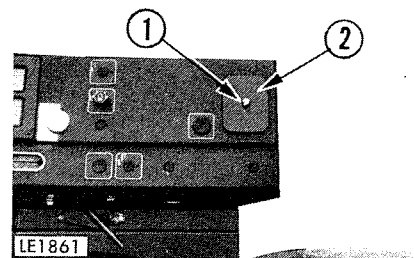
This device indicates clogging of the air cleaner element. When red piston (1) appears in the transparent part of this indicator, the element is clogged. Immediately clean element.

After cleaning, push indicator button (2) to return red piston to original position.

Dust indicator is on air cleaner bracket in engine hood.

## FUSE BOX

The fuses protect the electric devices and wiring from burning out. If any fuse is rusted or coated with white powder, replace it.

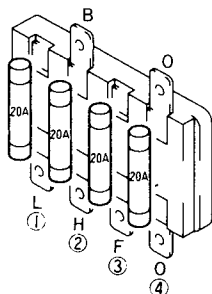


Loosen bolt (1) and remove cover (2).

- ★ Replace a fuse with another of the same capacity.

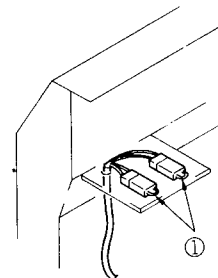
**!** Before replacing a fuse, be sure to turn off the starting switch.

### Fuse arrangement



No.	Terminal mark	Fuse capacity	Circuit	Remark
①	L	20 A	Head lamp Room lamp	—
②	H	20 A	Horn, Feed pump Cab heater	—
③	F	20 A	Monitor system Wiper	—
④	O	20 A	Engine stop motor	—

### FUSIBLE LINK



If the electrical power does not come on when the starting switch is turned to the ON position, fusible links (1) may be disconnected, so check or replace them.

★ The following checks can be made from the wiring of the mounting connectors for fusible links (1).

5WB (black and white wire):

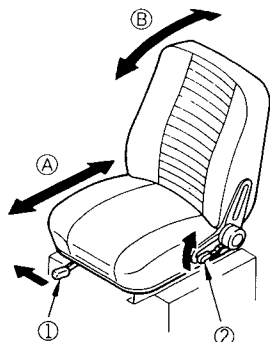
Chargine circuit

5W (white wire):

Starting circuit,

Machine power source

## OPERATOR'S SEAT



### (A) Forward-backward adjustment

Move lever (1) to the right, move the seat to the best position and release the lever. The seat can be moved forward or backward over 120 mm in 6 stages.

### (B) Backrest adjustment

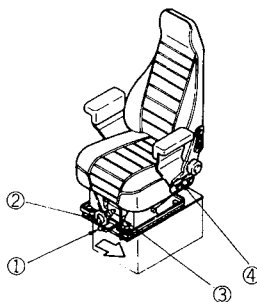
Pull lever (2) in the direction of arrow, move the backrest to the desired position and release the lever.

### Location of tool kit

The tool kit is kept behind the operator's seat.

## OPERATOR'S SEAT

(Bucket type reclining seat with armrest)



### Forward-backward adjustment

Set the seat in the desired position by moving lever (1) to the direction of arrow; then release the lever.

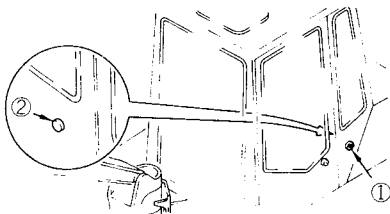
The seat can be adjusted forward or backward 160 mm (in 9 steps).

### Seat cushion adjustment

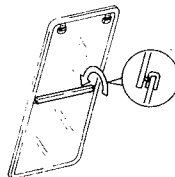
Move knob (2) until clearance between tip of chain (3) and frame becomes zero. Seat is now adjusted in the most comfortable condition.

### Backrest adjustment

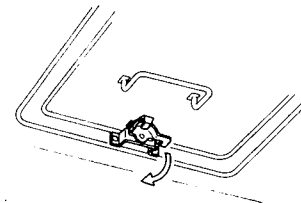
Set seat in desired position by pulling lever (4) upward, then release lever.

**DOOR LOCK**

To hold an open door stably, use a door lock. The door will be held positively when pushed against catch (1). In order to release the door, depress the black button (2) in the operator's cab.

**FRONT WINDOW**

The upper part of the front window can be opened and closed. To fully close the front window (when washing the machine or during rainfall), close the upper part and insert the center sash between the upper and lower parts.

**CEILING WINDOW**

Ceiling window is opened by releasing the lock in the direction of the arrow and pushing the ceiling window.

## LOCKING CAP

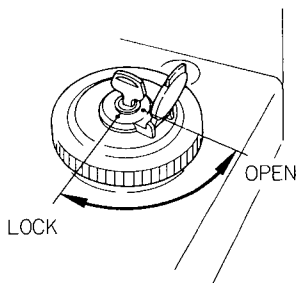
The fuel tank filler port is equipped with a lock.

★ Use the starting key to open and close the cap.

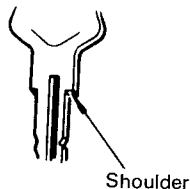
Open and close locking cap as follows:

- To open the cap

1. Insert the key into the cap.



★ Insert the key as far as it will go.  
If the key is turned before it is inserted all the way, it may break.



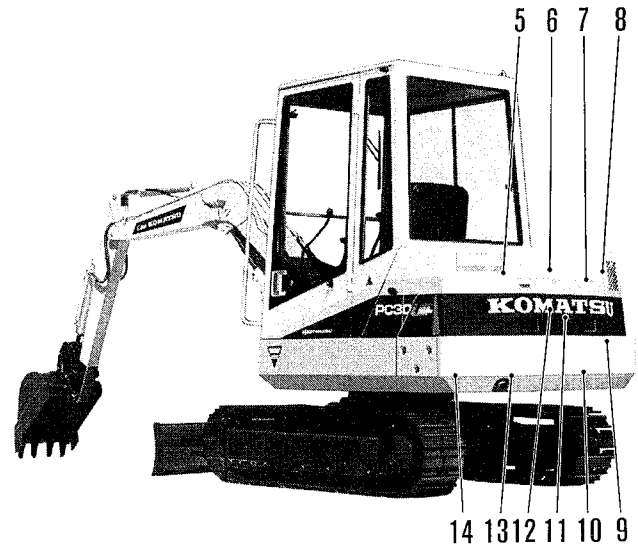
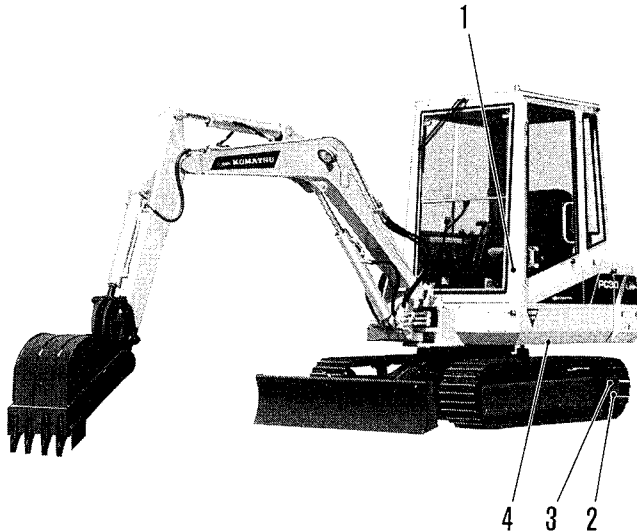
2. Turn the key counterclockwise, align the match mark on the cap with the rotor groove, then remove the cap.

- To lock the cap.

1. Turn the cap into place.
2. Turn the key clockwise and take the key out.

# OIL FILLER AND LEVEL GAUGE POSITIONS

- |  |                               |                                |
|--|-------------------------------|--------------------------------|
| 1. Swing machinery case level gauge and oil filler | 6. Hydraulic tank oil filler  | 11. Engine oil pan level gauge |
| 2. Final drive case drain plug                     | 7. Engine oil pan oil filler  | 12. Hydraulic tank level gauge |
| 3. Final drive case level plug                     | 8. Cooling water inlet        | 13. Hydraulic tank drain plug  |
| 4. Swing machinery case drain plug                 | 9. Cooling water drain valve  | 14. Fuel tank drain valve      |
| 5. Fuel tank oil filler                            | 10. Engine oil pan drain plug |                                |



## CHECK BEFORE STARTING

Pre-operation checks forestall machine trouble. Never neglect them.

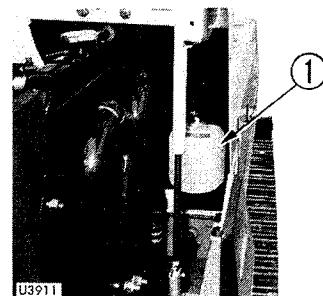
### a. WALK-AROUND CHECK

Look around the machine and under the machine to check for loose nut or bolts, collection of dirt, or leakage of oil, fuel, or coolant, and check the condition of the work equipment and hydraulic system. Check also for loose wiring, play, and collection of dust at places which reach high temperatures.

1. Check for oil leak at high pressure hose, high pressure hose joints and hydraulic cylinder seal.
2. Check swing machinery case for oil leak.
3. Check hydraulic tank for oil leak.
4. Check final drive case for oil leaks.

5. Check radiator for water leak.
6. Check around the engine for water and oil leaks.
7. Check tightness of exhaust pipe mounting bolt.
8. Check tightness of battery terminal.
9. Check tightness of air cleaner mounting bolt.

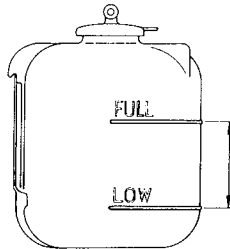
### b. CHECK AND REFILL COOLANT



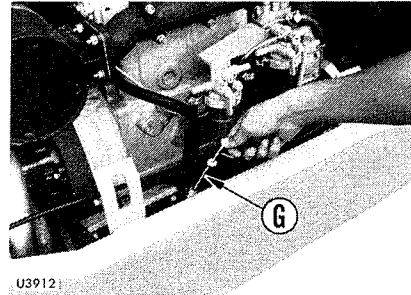
Check the level of the coolant.

The water level must be between the FULL and LOW marks on sub-tank (1). If the level is too low, add water to sub-tank (1).

### c. CHECK OIL LEVEL IN ENGINE OIL PAN



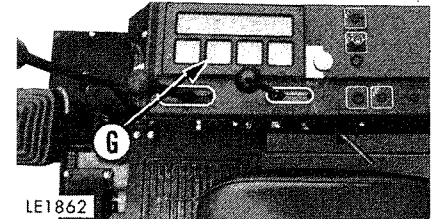
**! Do not open the radiator cap unless necessary. When checking the coolant, always check when the engine is cold (check the sub-tank).**



Check the engine oil level. The oil level should be between H and L of gauge (G).

- ★ When checking the oil level, park the machine on a level surface, stop the engine and wait for 15 minutes before checking.
- ★ The type of lubricant used depends on the ambient temperature. Select according to the tabel "FUEL, COOLANT AND LUBRICANTS".

### d. CHECK FUEL LEVEL

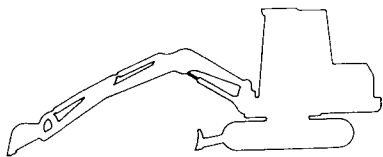


Check the fuel level using sight gauge (G).

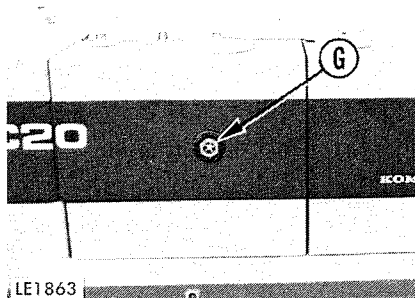
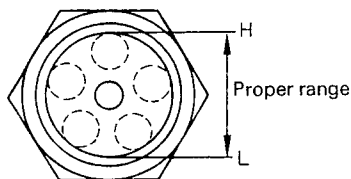
Upon completion of work, pour in additional fuel from filler until the fuel tank is full.

- ★ If breather hole in the cap is blocked up, fuel flow to the engine may stop. Accordingly, clean it from time to time.
- ★ Feul capacity: 50 ℓ
- ★ When filling with fuel, do not let the fuel overflow. This may cause fire.

**e. CHECK AND REFILL OF OIL IN HYDRAULIC TANK**

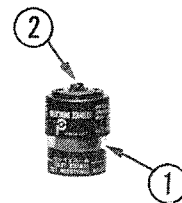


1. Run the engine at low speed, retract the arm and bucket cylinder, lower the boom until the tips of teeth touch the ground and then stop the engine.



2. Check the oil level in the hydraulic system.  
The oil level should be between top H and bottom L lines of sight gauge (G).
- ★ The type of lubricant used depends on the ambient temperature. Select according to the table "FUEL, COOLANT AND LUBRICANTS".

**f. CHECK DUST INDICATOR**



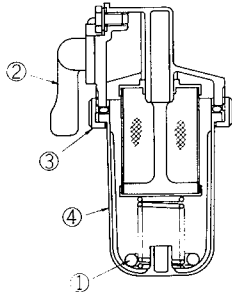
T8774

When air cleaner element is clogged, the red piston of dust indicator (1) reaches service level and gets locked.

In that case, clean element referring to the section "WHEN REQUIRED".

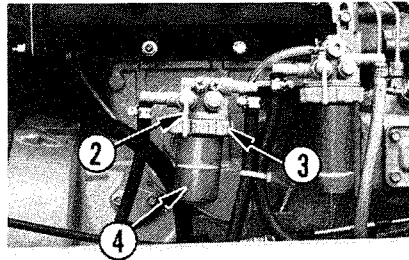
After cleaning element, push bottom (2) to return red piston.

### g. CHECK FOR SEDIMENT AND WATER IN THE WATER SEPARATOR



Check for water with red ring (1) inside the water separator.

★ If there is water inside the water separator, red ring (1) will float to the surface of the water, so drain the water as follows.



U3915

1. Place handle (2) to the CLOSED position.
2. Loosen ring (3), then remove case (4) and throw away the water inside it.
3. Install case (4) and tighten ring (3).
4. Drain the water and sediment from the fuel tank. See EVERY 50 HOURS SERVICE.

### h. CHECK ELECTRICAL WIRING

Check for any sign of disconnection or short circuit in the electric wiring. Check also for loose terminals and tighten any loose parts.

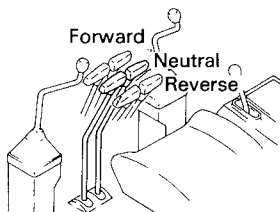
Check the following points carefully.

- Battery
- Starting motor
- Alternator

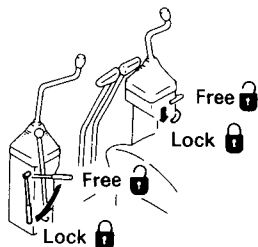
## OPERATING YOUR MACHINE

### BEFORE STARTING THE ENGINE

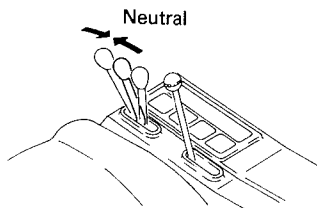
1. Put the traveling and the steering control levers in the N (neutral) position.



2. Put the left and right work equipment levers in neutral and check that the safety levers are locked.

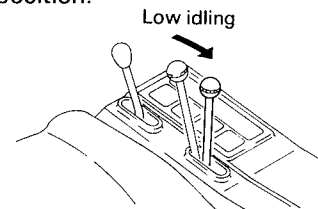


3. Check that the blade control lever is at the neutral position.

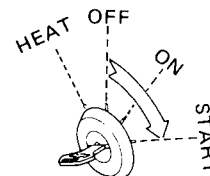


### TO START THE ENGINE

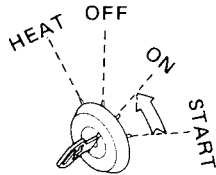
1. Pull the fuel control lever a little towards you from the low idling position.



2. Turn the starting key to the START position.



3. When engine is started, release the starting key and the key will return automatically to ON.



- ★ If engine will not start, repeat the starting procedure after 2 minutes.
- ★ Do not leave the key in START for more than 20 seconds.
- ★ If the engine has been warmed up, it is possible to start it by putting the fuel control lever in the low idling position.

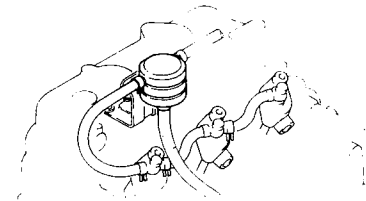
### Special starting

When starting after running out of fuel, fill with fuel, then fill the fuel filter cartridge with fuel and bleed the air from the fuel system before starting.

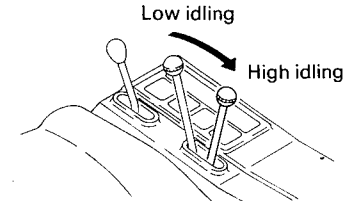
Refer to FUEL FILTER in EVERY 500 HOURS SERVICE.

### STARTING AT LOW TEMPERATURE

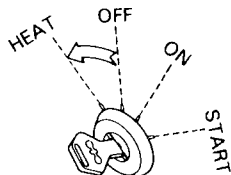
1. Check the oil level in the thermostat fuel tank.



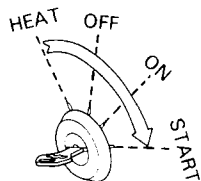
2. Fully pull the fuel control lever.



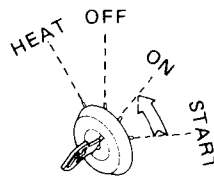
3. Move the key to HEAT position, and thermostart signal lamp will come on. The preheating will be completed in approx. 18 seconds, and the lamp will go off at the same time.



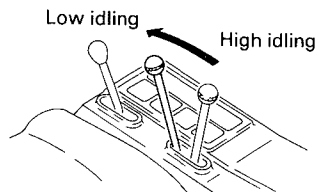
4. Then turn the key in the START position and start up the engine.



5. Release the starting key, and the key will return automatically to ON.



6. Put the fuel control lever in the low idling position.



- ★ If the engine does not start up under the above procedure, repeat steps 3 and 4 after waiting for about 2 minutes.

**!** never use starting aid fluids as they may cause explosions.

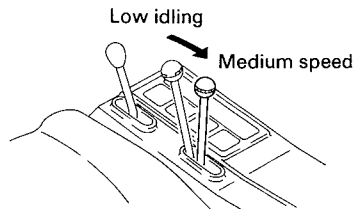
## CHEKS AFTER STARTING

After starting, make the following checks.

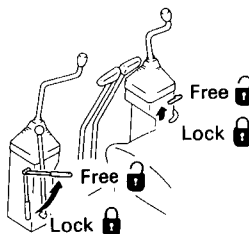
1. Run the engine at low idling speed, and check that the engine oil pressure warning lamp has gone out.



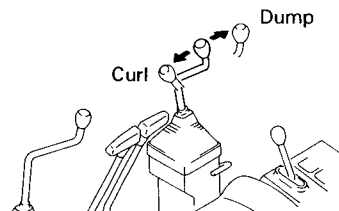
2. Pull the fuel control lever and run the engine at medium speed.



3. Free the safety lever of the bucket control lever.



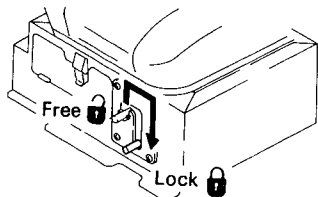
4. Leaving the bucket control lever in either pushing or pulling side, run the engine for about 5 minutes to warm up the hydraulic oil.



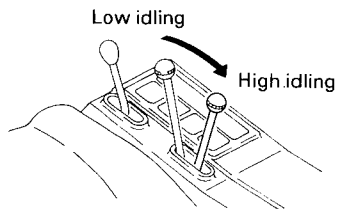
- ★ Avoid abruptly accelerating the engine until the completion of warm-up.
5. After warm-up run is completed, check gauges, warning lamp for proper operation.
  6. Check if the exhaust color is normal or whether there is any abnormal noise or vibration.
- ★ Do not run the engine at low idling or high idling for more than 20 minutes. If it is necessary to run the engine at idling, apply a load from time to time or raise the engine speed to a midrange speed.

## TO MOVE THE MACHINE OFF

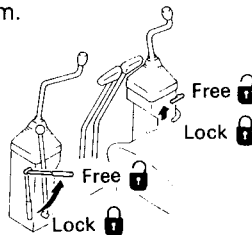
1. Put the swing lock lever into the lock position by pushing the lever down.



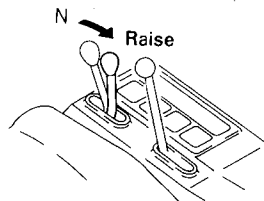
2. Pull the fuel control lever to increase engine speed.



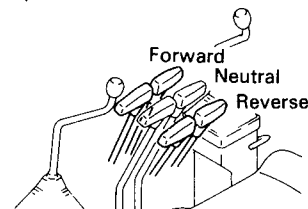
3. Free the safety levers of left and right work equipment levers, move the work equipment in and raise it to a height of about 40 to 50 cm.



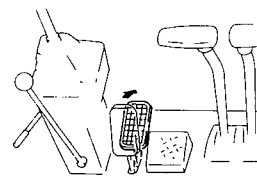
4. Pull the blade control lever and raise the blade.



5. Slowly incline left and right tabling and the steering levers in the forward (forward moving off) or reverse (reverse moving off) direction, and move off.



6. Depress the accelerator pedal (only for PC30) to increase travel speed.



**!** Check whether the track frame is facing forward or backward before operating the traveling and steering levers.

**!** Avoid abruptly operating the traveling and steering levers with the fuel control lever fully open, as this will cause the machine to move off suddenly.

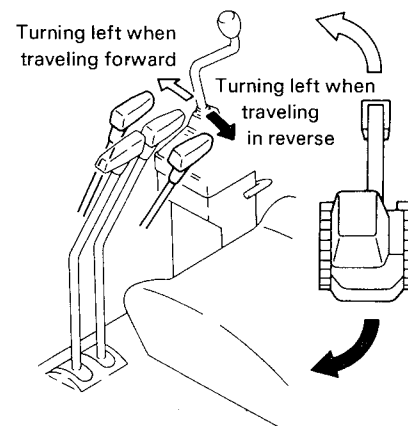
## TURNING (CHANGING DIRECTION)

Operating the travel levers to change direction.

Operated the two travel levers as follows.

- ★ When the sprockets are at the front, the operation of the travel levers is reversed, so before operating the travel levers, check the position of the sprockets.
- ★ Avoid sudden changes in direction as far as possible. When carrying out counterrotation turns (spin turns), stop the machine first before turning it.
- ★ When changing direction in places where there is large resistance to turning, do not use the accelerator pedal. (only for PC30)

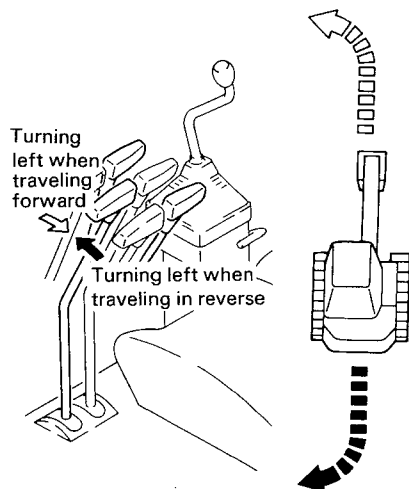
## When changing direction with machine stopped



When turning left, operate the RIGHT travel lever as follows. When traveling FORWARD, push lever FORWARD. When traveling REVERSE, pull lever BACK.

- ★ When turning right, operate the left travel lever in the same way.

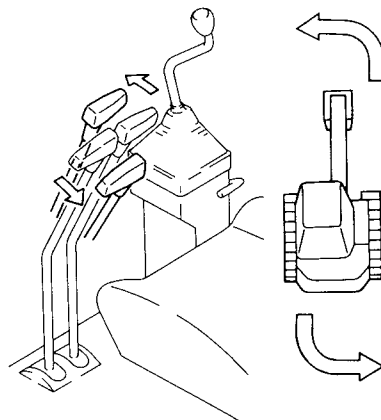
### Changing direction when traveling (when both left and right travel levers are in the same position)



When turning to the left, return the left travel lever to neutral, and the machine will turn to the left (pivot turn).

★ When turning right, operate the right travel lever in the same way.

### When making a counterrotation turn (spin turn)



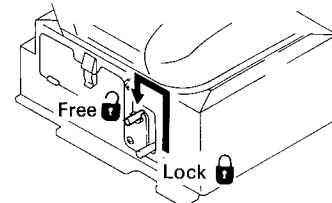
When turning to the left on the spot, pull the left travel lever back and push the right lever forward.

★ When making a counterrotation turn to the right, pull the right travel lever back and push the left lever forward.

## SWING OPERATIONS

Always check that the surrounding area is safe before swinging the upper works.

1. Before swinging, pull out the swing lock lever and release the lock.

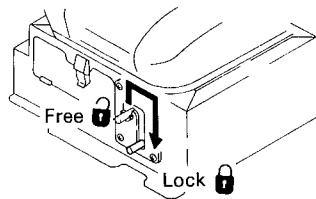


★ Before starting swing operations, always check that the lock is released.

2. Use the left work equipment control lever to swing the upper works.

★ Never insert the swing lock lever when swinging.

3. When not swinging, align the upper works with the track frame, and insert the swing lock lever to lock the upper works.



- ★ Do not operate the swing lock lever in any other position.

## OPERATION OF THE WORK EQUIPMENT

The work equipment is operated using the right and left work equipment control levers, and blade control levers.

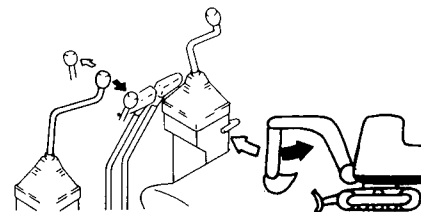
The left work equipment control lever controls the arm, the swing and boom swing operation and the right work equipment control lever controls the boom and the bucket.

If you release the lever it returns to the neutral position and the work equipment is held in that position.

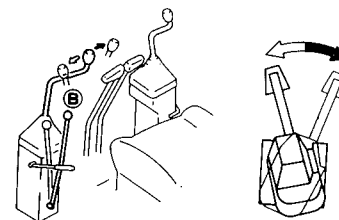
- ★ When switching swing/boom swing selector lever, the left work equipment control lever is used to swing the boom and the upper works.

- ⚠** When operating the work equipment, do not depress the travel accelerator pedal. (only for PC30).

## ARM OPERATION

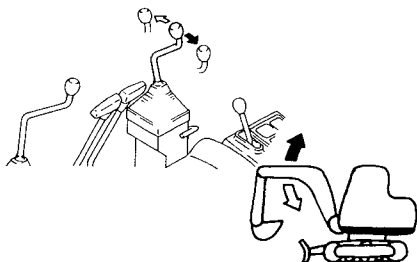


## SWING OPERATION

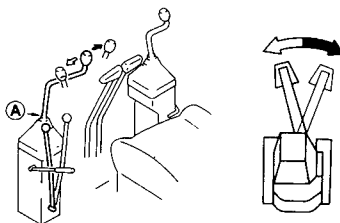


- ★ If the swing/boom swing selector lever is in the (B) position.

## BOOM OPERATION

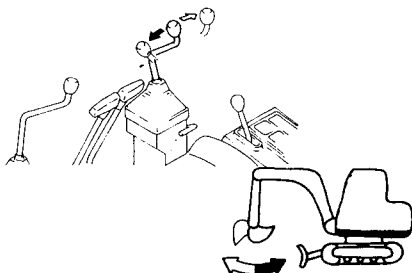


## BOOM SWING OPERATION

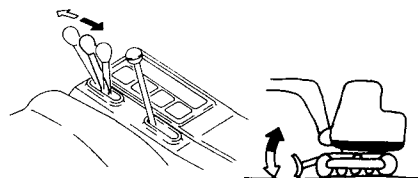


★ If the swing/boom swing selector lever is in the (A) position.

## BUCKET OPERATION

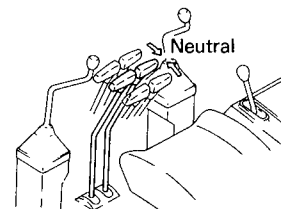


## BLADE OPERATION

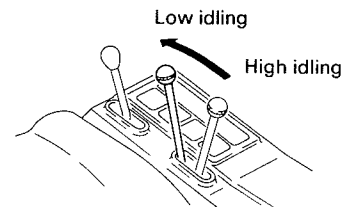


## TO STOP THE MACHINE

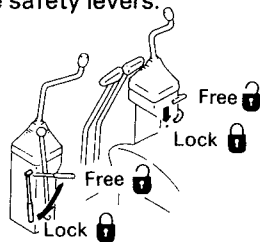
1. Put the left and right traveling and the steering levers in the neutral position.



2. Lower the engine speed using the fuel control lever.



3. Lower the bucket horizontally until its underside touches the ground.
4. Lock the work equipment levers with the safety levers.

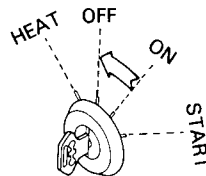


5. Lower the blade to ground.

**! When stopping the machine, select flat hard ground and avoid dangerous places. If it is unavoidably necessary to park the machine on a slope, insert blocks underneath the track shoes. As an additional safety measure, thrust the bucket into the ground.**

## TO STOP THE ENGINE

1. Run the engine at low idling speed for about 5 minutes to allow it to gradually cool down.
2. Return the starting key to the OFF position, stop the engine and remove key.



- ★ If the engine is abruptly stopped before it has cooled down, engine life may be greatly shortened. Consequently, do not abruptly stop the engine apart from an emergency.
- ★ In particular, if the engine has overheated, do not abruptly stop it but run it at medium speed to allow it to cool gradually, then stop it.

## PRECAUTIONS FOR OPERATION

- Be careful not to compact the soil or damage earth mounds as a result of the swinging force.
- When swinging, do not dig the bucket teeth into the soil.
- Do not move off and excavate with the bucket leaving dug into the ground.
- When working with the machine, do not move the cylinder to the end of its stroke but leave a small safety margin.
- Do not use the dropping force of the bucket as a pickaxe, breaker, or pile driver.
- Do not use the dropping force of the machine for digging.
- It is better to excavate hard rocky ground after breaking it up by some other means. This will not only reduce damage to the machine but make for better economy.

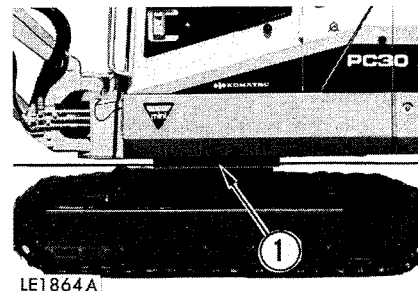
- Never allow the blade to butt against, or give strong impact. To do such work will damage the blade and the hydraulic cylinder.
- Never hit the blade by the bucket because they interfere in lowering and retracting for moving and transportation.
- Do not support the machine on one end of the blade to use it as an outrigger.
- Do not hit the boom cylinder against the blade when digging the deep ditch in front of the blade. Back hoe work should be carried out after keeping the blade to the opposite position of the bucket.

- Note that the following phenomena are not faults:

- 1) When the arm is pulled back, it will sometimes stop when becomes more or less vertical.
- 2) The arm may sometimes stop when the bucket teeth become more or less horizontal.
- 3) At the beginning and end of a swinging, a noise may sometimes be emitted from the brake valve.
- 4) When descending a steep slope at low speed, a noise may sometimes be emitted from the travel motor.

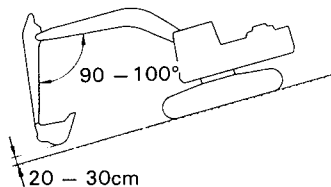


**If it is necessary to use the equipment control levers when the machine is traveling, temporarily stop the machine, then operate the work equipment.**



- Do not immerse the machine in water by more than the permissible depth (under swing circle (1)). In addition, properly grease parts which have been immersed in water for a long time, until the old grease comes out from the bearings (vicinity of bucket pins, swing circle system, etc.).

- When driving the machine out of water, if the angle of the machine exceeds  $15^\circ$ , the rear of the upper structure will go under water, and water will be thrown up by the radiator fan. This may cause the fan to break.  
Be extremely careful when driving the machine out of water.
- When traveling down a hill, adjust the speed with the travel lever and fuel control lever. If the grade exceeds  $15^\circ$ , set the machine in the posture shown in the diagram below, and reduce the engine speed.



**! Do not travel on slopes of over  $30^\circ$  as there is danger that the machine may overturn.**

- To brake the machine during downhill runs, put the traveling and steering lever in the neutral position. This will cause the brake to be automatically applied.
- When climbing a hill, if the shoes slip or the travel motor relieves, preventing the machine from climbing by means of the tracks alone, it is possible to use the force of the arm as an aid.
- When the engine stops on a slope, move the traveling and steering levers to neutral position and lower the bucket. Thereafter, turn starting key to START.
- When the engine stops on a slope, the boom will move by its own weight if the swing lever is moved. Therefore, do not move the swing lever under any conditions.

## HOW TO ESCAPE FROM MUD

- Always operate carefully to avoid getting stuck in mud. If the machine does get stuck in mud, use the following procedures to get the machine out.
- **When one side is stuck.**  
When only one side is stuck in mud, use the bucket to raise the track, then lay boards or logs and drive the machine out. If necessary, put a board under the bucket also.
- ★ When using the boom or arm to raise the machine, always have the bottom of the bucket in contact with the ground. (Never push with the teeth.) The angle between the boom and arm should be  $90^\circ$  to  $110^\circ$ .

- **When both sides are stuck.**

When the tracks on both sides are stuck in mud and the machine will not move, lay boards as explained on the left, and dig the bucket into the ground in front. Then pull in the arm as in normal digging operations and put the travel levers in the FORWARD position to pull the machine out.

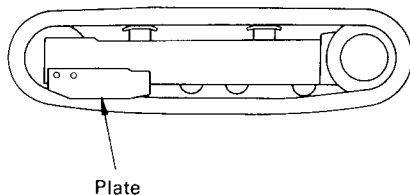
## **PRECAUTIONS WHEN USING RUBBER SHOES**

- When traveling, avoid traveling over sharp objects or over stones on the road, and avoid using the machine in unstable conditions.
- Turning suddenly on road surfaces with a high friction coefficient (such as concrete) will cause the rubber shoes to break.
- Do not go into places where the temperature is high, such as immediately after a bonfire.
- In areas where there are large amounts of rocks and stones, the rubber shoes may be damaged or come off because of rocks or stones caught in the rubber shoe, so drive extremely carefully in such areas.
- Do not rub along concrete walls when driving.
- Be careful not to let oil get stuck on the rubber shoes. If there is any oil on the shoes, wipe it off immediately.
- When storing for long periods, keep indoors away from direct sunlight and rain.
- The adhesion of the metal core is attacked by salt, so avoid using near the sea.
- Because of the properties of rubber, use the rubber crawler within a range of  $-25^{\circ}\text{C}$  to  $+55^{\circ}\text{C}$ .
- Always maintain the shoes at a suitable tension.
- Sudden changes of direction when traveling cause early wear and damage of the rubber shoes, so avoid such operations as far as possible. When turning on the spot (spin turn), stop the machine, and run the engine at mid-range speed or below when turning.

- Rubber shoes are likely to slip on snow or icy roads.

When working on snow-covered or icy slopes, avoid using rubber shoes and take full precautions to ensure safety.

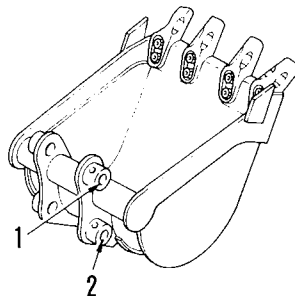
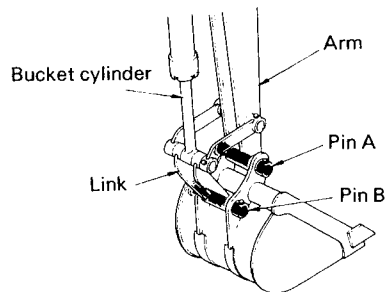
- When changing from steel shoes to rubber shoes, always remove the stopper plate used to prevent the track from coming off.



**!** When changing from steel shoes to rubber shoes, or from rubber shoes to steel shoes, always contact your Komatsu distributor to have the work carried out.

## REPLACEMENT OF BUCKET

**Stop the machine on a firm, flat surface. When performing joint work, make clear signals to each other and work carefully for safety's sake.**



1. Select a flat surface and stabilize the bucket.
2. After removing the stop bolt and nut for each pin, extract pins A and B.
- ★ After removing the pins, make sure that they do not become contaminated with sand or mud and that the seals of bushing on both sides do not become damaged.
3. Couple the arm to hole (1), then connect the link to hole (2).
4. After mounting the stop bolt and nut for each pin, apply grease to each pin.

# COLD WEATHER OPERATION

## PREPARATION FOR LOW TEMPERATURE

If the temperature becomes low, it becomes difficult to start the engine, and the coolant may freeze, so do as follows.

## FUEL AND LUBRICANTS

Change to fuel and oil with low viscosity for all components. For details of the specified viscosity, see the TABLE OF FUEL, COOLANT AND LUBRICANTS.

## COOLANT

After cleaning inside of the cooling system, add antifreeze to the coolant to prevent the coolant from freezing when the machine is not being used.

- ★ For details of the antifreeze mixture when changing the coolant, see WHEN REQUIRED.


## Care in using Antifreeze

Use a Permanent Antifreeze (ethylene glycol mixed with corrosion inhibitor, antifoam agent, etc.) meeting the standard requirements as shown below. With permanent antifreeze, no change of coolant is required for a year. If it is doubtful that an available antifreeze meets the standard requirements, ask the supplier of that antifreeze for information.

Standard requirements for permanent antifreeze

- SAE ..... J1034
- FEDERAL STANDARD  
..... O-A-548D

- ★ Never use methanol, ethanol or propanol based antifreeze.
- ★ Where no permanent antifreeze is available, an ethylene glycol antifreeze without corrosion inhibitor may be used only for the cold season. In this case, clean the cooling system twice a year (in spring and autumn). When refilling the cooling system, add antifreeze in autumn, but do not add any in spring.
- ★ Absolutely avoid using any water leak preventing agent irrespective of whether it is used independently or mixed with an antifreeze.
- ★ Do not mix one antifreeze with a different brand.

 **Antifreeze is flammable, so keep it away from any flame.**


## BATTERY


As ambient temperature drops, battery capacity will drop, and electrolyte may sometimes freeze if battery charge is low. Maintain battery at a charge level of approx. 100% and insulate it against cold temperature so that machine can be readily started the next morning.

- ★ Measure specific gravity of fluid and obtain rate of charge from the following conversion table:

Temp. of fluid Rate of charge	20°C	0°C	-10°C	-20°C
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

- ★ When electrolyte level is low, add distilled water in the morning before work instead of after the day's work. This is to prevent fluid from freezing at night.

 **To avoid gas explosions, do not bring fire or sparks near the battery.**

 **If the electrolyte gets on your skin or clothes, immediately wash with plenty of clean water.**

## CAUTIONS AFTER COMPLETION OF WORK

1. Mud and water on the machine body should be completely removed.

Park the machine on concrete or hard ground. If this is impossible, park the machine on wooden boards. This will prevent the accessories from freezing or the track and undercarriage from freezing to the ground thereby preventing vehicle movement the next morning. Particular attention should be given to water drops collected on the surface of the hydraulic cylinder piston rods. Such droplets must be fully wiped off because if water is frozen to the rod when the cylinder is utilized, the cylinder oil seals may be damaged.

2. Drain water collected in fuel system so that such water may be frozen at night.

3. As battery capacity drops at low ambient temperature, cover the battery or remove it from the machine to be kept warm at night.

## AFTER COLD WEATHER

When weather becomes warm, perform the following without fail:

- Replace lubricating oils for various units with the ones specified for warm-weather use.
- If for any reason permanent anti-freeze cannot be used, and an ethyl glycol base antifreeze (winter, one season type) is used instead, or if no antifreeze is used, drain the cooling system completely, then clean out the inside of the cooling system thoroughly, and fill with fresh water.

## PERIODIC MAINTENANCE

Proper lubrication and maintenance assure trouble-free operation and long machine life. Time and money spent for scheduled periodic maintenance will be amply compensated by prolonged machine operation and reduced operating cost.

All hourly figures given in the following descriptions are based on service meter readings. In practice, however, it is recommended to rearrange all of them into units of days, weeks and months to make the maintenance schedule more convenient. Under rough job site or operating conditions, it is necessary to somewhat shorten the maintenance intervals stated in this manual.

## MAINTENANCE TABLE

No.	ITEM	SERVICE	PAGE
<b>CHECK BEFORE STARTING</b>			
a	Walk-around check		20
b	Coolant	Check and supply	20
c	Engine oil pan	Check and supply	21
d	Fuel tank	Check and supply	21
e	Hydraulic tank	Check and supply	22
f	Dust indicator	Check	22
g	Water separator	Check	23
h	Electrical wiring	Check	23
<b>INITIAL 50 HOURS SERVICE</b>			
a	Hydraulic filter	Replace element	47
b	Hydraulic tank strainer	Clean	47

No.	ITEM	SERVICE	PAGE
<b>EVERY 50 HOURS SERVICE</b>			
a	Fuel tank	Drain water and sediment	47
b	Dust cup	Clean	47
c	Lubricating		48
-1	Swing circle pinion	Lubricate 1 point	48
<b>EVERY 100 HOURS SERVICE</b>			
a	Lubricating		49
-1	Boom-swing cylinder foot pin	Lubricate 1 point	49
-2	Boom cylinder foot pin	Lubricate 1 point	49
-3	Boom-swing cylinder rod end	Lubricate 1 point	49
-4	Boom foot pin	Lubricate 1 point	49
-5	Boom-swing bracket pin	Lubricate 2 points	49
-6	Boom cylinder rod end	Lubricate 1 point	49
-7	Arm cylinder foot pin	Lubricate 1 point	49
-8	Arm cylinder rod end	Lubricate 1 point	49

No.	ITEM	SERVICE	PAGE
-9	Boom-arm coupling pin	Lubricate 1 point	49
-10	Bucket cylinder foot pin	Lubricate 1 point	49
-11	Bucket cylinder rod end	Lubricate 1 point	49
-12	Link coupling pin	Lubricate 1 point	49
-13	Bucket-link coupling pin	Lubricate 1 point	49
-14	Arm-bucket coupling pin	Lubricate 1 point	49
-15	Arm-link coupling pin	Lubricate 1 point	49
-16	Blade cylinder rod end	Lubricate 1 point	50
-17	Blade cylinder foot pin	Lubricate 1 point	50
-18	Blade foot pin	Lubricate 2 points	50
b	Swing machinery case	Check and supply	50

No.	ITEM	SERVICE	PAGE
<b>INITIAL 250 HOURS SERVICE</b>			
a	Final drive case	Change oil	50
b	Swing machinery case	Change oil	50
c	Engine valve clearance	Check and adjust	50
<b>EVERY 250 HOURS SERVICE</b>			
a	Final drive case	Check and supply	51
b	Fan belt	Check tension	51
c	Hydraulic filter	Replace element	52
d	Battery electrolyte	Check fluid level	53
e	Air cleaner element (without dust indicator)	Check, clean or replace element	54
f	Water separator element	Clean	55
g	Engine oil pan and filter	Change oil and replace cartridge	55

# MAINTENANCE TABLE

No.	ITEM	SERVICE	PAGE
<b>EVERY 500 HOURS SERVICE</b>			
a	Fuel filter	Replace element	57
b	Radiator fins	Clean	57
c	Lubricating		58
-1	Swing circle	Lubricate 2 points	58
<b>EVERY 1000 HOURS SERVICE</b>			
a	Final drive case	Change oil	59
b	Swing machinery case	Change oil	59
<b>EVERY 2000 HOURS SERVICE</b>			
a	Hydraulic tank	Change oil and clean strainer	61
b	Alternator and starting motor	Check	62
c	Engine valve clearance	Check and adjust	62

No.	ITEM	SERVICE	PAGE
<b>WHEN REQUIRED</b>			
a	Air cleaner element (with dust indicator)	Check, clean or re-place when required	63
b	Cooling system	Clean	65
c	Track	Check and adjust tension	68
d	Bucket teeth	Replace	69
e	Window washing fluid	Check and supply	70

## INITIAL 50 HOURS SERVICE

Perform the following maintenance after running the machine for the first 50 hours.

### a. HYDRAULIC FILTER

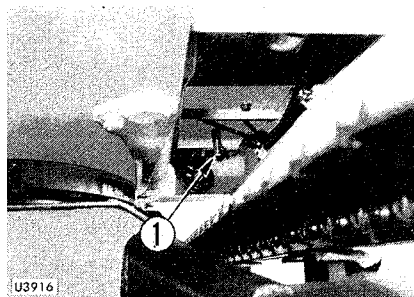
### b. HYDRAULIC TANK STRAINER

For details of the method of replacing or maintaining, see the section on EVERY 250 HOURS AND 2000 HOURS SERVICE.

Simultaneously, maintenance for 50 hours should be carried out.

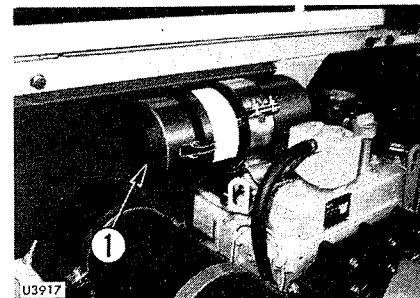
## EVERY 50 HOURS SERVICE

### a. FUEL TANK



Loosen valve (1) on the bottom of the tank so that the sediment and mixed water will be drained in accompaniment with fuel.

### b. AIR CLEANER DUST CUP

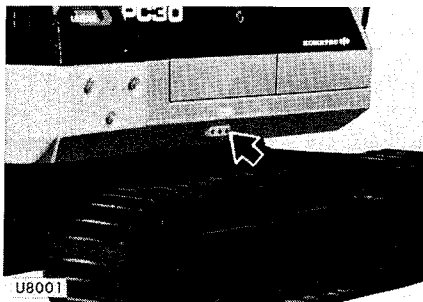


1. Remove dust cup (1), dispose the dust in it.
2. Clean inside of the cup.

**c. LUBRICATING**

Apply grease to the grease fittings shown by arrows.

1. Swing circle pinion (1 point)



Turn the chassis little by little and apply grease through the grease fitting.

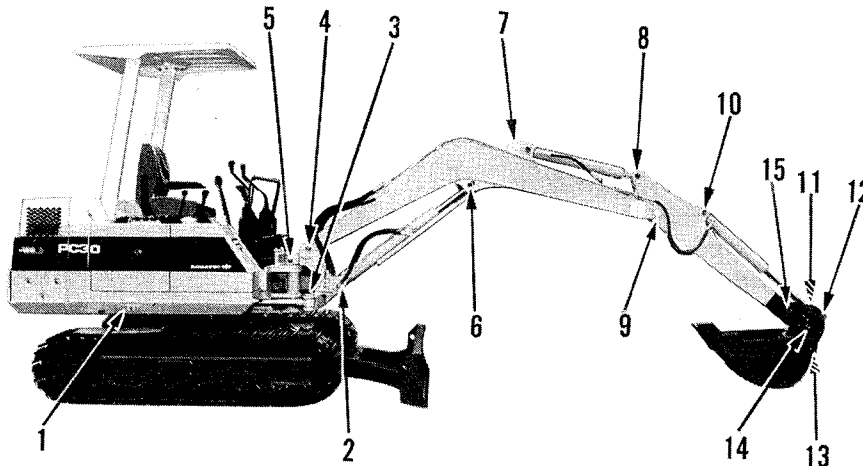
- ★ When applying grease, stop the swing operation.

## EVERY 100 HOURS SERVICE

★ Maintenance for every 50 hours should be carried out at the same time.

### a. LUBRICATING

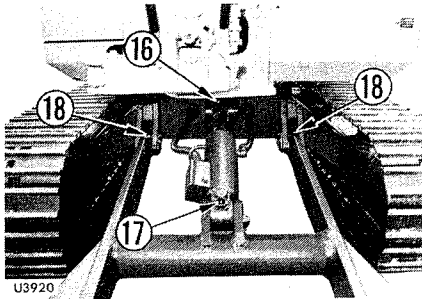
Apply grease to the grease fittings shown by arrows.



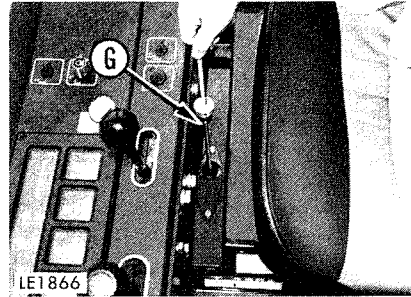
1. Boom-swing cylinder foot pin (1 point)
2. Boom cylinder foot pin (1 point)
3. Boom-swing cylinder rod end (1 point)
4. Boom foot pin (1 point)
5. Boom-swing bracket pin (2 points)
6. Boom cylinder rod end (1 point)
7. Arm cylinder foot pin (1 point)
8. Arm cylinder rod end (1 point)
9. Boom-arm coupling pin (1 point)
10. Bucket cylinder foot pin (1 point)
11. Bucket cylinder rod end (1 point)
12. Link coupling pin (1 point)
13. Bucket-link coupling pin (1 point)
14. Arm-bucket coupling pin (1 point)
15. Arm-link coupling pin (1 point)

EVERY 100 HOURS SERVICE  
INITIAL 250 HOURS SERVICE

- 16. Blade cylinder rod end (1 point)
- 17. Blade cylinder foot pin (1 point)
- 18. Blade foot pin (2 points)



#### b. SWING MACHINERY CASE



Check the oil level in the swing machinery case.

The oil level should be between H and L of gauge (G).

- ★ Check that dipstick (G) is completely inserted in.
- ★ The type of lubricant used depends on the ambient temperature. Select according to the table "FUEL, COOLANT AND LUBRICANTS".

## INITIAL 250 HOURS SERVICE

Perform the following maintenance after running the machine for the first 250 hours.

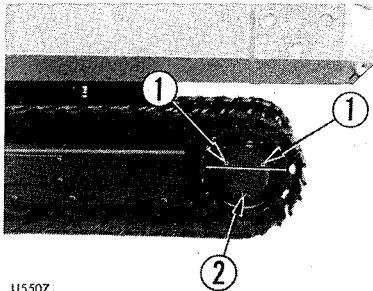
- a. FINAL DRIVE CASE
- b. SWING MACHINERY CASE
- c. ENGINE VALVE CLEARANCE

For details of the method of replacing or maintaining, see the section on EVERY 500 HOURS, 1000 HOURS AND 2000 HOURS SERVICE.

## EVERY 250 HOURS SERVICE

★ Maintenance for 50 and 100 hours should be carried out at the same time.

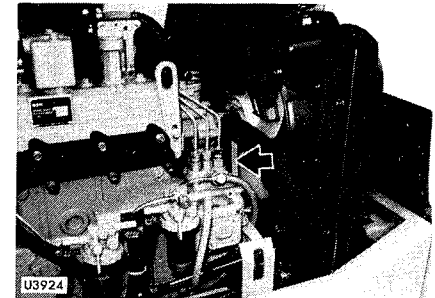
### a. FINAL DRIVE CASE



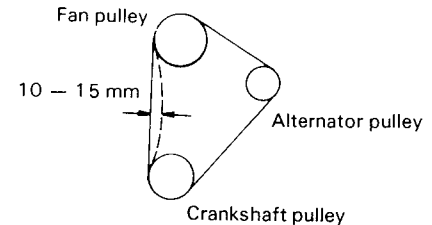
1. Set level plugs (1) (2 places) parallel to the ground with drain plug (2) at the bottom.
2. Remove one of plugs (1). If the oil is not filled up to near the bottom line of the plug hole, refill with engine oil through plug hole.

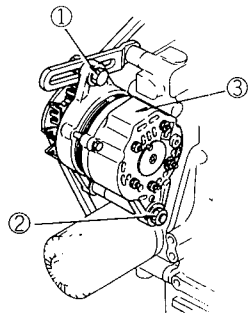
★ The type of lubricant used depends on the ambient temperature. Select according to the table "FUEL, COOLANT AND LUBRICANTS".

### b. FAN BELT



1. The belt tension should normally deflect by 10 to 15 mm when pressed with the finger at a point midway between the fan pulley and the crankshaft pulley (approx. 6 kg).

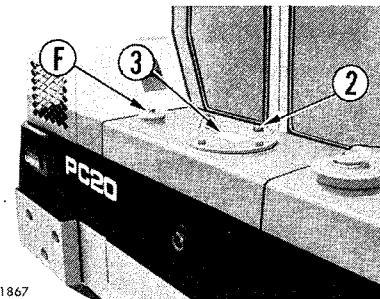




2. To adjust the belt tension, loosen bolt (1) and nut (2) and shift alternator (3) slightly.

- ★ When adjusting the V-belt, do not attempt to push alternator (3) directly with a bar or the like, but use a wood pad to prevent damage to the core.
- ★ Check each pulley for damage, and V-grooves and V-belt for wear. Particularly, check whether V-belt is in contact with bottom of V-groove through wear.
- ★ Replace belt if it has stretched, leaving no allowance for adjustment, or if there is a cut or crack on bolt.

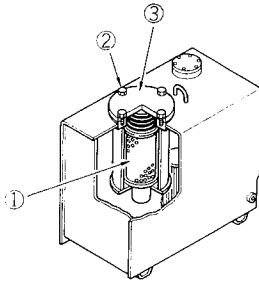
### c. HYDRAULIC FILTER



LE1867

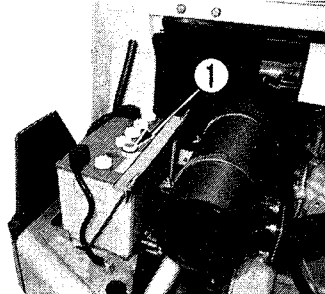
1. Gradually loosen cap (F) of the oil filler to relieve inner pressure.
2. Remove the bolts (2) and cover (3).

#### d. BATTERY ELECTROLYTE



3. Remove element (1) and replace it with a new one after cleaning the removed parts and the case interior.

**⚠ When removing the cover, undo the bolts (4 bolts) gradually to prevent the cover flying off under the force of the spring.**



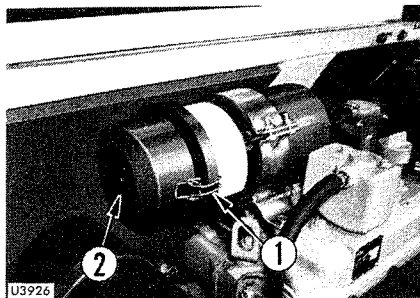
U3922

1. Remove cap (1).
  2. If the electrolyte level is lower than the prescribed level (10 to 12 mm above the plate), supply distilled water.
- ★ Should any of the acid be spilt, have it replenished by the nearest battery shop with acid of the correct specific gravity.
  - ★ When inspecting electrolyte level, clean the air hole of the battery cap.

**⚠ If the electrolyte gets on your skin or clothes, immediately wash with plenty of clean water.**

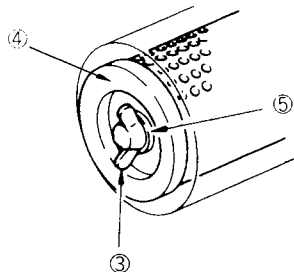
**⚠ To avoid gas explosions, do not bring fire or sparks near the battery.**

**e. AIR CLEANER ELEMENT**  
**(without dust indicator)**



1. Remove clip (1) and dust cup (2).
2. Remove wing bolt (3) and element (4).

Clean the element, inside of the case and the dust cup, and install them.

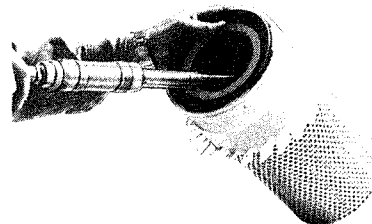


- ★ Cover the air inlet port when removing element.
- ★ Be sure to assemble seal washer (5) when mounting element.
- ★ Install the dust cup holding it's arrow mark upward.
- ★ Replace the element which has been cleaned 6 times repeatedly or used throughout a year.
- ★ Replace seal washer (5), wing bolt (3) if they are broken.

**! Do not clean or replace the air cleaner element with the engine running.**

**Cleaning element**

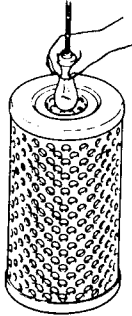
**With compressed air**



B0309

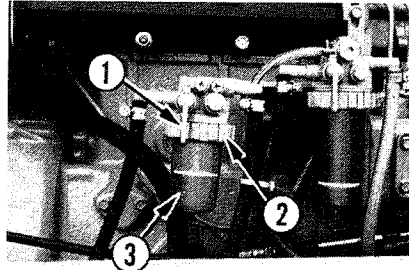
Direct dry compressed air (less than 7 kg/cm<sup>2</sup>) to element from inside along its folds, then direct it from outside along its folds and again from inside, and check element.

**! When using compressed air, wear safety glasses and other things required to maintain safety.**



- ★ If small holes or thinner parts are found on element when it is checked with an electric bulb after cleaning and drying, replace the element.
- ★ Do not use element whose folds or gasket or seal are damaged.
- ★ When cleaning element, do not hit it or beat it against something.

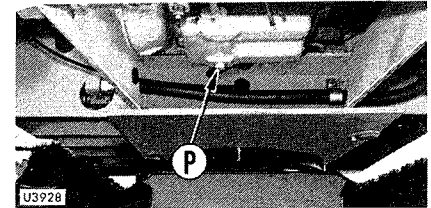
#### f. WATER SEPARATOR ELEMENT



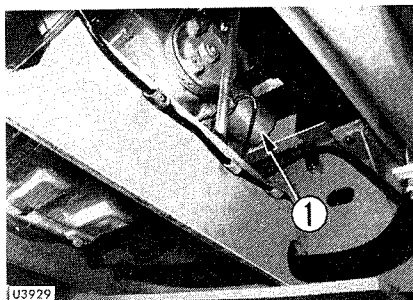
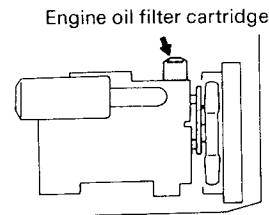
U3927

1. Tighten handle (1).
  2. Loosen ring (2), then remove case (3) and the element.
  3. Clean the inside of the case and the element with diesel oil.
  4. Install the element and case (3), then tighten ring (2).
- ★ Be careful not to lose the red ring inside the case.
5. Open handle (1).

#### g. ENGINE OIL PAN AND FILTER

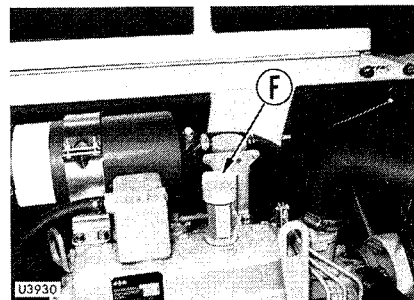


1. To facilitate filter replacement, stop the engine after turning the upper frame a little (about 30°).
  2. Remove the drain plug (P) to drain oil. After draining, tightening the drain plug.
  3. Using a filter wrench, remove cartridge (1) of the engine oil filter by turning it counterclockwise.
- ★ If filter cartridge (1) is removed immediately after stopping the engine, oil will spill. Wait at least 10 minutes after stopping the engine before replacing the filter cartridge.



4. Clean the filter base and apply engine oil to the seal on the new filter cartridge.
- ★ To install cartridge, bring its packing surface into contact with sealing surface of filter base and then tighten cartridge 1/2 to 3/4 turn.
5. After replacing the cartridge, pour in the specified quantity of engine oil from oil filler (F).

6. Run the engine for a short time at idling, then stop the engine and leave for about five minutes. Measure the oil level and check that it is between H and L marks on the gauge.
- ★ Refill capacity: 4.5 ℓ
- ★ The type of lubricant used depends on the ambient temperature. Select according to the table "FUEL, COOLANT AND LUBRICANTS".

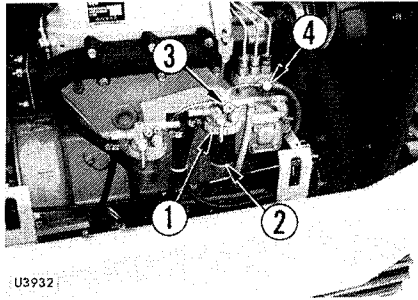


- ★ Be sure to fit a genuine Komatsu cartridge.
- ★ Replace once every 6 months, regardless of the number of hours operated.
- ★ When fitting the cartridge, be careful not to tighten it up excessively.
- ★ Use API category CD class oil. If CC class oil must be used, change the oil and replace the oil filter at half the usual interval.

## EVERY 500 HOURS SERVICE

★ Maintenance for every 50, 100 and 250 should be carried out at the same time.

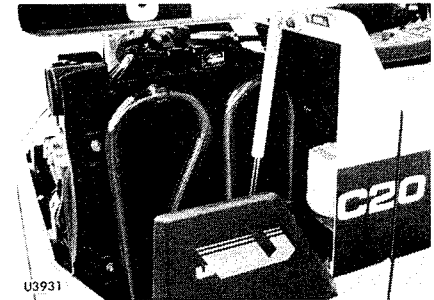
### a. FUEL FILTER



1. Loosen the ring (1) and take the element out of the filter, using the service tools furnished with the machine.
  2. Wash element cup (2) in light oil or in a cleaning oil and install a new element in the filter.
- ★ When replacing a fuel filter element, replace the filter O-ring at the same time.

3. Turn the starting switch key to the ON position.
  4. Push air bleed button (3) of the fuel filter, and continue to press it until no more bubbles come out from the air bleed hose.
  5. Push air bleed button (4) of the injection pump inlet port, and continue to press it until no more bubbles come out from the air bleed hose.
  6. When no more bubbles come out, turn the starting switch key to the OFF position.
- ★ When the machine has been out of use for a long time, bleed the air also before starting the engine.

### b. RADIATOR FINS



Clean the radiator fins clogged with mud, dust and leaves with compressed air. Steam or water may be used instead of compressed air.

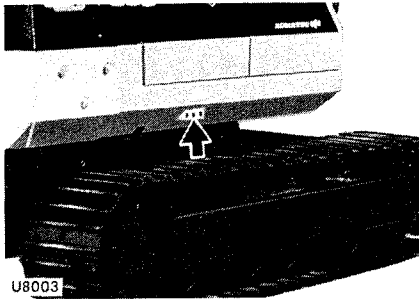
- ★ The rubber hose should be checked at the same time. If the hose is found to have cracks or to be hardened by ageing, such hose should be replaced by new one. Further, loosened hose clamp should also be checked.

EVERY 500 HOURS SERVICE

**c. LUBRICATING**

Apply grease to the grease fittings shown by arrows.

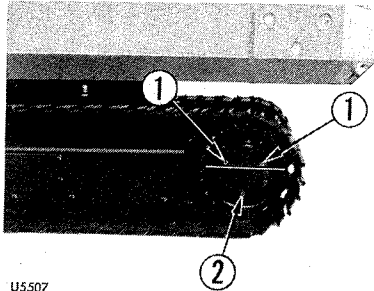
1. Swing circle (2 points)



## EVERY 1000 HOURS SERVICE

★ Maintenance for every 50, 100, 250 and 500 hours should be carried out at the same time.

### a. FINAL DRIVE CASE



U5507

1. Set level plugs (1) (2 places) parallel to the ground with drain plug (2) at the bottom.
2. Remove plug (2) to drain the oil. After draining, tighten the plug.
3. Then, supply new engine oil through oil filler (1) respectively to the specified level. (Refer to EVERY 250 HOURS SERVICE.)

★ The type of lubricant used depends on the ambient temperature. Select according to the table "FUEL, COOLANT AND LUBRICANTS".

★ Refill capacity: 1.2 ℓ (each side)

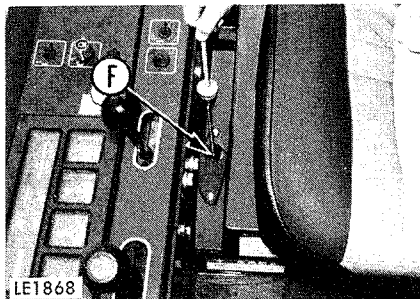
### b. SWING MACHINERY CASE



U3935

1. Drain off oil from drain plug (P) at the bottom of the machine. After draining, tighten the drain plug.

## EVERY 1000 HOURS SERVICE



2. Pour in the specified amount of engine oil from gauge hole (F).  
(Refer to EVERY 100 HOURS SERVICE.)

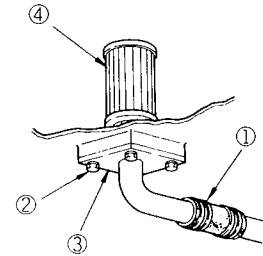
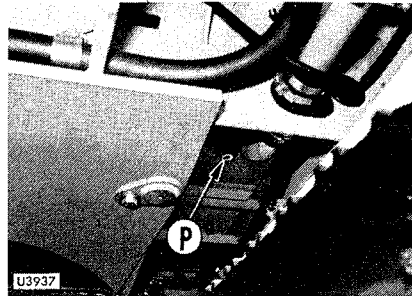
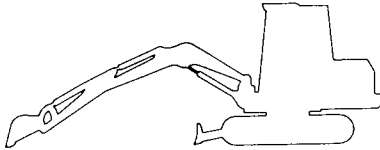
★ The type of lubricant used depends on the ambient temperature. Select according to the table "FUEL COOLANT AND LUBRICANTS".

★ Refill capacity: 1.3 ℓ

## EVERY 2000 HOURS SERVICE

★ Maintenance for every 50, 100, 250, 500 and 1000 hours should be carried out at the same time.

### a. HYDRAULIC TANK



1. Retract the arm and bucket cylinder, then lower the boom and put the tips of the teeth in contact with the ground.
2. Remove drain plug (P) to drain off the oil. After draining off the oil, tighten up drain plug (P).

3. Loosen hose band (1) and bolt (2). Remove flange (3) and wash the strainer (4).
4. Pour in the specified amount of engine oil from oil filler. (Refer to CHECK BEFORE STARTING.)

★ The type of lubricant used depends on the ambient temperature. Select according to the table "FUEL COOLANT AND LUBRICANTS".

★ Refill capacity: 35 ℓ

★ After changing oil, put the control levers in N (neutral) position and run the engine at low idling speed for a few minutes before operation of work equipment.

**b. ALTERNATOR AND STARTING MOTOR**

As the hours of engine employment indicate that the brushes are already worn out, you should request repair from a Komatsu distributor.

- ★ They should be repaired every 1000 hours, if the machine is frequently operated at night.

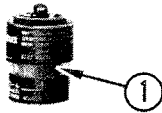
**c. ENGINE VALVE CLEARANCE**

Ask Komatsu distributor to check engine valve clearance because special tools should be used.

## WHEN REQUIRED

### a. CHECK, CLEAN AND REPLACE AIR CLEANER ELEMENT (with dust indicator)

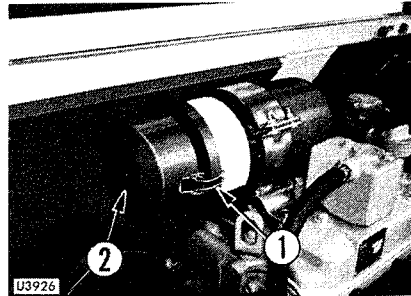
#### Checking



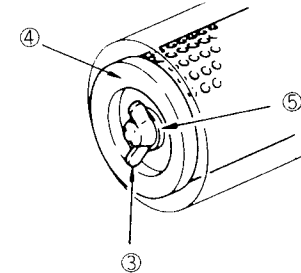
T8816

Whenever the red piston in dust indicator (1) appears, clean the air cleaner element. Stop the engine when cleaning the element.

#### Cleaning or replacing element



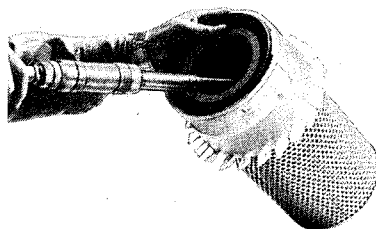
1. Remove clip (1) and dust cup (2).
2. Remove wing bolt (3) and element (4).  
Clean the element, inside of the case and the dust cup and install them.
3. Push the dust indicator reset button to return the red piston to the original position.



- ★ Cover the air inlet port when removing element.
- ★ Be sure to assemble seal washer (5) when mounting element.
- ★ Install the dust cup holding it's arrow mark upward.
- ★ Replace the element which has been cleaned 6 times repeatedly or used throughout a year.

## Cleaning element

### With compressed air



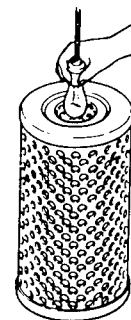
80509

- ★ Replace seal washer (5), wing bolt (3) if they are broken.

**! Do not clean or replace the air cleaner element with the engine running.**

Direct dry compressed air (less than 7 kg/cm<sup>2</sup>) to element from inside along its folds, then direct it from outside along its folds and again from inside, and check element.

**! When using compressed air, wear safety glasses and other things required to maintain safety.**



- ★ If small holes or thinner parts are found on element when it is checked with an electric bulb after cleaning and drying, replace the element.
- ★ Do not use element whose folds or gasket or seal are damaged.
- ★ When cleaning element, do not hit it or beat it against something.

## b. CLEAN INSIDE OF COOLING SYSTEM

Clean the inside of the cooling system, change the coolant, and add the corrosion resistor agent KI, according to the table.

- ★ Stop the machine on level ground when cleaning or changing the coolant.
- ★ Use a permanent type of antifreeze.

If, for some reason, it is impossible to use permanent type antifreeze, use an antifreeze containing ethylene glycol.

- ★ Always add Komatsu genuine corrosion resistor agent KI. One packet of corrosion resistor agent contains 100g. The standard density of the mixture should be 7g/ℓ.

- ★ Use city water for the cooling water.

If river water, well water or other such water supply must be used, contact your Komatsu distributor.



**Antifreeze is flammable, so keep it away from any flame.**

Kind of coolant	Cleaning inside of cooling system and changing coolant	Adding corrosion resistor agent KI
Permanent type antifreeze (All season type)	Every year (autumn) or every 2000 hours whichever comes first	Every 1000 hours and when cleaning the inside of the cooling system and when changing coolant
Non permanent type antifreeze containing ethylene glycol (Winter, one season type)	Every 6 months (spring, autumn) (Drain antifreeze in spring, add antifreeze in autumn)	
When not using antifreeze	Every 6 months or every 1000 hours whichever comes first	

- Add antifreeze in the cooling water

When deciding the ratio of antifreeze to water, check the lowest temperature in the past, and decide from the mixing rate table given below.

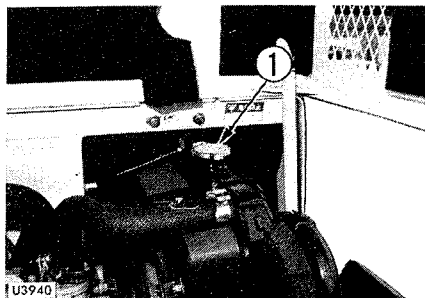
It is actually better to estimate a temperature about 10°C lower when deciding the mixing rate.

### Mixing rate of water and antifreeze

Min. atmospheric temperature (°C)	- 5	- 10	- 15	- 20
Amount of antifreeze (ℓ)	1.2	1.5	1.8	2.1
Amount of water (ℓ)	3.8	3.5	3.2	2.9

- ★ We recommend use of an antifreeze density gauge to control the mixing proportions.

### Water filler

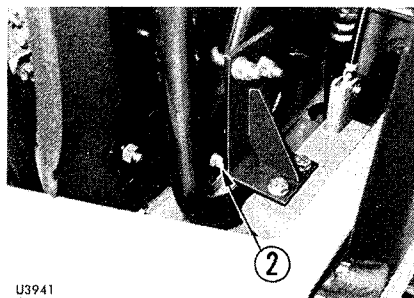


1. Stop the engine, turn radiator cap (1) slowly until it comes off.
2. Loosen drain valve (2) at the bottom of radiator and drain plug (3) at the side of cylinder block and drain off the cooling water.

**!** If the water temperature is high, do not remove the cap. This is because of the possibility of scalding water spurting out.

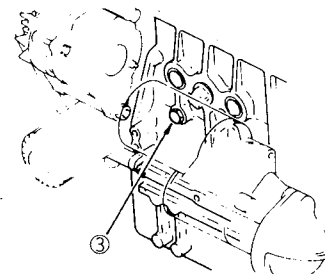
When removing the cap, turn the cap slowly to allow pressure to be relieved.

### Drain valve (radiator)

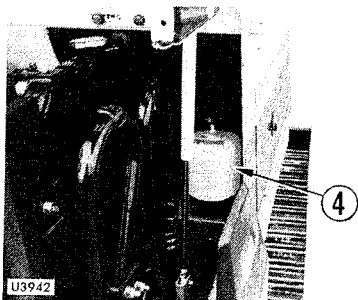


3. After draining the water, close drain valve (2) and drain plug (3), then pour in water to fill the radiator. When the radiator is full, start the engine and run it at low idling.
  4. Keep the engine running at low idling, open drain valve (2) and drain plug (3), and flush with running water for 10 minutes.
- ★ When flushing, adjust the flow so that water is added at the same rate as the water is drained to keep the radiator always full.

### Drain plug (cylinder block)



5. After washing the cooling system, stop the engine. Open drain valve (2) and plug (3) to drain water and close drain valve (2) and plug (3).
6. After draining off the cooling water, wash out the cooling system using commercially available detergent. Follow the instructions on the detergent container.

**Sub-tank**

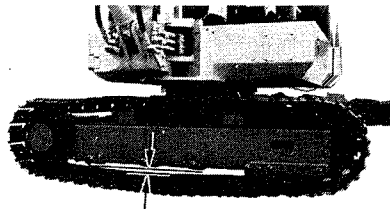
7. After washing the cooling system, drain off all the water, then close up drain valve (2) and plug (3) and pour in clean water (ex. city water) slowly up to the vicinity of the water filler.
8. When the water reaches the vicinity of the water filler, put the engine at low idling, open the drain valve (2) and plug (3), then pass water through the cooling system until clean water comes out from the drain valve and plug.
- ★ When flushing, adjust the flow so that water is added at the same rate as the water is drained to keep the radiator always full.
9. When the water becomes completely clean, stop the engine and close the drain valve (2) and plug (3).
10. Add the specified amount of the corrosion resistor agent KI to the radiator.
- ★ Use a genuine Komatsu corrosion resistor agent. For details of the adding procedure, follow the instructions on the agent.
11. Supply water until it overflows from water filler.
12. Run the engine 5 minutes at low idling and then for another 5 minutes at high idling to eliminate air trapped in the cooling system (leave radiator cap off during this operation).
13. After draining water in sub-tank (4), wash the sub-tank interior, and supply water so that the water level is between H and L marks.
14. Stop the engine and wait for about 3 minutes. Supply cooling water up to the specified level. Tighten the cap.

**c. CHECK TRACK TENSION  
(STEEL SHOES)**

The wear of pins and bushings on the undercarriage will vary with the working conditions and soil properties. It is thus necessary to continually inspect the track tension so as to maintain the standard tension on it.

If the track tension is not at the standard value, adjust it in the following manner:

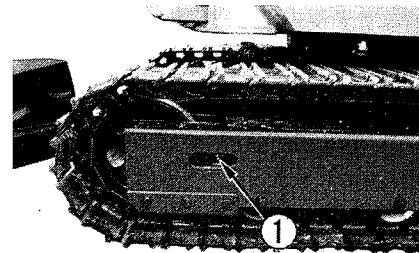
**Inspection**



U3938

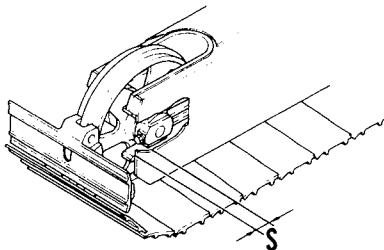
Raise the machine by means of the boom and arm, and measure the clearance between the tread of the 2nd track roller from the sprocket and the roller contact face of the track link. If the clearance is between 30 and 50 mm, the track tension is normal.

**Adjustment**



U3939

For tightening the tension, pressurize grease through lubricator (1). On the other hand, for loosening the tension, extract grease by reversely rotating lubricator (1) gradually.



Grease may be pressurized till S will be 0 mm. In case the tension is yet loose after applying pressurized injection of grease till the above-mentioned limit, it indicates that the pin bush is reduced by too much abrasion. So it is necessary either to turn or replace the pins and bushings. Consult your Komatsu distributor for repair.

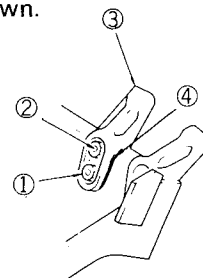


**Do not loosen the lubricator (1) over one complete rotation. Also, be careful not to loose any part other than the lubricator (1).**

**If the lubricator (1) or any other part should be loosened excessively, it will be liable to fly out under the high pressure of jammed grease. If grease does not ooze smoothly, try moving the machine back and forth for a short distance.**

#### **d. REPLACE BUCKET TEETH**

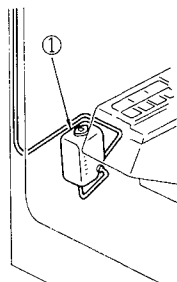
Replace the teeth before they wear down.



1. Raise the bucket to a suitable height, and fit a block under the bucket to prevent it from coming down.
- ★ Set the bottom of the bucket horizontal.
2. Remove nuts and bolts (1) and (2), then remove tooth (3).
3. Install the new tooth to the bucket.
4. Adjust clearance inserting shim (4) when finding much clearance between the teeth and the bucket.

**e. CHECK AND REFILL WINDOW  
WASHING FLUID**

Do this, when there is air in the window washing fluid.



- ★ Tightening torque of mounting bolt.  $26.5 \pm 3.5$  kgm
- ★ After using the bucket for several hours, tighten the mounting bolts again.

Check the washing fluid levels in washer tank (1). When the fluid has run short, add automotive window washing fluid.

- ★ To prevent the nozzles from clogging, be careful not to let dust get into the fluid.

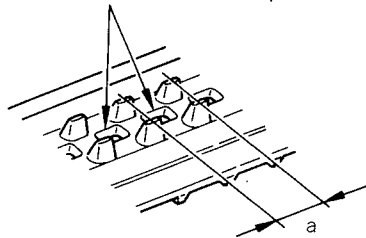
# HANDLING RUBBER SHOES

## INSPECTION OF RUBBER SHOES

Replace the rubber shoes with new parts if they are in the following condition.

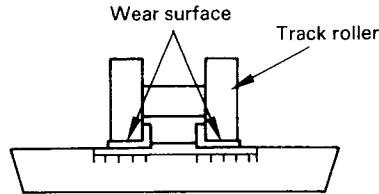
- When dimension "a" is less than 112.2 mm.

Holes in rubber for machine of sprocket

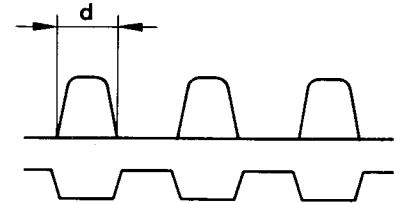


- If cracks or deep cuts reach the steel cord inside the rubber shoe, or if the steel cord is cut, replace the shoes.

- Check the contact surface between the rubber shoe and the track roller, and replace the shoe if more than half of the metal core can be seen from the rubber shoe.



- When width "d" of wire core is worn to 2/3 of the width of a new part.

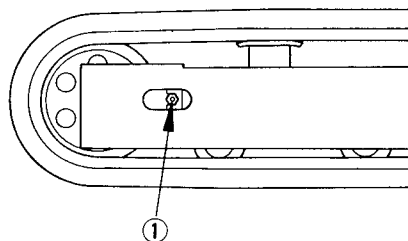


- When the wire core has come out because of excessive tension.

## REPLACEMENT OF RUBBER SHOE

### Removal of rubber shoe

1. Raise the chassis with the boom and arm.

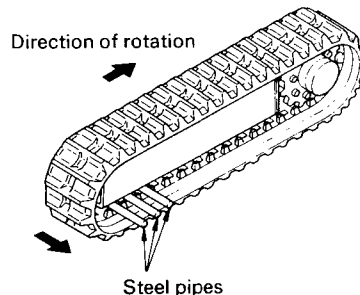


2. Loosen lubricator (1) and drain the grease inside.

**!** Do not loosen the lubricator (1) over one complete rotation. Also, be careful not to loose any part other than the lubricator (1).

If the lubricator (1) or any other part should be loosened excessively, it will be liable to fly out under the high pressure of jammed grease.

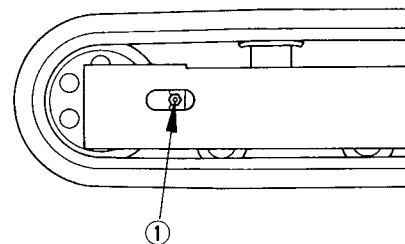
3. Fit steel pipes inside the rubber shoe, rotate the sprocket in reverse so that the steel pipes make the rubber shoe come up from the idler, then slide to the side to remove.



**!** When carrying out the above operation, check that the internal grease has all been removed before rotating the sprocket.

### Installation of rubber shoe

1. Raise the chassis with the boom and arm.

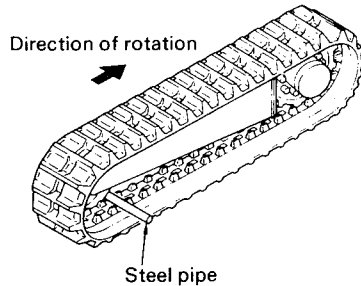


2. Loosen lubricator (1) and drain the grease inside.

**!** Do not loosen the lubricator (1) over one complete rotation. Also, be careful not to loose any part other than the lubricator (1).

If the lubricator (1) or any other part should be loosened excessively, it will be liable to fly out under the high pressure of jammed grease.

3. Mesh the rubber shoe with the sprocket and fit it over the idler.
4. Rotate the sprocket in reverse and push in the rubber shoe.



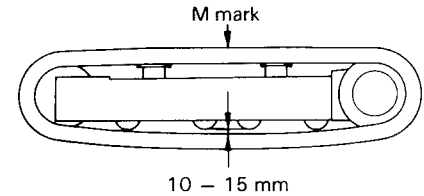
5. Using a steel pipe, fit the rubber shoe and rotate the sprocket again.
6. Check that the rubber shoe is fitted securely on the sprocket and idler.
7. Adjust the track tension.  
(For details, see CHECK TRACK TENSION.)
8. Check that the track tension is correct and that the rubber shoe is correctly meshed on the sprocket and idler, then lower the machine to the ground.

### CHECK TRACK TENSION

The wear of the rubber shoe will vary with the working conditions and type of soil. Therefore, it is necessary to inspect the wear and track tension frequently.

After fitting new parts, be sure to carry out the first inspection after 30 hours of use.

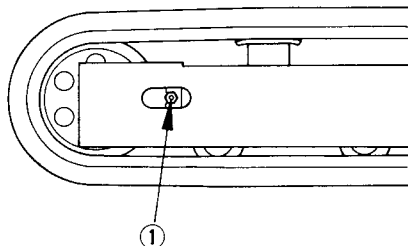
### Inspection



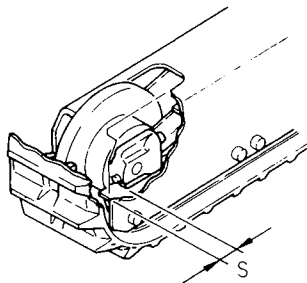
Set the connection (M mark) of the rubber shoe at the top midway between the two axles. Then use the arm and boom to raise the machine, and check the clearance between the rolling surface of the track shoe roller and the tread of the 3rd track roller from the sprocket.

The standard clearance is 10 to 15 mm. If the clearance is more than 20 mm, the tension must be adjusted.

## Adjustment



For tightening the tension, pressurize grease through lubricator (1). On the other hand, for loosening the tension, extract grease by reversely rotating lubricator (1) gradually.



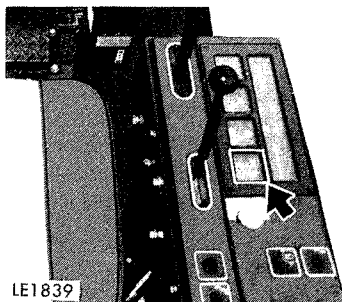
2. If the tension is slack even when dimension S is adjusted to 50 mm, it is necessary to replace the rubber shoes. Contact your Komatsu distributor for replacement.

**!** Do not loosen the lubricator (1) over one complete rotation. Also, be careful not to loose any part other than the lubricator (1).

If the lubricator (1) or any other part should be loosened excessively, it will be liable to fly out under the high pressure of jammed grease. If grease does not ooze smoothly, try moving the machine back and forth for a short distance.

## SERVICE METER

This meter indicates the integrated work hours. So, use it according to the following instructions.



- Record the readings at the start and the end of work, this is the work record of the machine.
- This record will indicate, when periodical maintenance is due.
- It also indicates the integrated working hours when machine problems are encountered.

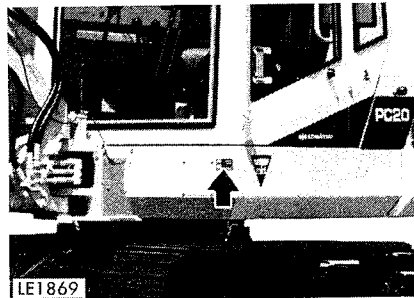
### ★ How the meter progresses

This meter shows the total operation hours of the machine. As long as the starting switch is put in ON position, this meter indicates every 1/10 hour of operation regardless of the engine speed. The lowest figure indicates 6 minutes of operation.

# MACHINE AND ENGINE SERIAL NUMBERS

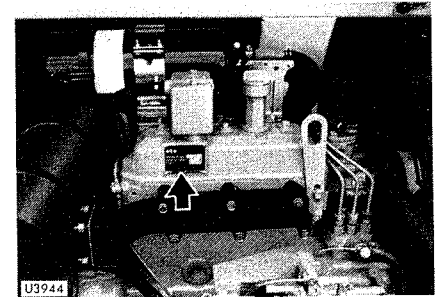
When calling for a service of mechanic or when making replacement-parts order, be sure to give Komatsu distributor the machine and engine serial numbers as well as the service meter reading before mentioned. These numbers are found on the plates shown in the photos below.

- Location of the machine serial number mark



This is seen on the front left of the frame.

- Location of the engine serial number mark



This is seen on the upper left of the cylinder head, when seen from the fan side.

# FUEL, COOLANT AND LUBRICANTS

## PROPER SELECTION OF FUEL, COOLANT AND LUBRICANTS

RESERVOIR	KIND OF FLUID	AMBIENT TEMPERATURE					CAPACITY (ℓ)	
		14 -10	32 0	50 10	68 20	86° F 30° C	Specified	Refill
Engine oil pan	Engine oil			SAE 30			4.6	4.5
		SAE 10W						
Swing machinery case							1.5	1.3
Final drive case (each)				SAE 30			1.2	1.2
				SAE 10W				
Hydraulic tank	Engine oil			SAE 10W-30			48	35
				SAE 15W-40				
Fuel tank	Diesel fuel	*					50	—
			ASTM D975 No. 2					
Cooling system	Water	Add antifreeze					5	—

\* ASTM D975 No. 1

**NOTE:**

- (1) When fuel sulphur content is less than 0.5%, change oil in the oil pan every periodic maintenance hours described in this manual.  
Change oil according to the following table if fuel sulphur content is above 0.5%.

Fuel sulphur content	Change interval of oil in engine oil pan
0.5 to 1.0%	1/2 of regular interval
Above 1.0%	1/4 of regular interval

ASTM: American Society of Testing and Material

SAE: Society of Automotive Engineers

API: American Petroleum Institute


- (2) When starting the engine in an atmospheric temperature of lower than 0°C, be sure to use engine oil of SAE10W, even though an atmospheric temperature goes up to 10°C more or less in the day time.
- (3) Use API classification CD as engine oil and if API classification CC, reduce the engine oil change interval to half.

Specified capacity: Total amount of oil including oil for components and oil in piping.

Refill capacity: Amount of oil needed to refill system during normal inspection and maintenance.

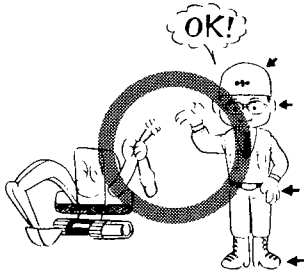
# **SAFETY AND OPERATION**

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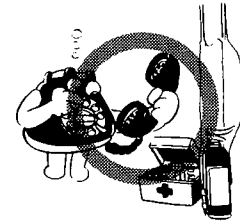
## SAFETY HINTS • • •

### OPERATION GENERAL

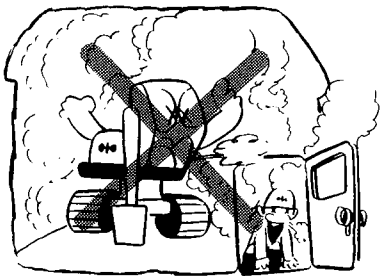


- Wear well-fitting helmet, safety shoes and working clothes. If the nature of the work requires safety, wear protective goggles or mask, thick gloves, ear plugs or other protection.

- Accidents or injuries are liable to occur when the operator is careless or slack. It is most important to bear safe operation in mind at all times.
  - Take care of your health. Do not operate when tired, or after drinking.
  - Learn the prohibitions, cautions and rules about work procedures in the work site.
- When there is a leader, fix standard signals and always follow these signals when operating.



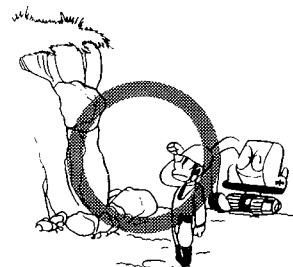
- If there should be an accident or fire or any other such unexpected mishap, deal with it quickly, using the nearest apparatus. Learn beforehand the locations of the first aid boxes and fire extinguishers and how to use them. It is also important to know the emergency contact system.
- Learn about the safety devices on your own machine and about how to use them. Confirm that they are correctly attached in the prescribed position. Such safety devices include:
  - ★ Protective-Devices
  - ★ Seat Belts



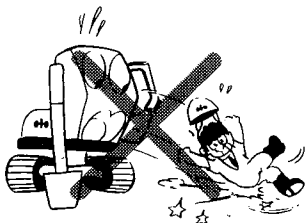
- Exhaust gas is dangerous. When running the engine for long periods in a poorly ventilated area, there is a danger of gas poisoning, so open the windows or doors to ensure a good supply of fresh air.
- Read the Operation and Maintenance Manual carefully. Learn how to use the control devices, gauges and warning devices. Be sure you understand the meaning of the caution plates. Remember the check points and checking method for engine oil, fuel, cooling water and hydraulic oil levels.

- When operating inside a building always be sure of the clearance of the ceiling, entrances, aisles, etc. and the load limit of the floor.
- Never allow other person than the operator to ride on the machine during operation.

## BEFORE STARTING OPERATION



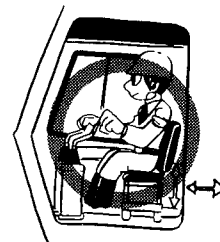
- Examine the lay of the land and the kind of soil at the work site to determine the dangerous points and the best method of operation.  
Proceed with the work only after making safety arrangements about the dangerous points.
- Inspect leakages from the fuel, lubricating and hydraulic systems. Check that the shoe bolts are not loose, and that no other parts are damaged or missing. Machines having such failures should not be operated.



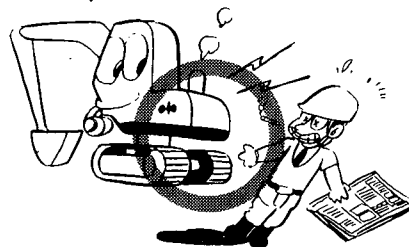
- When getting on or off the machine, use the handrail provided. Do not jump up or down from the machine.



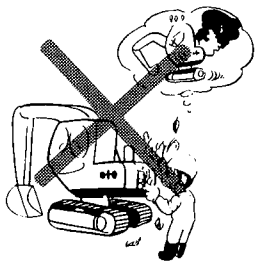
- Do not leave parts or tools lying around in the vicinity of or on the floor of the operator's cab. Keep everything in its proper place.
- Wipe off thoroughly any grease, oil or mud on the handrail, floor or control levers. Failure to do this may cause you to slip.
- Check the level of the fuel, lubricants and cooling water. Extinguish cigarettes before checking or replenishing. Check that the radiator cap and each oil filler caps or plugs are firmly tightened.



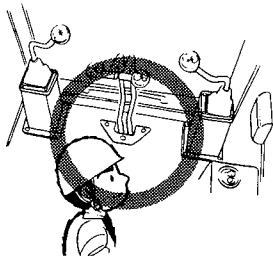
- Adjust the operator's seat until it is in the most comfortable position for operating. Always sit in the seat while operating. Do not operate the machine from any other position.



- To ensure the safety of workers near the machine, always sound the horn to warn them before starting the engine and moving the machine. Be particularly careful to check that the rear is clear before backing the machine.



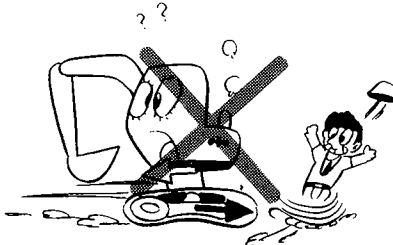
- Inspect the inside of the engine room and remove any dead leaves or papers. Dead leaves or papers are highly inflammable and can cause fires.



- Before starting the engine, confirm that all control levers are in **NEUTRAL**.

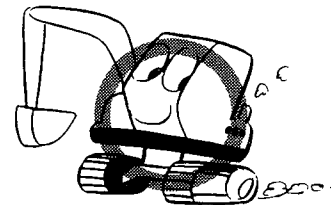
## AFTER STARTING THE ENGINE

- Confirm that all gauges and warning devices are functioning correctly, and that the gauge readings are within the prescribed range.
- Check the play and travel of each lever.
- Operate the working equipment to confirm that they are functioning normally.



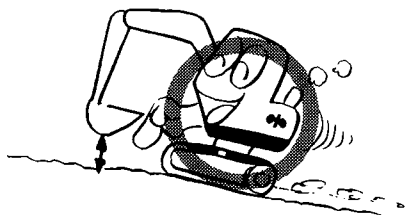
- Before operating the traveling and steering levers, check whether the track frame is forward or backwards. If the track frame is facing backwards, operate the traveling and steering levers in the reverse manner to that when the track frame is facing forward.

- Move the machine slowly and listen carefully to the engine or gears to confirm that they are not making any unusual noises.

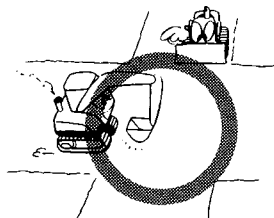


- Choosing a safe place, turn the machine to the left and right to confirm that the traveling and steering levers are functioning normally.
- If these tests reveal anything wrong, however slight it may be, contact the man in charge of the machine and operate the machine only after obtaining his permission.

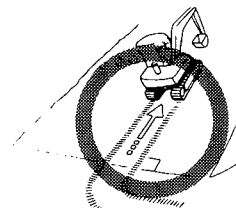
## DURING OPERATION



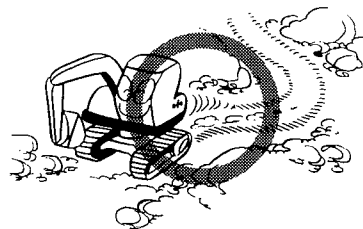
- Maintain the bucket at a height of 40 to 50 cm above the ground so that it can be quickly lowered to the ground and the machine stopped in an emergency.
- As far as possible, operate the machine so that it does not tilt. (Do not tilt it by more than 35° in either the forward, rear, left or right directions, even under static conditions.)



- Always operate slowly in crowded places. On haul roads or in narrow places, give way to loaded vehicles.
- Do not allow unauthorized persons into the work area.
- Before reversing or turning, ensure that there is nobody in the vicinity. Also, be careful of obstacles.



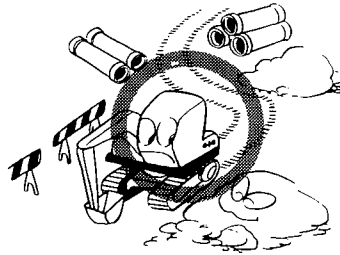
- When operating on slopes, as far as possible, avoid turning the machine on a slope. It may cause the machine to roll over or slip sideways.



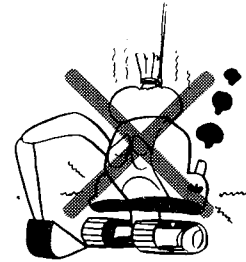
- When operating the machine along a road, retract the working equipment to improve machine stability. As far as possible proceed along a flat road.



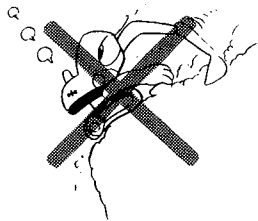
- The machine should always be operated at a speed where it can be correctly controlled. Never do the following:
  - 1) Speeding
  - 2) Sudden starting, sudden braking, sudden turning.
  - 3) Snaking
  - 4) Coasting
- When operating on uneven ground or in places where there are obstacles, remember the following points:
  - ★ Operate at as low a speed as possible and avoid sudden changes in direction.



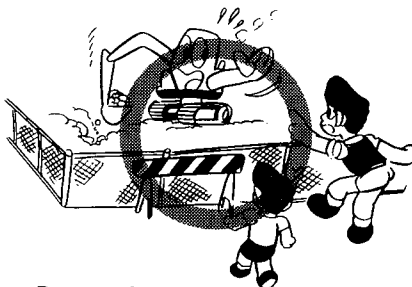
- ★ Wherever possible, avoid traveling over large rocks, fallen trees, tree stumps and other such obstacles. Either use the working equipment to remove them, or travel round them. When it is impossible to avoid traveling over them, reduce speed and mount over the obstacle. Just before the front of the machine tips down, reduce speed even more to make the shock of hitting ground as small as possible.
- ★ Never mount over an obstacle at an angle; never disengage one traveling and steering lever to travel over an obstacle.



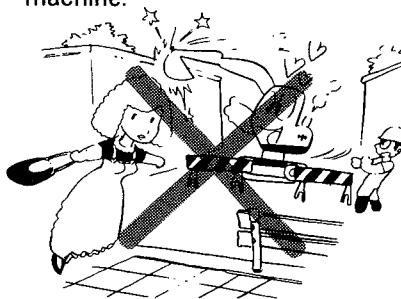
- The machine condition can be judged from many factors. Changes in the gauges, sound, vibration, exhaust gas color or response of the control levers can indicate the occurrence of some disorder. If any disorder occurs, park the machine immediately in a safe place and take appropriate action. Be especially careful in the case of a fuel leak as there is danger of fire.



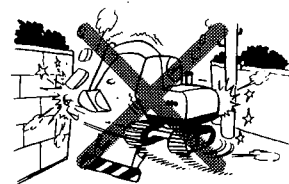
- The work area should be made as flat as possible. If the work area is flat, operation is made much easier and this reduces operator fatigue.
- Always concentrate. It is extremely dangerous to allow yourself to be distracted or to think of other things when operating a machine. In dangerous places, or where there is restricted visibility, it is important to get down from the machine and confirm whether it is safe before continuing work.



- Be careful of those around you, and always confirm that there is no person or obstacle in the way before moving or turning the machine.

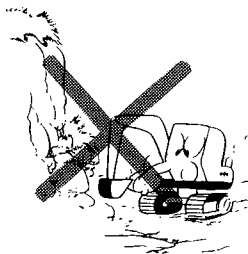


- When using the working equipment, be sure to keep your eyes on it all the time. Failure to do this may result in an accident.

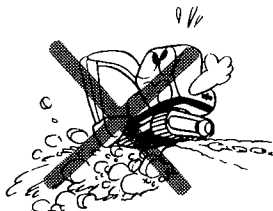


- When passing through a narrow space, be careful of the side and overhead clearances. Take special care not to touch any obstacles on either side or overhead. If necessary, have someone outside the machine call out instructions.
- Be careful not to operate the machine into a bog. In the event that the machine goes into a bog, extract it in the following manner;
  - 1) If only one track of the machine is in the bog, push the bucket down against the ground on the side of the machine which is stuck so as to float the track. Then place logs or timber underneath the track and free the machine.

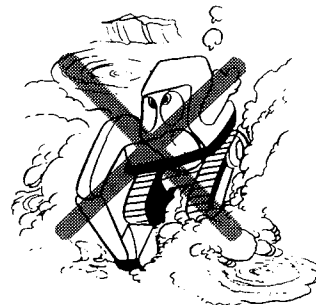
- ★ When raising the undercarriage by means of the boom or arm, push the bottom of the bucket against the ground (on no account use the teeth) until the angle between the boom and the arm is  $90^{\circ}$  to  $110^{\circ}$ .
- 2) If both tracks of the machine are in the bog and slip, preventing the machine from getting in, place logs or timber under the tracks in the manner described in 1), then thrust the bucket into the soil in front of the machine and drag it out by bending the arm in the same manner as when excavating and putting the traveling and steering lever into the forward position.



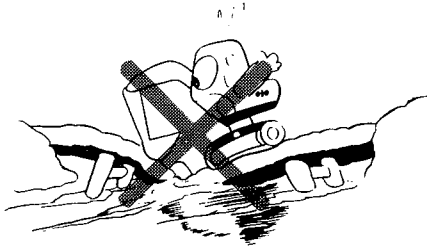
- After earthquakes, confirm that the ground is still firm; after blasting, confirm that there are no unexploded charges remaining.



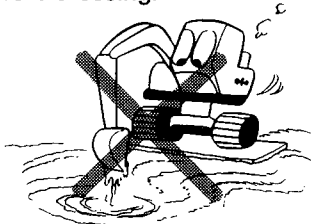
- When working on river embankments or other places made of piled soil, there is the danger that the weight of vibration of the machine may cause the machine to sink into the piled soil, so be extremely careful when operating in such places.



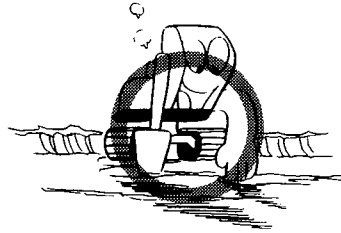
- When continuing operations after rain, remember that conditions will have changed from those before the rain started, so proceed with caution. Be particularly careful when approaching the shoulder of the road or cliffs, as they may have been loosened by the rain.



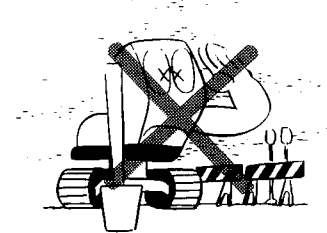
- Check the load limits of bridges before crossing.



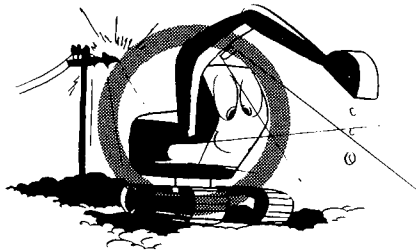
- When working in water or marshy ground, be careful of the following:
  - ★ When working on soft ground, place thick boards on the ground to prevent the machine sinking. Place the boards horizontally and arrange them as neatly as possible.



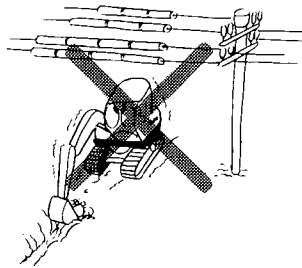
- When operating in water or when crossing shallows, first check the bed soil condition and the depth and flow speed of water, then proceed, taking care not to go beyond the permitted depth.
  - ★ First check the water depth, the firmness of the ground and the strength of the current. Do not enter if the water exceeds the permissible depth (up to the bottom of the swing circle).



- When operating in fog, mist or smoke, where visibility is bad, be especially careful to confirm first whether operation is safe. When visibility drops below safety level, stop work and wait for the visibility to improve.



- When operating at night, remember the following points:
  - ★ Be sure to arrange an adequate lighting system.
  - ★ At night it is very easy to make mistakes in assuming the distance and height of objects and land.

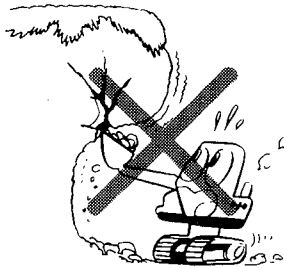


- Be very careful not to touch electric wires, always bearing in mind that there is a possibility of receiving an electric shock.
- ★ Wear rubber or leather soled shoes.
- ★ Position a full-time watcher at the site to ensure that operator is not exposed to the risk of electric shock.

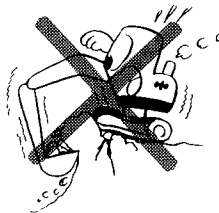
- ★ Depending upon the supply voltage it is conceivable that an electric shock may be received by merely coming into the vicinity of an electric feeder wire. Accordingly, observe the minimum distances given in the table below, taking into account the inertia of the boom when in motion.

Supply voltage (number of insulators)	Minimum safe separation
6.6 kv (distribution line)	3 m
33.0 (1 to 3 insulators)	4 m
66.0 (5 to 8 insulators)	5 m
154.0 (10 to 18 insulators)	8 m
275.0 (16 to 30 insulators)	10 m

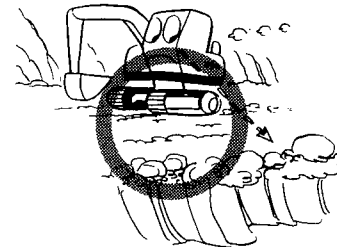
- ★ Become familiar with the necessary measures to be taken in the event that a operator receives an electric shock.



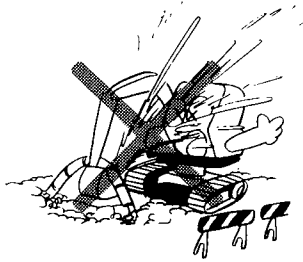
- Do not perform excavation at the bottom of a precipice as it is dangerous practice.
- If it is unavoidably necessary to operate the working equipment lever when traveling the machine in the vicinity of a precipice, road shoulders, on sloping ground or through a confined space, stop the machine momentarily before operating the working equipment lever in order to minimize danger.



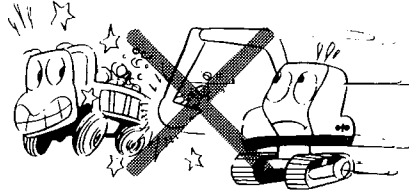
- When working on loose, crumbly soil, do not dig deeply and back the machine off smartly. If the ground crumbles, preventing the machine from getting away in time, do not panic and raise the working equipment. It is often better in the interests of stability to leave it down.
- Do not undercut the machine, unless absolutely necessary. If necessary, always take care to prevent the machine falling.



- When operating at the edge of a cliff or on the shoulder of a road, remember the following points:
  - ★ When operating in a place where there is danger of the machine falling over the side, be doubly careful. Do not approach the edge of the cliff or road shoulder by mistake.

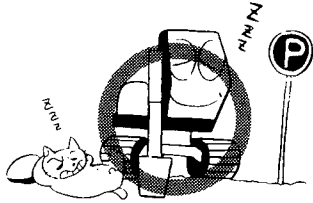


- If you suspect that there are buried facilities (water or gas pipes, etc.) at the work site, check with the companies responsible for looking after such facilities and also try a different method of excavation. Then, after confirming the existence and location of such facilities, carefully carry out excavation work.



- Take care not to swing the bucket against the sides of trenches or dump trucks. Load the truck from the rear.

## PARKING



- When parking the machine, park it in a safe place outside the working area, or in the specified place. The following factors should be considered when choosing a parking place: it should be on flat, firm ground where there is no danger of rock-falls, landslides or floods. If the machine has to be parked on a slope, it should be parked facing directly up or down the slope, and chocks should be placed under the tracks. When the machine is facing downhill, lower the bucket so that it cuts slightly into the ground to further increase the safety.

- When parking the machine, return the working equipment levers to neutral, apply the brake lock, lower the bucket to the ground, and put all safety levers in the lock position. Switch off the engine and remove the key.



- Before leaving the machine, carry out the following:
  - ★ Apply the swing lock.
  - ★ Lower the bucket to the ground.
  - ★ Put the working equipment lever in neutral and lock it.
  - ★ Stop the engine and remove the key to prevent other people using the machine.
  - ★ Lock the cab.

# HANDLING OF BATTERY

## PRECAUTIONS FOR CHARGING BATTERY

1. Before charging, disconnect the cable from the negative (—) terminal of the battery. Otherwise, an unusually high voltage will damage the alternator.
2. While charging the battery, remove all battery plugs for satisfactory ventilation. To avoid gas explosions, do not bring fire or sparks near the battery.
3. If the electrolyte temperature exceeds 45°C, stop charging for a while.
4. Turn off the charger as soon as the battery is charged. Overcharging the battery may cause followings:
  - 1) Overheating the battery
  - 2) Decreasing the quantity of electrolyte.
  - 3) Damaging the electrode plate.
5. If the electrolyte gets on your skin or clothes, immediately wash with plenty of clean water.
6. Do not mix up cables (positive (+) to negative (—) or negative (—) to positive (+)), as it will damage the alternator.
7. When inspecting or servicing a battery, be sure to stop the engine and turn the starting switch key to “OFF” position.
8. When performing any service to battery besides checking the electrolyte level or measuring the specific gravity, disconnect cables from the battery.

## REMOVAL AND INSTALLATION OF BATTERY

- When removing battery, first disconnect the cable from the ground (normally, from the negative (–) terminal). If a tool touches a cable connecting the positive terminal and the chassis, there is danger of sparks being emitted.
- When installing battery, the ground cable should be connected to the ground terminal as the last step.

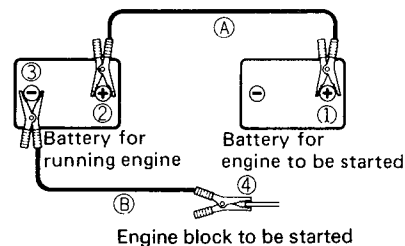
## STARTING ENGINE WITH A BOOSTER CABLE

**When starting up the engine with a booster cable, do as follows:**

1. Before connecting the booster cable
  - 1) Size of booster cable and clip should be suitable for the battery size.
  - 2) Check cables and clips for breaks, corroded surfaces, etc.
  - 3) Make sure cables and clips are firmly secured.
  - 4) Keep the starting switch in "OFF" position.
  - 5) The battery of the running engine must be the same capacity as that of engine to be started.

2. Connect the booster cables in the following manner.

- 1) Connect one clip of booster cable A to the positive (+) terminal of the engine to be started.
  - 2) Connect the other clip to the positive (+) terminal to the engine which is running.
  - 3) Connect one clip of booster cable B to the negative (–) terminal of the engine which is running.
  - 4) Connect the other clip to the engine block to be started.
- ★ Make sure the clips are firmly connected to battery terminals. Then, start the engine.



**⚠ When connecting the cables, never contact the positive (+) and negative (−) terminals.**

**⚠ Make sure that the booster cable connections are correct. Connect the booster cable to the engine block as far as possible from the battery.**

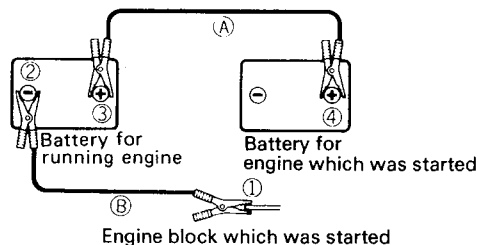
### 3. Starting engine

- 1) Turn the starting switch to START position and start up the engine.
- 2) If the engine doesn't start at first, try again after 2 minutes or so.

**After the engine has started, the booster cables should be disconnected in the reverse order in which they were connected.**


1. Disconnecting the booster cables
  - 1) Disconnect the clip of booster cable B from the engine block which was started.
  - 2) Disconnect the other clip from the negative (−) terminal of the running engine.

- 3) Disconnect the clip of booster cable A from the positive (+) terminal of the running engine.
- 4) Disconnect the other clip from the positive (+) terminal of the engine which was started.



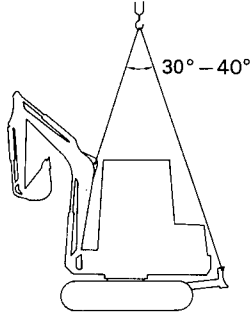
# TRANSPORTATION

**When transporting the machine, observe the various road rules, road transportation vehicle laws and vehicle limit ordinances, etc. It is a good idea to obtain a special platform for loading and unloading the machine. When it is unavoidably necessary to use a gangplank, however, at the very least observe the following for the sake of safety.**

1. Properly apply the brakes on the trailer and insert blocks beneath the tires to ensure that it does not move. Then fix the gangplank in line with the centers of the trailer and the machine.
  - ★ Make sure the gangplank has sufficient width, length and thickness to enable the machine to be safely loaded and unloaded. If the gangplank sags appreciably, reinforce it with blocks, etc.
  - ★ Lock the upper works using the swing lock lever.
2. Determine the direction of the gangplank, then slowly load or unload the machine.
  - ★  **Remove the mud from the undercarriage to prevent the machine from slipping to the side on slopes.**
3. Correctly load the machine onto the specified part of the trailer. After loading the machine, fully extend the bucket and arm cylinders, then slowly lower the boom.
  - ★ When transporting the machine, place rectangular timber under one end of the bucket cylinder to prevent it touching the ground, thereby saving it from possible damage.
4. When transporting the machine, place rectangular timber underneath the front and rear track shoes to prevent the machine from moving about. Also, hold it down with chains or rope. Be particularly careful to ensure that the machine does not slip sideways.
5. Lock the swing lock lever and apply the lock to the work equipment levers.
  - ★ Determine the route for transporting the machine by taking into account the width, height and weight of the machine.

# METHOD OF RAISING THE MACHINE

Raise the machine as follows.



1. Rotate the upper structure so that the blade is at the rear of the machine, then apply the swing lock.
2. Raise the blade fully.
3. Extend the bucket cylinder, arm cylinder, and boom cylinder fully, then set the work equipment control levers at neutral, and apply the safety lever.
4. Center the boom swing, then set the boom swing control lever at neutral, and apply the safety lever.

5. Install shackles to both ends of the blade and to the lifting brackets on the boom (4 places), then fit the wire rope securely.

- ★ Always use the brackets at 4 places.
- 6. Make the angle of the wire rope approx. 30° – 40° when raising.
- ★ When raising, pay attention to the center of gravity and be extremely careful to maintain the balance.
- ★ Never attempt to raise the machine with the boom swing or upper structure at an angle.



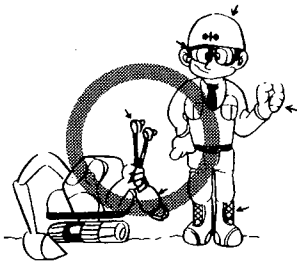
**Do not raise the machine with any worker on the machine.  
This is extremely dangerous.**



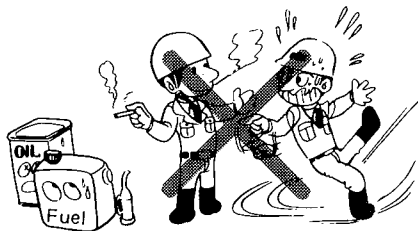
**When raising the machine, be sure to use wire ropes that are of ample capacity for the weight of the machine.**

## PRECAUTION FOR MAINTENANCE

### SAFETY ..... ⚠

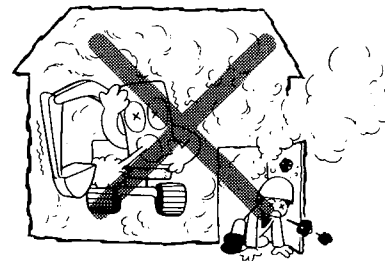


- Wear well-fitting helmet, safety shoes and working clothes. When drilling, grinding or hammering, always wear protective goggles.

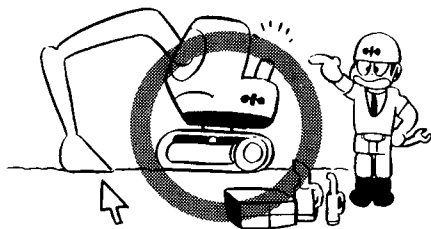


- Fuel or oil are dangerous substances. Never handle fuel, oil, grease or oily clothes in places where there is any fire or flame. As preparation in case of fire, always know the location and directions for use of fire extinguishers and other fire-fighting equipment.

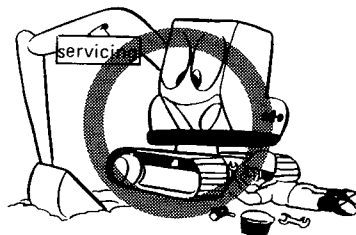
- Do not handle electrical equipment while wearing wet gloves, or in wet places, as this can cause electric shock.
- During maintenance do not allow any unauthorized person to stand near the machine.



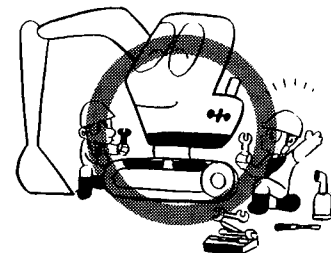
- Exhaust gas is dangerous. When working inside, be particularly careful to have good ventilation.



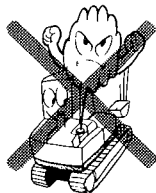
- Unless you have special instructions to the contrary, maintenance should always be carried out with the engine stopped. Lock the swing lock lever and also all of the safety levers. If maintenance is carried out with the engine running, there must be two men present: one sitting in the operator's seat and the other one performing the maintenance. In such a case, never touch any moving part.



- When working underneath the machine, place a sign to that effect on the operator's seat and, if necessary, put a similar signs in the vicinity as well.
- Do not go underneath the machine after raising it up using the boom and the arm.



- When working with others, choose a group leader and work according to his instructions. Do not perform any maintenance beyond the agreed work.
- When maintenance has to be carried out with the working equipment raised, they must be securely supported by blocks.



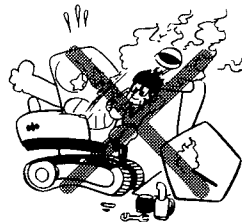
- Always remember that the hydraulic oil circuit is under pressure. When feeding or draining the oil or carrying out inspection and maintenance, release the pressure first.

#### Method of relieving pressure

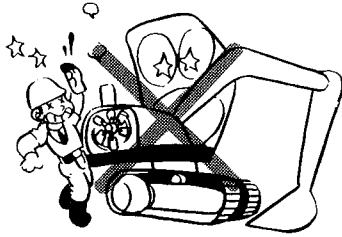
- 1) Lower the working equipment to the ground and stop the engine after idling it for two or three minutes. Then operate the various operation levers. (working equipment, traveling and steering lever through their full stroke in each direction)

When removing air instruments or pipings, open the drain valve under the air reservoir to relieve air pressure.

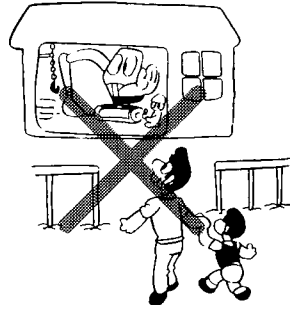
- 2) Gradually unscrew the cap of the hydraulic tank and leave it for a few minutes.



- Flames should never be used instead of lamps. Never use a naked flame to check leaks or the level of oil, fuel, antifreeze or electrolyte.
- Immediately remove any oil or grease on the floor of the operator's compartment, or on the handrail. It is very dangerous if someone slips while on the machine.
- Be particularly careful when removing the radiator cap. If this is done immediately after using the machine, there is a danger that boiling water may spurt out.



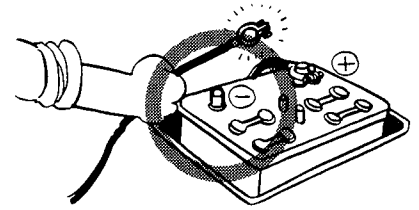
- Do not check the fan belt tension while the engine is running. Be sure to turn off the engine before inspecting other rotating parts and the vicinity thereof.



- Do not allow anybody other than the necessary workers to go near the machine while it is being inspected or maintained. Also, be careful of people in the vicinity. It is necessary to exercise particular care when performing grinding or welding, or when swinging a large hammer.



- Use the tool which is suitable for the maintenance work.



- Remove the minus terminal from the battery in maintaining the electrical system.
- When the tracks are removed, never put your fingers between the shoes.
- When carrying out other difficult maintenance works, carrying them out carelessly can cause unexpected accidents. If you consider the maintenance is too difficult, always request Komatsu distributor to carry out it.

## MISCELLANEOUS

- Thoroughly wash the machine, particularly the oiling and greasing parts and the vicinity, thereof, in order to prevent the ingress of dust.
- Use genuine Komatsu replacement parts specified in the parts list.
- Use Komatsu specified oil and grease. Use oil and grease having the recommended viscosity for the particular ambient temperature.
- Use clean oil and grease and keep them in clean containers to avoid the ingress of dust.
- Inspect or replace oil in a dust-free location to prevent the ingress of dirt.
- Drain off used oil after heating it to a suitable temperature (about 20 to 40°C).
- When the strainer is located in the oil filler, the strainer must not be removed while adding oil.
- When adding oil or checking the oil level, check that the oil is at the correct level.
- After greasing up, always wipe off the old grease that was forced out.
- When changing the oil or filter, check the drained oil and filter for any signs of excessive metal particles or other foreign materials.
- When removing parts containing O-rings, gaskets or seals, clean the mounting surface and replace with new sealing parts.
- When washing the machine, ensure that water does not get onto the alternator.
- Special measuring apparatus is needed for testing hydraulic pressure.
- Thoroughly wash the machine. In particular, be careful to clean the filler caps, grease fittings and the area around the dipsticks. Be careful not to let any dirt or dust into the system.
- When check an open cover there is a risk of dropping things in. Before removing the covers to inspect cover, empty everything from your pockets. Be particularly careful to remove wrenches and nuts.

- When working on the sea shore, check that the various plugs and valves, etc., are tightened up properly. After the completion of work, thoroughly wash the machine and carefully clean all electrical equipment to ensure that it does not corrode.
- Before working in muddy water, rain or snow, check that the various plugs, valves, are properly screwed up. Upon completion of work, wash the machine, then check the various parts of the machine for cracking, scratching, loose or missing nuts and bolts. Also, oil and grease the various parts of the machine.
- When working in a dusty location, be careful of the following:
  - 1) Inspect the dust indicator to see whether the air cleaner is blocked up. Clean the air cleaner as soon as it becomes dirty.
  - 2) Clean the radiator core so that it does not become blocked up.
  - 3) Clean or replace the fuel filter as soon as it becomes dirty.
  - 4) Clean the electrical equipment, particularly the starting motor and alternator, to prevent accumulation of dust.
- When working on rocky ground, be careful of damage to the undercarriage, loose nuts and bolts, cracks, wear and other damage. Also, adjust the track tension so that it is a little slacker than usual.
- When installing car radio and a walkie-talkie or citizen band, contact your Komatsu distributor.
- When washing the machine, take care not to splash water over the electrical equipment. If it is soaked with water, it may not operate normally.
- After disconnecting the connector, cover it with a vinyl bag to prevent oil or dust from sticking to its contact section.
- When welding, be careful of the following:
  - 1) Turn OFF the power (starting switch).
  - 2) Do not continuously apply more than 200 V.
  - 3) Install the ground cable at least 1 m from the range to be welded.
  - 4) Take care not to install the seals between the grounded point and the range to be welded.

## PRECAUTIONS FOR MAINTENANCE

- After replacing oil, filter element or strainer, bleed the air from the circuit.
- After replacing hydraulic oil and filter element, or replacing the hydraulic cylinder or the piping system for the machine, the air vent operation is necessary. Low-idle the engine, and proceed as follows:
  1. Extend and contract each cylinder 4 to 5 times, taking care not allowing it to reach its stroke end (i.e., allowing it to return from a point of about 100 mm before the stroke end.)
  2. Then, extend and contract each cylinder 3 to 4 times up to the stroke full end.
- ★ Sudden running of the engine at a high speed and allowing of the cylinder to reach the stroke end cause damage to the piston packing, etc. due to the air trapped in the cylinder.

# STORAGE

## BEFORE STORAGE

To place the machine in storage for an extended period of time, the following measures must be taken to insure that it can be returned to operation with minimum of service.

- After every part is washed and dried, the machine shall be housed in a dry building. Never leave it outdoors.  
In case it is indispensable to leave it outdoors, lay wood plates on the ground, and park the machine on the wood plates and cover it with canvas etc.
- Completely fill fuel tank, lubricate and change oil before storage.
- Apply a thin coat of grease to metal surface (hydraulic piston rods and front idler adjusting rods).
- As to batteries, remove the terminals and cover them, or remove them from the machine and store separately.

- When the ambient temperature is anticipated to drop below 0°C, always add antifreeze in the cooling water.
- The fuel control lever shall be set to STOP position.

## DURING STORAGE

- Operate the engine and move the machine for a short distance once a month so that new oil film will be coated over movable parts and component surfaces.
- Before operating the work equipment, wipe off the grease on the hydraulic piston rod.



**If it is unavoidably necessary to carry out rust-preventive operation while the machine is indoors, open up doors and windows to improve ventilation and prevent the gas poisoning.**

## AFTER STORAGE

After storage (when it is kept without cover or the rust-preventive operation once a month is not made), you shall apply the following treatment before operation.

- Loosen the drain plugs on oil pan and other cases and drain mixed water.
- Remove the cylinder head cover and lubricate sufficiently valves and rocker arms. And inspect the valve operation.
- After the engine is started, operate it until it is warmed up completely.

## COOLANT AND LUBRICANTS

No.	Supplier Name	Engine Oil [CD] SAE10W, SAE30, SAE10W/30, SAE15W/40	Grease [Lithium-Base] NLGI-2	Anti-Freeze Coolant [Ethylene Glycol Base] [Permanent Type]
1	AGIP	Diesel Sigma S Superdiesel Multigrade	GR M	—
2	AMOCO	Amoco 300	Super Permalube Grease	—
3	ARCO	Arco Fleet S-3 Plus	Litholine H-EP	—
4	BP	Vanellus C-3	Energrease L2 Energrease LS2	Antifreeze
5	CALTEX	RPM Delo 300 RPM Delo 400	Marfak Multipurpose Marfak All Purpose	AF Engine Coolant
6	CASTROL	RX Super CRD	LM Grease	Antifreeze
7	CHEVRON	Delo 300 Delo 400	Multi-Motive Grease Ultra-Duty Grease 2	—
8	ELF	Multiperformance 3C Performance 3C	Multi EPEXA 2	Glacelf
9	EXXON (ESSO)	Essolube D-3 Essolube XD-3 Essolube XD-3 Extra	Multi Purpose Grease Beacon EP2	—

No.	Supplier Name	Engine Oil [CD] SAE10W, SAE30, SAE10W/30, SAE15W/40	Grease [Lithium-Base] NLGI-2	Anti-Freeze Coolant [Ethylene Glycol Base] [Permanent Type]
10	GULF	Super Duty	Gulfcrown Grease No. 2 Gulfcrown EP Special Grease No. 2	Cruisemaster Antifreeze and Summer Coolant
11	MOBIL	Delvac 1300 Delvac 1400 Delvac 1400 Super	Mobilgrease MP Mobilgrease 77 Mobilgrease 532 Mobilux EP2	Permazone
12	PENNZOIL	Supreme Duty Fleet Multi-Duty	Multi-Purpose No. 705 Wheel Bearing No.707L	Anti Freeze & Summer Coolant
13	SHELL	Rimula Rimula X	Alvania Grease EP	—
14	SUN	Sunfleet Dieselube XL Sunfleet Super C	Sunfleet HP Sun Prestige 742 EP	Sunoco Multi-Season Anti-Freeze
15	TEXACO	Ursa Super Plus Ursa Oil LA Ursa Super LA	Marfak All Purpose Marfak Multi Purpose 2	Startex AF & Summer Coolant
16	TOTAL	Rubia S Rubia x	Multis EP2	Antifreeze
17	UNION	Guardol	Unoba EP	—