Operation & Maintenance Manual

SEAM0154C03

D85A,E-18

BULLDOZER

SERIAL NUMBERS D85A-26001 and up
D85E-26001

KOMATSU

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.

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 250 hours of operation*, the machine should be maintained in the following manner:

1) Checking and adjustment of engine valve clearance
2) Replacement of engine fuel filter elements
3) Replacement of corrosion resistor element
4) Replacement of engine oil, hydraulic oil, transmission and steering clutch oil and all oil filter elements.

(For replacement procedure, refer to EVERY 250 HOURS SERVICE, EVERY 500 HOURS SERVICE, EVERY 1000 HOURS SERVICE and EVERY 2000 HOURS SERVICE).

★ When replacing oil filter elements (cartridges), check their interiors for dirt and dust. If heavily collected, check for possible cause before starting operation.

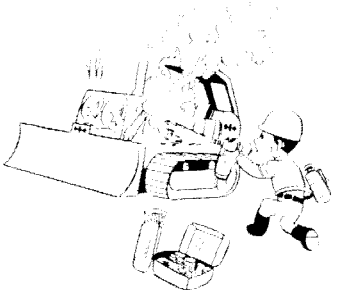
* Hours of operation are indicated by the service meter.

CONTENTS

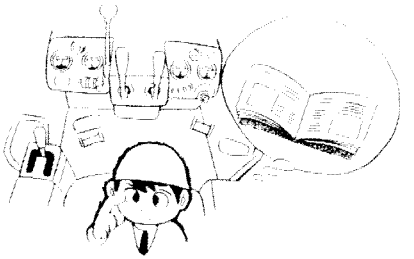
SAFETY HINTS · · · ⚠

OPERATION
GENERAL

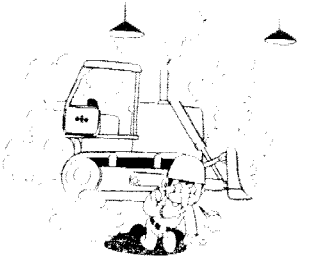
- Wear well-fitting helmet, safety shoes and working clothes. If the nature of the work requires safety, wear protective goggles or mask, thick gloves, ear plugs or other protection.
- Accidents or injuries are liable to occur when the operator is careless or slack. It is most important to bear safe operation in mind at all times.
- Take care of your health. Do not drive 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.



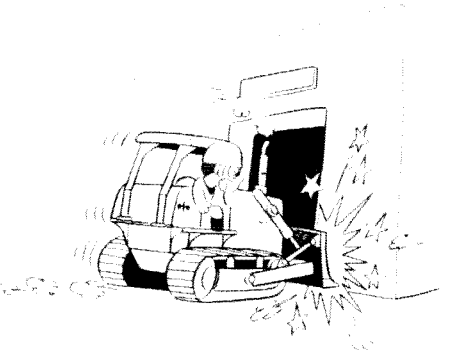
- If there should be an accident or fire or any other such unexpected mishap, deal with it quickly, using the nearest apparatus.
  Learn beforehand the locations of the first aid boxes and fire extinguisheis and how to use them. It is also important to know the emergency contact system.
- Learn about 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:
  - ★ Guards
  - ★ Canopies
  - ★ Protective Devices
  - ★ Roll-Over Protective Structures
  - ★ Seat Belts, etc.



- 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.



- 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.

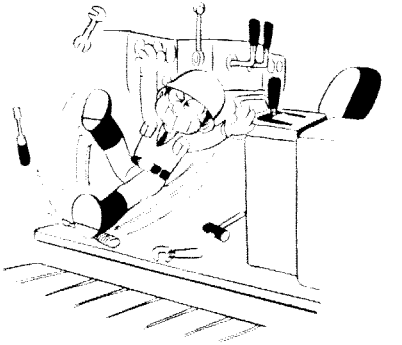


- When operating inside a building always be sure of the clearances of the ceiling, entrances, aisles, etc. and the load limit of the floor.
- Never allow other person than the operator to ride on the machine during operation.

BEFORE STARTING OPERATION

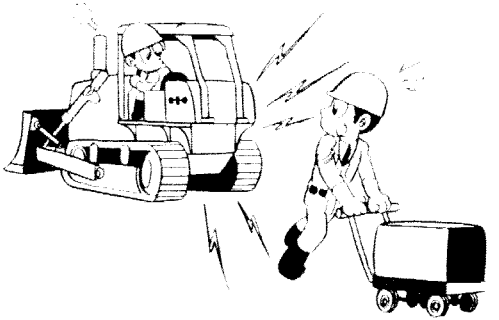
- Examine the lay of the land and the kind of soil at the work site to determine the dangerous points and the best method of operation.
  Proceed with the work only after making safety arrangements about the dangerous points.
- Inspect leakages from the fuel, lubricating and hydraulic systems. Check 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 and step provided. Do not jump up or down from the machine.



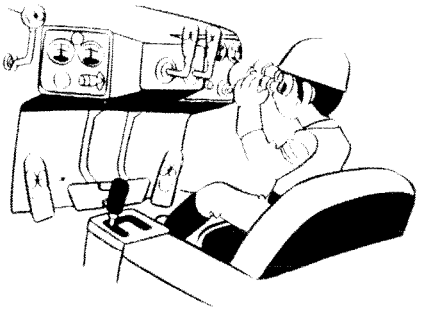
- Do not leave parts or tools lying around in the vicinity of or on the floor of the operator's compartment. Keep everything in its proper place.
- Wipe off throughly any grease, oil or mud on the step, handrail, floor or control levers. Failure to do this may cause you to slip.
- Check the level of 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.

- Adjust the seat so that the brake pedal can be depressed all the way with the operator's back against the backrest.
- Before operating the machine, check and fasten the seat belt. (Option)
- Inspect the seat belt and fittings, replace any damaged or worn parts. (Option)

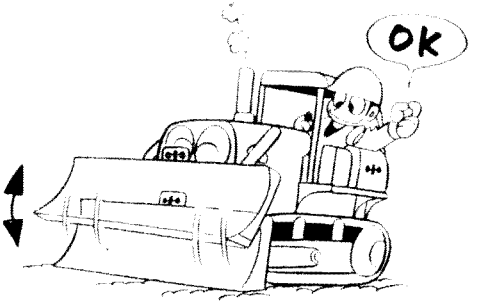


- To ensure the safety of workers near the machine, always sound the horn to warn them before starting the engine and moving the machine. Be particularly careful to check that the rear is clear before backing the machine.
- Inspect the inside of the engine room and remove any dead leaves or paper. Dead leaves or paper are highly inflammable and can cause fires.
- Before starting the engine, confirm that all control levers are in "NEUTRAL" or "HOLDING".

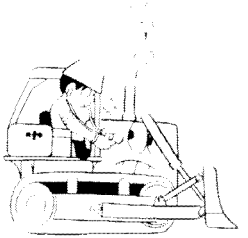
AFTER STARTING THE ENGINE



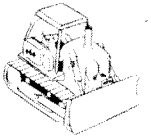
- Confirm that all gauges and warning devices are functioning correctly, and that the gauge readings are within the prescribed range.
- Check the play and travel of each lever and pedal.



- Operate the blade and ripper to confirm that they are functioning normally.

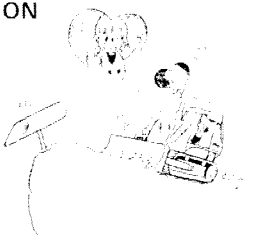


- Move the machine slowly and listen carefully to the engine or gears to confirm that they are not making any unusual noises.
- Operate the gear shift lever to confirm that the travel speeds for forward and reverse are functioning normally. Also carry out a brake test at each travel speed.

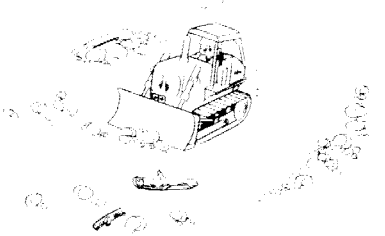


- Choosing a safe place, turn the machine to the left and right to confirm that the steering devices are functioning normally.
- If these tests reveal anything wrong, however slight it may be, contact the man in charge of the machine and operate the machine only after obtaining his permission.

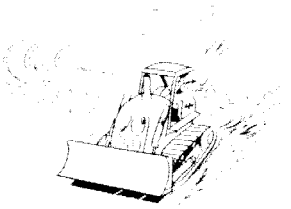
DURING OPERATION



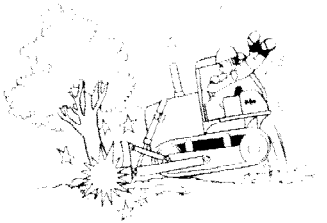
- Always concentrate. It is extremely dangerous to allow yourself to be distracted or to think of other things when operating a machine.
  In dangerous places, or where there is restricted visibility, it is important to get down from the machine and confirm whether it is safe before continuing work.



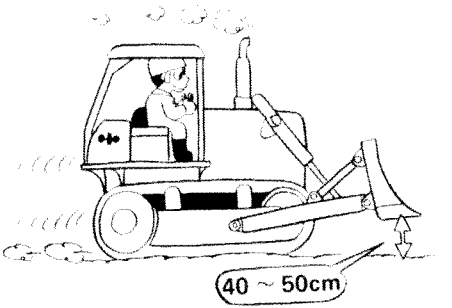
- The work area should be made as flat as possible. If the work area is flat, operation is made much easier and this reduces operator fatigue.



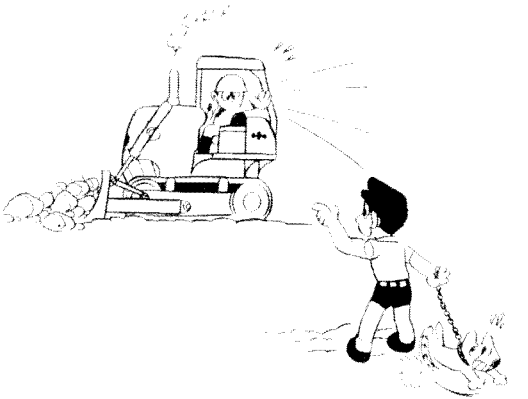
- The machine should always be operated at a speed where it can be correctly controlled. Never do the following:
  - ★ Speeding
  - ★ Sudden starting, sudden braking, sudden turning.
  - ★ Snaking
  - ★ Coasting



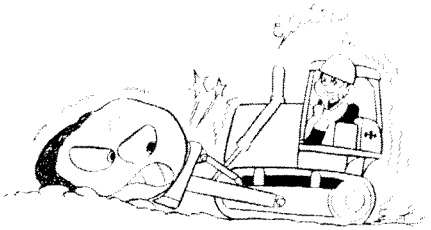
- Be careful of those around you, and always confirm that there is no person or obstacle in the way before driving or turning the machine.
- Always operate slowly in crowded places. On haul roads or in narrow places, give way to loaded vehicles.



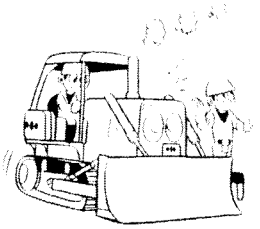
- When driving the machine, keep the blade 40 to 50cm above the ground.



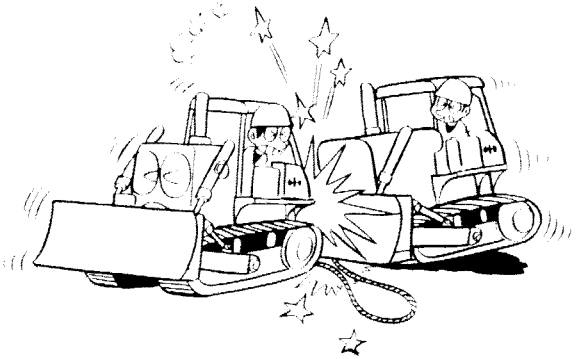
- Do not allow unauthorized persons into the work area.



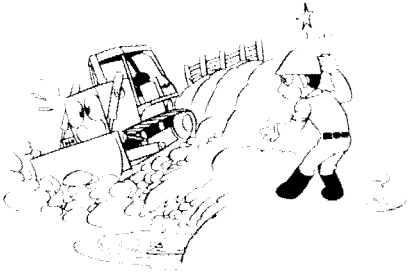
- Always be aware of the operating capacity of the machine. Using the machine to do work beyond its capacity will not only damage the machine, but may even cause unexpected accidents.



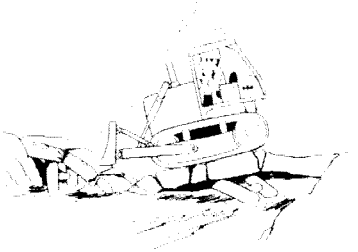
- The machine condition can be judged from many factors. Changes in the gauges, sound, vibration, exhaust gas color or response of the control levers can indicate the occurrence of some disorder. If any disorder occurs, park the machine immediately in a safe place and take appropriate action. Be especially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



- If the machine breaks down and needs to be towed, first confirm that the brakes are working properly, and then tow, using a wire rope or any other suitable towing equipment.
- When parking the machine after discontinuing work, put the gear shift lever into "NEUTRAL", apply the brake lock, lower the blade and ripper to the ground, and put all safety levers into the "LOCK"position. Never leave the operator's seat without switching the engine off.

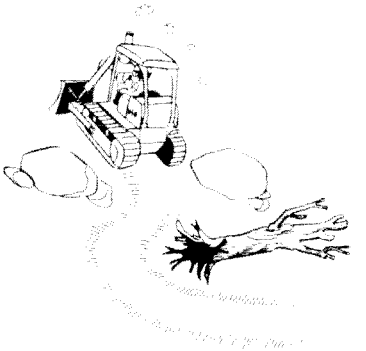


- When continuing operations after rain, remember that conditions will have changed from those before the rain started, so proceed with caution.
  Be particularly careful when approaching the shoulder of the road or cliffs, as they may have been loosened by the rain.

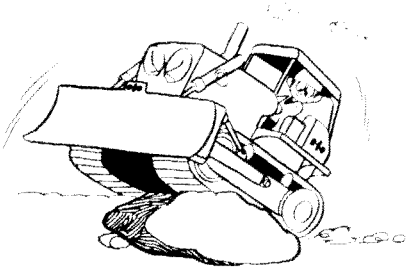


- Check the load limits of bridges before crossing.
- After earthquakes, confirm that the ground is still firm; after blasting, confirm that there are no unexploded charges remaining.

- When operating on uneven ground or in places where there are obstacles, remember the following points:
  - When operating on uneven ground, drive at as low a speed as possible and avoid sudden changes in direction.

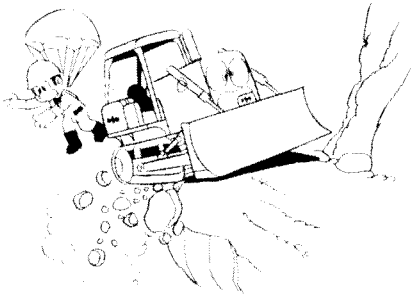


  - Wherever possible, avoid travelling over large rocks, fallen trees, tree stumps and other such obstacles. Either use the working equipment to remove them, or travel round them.
    When it is impossible to avoid travelling over them, put the gear shift lever into a low speed, reduce speed and mount 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.

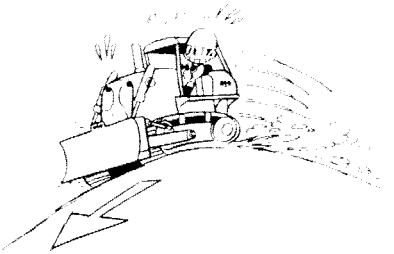


○ Never mount over an obstacle at an angle; never disengage one steering clutch to travel over an obstacle.

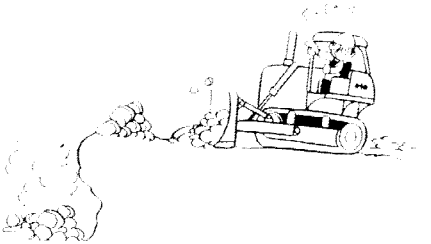
- When operating at the edge of a cliff or on the shoulder of a road, remember the following points:



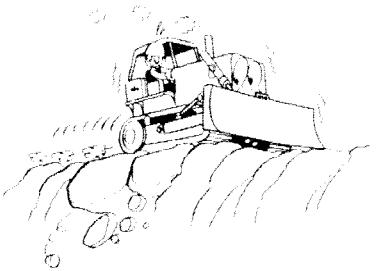
○ When operating in a place where there is danger of the machine falling over the side, be doubly careful. Do not approach the edge of the cliff or road shoulder by mistake.



○ At the instant when the soil is dumped over the cliff, or when the machine passes the summit of a slope, the machine speed suddenly increases. This is dangerous, so press the decelerator pedal or use the fuel control lever to reduce the speed, and at the same time return the gear shift lever to "NEUTRAL".

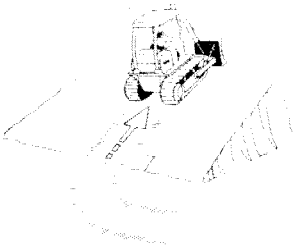


○ When dumping soil over a cliff, dump the first excavated soil without dumping it over, and use each succeeding excavated soil to push the previous excavated soil over. Be sure not to approach the edge by mistake.

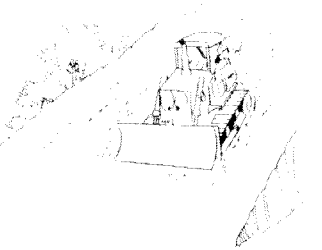


○ When working on river embankments or other places made of piled soil, there is the danger that the weight or vibration of the machine may cause the machine to sink into the piled soil, so be extremely careful when operating in such places.

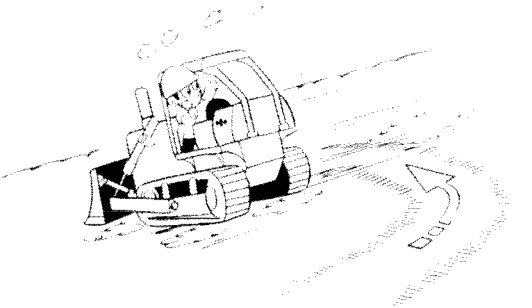
- When operating on slopes, remember the following points:



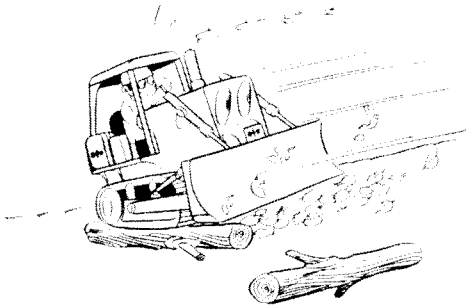
○ When driving on a slope, always drive directly up or down it. Never drive horizontally or diagonally across the slope, as this may cause the machine to roll over or slip sideways.



○ When going down a slope, use the engine as a brake. If this is not enough to control the speed of the machine, use the steering brake as well.
Never coast down a slope with the gear shift lever in "NEUTRAL".

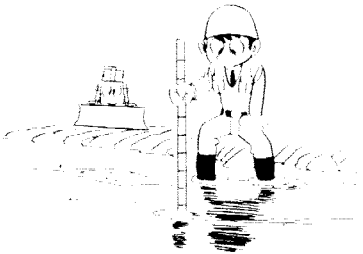


○ As far as possible, avoid turning the machine on a slope. It may cause the machine to roll over or slip sideways.

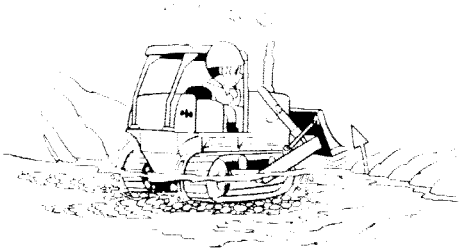


- In forest areas, do not mount fallen trees or logs. Piles of leaves or branches are also very slippery, so proceed with caution.
- Before going up or down a slope, select a travel speed most suited to the slope. Do not change gear on the slope.
- If the engine stalls on a slope, first use the brake to stop the machine, then return the gear shift lever to "NEUTRAL" before starting the engine again.

- When operating in water or in muddy areas, remember the following points:

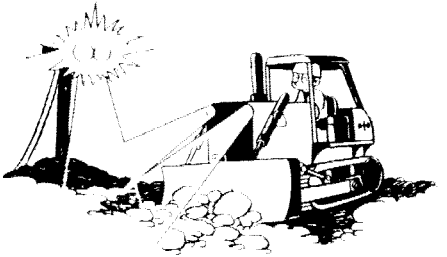


- When operating in water or when crossing shallows, first check the bed soil condition and the depth and flow speed of water, then proceed, taking care not to go beyond the permitted depth.

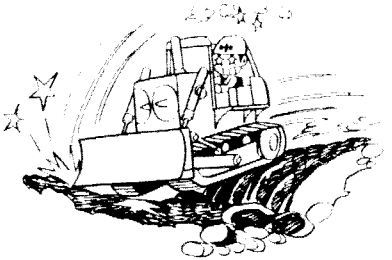


- If the machine gets stuck in mud, it is completely useless to increase the engine speed, causing the tracks to spin, or to rock the machine backwards and forwards. In such a case, raise the blade to reduce the load, and drive out slowly.

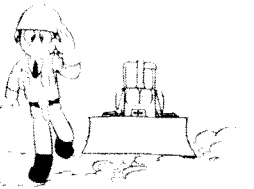
- When passing through a narrow space, be careful of the side and overhead clearances. Take special care not to touch any obstacles on either side or overhead. If necessary, have someone outside the machine call out instructions.
- When operating at night, remember the following points:



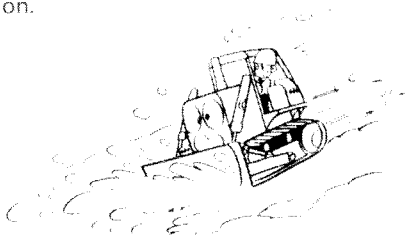
○ Be sure to arrange an adequate lighting system.



○ At night it is very easy to make mistakes in assuming the distance and height of objects and land.



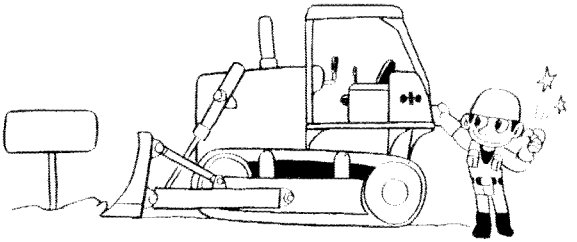
- When operating in fog, mist or smoke, where visibility is bad, be especially careful to confirm first whether operation is safe.
  When visibility drops below safety level, stop work and wait for the visibility to improve.
- When operating in snow, or cleaning snow, remember the following points:
  ○ Even slight slopes can cause unexpected side slipping, so in such places, operate with extreme caution.



○ Never use the steering brake to stop suddenly on slopes. Lowering the working equipment is a far more effective way of stopping.

- During operation, use the seat belt. (Option)

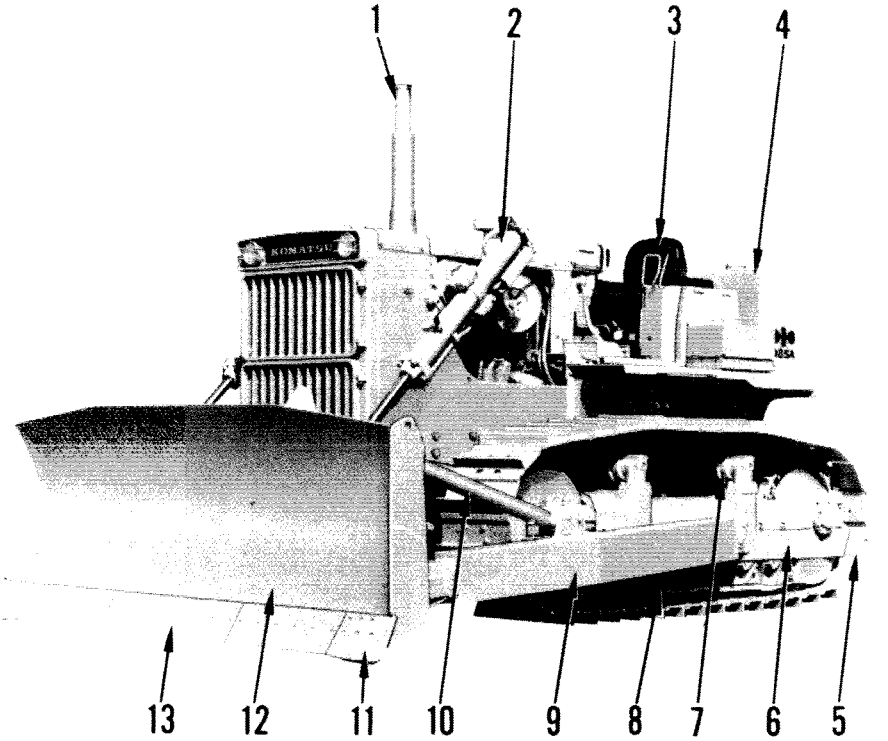
PARKING



- 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 rockfalls, 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 blade so that it cuts slightly into the ground to further increase the safety.
- When parking the machine, return the gear shift lever to "NEUTRAL", apply the brake lock, lower the blade and ripper to the ground, and put all safety levers in the "LOCK" position. Switch off the engine and remove the key.

GENERAL LOCATIONS

1. Exhaust pipe
2. Blade lift cylinder
3. Operator's seat
4. Fuel tank
5. Shoe
6. Track frame
7. Carrier roller
8. Track roller
9. Frame
10. Brace
11. End bit
12. Blade
13. Cutting edge


1
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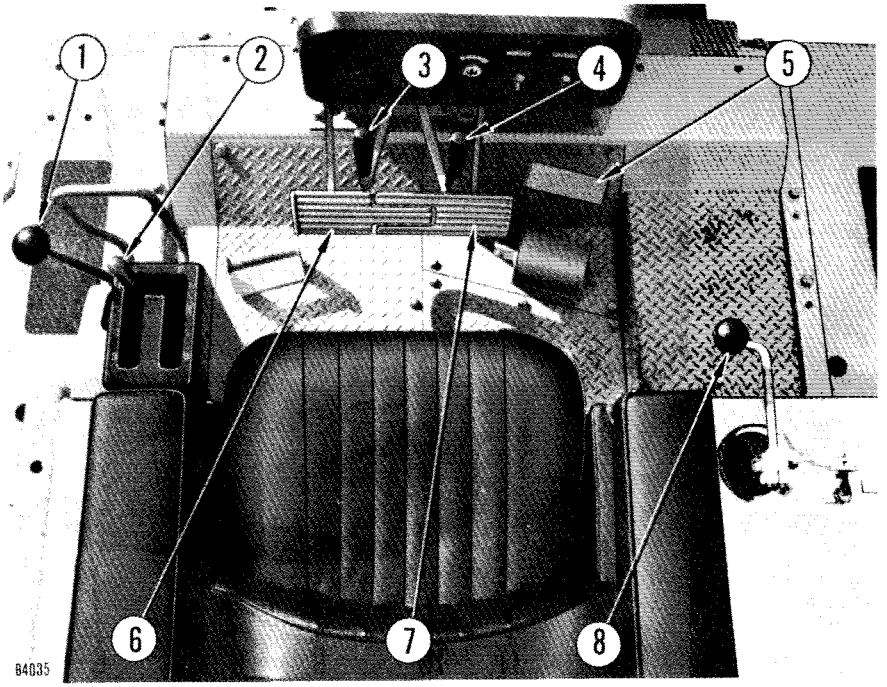
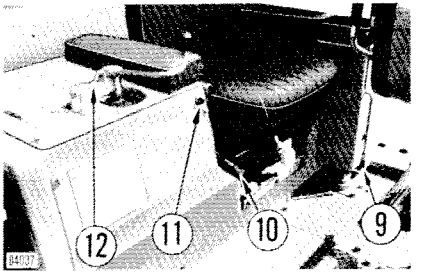
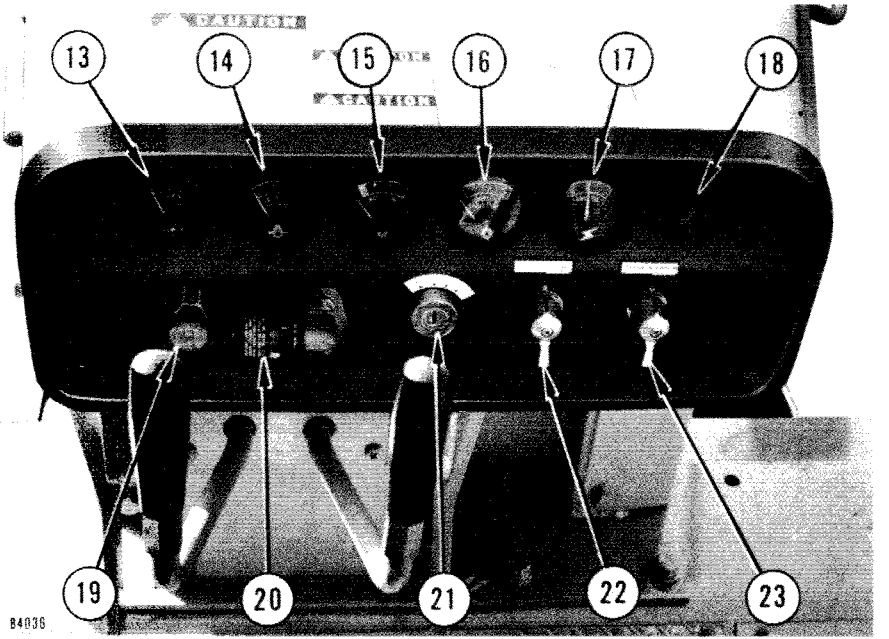
OPERATOR'S COMPARTMENT





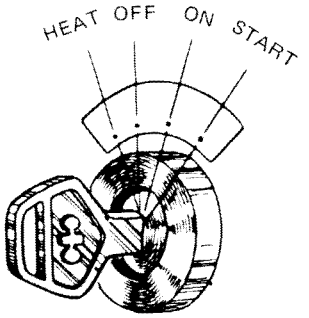
1. Fuel control lever
2. Gear shift lever
3. Steering lever (left)
4. Steering lever (right)
5. Decelerator pedal
6. Brake pedal (left)
7. Brake pedal (right)
8. Blade control lever
9. Safety lever
10. Brake lock lever
11. Horn button
12. Safety lock
    (for blade control lever)

13. Priming pump fuel pressure gauge
14. Engine oil pressure gauge
15. Engine water temperature gauge
16. Torque converter oil temperature gauge
17. Ammeter
18. Heater signal
19. Priming pump
20. Dust indicator
21. Starting switch
22. Lamp switch
23. Preheater switch



INSTRUMENTS AND CONTROLS

STARTING SWITCH



OFF

Key insertion-withdraw position.

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

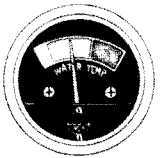
At this position, after the preheater switch is turned in ON position, the current will flow to the glow plug. Use the priming pump to start the engine at low ambient temperatures. After heating, immediately turn the key to START position.

★ Be sure to use the starting key to start the engine.

ENGINE OIL PRESSURE GAUGE

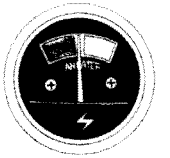
- When the indicator is in the green range during operation, oil pressure is normal.
- When engine temperature goes down, the indicator may move outside the green range. If so, warm up engine.

ENGINE WATER TEMPERATURE GAUGE



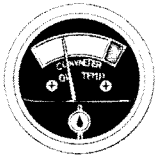
- When indicator is in the green range during operation, water temperature is normal.
- After engine start-up, warm up the engine until indicator moves into green range.
- If indicator moves from green into red range during operation, run the engine at low idling speed until water temperature goes down.

AMMETER



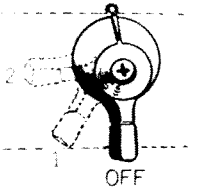
- The green range and center range indicate the battery is being charged; the red range indicates discharging.
- When indicator registers in the center of the scale or in green range, the alternator is in good condition.

TORQUE CONVERTER OIL TEMPERATURE GAUGE



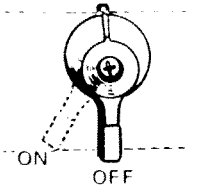
- When indicator is in green range during operation, the oil temperature is normal.
- If indicator moves from green range into red range, reduce the work load until the oil temperature goes down.

LAMP SWITCH

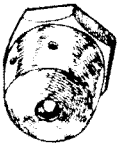


With lamp switch in position **1**, the meter lamp will light. With lamp switch in position **2**, the meter lamp, head lamps and rear lamps will light.

PREHEATER SWITCH HEATER SIGNAL



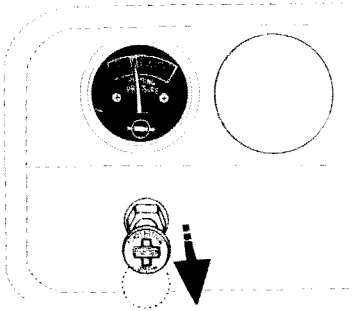
Preheater switch



Heater signal

To start the engine in cold weather, turn on the preheater switch and turn the starting switch to HEAT. The intake manifold glow plug will become red heat. Heater signal indicates red hot state of glow plug. After starting the engine, be sure to turn off the preheater switch.

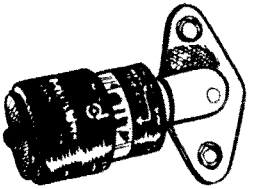
PRIMING PUMP
PRIMING PUMP FUEL PRESSURE GAUGE



When starting the engine in cold weather, the priming pump feeds fuel under pressure to the intake manifold injection nozzle. When gauge shows green range during priming pump is operated, fuel is being injected in a properly atomized state.

Priming pump should be operated by moving the knob in and out. (Refer to COLD WEATHER STARTING)

DUST INDICATOR

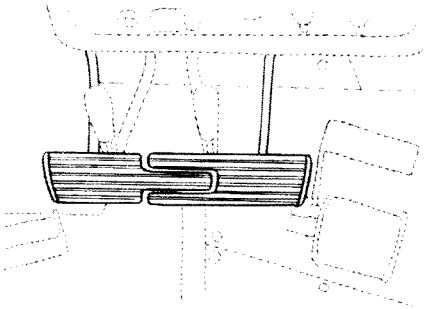


This device indicates clogging of the air cleaner element. When the red piston appears in the transparent part of this indicator, the element is clogged. Immediately clean element. After cleaning, push indicator button to return red piston to original position.

HORN BUTTON

Horn sounds when horn button under right front arm rest is pushed.

BRAKE PEDALS

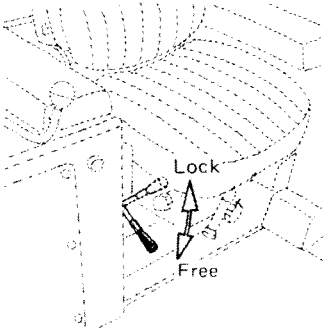


When both brake pedals are depressed simultaneously by stepping on the center area, both right and left brakes are actuated.

If steering lever is pulled out halfway and the brake pedal on the same side as the lever is depressed at the same time, the machine will make a pivot turn.

⚠ **Do not place your foot on pedals unnecessary.**

BRAKE LOCK LEVER

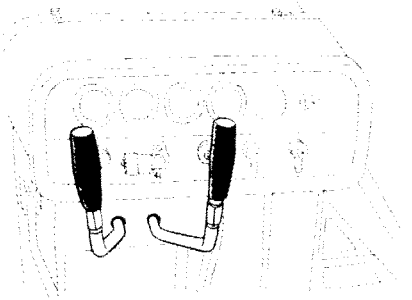


This device is used to lock the brake pedals when parking. When both pedals are depressed and the lock lever is placed in LOCK, both brakes are locked.

To release brakes, depress both brake pedals and set the lever in FREE.

⚠ **When locking or releasing brakes, be sure to KEEP THE ENGINE RUNNING. If brakes are applied with the engine stopped, the oil pressure booster will not work, thus decreasing the braking force and causing DANGER.**
(Take special care when parking on a slope).

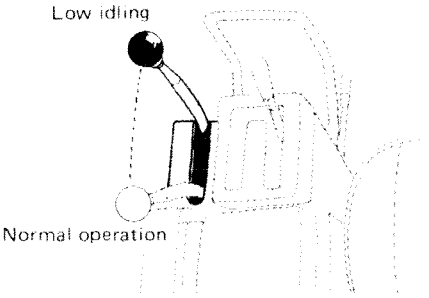
STEERING LEVERS



When left-hand steering lever is pulled out halfway, the left steering clutch is disengaged. When pulled all the way out, the left steering brake is actuated and the machine will turn left.

Similarly, the right-hand steering lever can be operated for right turns.

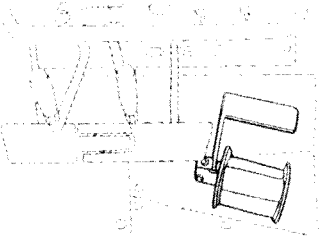
FUEL CONTROL LEVER



To set the lever to low-idling position, push lever forward.

To increase engine revolution, pull lever backward.

DECELERATOR PEDAL

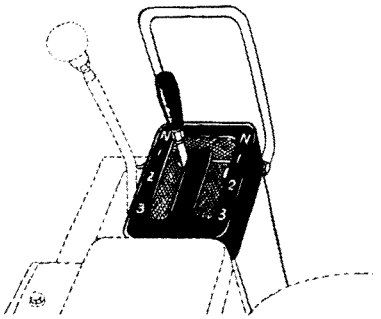


This pedal is used to decelerate engine speed.

To quickly restore normal engine power during ripper operation, this pedal is designed to be operated in two stages. Normally, the pedal is used at the first stage (800 to 850 rpm). When required, the pedal can be further depressed so the engine runs at low idling speed.

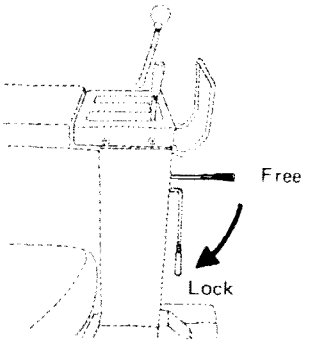
⚠ When arriving at the top of a slope, or when dumping earth from a cliff, the machine will increase its speed with the sudden loss of load.
Slow the machine by depressing the decelerator pedal.

GEAR SHIFT LEVER



Three-speed forward and three-speed reverse travel can easily be selected by simply shifting the gear shift lever to any desired speed position. Even when you start the engine without setting gear shift lever in NEUTRAL, the machine won't start because safety valve functions. In such case, you should repeat the shifting operation after setting the gear shift lever to N position.

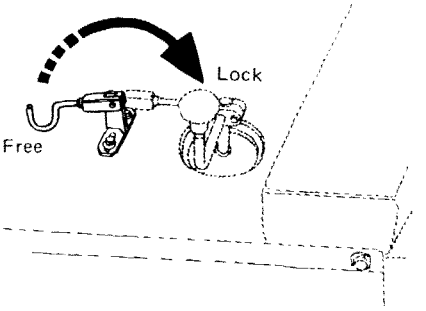
SAFETY LEVER (For gear shift lever)



This is the locking device of the gear shift lever.

⚠ **When the machine is stopped for a while, be sure to set the gear shift lever in neutral and set the safety lever to LOCK.**

SAFETY LOCK (For blade control lever)



This device is used to lock the blade control lever.

⚠ **When parking or servicing the machine, be sure to turn the safety lock in the direction of the arrow, so the blade control lever is locked.**

OPERATOR'S SEAT

Set operator's seat as follows for maximum comfort.

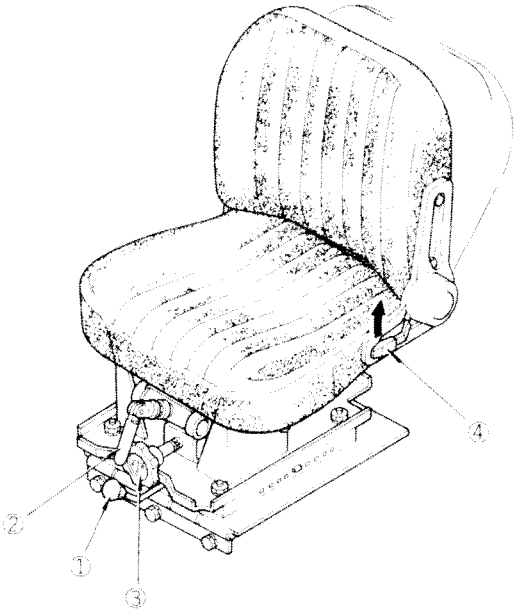
FORWARD AND BACKWARD ADJUSTMENT

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

The seat can be adjusted forward or backward 160mm (in 8 steps).

HEIGHT ADJUSTMENT

To raise seat, turn knob (2) clockwise; to lower, turn counterclockwise. Adjustable range: 50mm



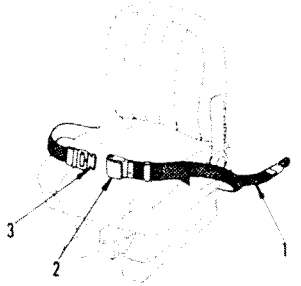
TILTING ADJUSTMENT

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

SEAT ADJUSTMENT ACCORDING TO OPERATOR'S WEIGHT

Turn knob (3) to right or left to suit your weight for maximum comfort.

SEAT BELT (OPTION)



⚠ **Before fastening the seat belt, inspect the securing brackets and belt for abnormal conditions.**

Fasten the belt and remove it in the following manner.

1. Adjust the seat so that the brake pedal can be depressed all the way with the operator's back against the backrest.
2. After positioning the seat, install the tether belt (1). With the seat unoccupied, tense the belt slightly across the seat and install.

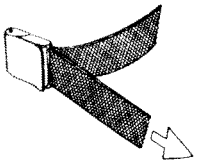
⚠ **Check that there are no kinks in the belt.**

3. Sit in the seat. Hold buckle (2) and insert (3) into the buckle (2). Check that the belt has locked by pulling it.
4. When removing the belt, raise the tip of the buckle lever to release it.

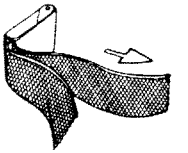
★ Fasten belt along your body without kinking it. Adjust the lengths of the belt on both the buckle and the insert sides so that the buckle is located at the mid-point of your body front.

Adjust the belt length in the following manner.

i) To shorten the belt, pull the free end of the belt on either the buckle body or insert side.



ii) To lengthen, pull the belt while holding it at a right angle to buckle or insert.



5. When operating a machine equipped with ROPS, be sure to use the seat belt.

★ Inspect bolts and fittings on the chassis for tightness. Retighten any loose bolts to 2 to 3kgm torque.

★ If the seat belt is scratched or frayed or if any of the fittings are broken or deformed from long service, replace the seat belt immediately.

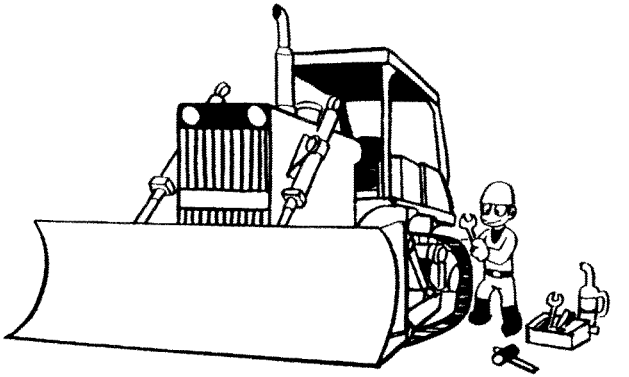
CHECK BEFORE STARTING

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

a. Walk around the machine and check for any trace of oil or water leakage. Examine connections of high pressure hoses, hydraulic cylinders, final drive, radiator and floating seals with special attention.
   If any leakage is evident, check for the cause and repair. If difficulty is encountered, consult your Komatsu distributor.
   In particular check carefully for any leakage from the fuel system and take the necessary action if any problem is found.
   - Loose hose clamp → Tighten clamp
   - Damaged hose or piping → Replace or repair damaged parts

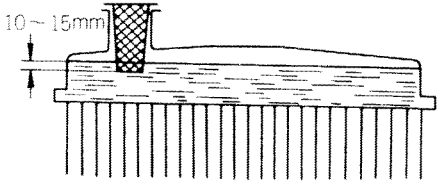
b. Check tightness of bolts and nuts, and retighten if required. Particular checks are required for mounting of air cleaner, muffler, track roller supports and shoe bolts.

c. Check for any sign of disconnection or short circuits in the electric wiring, and check for loose terminals. If any problem is found, replace, repair, or tighten the parts.

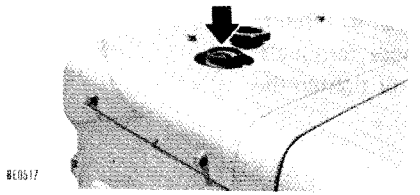


d. CHECK AND REFILL COOLANT

Remove radiator cap and check that coolant is in contact with bottom of strainer as shown in figure below. If coolant is not in contact, add coolant through water filler until it overflows. To refill the radiator, first stop the engine and pour in water until the water overflows the filler opening. Then, start the engine, check the water level again after a five-minute idling, and add water if necessary. If an excessively large quantity of water is required to correct the water level, leakage of water from somewhere in the cooling system is assumed. Inspect and remedy the cause of leakage.



⚠ **To remove cap, release radiator pressure little by little by loosening cap slowly; then remove cap.**



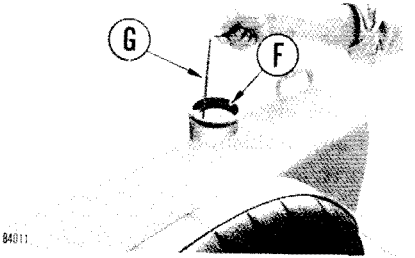
e. CHECK FUEL LEVEL

Remove cap and pull out fuel dipstick (G) and check fuel level.

After each operation, fill fuel from filler (F). A clogged cap breather hole may stop the fuel flow to the engine. Check it from time to time and clean.

★ Cap breather hole is bored in cap.

★ When adding fuel, be careful not to let the fuel overflow and pour out.



f. CHECK AND CORRECT OIL LEVEL IN THE ENGINE OIL PAN.

Use the dipstick (G) to check the oil level. If necessary, add oil at the oil filler (F).

★ Above 0°C: Use engine oil CLASS-CD SAE30.
Below 10°C: Use engine oil CLASS-CD SAE10W.

★ Stop the engine when checking the oil level. Checking the oil level with the engine idling may be allowed, if the following precautions are thoroughly satisfied:

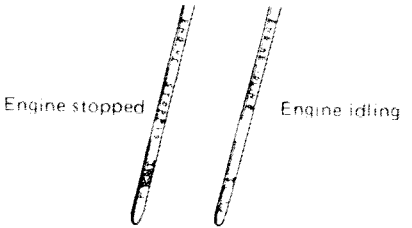
i) Check that the engine oil pressure gauge and water temperature gauge shows green ranges.
ii) Remove the oil filler cap.
iii) Read the dipstick on its reverse side where it is stamped, "ENGINE IDLING."

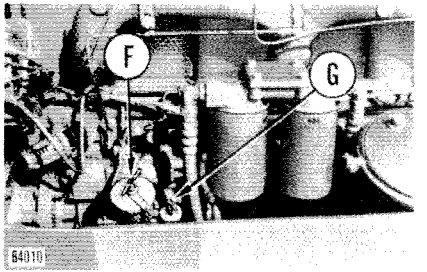
g. CHECK AND SUPPLY OIL IN THE STEERING CLUTCH CASE (INCL. TRANSMISSION AND TORQUE CONVERTER CASE)

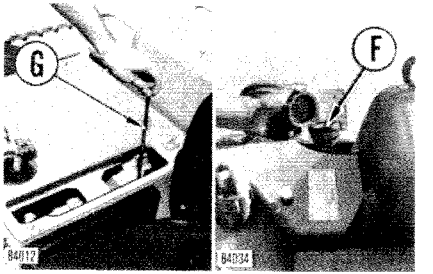
Use the dipstick (G) to check the oil level. If necessary, add oil at the oil filler (F).

★ Above 0°C: Use engine oil CLASS-CD SAE30.
Below 10°C: Use engine oil CLASS-CD SAE10W.

★ Stop the engine when checking the oil level.







h. DRAIN WATER AND PRECIPITATION IN THE FUEL TANK

Loosen the cock at the bottom of the tank. Drain precipitation accumulated on the bottom together with mixed water and fuel.

i. IS THE TRAVEL OF THE STEERING LEVER ADEQUATE?

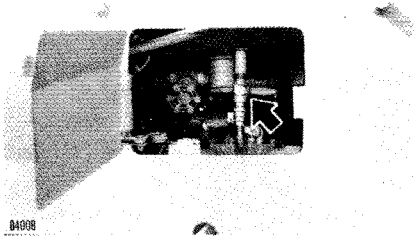
The standard travel is 140 to 150mm at the center of the grip. (Operating force while engine idling is approx. 8kg.)

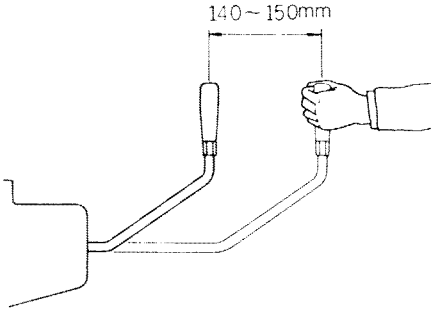
The travel increases as brake lining wears. It becomes normal when adjusting brake.

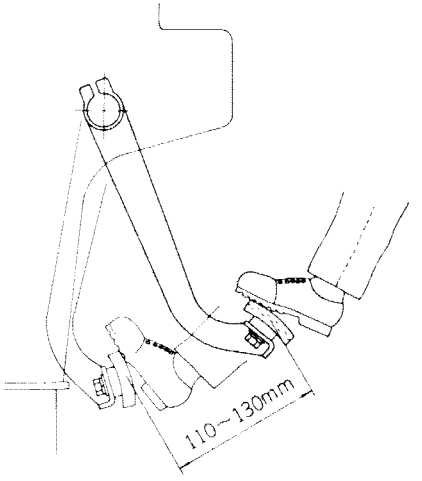
j. IS THE TRAVEL OF BRAKE PEDAL ADEQUATE?

The standard travel is 110 to 130mm while engine idling (Operating force is approx. 15kg.) and approx. 75mm while engine stopped.

If pedal travel exceeds 200mm, brake functions inadequately, so adjust it according to the section ADJUSTMENT.



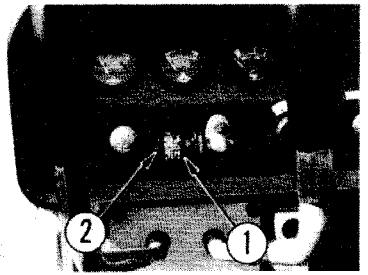




k. CHECK DUST INDICATOR

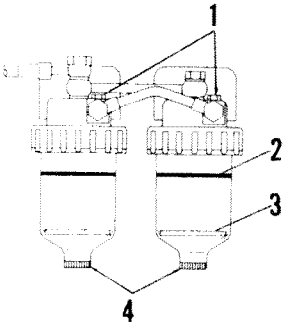
When air cleaner element is clogged, the red piston of dust indicator (1) reaches service level and gets locked. In that case, clean element referring to section "WHEN REQUIRED".

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



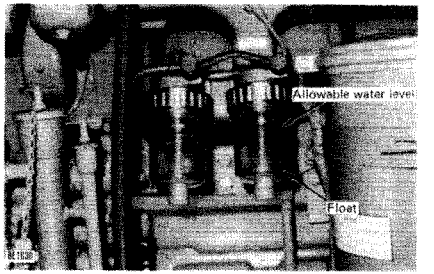
l. CHECK FOR SEDIMENT AND WATER IN THE WATER SEPARATOR (OPTION)

The water separator separates water mixed in the fuel. If the float is at or above the red line, drain the water. For the draining procedure, see section "WHEN REQUIRED" for page 99.



1. Air bleeding plug
2. Allowable water level (red line)
3. Float
   (floats on water to indicate the water level)
4. Drain plug

★ Even if a water separator is installed, be sure to check the fuel tank to remove water and sediment in the fuel.



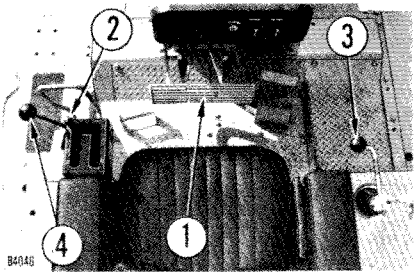
OPERATING YOUR MACHINE

ENGINE HANDLING

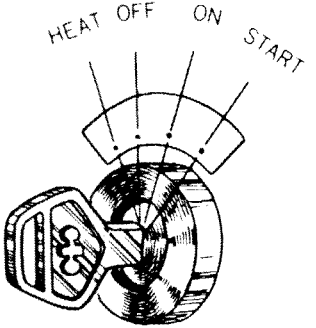
Before Starting

The following pre-operation checks and actions are required.

- Are brake pedals (1) locked?
- Has blade been lowered to ground?
- Has gear shift lever (2) been locked?
- Has blade control lever (3) been locked?
- Move fuel control lever (4) into engine low-idling position.



Starting



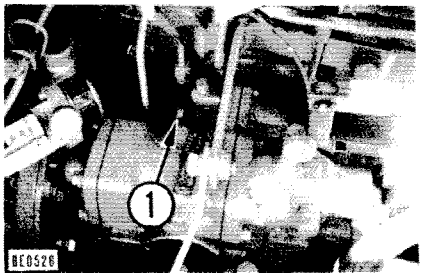
1. Crank engine and start.
2. When engine has started, return starting key to ON.

★ Do not leave key in START for more than 20 seconds.
★ If engine will not start, repeat the starting procedure after an interval of about 2 minutes.
★ To start engine in cold weather, refer to COLD WEATHER OPERATION.

STARTING ON SPECIAL CONDITIONS

- **Starting with electrical trouble in shut-off valve**
  Screw in knob (1) of shut-off valve and open valve to start engine. When engine has been started, screw out knob (1) to stop engine.

- **Restarting after starting switch has been shut off**
  In case starting switch has been mistakenly shut off during operation, turn on switch after engine has come to a complete stop.



Checks after Start-up

After starting the engine, carry out the following checks prior to machine operation.

1. Run engine at low idling speeds and make sure the engine oil pressure gauge shows green range.
2. Pull fuel control lever halfway to run engine at midrange speeds for about 5 minutes with no load.
3. Run engine with light load until engine water temperature gauge indicator moves into green range.
4. After warm-up run, check all gauges for proper operation.
5. Check for normal coloration of exhaust, and any abnormal noise or vibration.
6. Check for any leakage of oil, fuel or water.

★ Avoid abrupt acceleration until warm-up run is completed.

★ The procedure in 1, 2 and 3 above is called "warm-up run".
If engine oil pressure gauge indicator moves outside the green range after starting a cold engine, this warm-up run should be continued after the indicator moves into the green range.

★ When warm-up run is continued for more than 20 minutes, the engine should be run with load from time to time. If warm-up run with load is impossible, the engine should be run at mid-range speeds.
If no-load warm-up run is continued for more than 20 minutes, oil may leak out from the bottom of the turbocharger turbine.

Stopping the Engine

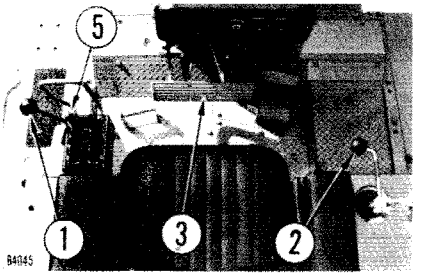
1. Cool the engine by running it at low idling speed for about 5 minutes.
2. Return starting switch key to OFF and remove key.

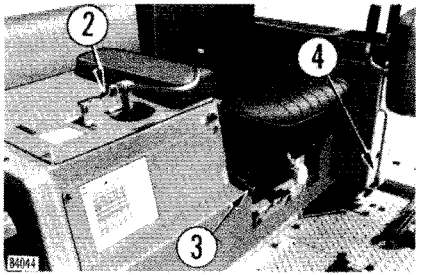
★ If engine is stopped abruptly before it cools down, engine life may be greatly shortened.
Never stop engine abruptly except in case of emergency.

OPERATION OF MACHINE

Travelling

1. Pulling fuel control lever (1), increase engine speed.
2. Unlock the blade control lever (2) and raise blade 400 to 500mm off ground.
3. Step on the intersecting point of both right and left brake pedals (3), place brake lock lever in FREE, and return brake pedals to home positions.
4. Set safety lever (4) in FREE position.
5. Set gear shift lever (5) in proper position and start machine.





★ When starting travel, reduce engine speed by depressing the decelerator pedal to reduce shock.

⚠ **When starting the machine on a steep uphill grade, run engine at full-throttle and shift gear shift lever into 1st with brake pedals depressed. When machine has started slowly (or track shoes are slipping), propel the machine by slowly releasing brake pedals.**

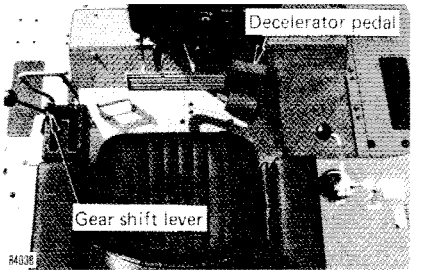
★ Even when you start the engine without setting gear shift lever in NEUTRAL, the machine won't start because safety valve functions. In this case, repeat the shifting operation after setting the gear shift lever in NEUTRAL.

Gear Shifting

Gears can be shifted into any position by the gear shift lever. There is no need to stop machine to shift gears.

Shifting from Forward to Reverse (and Vice Versa)

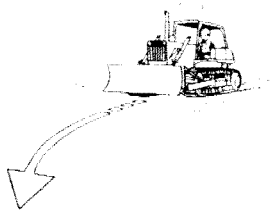
First depress the decelerator pedal and then operate the gear shift lever.

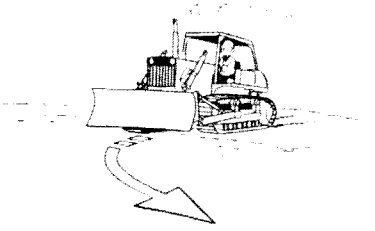


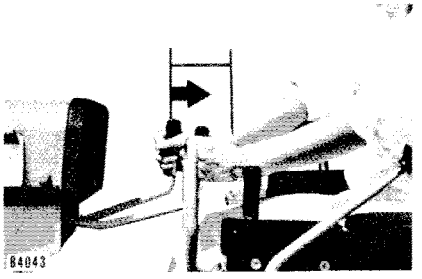
Turning

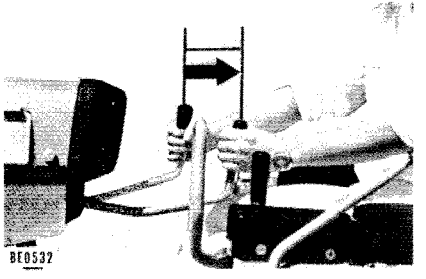
To turn the machine to one direction, pull the steering lever on the same side halfway. This disengages the steering clutch and allows the machine to start turning slowly.

When the steering lever is further pulled all the way out and the brake pedal on the same side is depressed, the machine will make a sharp pivot turn.









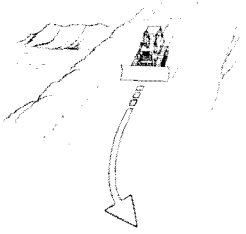
Turning while descending a slope

When descending such a sharp slope that the machine will go down of its own weight or when going down a slope with a scraper or the like, you should exercise great care. The machine will turn to the **opposite side** to that of the pulled lever.

⚠ **Avoid as much as possible turning the machine on a slope. The machine will tend to slip sideways. Particular care should be taken on soft or clay land.**

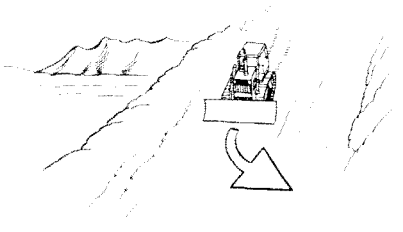
When turning left gently:

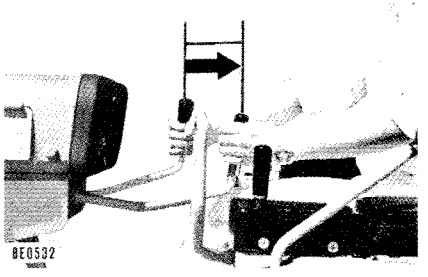
When the right steering lever is pulled halfway, the machine turns left gently (which results in opposite steering).



When turning left at that position:

When the left steering lever is pulled to the full, the machine turns left at that position (which does not result in opposite steering).





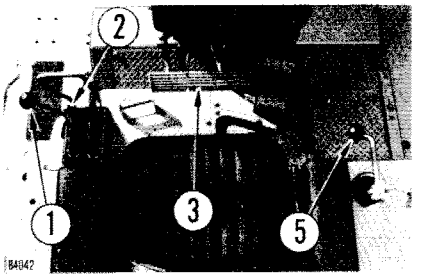
★ When turning right, perform the same procedure by using the steering lever situated opposite to that used for left turning.

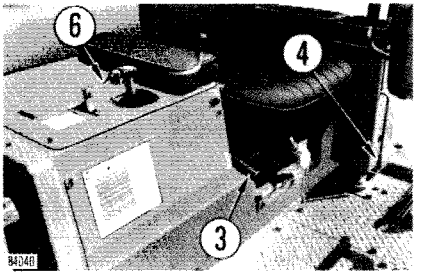
Stop

1. Reduce engine speed with fuel control lever (1).
2. Set the gear shift lever (2) in neutral position.
3. Apply brakes by stepping on the intersecting point of both brake pedals (3).
4. Lock brakes with brake lock lever (3).
5. Lock gear shift lever with safety lever (4).
6. Lower blade to ground while keeping it horizontal.
7. Lock blade control lever (5) with safety lock (6).

★ For stopping engine, refer to Stopping the Engine in Engine Handling section.

⚠ **Always stop the machine on flat, stable ground. Avoid parking in a dangerous place.**





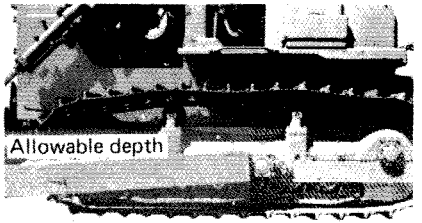
PRECAUTIONS FOR MACHINE OPERATION

- When torque converter oil temperature gauge indicator exceeds green range while operating, reduce load and wait for lowering of temperature.
- When stepping on decelerator pedal while going uphill, climbing ability will be reduced and machine will stop. Furthermore, engine sometimes will stall.
  Be careful not to depress decelerator pedal until engine stops, for braking force is reduced when engine stops.
  When decelerator pedal is depressed by mistake and machine is stopped, immediately depress brake pedals before engine stops.
- If the fuel level is too low on sloped areas, the engie may draw excess air due to inclined machine or machine vibration and stop, and as a result, braking force may decrease. Be careful for remaining fuel in the fuel tank.

- When operating machine on sloped areas of more than 20°, fill every place with oil to H level.
- If the engine tachometer indicator moves into the red range while descending a slope with engine brake, also apply the brakes immediately.
  Failure to brake may result in over-running, causing engine trouble.
  Use care, not to shift gears while descending down with a scraper (or the like) mounted, for the engine tends to overrun.

When working in water or in muddy areas, observe the following instructions:

- Before beginning work, securely tighten each drain plug.
- Do not operate machine in such a depth that carrier rollers are submerged. Further, be careful so that the cooling fan will not come in contact with the water.



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- During suspension of work, or after complection of work, remove mud from each part and check engine oil pan, torque converter case, transmission case, steering case, hydraulic system, etc. for:
  - Oil leakage
  - Rise in oil level

  Also check for any water mixed into oil. If necessary, remove drain plugs and check. Pay particular attention to the final drive case.

COLD WEATHER OPERATION

PREPARATION FOR LOW TEMPERATURE

- Replace lubrication oil by that with prescribed viscosity.
- Fuel of low pour point shall be used. ASTM D975 No.1 diesel fuel should be used at atmospheric temperature lower than $-10^{\circ}C$.
- Add antifreeze in the cooling water When the atmospheric temperature drops lower than $0^{\circ}C$ while the machine is stopped, prevent freezing by adding antifreeze to the cooling water. The mixing rate of antifreeze is determined according to the expected minimum temperature. The following table shall be used.

Mixing rate of water and antifreeze

Min. atmospheric temperature (°C)	-5	-10	-15	-20	-25	-30
Amount of antifreeze (ℓ)	18.5	24	29	33	36.5	39.5
Amount of water (ℓ)	60.5	55	50	46	42.5	39.5

★ **Cautions for using antifreeze**

1) Permanent type antifreeze shall be used.
2) Soft water (ex: city water) shall be used as mixing water.
3) Cooling systems must be thoroughly flushed before filling with antifreeze mixture.
4) When the climate becomes warmer and antifreeze is not needed, replace with soft water (ex: City water) after thoroughly cleaning the cooling system.

⚠ Do not expose antifreeze to ignition sources. It is inflammable.

- 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

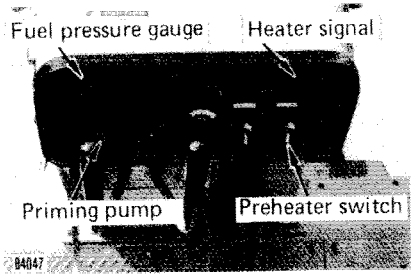
★ When electrolyte level is low, add distilled water in the morning before work instead of after the day's work. This is to prevent fluid from freezing at night.

★ When temperature rises, change lubricating oil in each unit to that of recommended viscosity.
Completely drain antifreeze from cooling system and fill with soft water (for example, city water) after thorough flushing.

START UP OF ENGINE IN COLD WEATHER

As to cautions related to engine start up, refer to the item "engine start."

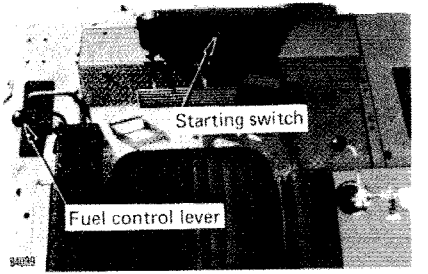
1. Rotate the knob to release lock of priming pump and lightly operate the pump 2 to 3 times so that the air in the fuel pipe line of "fuel tank → priming pump → injection nozzle" is pushed out. (The pump will move lightly when air exists. Stop the operation when the indicator of the fuel pressure gauge starts to move and you begin to feel resistance as the air is force out.)



2. Place fuel control lever in engine low idling position.
3. Set the preheater switch to "ON" and turn the starting key to the HEAT position, and the heater signal will be lighted red hot.

   Necessary preheating time is as follows.

Ambient temperature	Preheating time
Above 5°C	–
5°C ~ –20°C	60 seconds



4. While operating priming pump knob so that fuel pressure gauge indicator stays in green range, turn key to START position to start engine.
5. After starting engine, immediately turn key to HEAT position and operate priming pump knob so that fuel pressure gauge indicator is in green range.
6. When normal operation is reached, turn the key to "ON".
7. Lock the knob of the priming pump, and turn the preheater switch to OFF.

★ When the priming pump is operated before the heater signal is not yet red hot, glow plug may be dampened so that insufficient ignition is caused which makes the start difficult.

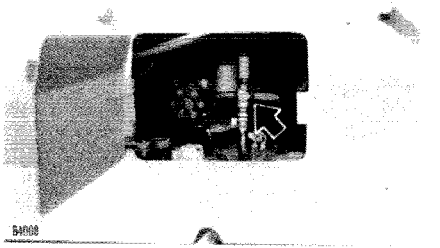
★ If normal engine operation is obtained soon after engine starting, skip step 5. and proceed next operation.

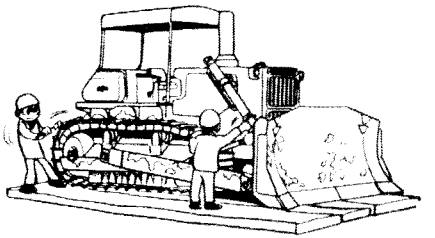
★ In case the engine will not start by the abovementioned operation, repeat the operation of 3. and 4. after the lapse of about 2 minutes.

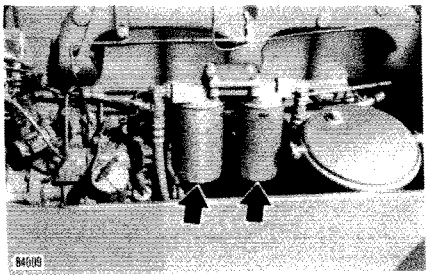
★ After the engine is started, operate the warming up without fail. Operate the machine at low speed at first, and then gradually increase the load.

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) As battery capacity drops greatly when temperature is low, put cover on battery or keep it at warm place after removing from machine.
   Put battery back on machine next morning. Keep battery warm.
3) Drain water collected in fuel filters and fuel tank to prevent its freezing during the night and restricting the flow of fuel the following day.







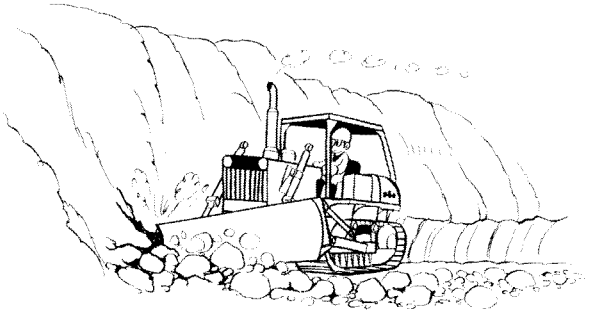
BULLDOZER'S WORK

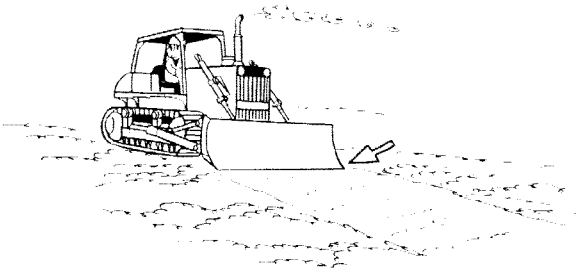
CUTTING INTO HARD OR FROZEN GROUND OR DITCHING

For digging and ditch excavation of hard or frozen ground, tilt the blade. Even hard ground can be dug effectively by a tilted or angled blade. If the ground is harder, use a ripper attachment for better efficiency.

SMOOTHING

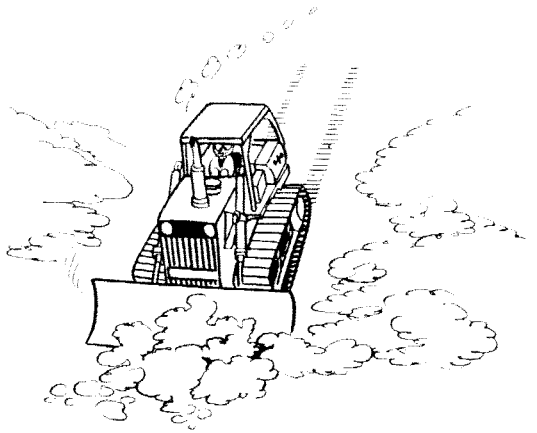
Uneven ground surfaces remaining after digging can be levelled off by fine operation of blade. The basic method is to operate the machine at low speeds with the blade fully loaded with soil and sand. A flat finished surface is also possible by slowly backing the machine with the blade "floating" so it is dragged across the surface. However, avoid this on rocky or stony ground, as it may damage the blade.





DOZING

A bulldozer digs and transports dirt in a forward direction. Distance per trip should preferably be 70 meters at maximum. If longer, use of a scraper is economical. Slope excavation can always be most effectively carried out by proceeding from the top downward.



FELLING AND UPROOTING

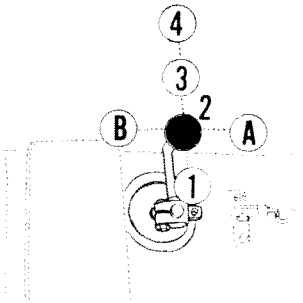
A tree, 10 to 30cm in diameter, can be felled by giving 2 or 3 pushes with the blade held off the ground. Next, back the machine and lower the blade to cut into the earth. Break the roots and push them forward while digging.

Never allow the machine to butt against, or give strong impact to a tree by operating at high speeds.

BLADE OPERATION

OPERATION OF TILTDOZER

LEVER OPERATION

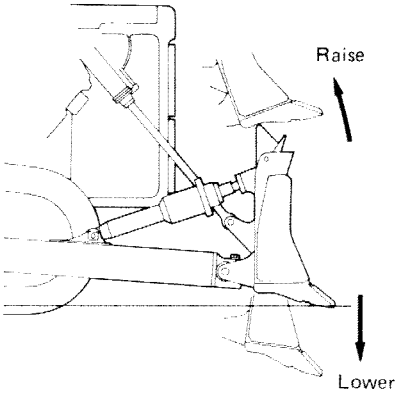


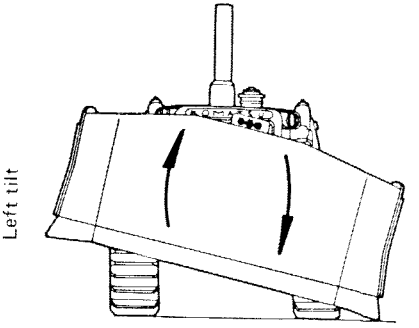
Lever Position

1. RAISE
2. HOLD
   Blade is stopped and held in this position.
3. LOWER
4. FLOAT
   Blade can be freely raised and lowered. When released, it will not return to HOLD position, so it must be moved back by hand.

A. RIGHT TILT
B. LEFT TILT
   Blade can be tilted at any position of 1 to 3 above.

- ★ A and B are possible only with tiltdozer.
- ★ Lever should be returned quickly to HOLD position at the end of tilt cylinder stroke.
- ★ Do not operate lever when blade is at top or bottom position.





ADJUSTMENT OF TILT ANGLE

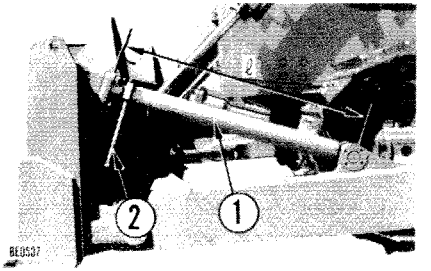
Tilting up to about 435mm is possible by simply operating the blade control lever, but if required, further tilting up to 735mm is also possible by changing the length of left brace (1).

If distance between joints is lengthened by turning the brace using adjustment rod (2):

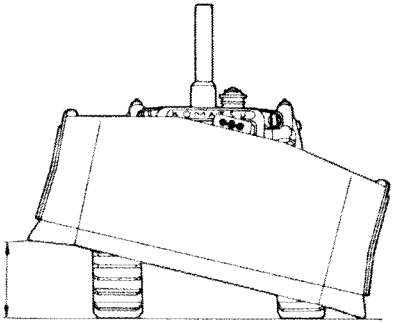
Left tilting— Decrease
Right tilting— Increase

If distance is shortened:

Left tilting— Increase
Right tilting— Decrease



★ The length of brace (ℓ) is 1286mm normally and can be varied in the range of 1231 to 1341mm. Do not attempt to extend the brace over 1341mm to prevent arising of an undue condition.



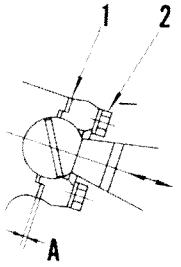
★ When turning brace by using the adjustment rod, keep blade off the ground and tilt it (as required).

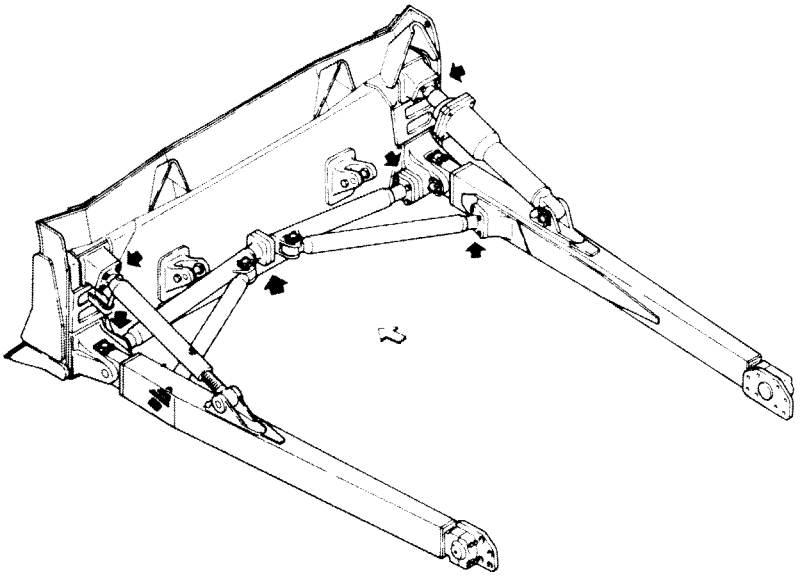
CHECKING END PLAY

Adjust the ball joints (at 7 places) with shims so that play of each ball becomes within 1mm in axial direction (shown by an arrow in the figure).

1. Remove shim (1) and tighten bolts (2) until play of the ball joint is eliminated.
2. Measure clearance "A" and remove bolts (2).
3. Install shim (1) having its thickness of (A + 0 ~ 1)mm and tighten bolts (2).

★ Confirm that ball joint can move smoothly after tightening bolts.





OPERATION OF ANGLEDOZER

Blade can be operated in a similar manner to that of tiltdozer.

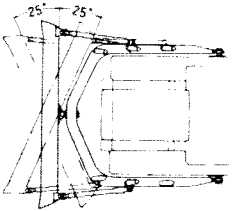
CHANGING OF BLADE POSTURE

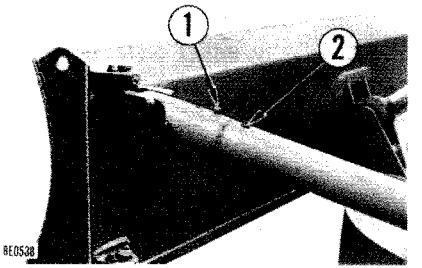
Angledozer blade posture can be changed in both angling and tilting. When changing blade posture, hold blade 300 to 400mm off ground.

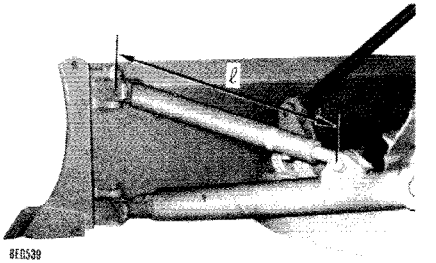
- **Angling**
  By replacing the pin connecting blade arm to C frame, blade can be angled at 25° on both right and left sides.

- **Tilting**
  To tilt, remove brace set bolt (1), insert adjustment rod into hole (2) in each brace, and turn it. Maximum tilting of 500mm is possible by shortening one brace and lengthening the other.

★ The length of brace (ℓ) is 1338mm normally and can be varied in the range of 1267 to 1424mm. Do not attempt to extend the brace over 1424mm to prevent arising of an undue condition.





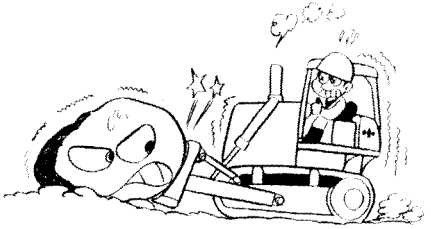


TIPS FOR LONGER UNDERCARRIAGE LIFE

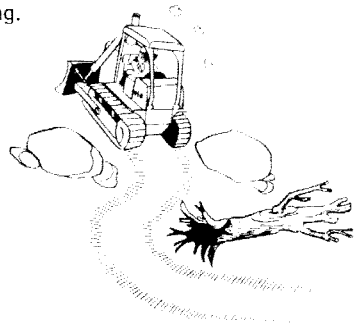
Undercarriage life greatly varies depending on operation method, inspection and maintenance. For most efficient operation, keep the following point in mind. (For inspection and adjustment procedures, refer to the section ADJUSTMENT)

OPERATION METHOD

- Select the track shoe that best suits the type of soil to be encountered in service.
- Avoid sudden starts, acceleration or stops, unnecessarily high speeds and sharp turns.
- Do not slip shoe during operation. If shoe slips, reduce load until slipping stops.



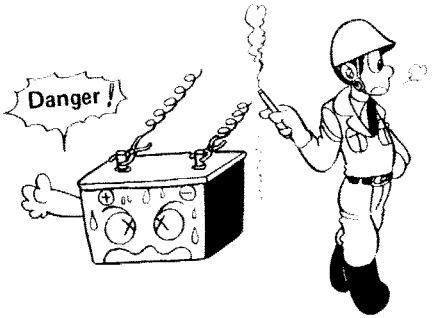
- When idlers or sprockets are lifted due to obstacles during dozing and ripping, do not attempt to force the machine to perform. Because work at this time exceeds machine working capability.
- When ground inclines to left or right during digging operation, do not continue to dig with machine inclined. Move machine back to level ground and start to dig again.
- On a slope, operate the machine parallel to the inclination of the slope. Do not operate across the slope. Also when on a slope, the machine should face toward the top of the slope.
- Always operate machine in a straight line whenever possible. When making turns, be careful not to allow the machine to stay to one side, so operation in both turning directions can be done properly. Make turns with the largest possible radius.
- Prior to operation, clear boulders and obstacles to prevent machine from riding over them while operating.

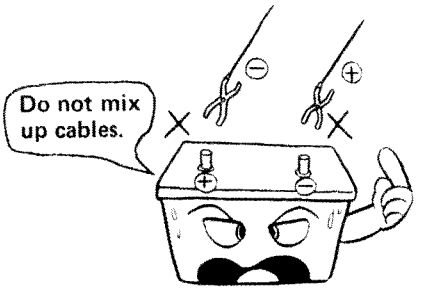


HANDLING OF BATTERY

PRECAUTIONS FOR CHARGING BATTERY

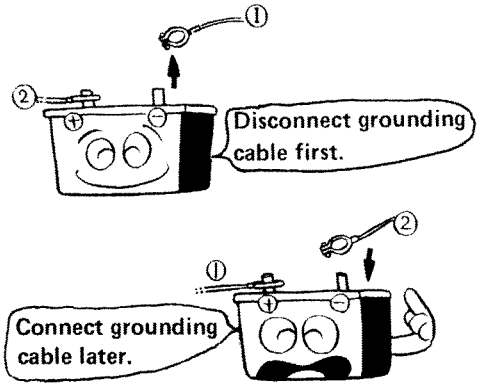
1. Before charging, disconnect the cable from the negative (–) terminal of the battery. Otherwise, an unusually high voltage will damage the alternator.
2. While charging the battery, remove all battery plugs for satisfactory ventilation.
   To avoid gas explosions, do not bring fire or sparks near the 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.
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

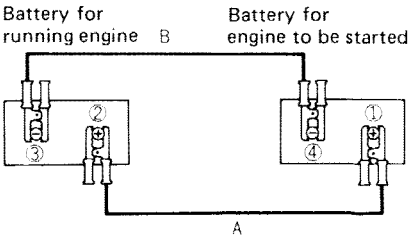
- When removing battery, first disconnect the cable from the ground (normally, from the negative (–) terminal). If a tool touches a cable connecting the positive terminal and the chassis, there is danger of sparks being emitted.
- When installing battery, the ground cable should be connected to the ground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



STARTING ENGINE WITH A BOOSTER CABLE

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

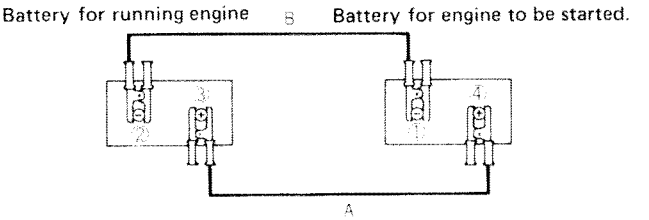
1. Before connecting the booster cable
   1) Size of booster cable and clip should be suitable for the battery size.
   2) Check cables and clips for breaks, corroded surfaces, etc.
   3) Make sure cables and clips are firmly secured.
   4) Keep the starting switch key in OFF position.
   5) The battery 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. Connect the other clip to the positive (+) terminal to the engine which is running.
   2) Connect one clip of booster cable B to the negative (–) terminal of the engine which is running. Connect the other clip to the negative (–) terminal of the engine to be started.
   3) Make sure the clips are firmly connected to battery terminals. Then, start the engine.



3. Starting the engine
   1) Turn the starting switch key 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 negative (−) terminal on the engine which was started and disconnect the other clip from the negative (−) terminal of the running engine.
   2) Disconnect the clip of booster cable A from the positive (+) terminal of the running engine and disconnect the other clip from the positive (+) terminal of the engine which was started.



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.

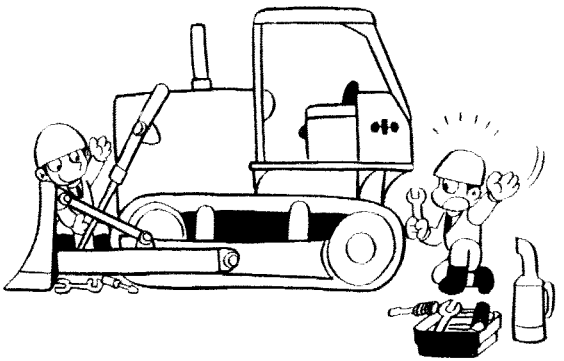
All hourly figures given in the following descriptions are based on service meter readings. In practice, however, it is recommended to rearrange all of them into units of days, weeks and months to make the maintenance schedule more convenient. Under rough job site or operating conditions, it is necessary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

PRECAUTIONS FOR MAINTENANCE

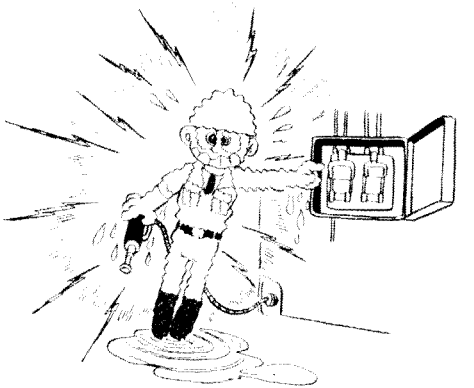
GENERAL

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

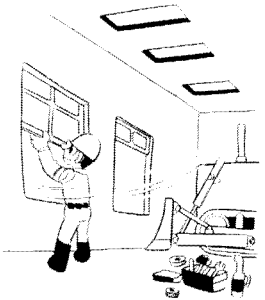
- Fuel or oil are dangerous substances.
  Never handle fuel, oil, grease or oily clothes in places where there is any fire or flame.
  As preparation in case of fire, always know the location and directions for use of fire extinguishers and other fire-fighting equipment.



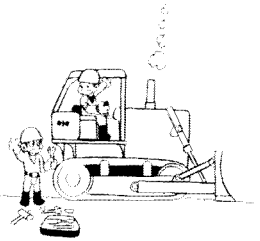
- When working with others, choose a group leader and work according to his instructions. Do not perform any maintenance beyond the agreed work.



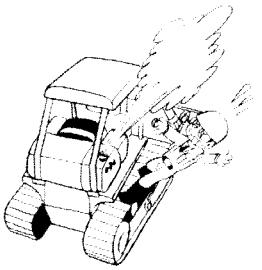
- Do not handle electrical equipment while wearing wet gloves, or in wet places, as this can cause electric shock.
- During maintenance do not allow any unauthorized person to stand near the machine.



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

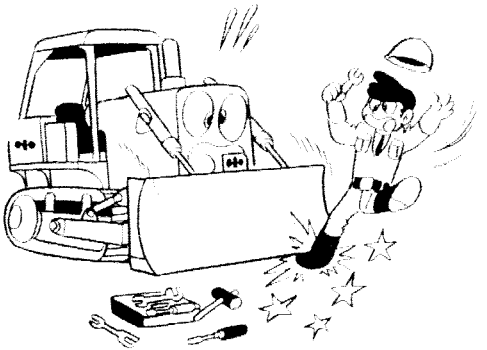


- Unless you have special instructions to the contrary, maintenance should always be carried out with the engine stopped. If maintenance is carried out with the engine running, there must be two men present: one sitting in the operator's seat and the other one performing the maintenance. In such a case,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

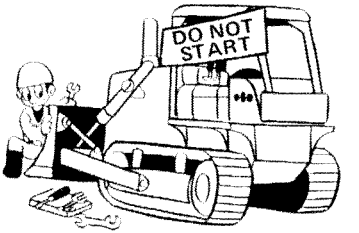


- Always remember that the hydraulic oil circuit is under pressure. When feeding or draining the oil or carrying out inspection and maintenance, release the pressure first.
  The procedure for releasing the hydraulic pressure is as follows: lower the blade and ripper to the ground, and stop the engine; move the control levers to each position two or three times and then slowly loosen the oil filler cap.
- Always use Komatsu genuine parts for replacement.
- Always use the grades of grease and oil recommended by Komatsu. Choose the viscosity specified for the ambient temperature.
- Always use pure oil or grease, and be sure to use clean containers.
- When checking or changing the oil, do it in a place free of dust, and prevent any dirt from getting into the oil.

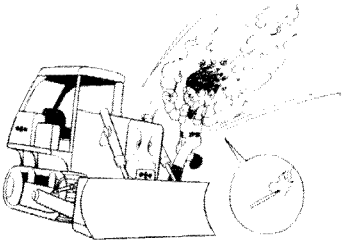
DURING MAINTENANCE



- Park the machine on firm, flat ground. Lower the blade and ripper to the ground and stop the engine. Return the gear shift lever to "NEUTRAL", apply the brake lock and set each control lever to "LOCK". When maintenance has to be carried out with the blade and ripper raised, they must be securely supported by blocks.
- 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.

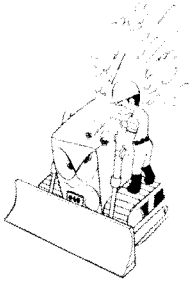


- Hang a caution sign in the operator's compartment (for example "Do not start" or "Maintenance in progress").
  This will prevent anyone from starting or moving the machine by mistake.

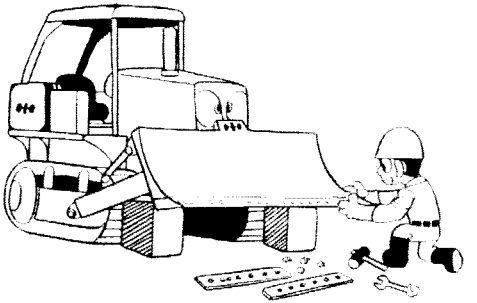


- Flames should never be used instead of lamps. Never use a naked flame to check leaks or the level of oil, fuel, anti-freeze or electrolyte.
- Immediately remove any oil or grease on the floor of the operator's compartment, or on the handrail. It is very dangerous if someone slips while on the machine.

- When check an open gear case there is a risk of dropping things in. Before removing the covers to inspect such cases, empty everything from your pockets. Be particularly careful to remove wrenches and nuts.
- Before draining the oil, warm up it to a temperature of 30 to 40° C.



- Be particularly careful when removing the radiator cap or the hydraulic oil tank filler cap. If this is done immediately after using the machine, there is a danger that boiling water or oil may spurt out.
- After replacing oil, filter element or strainer, bleed the air from the circuit.
- 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 the tracks are removed, never put your fingers between the shoes.



- When handling the cutting edges, always wear gloves.

- Special measuring apparatus is needed for testing hydraulic pressure.

- When changing the electrical circuit, adding additional or new equipment, or when replacing parts with parts which are not Komatsu genuine parts, please contact your distributor first.

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 the Komatsu distributor to carry out it.

MAINTENANCE TABLE

No.	ITEM	SERVICE	PAGE
	CHECK BEFORE STARTING		
a	Oil and water leak	Check	31
b	Nuts and bolts	Check and retighten	31
c	Electric wiring	Check and retighten	31
d	Coolant	Check and supply	32
e	Fuel	Check and supply	32
f	Engine oil pan	Check and supply	33
g	Steering clutch case (incl. transmission and torque converter case)	Check and supply	33
h	Fuel tank	Drain sediment	34
i	Steering lever	Check travel	34
j	Brake pedal	Check travel	34
k	Dust indicator	Check	35
l	Water separator (Option)	Inspect float position	35

★ **For new machine, change all oil, replace all filter elements and check engine valve clearance at the first 250 hours service.**

No.	ITEM	SERVICE	PAGE
	EVERY 250 HOURS SERVICE		
a	Check and correct oil level		75
-1	Final drive case	Check and supply	75
-2	Hydraulic tank	Check and supply	75
b	Greasing		76
-1	Fan pulley	Greasing 1 point	76
-2	Tension pulley	Greasing 1 point	76
-3	Tension pulley bracket	Greasing 1 point	76
-4	Brace screw	Greasing 1 point (for tiltdozer) 2 points (for angledozer)	76
-5	Cylinder support shaft	Greasing 2 points	76
-6	Cylinder ball joint	Greasing 2 points	77
-7	Cylinder support yoke	Greasing 4 points	77
-8	Tilt cylinder ball joint	Greasing 1 point	77
-9	Brace ball joint	Greasing 1 point (for tiltdozer only)	77
-10	Arm ball joint	Greasing 3 points (for tiltdozer only)	77

No.	ITEM	SERVICE	PAGE
	(EVERY 250 HOURS SERVICE)		
-11	Oblique arm ball joint	Greasing 2 points	78
c	Engine oil pan and full-flow filter	Change oil and replace element	78
d	Alternator drive belt	Check tension	79
e	Fuel filter	Drain water and sediment	80
f	Transmission and steering oil filter element	Replace	80
g	Battery electrolyte level	Check	81
h	Track shoe bolt	Check and retighten	81
	EVERY 500 HOURS SERVICE		
a	Fuel filter element	Replace	82
b	Bypass filter element	Replace	83
c	Corrosion resistor cartridge	Replace	83
d	Breathers	Clean	84

No.	ITEM	SERVICE	PAGE
	EVERY 1000 HOURS SERVICE		
a	Greasing		85
-1	Diagonal brace	Greasing 2 points	85
-2	Universal joint	Greasing 8 points	85
-3	Idler adjusting rod	Greasing 2 points	85
b	Steering clutch case (incl. transmission and torque converter case)	Change oil and clean strainer	86
c	Final drive cases	Change oil	87
d	Hydraulic tank	Change oil and replace filter element	88
e	Radiator fin	Check and clean	89
f	Undercarriage components	Check lubricating condition	89

No.	ITEM	SERVICE	PAGE
	EVERY 2000 HOURS SERVICE		
a	Greasing		90
-1	Decelerator pedal shaft	Greasing 2 points	90
-2	Gear shift lever shaft	Greasing 3 points	90
-3	Equalizer bar shaft	Greasing 1 point	90
-4	Brake pedal lever shaft	Greasing 6 points	90
-5	Fuel control lever shaft	Greasing 3 points	91
-6	Blade control lever shaft	Greasing 3 points	91
b	Alternator and starting motor	Check	92
c	Viscous damper	Check	92
d	Injector adjustment screw	Check tightening torque	92
e	Injector mounting bolt	Retighten	92
f	Engine valve clearance	Check and adjust	92

No.	ITEM	SERVICE	PAGE
	EVERY 4000 HOURS SERVICE		
a	PT pump AFC bellows	Replace	93
b	Intake and exhaust manifold	Retighten mounting bolt and nut	93
c	Injector	Check and clean	93
d	Turbocharger	Clean blower impeller	93
e	Turbocharger	Check play	93
f	PT pump	Check and adjust	93
g	PT pump	Replace filter screen and magnet	93
h	PT pump AFC	Check	93
i	Crankshaft	Check and adjust end clearance	93
j	Water pump	Check	93
			93

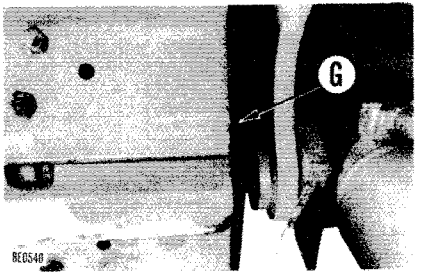
No.	ITEM	SERVICE	PAGE
	WHEN REQUIRED		
a	Air cleaner element	Check, clean or replace when required	94
b	Change coolant and clean cooling system	Twice a year (spring and autumn)	96
c	Track	Check tension when required	98
d	Glow plug	Before using starting aid, check once a year	99
e	Water separator (Option)	Drain water and sediment	99
f	Engine compartment	Check and clean	100
g	Fuses	Check	100
h	Transmission case	Clean	100

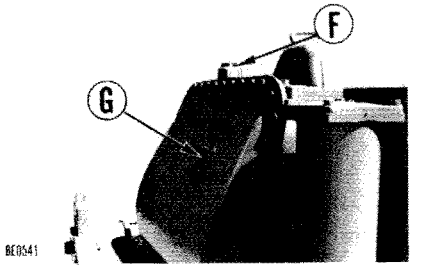
EVERY 250 HOURS SERVICE

a. **CHECK AND CORRECT EACH OIL LEVEL IN THE FOLLOWING UNITS.**

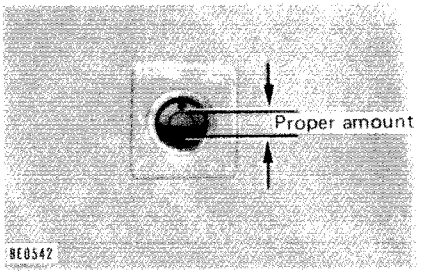
1. Final drive case
   Disengage the plug (G) and when it is found that the oil is not filled nearly to the lower edge of the plug hole, replenish engine oil through the oil filler.
   ★ Use CLASS CD SAE30 engine oil for all seasons.
   ★ The maintenance shall be made placing the machine on a horizontal plane.

2. Hydraulic tank.
   Lower the blade to the ground and stop the engine. If the level is not between the above and below line on the oil level gauge (G), replenish engine oil through the oil filler (F).
   ★ Use CLASS-CD SAE10W engine oil for all seasons.
   ★ This inspection shall be carried out before starting work.





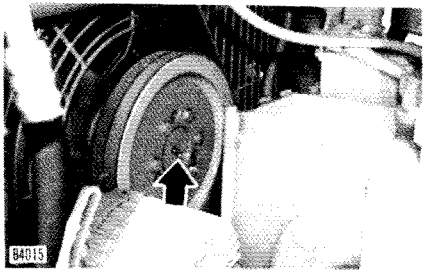
Detailed photograph of the oil level gauge



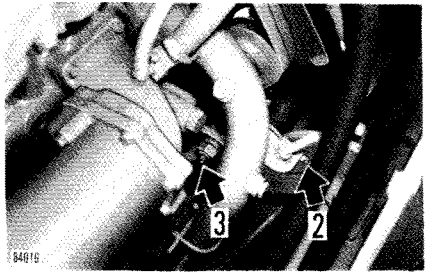
b. LUBRICATE THE FOLLOWING PARTS

Grease each point indicated by arrows.

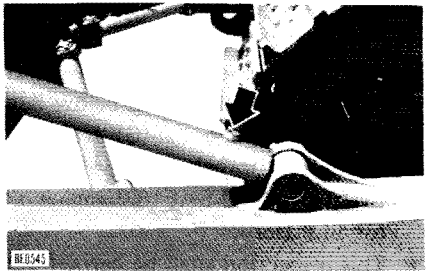
1. Fan pulley (1 point)



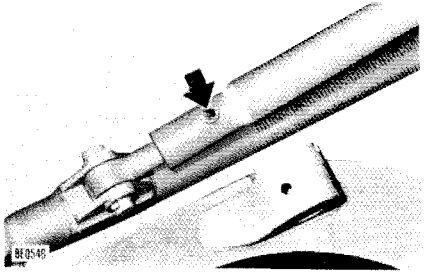
2. Tension pulley (1 point)
   Supply grease till it flows out of relief valve.
3. Tension pulley bracket (1 point)



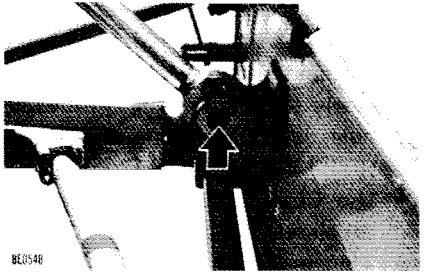
4. Brace screw
   - For tiltdozer (1 point)



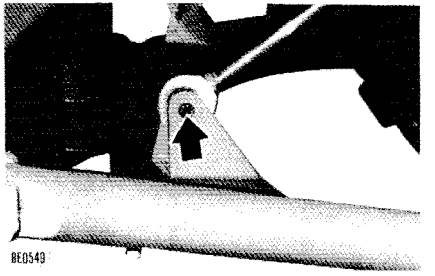
   - For angledozer (2 points)



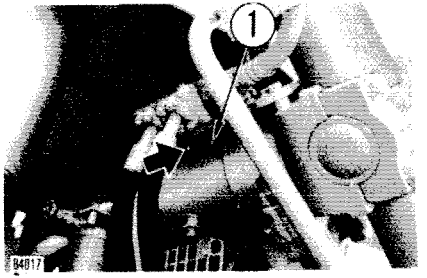
5. Cylinder ball joint
   - For tiltdozer (2 points)



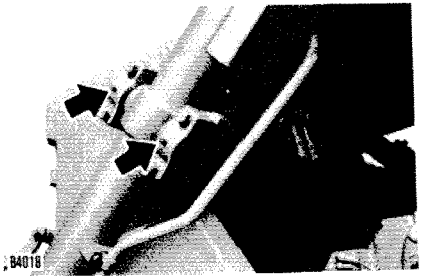
   - For angledozer (2 points)



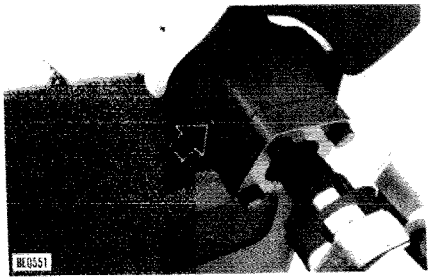
6. Cylinder support shaft (2 points)
Replenish grease till it flows out of the valve (1) and the rotating section.



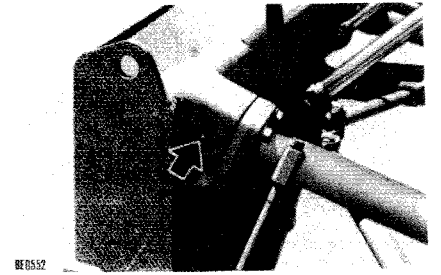
7. Cylinder support yoke (4 points)



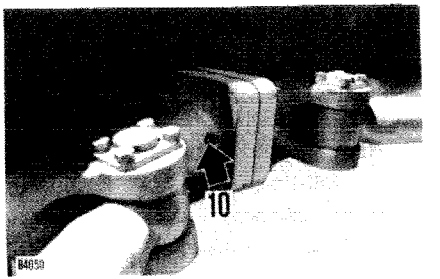
8. Tilt cylinder ball joint (1 point)



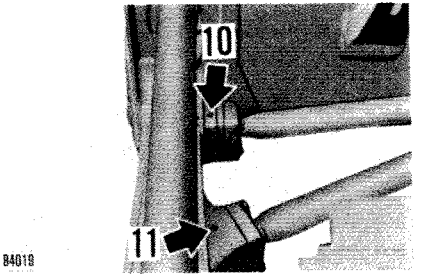
9. Brace ball joint
For tiltdozers only (1 point)



10. Arm ball joint (3 points)
For tiltdozers only



11. Oblique arm ball joint (2 points)
For tiltdozers only



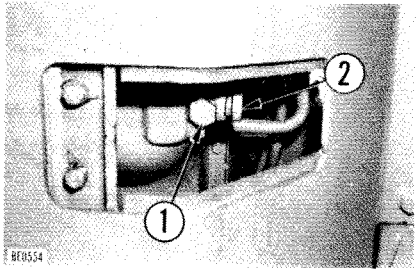
c. ENGINE OIL PAN AND FULL-FLOW FILTER

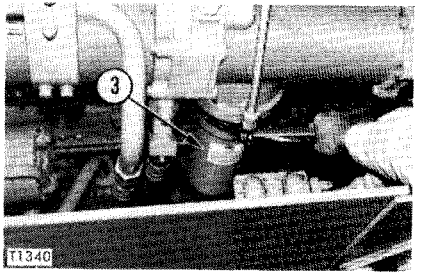
1. After removing the cover from underside of machine, remove the drain plug (1) and drain valve (2). Tighten the drain valve (2) and plug (1) after draining oil. Also drain oil from the by-pass filter drain plug. (Refer to section EVERY 500 HOURS SERVICE.)
2. Remove the cartridge element (3) of full-flow filter by turning it counterclockwise with a tool. Clean dust and unfiltered oil collected on the filter base. Install new element after applying engine oil (or a thin coat of grease) on packing surface of the element.

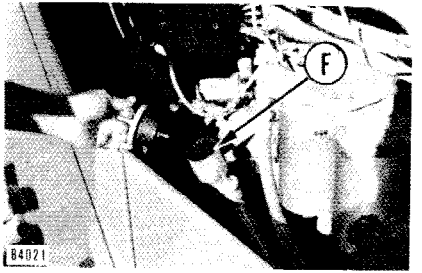
   To install the element, bring its packing surface into contact with sealing surface of filter base and then tighten the element 2/3 turn by hand. (Be careful not to overtighten.)
3. After replacing the element, fill engine oil through oil filler (F). Then idle the engine for a while, and recheck oil level.

★ Above 0°C: Use engine oil CLASS-CD SAE30.
Below 10°C: Use engine oil CLASS-CD SAE10W.

★ Refill capacity: 23 ℓ
kgm Drain plug (1) tightening torque: 6 ~ 8 kgm
kgm Drain valve (2) tightening torque: 5 ~ 8 kgm
★ Use a genuine Komatsu cartridge element.
★ Replace cartridge element every 6 months irrespective of operating hours.





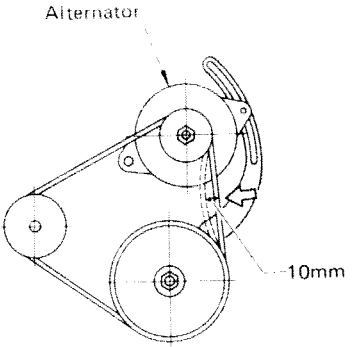


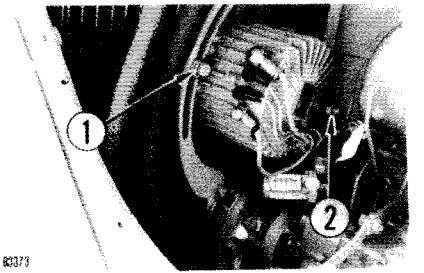
d. ALTERNATOR DRIVE BELT TENSION

A dip of approx. 10mm when the belt is depressed midway between the alternator pulley and driving pulley is standard.

Adjust tension if necessary. The adjustment is made by loosening the nuts (1) and (2) and shifting the position of the alternator.

- ★ When the belt is replaced, readjust its tension after running for an hour.
- ★ Check for damaged pulleys, worn V-grooves and worn V-belts. Carefully check each V-belt to confirm that it is free from contact with the bottom of V-groove in each pulley.
- ★ Replace a belt if it has been stretched, leaving no allowance for adjustment, or if flaws or cracks are found in the belt. Replace a set of two belts at the same time.



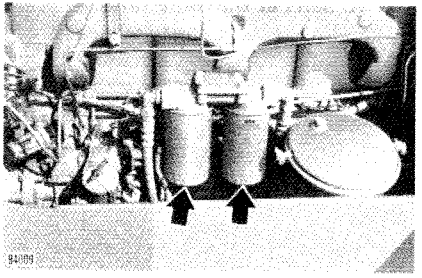


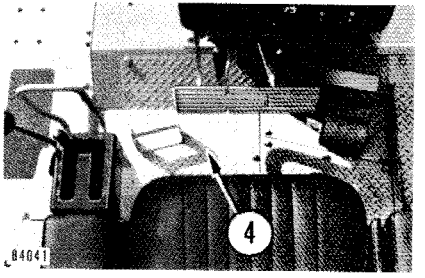
e. FUEL FILTER

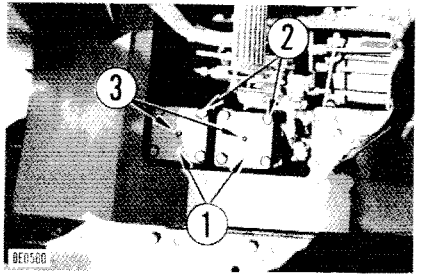
Remove drain plug at the bottom of cartridge. Drain water and sediments together with fuel.

f. TRANSMISSION AND STEERING OIL FILTER ELEMENT

1. Remove floor plate (4) at the left side of operator's seat.
2. Remove the bolts (2), disengage the covers (1), and take out the element. Then, clean the interior of the case as well as the disassembled parts, and attach new element.
   ★ Use a genuine Komatsu element.
3. After replacing the element or changing oil, start the engine. Loosen the air vent plug (3) to bleed air. When oil spurts out, retighten the plug.





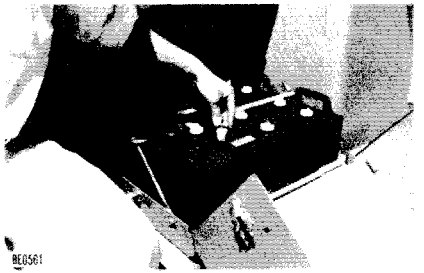


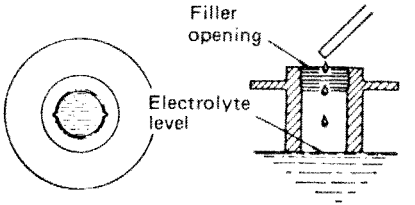
g. ELECTROLYTE LEVEL IN BATTERY

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.

★ Never use metal funnel for electrolyte supply.





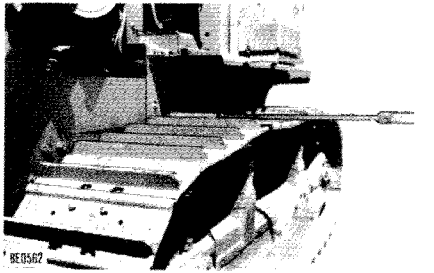
Top view Side section view

h. TRACK SHOE BOLT

The shoe bolt attaching the shoe to the link will be broken if it is used when loosened. So, you are required to retighten every time you find a loosened one.

★ Bolt tightening torque:

82 ± 6 kgm

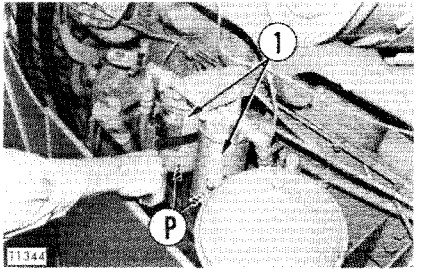


EVERY 500 HOURS SERVICE

★ **The maintenance for every 250 hours should be carried out at the same time.**

a. FUEL FILTER ELEMENTS

1. After closing valve at the bottom of fuel tank, and remove drain plugs (P) at the bottom of cartridge and drain fuel oil.
2. Remove cartridge (1) by turning it counterclockwise with a tool.
   Install new cartridge after filling them with fuel.
3. To install cartridge, bring their heads into contact with sealing surface and then tighten cartridge 1/2 to 3/4 turn by hand.
   ★ Be careful not to overtighten.
   ★ Use genuine Komatsu cartridge.



b. BY-PASS FILTER ELEMENT

1. Remove drain plug (3). After draining, tighten drain plug (3).
2. Loosen bolt (1) and remove band (2) and cover (4).
3. Loosen nut and remove the element. Wipe dirt and oil off the bottom of case, and install a new element.
4. After replacing the element, fill it with engine oil and install cover (4). Replace cover O-ring at the same time.

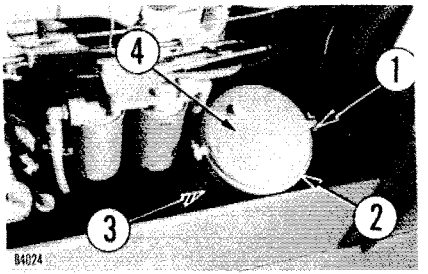
★ Clean the oil outlet orifice at the bottom of case thoroughly with compressed air.

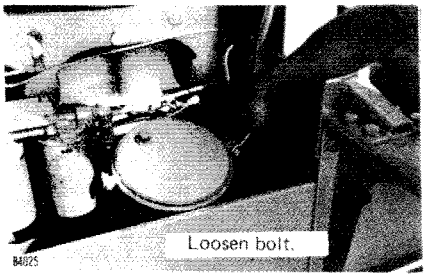
★ Use a genuine Komatsu element.

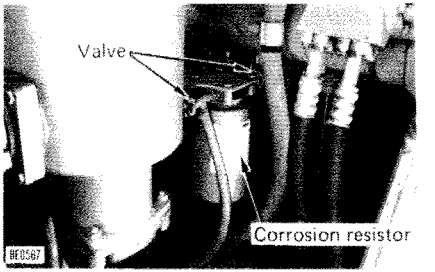
c. CORROSION RESISTOR CARTRIDGE

1. Screw-in the valves on the upper parts of corrosion resistor.
2. Remove cartridge by turning counterclockwise with a tool, and replace the cartridge by new one. To install the cartridge, coat engine oil to the sealing surface and turn the cartridge until the sealing surface touches the head. Then screw it further by 1/2 to 3/4 turn. (Be careful not to overtighten.)
3. After replacement, open the valves.

★ Use a genuine Komatsu cartridge.



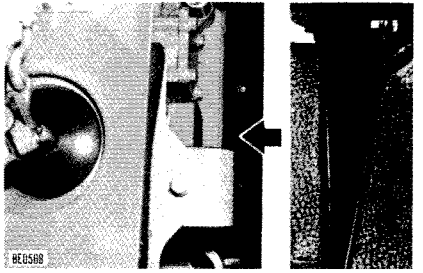




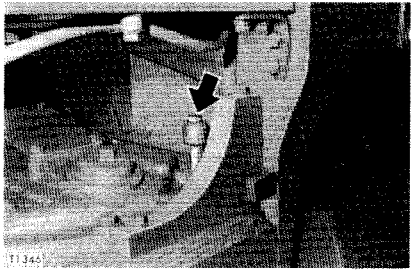
d. BREATHER

Remove the breathers and wash the interior by clean diesel oil so that dust accumulated inside will be washed away.

- Steering clutch case breather



- Final drive case breather



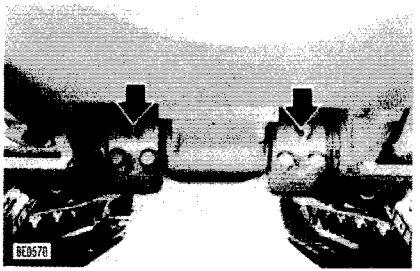
EVERY 1000 HOURS SERVICE

★ **Maintenance for every 250 and 500 hours should be carried out at same time.**

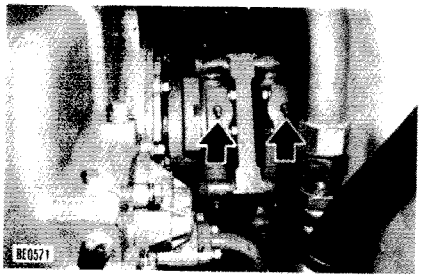
a. LUBRICATE THE FOLLOWING PARTS

Grease each point indicated by arrows.

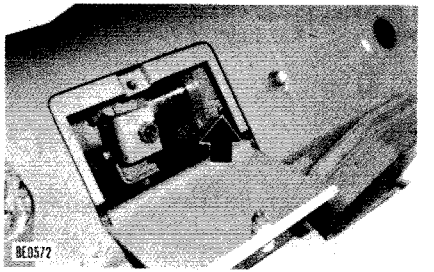
1. Diagonal brace (2 points)



2. Universal joint (8 points)

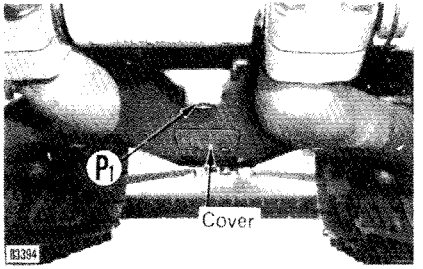


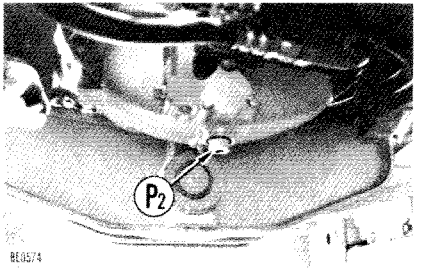
3. Idler adjusting rod (2 points)



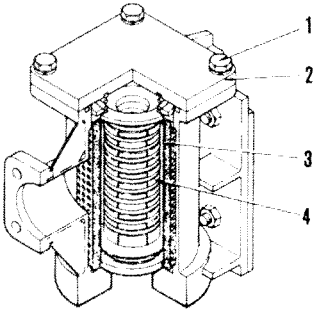
b. STEERING CLUTCH CASE (INCL. TRANSMISSION AND TORQUE CONVERTER CASE)

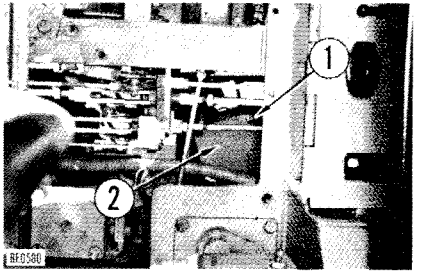
1. Remove drain plug (P_1), inspection cover at the bottom of machine body, and drain plug (P_2).
   After draining, tighten the plugs (P_1) and (P_2).



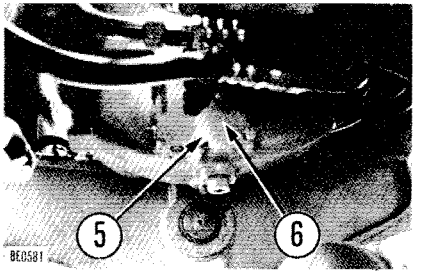


2. Remove left floor plate, bolt (1), cover (2), steering clutch case strainer (3) and magnet (4).





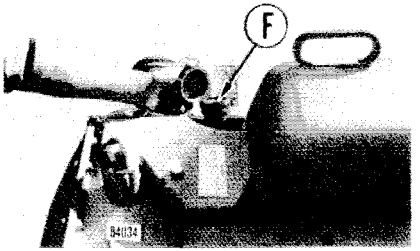
3. Next, loosen bolt (5) and remove strainer of torque converter together with cover (6).
4. Clean the interior of case, disassembled parts and the strainer. Then reinstall them. If the strainer is broken, replace it with a new one.



5. After replacing transmission and steering oil filter element (refer to the section EVERY 250 HOURS SERVICE), refill engine oil through oil filler (F).

★ Above 0°C: Use engine oil CLASS-CD SAE30.
Below 10°C: Use engine oil CLASS-CD SAE10W.

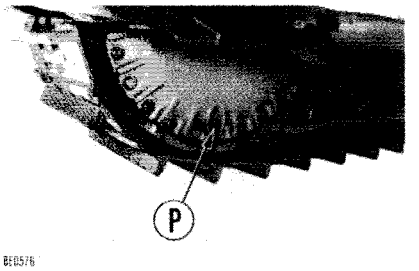
★ Refill capacity: 90ℓ



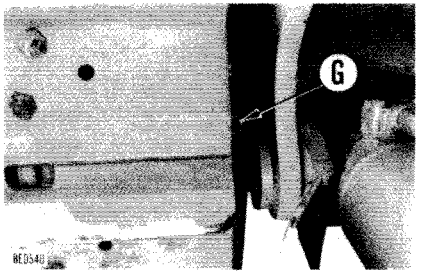
c. FINAL DRIVE CASE

1. Remove drain plugs (P) on each side of the machine body.
   After draining oil, tighten them.
2. Refill engine oil through oil filler plug (G).

★ Use CLASS-CD SAE30 engine oil for all seasons.



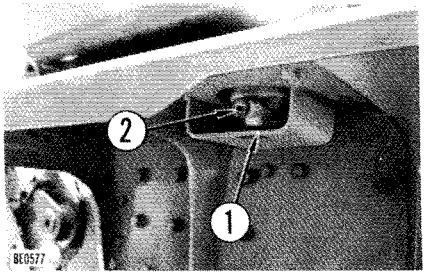
★ Refill capacity: 36ℓ (each side)

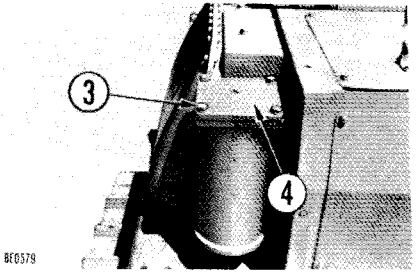


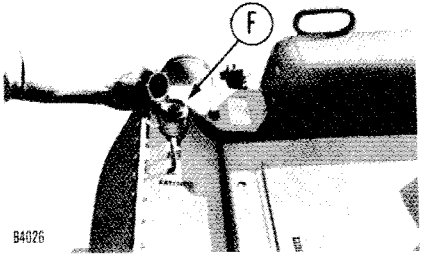
d. HYDRAULIC TANK

1. Remove drain plug (1) on the bottom of the tank, and remove drain valve (2).
   After draining oil, tighten them.
2. Next, remove bolt (3), cover (4) and the element.
3. Clean the disassembled parts and the interior of the filter, and install a new element.
4. After replacing the element, refill engine oil through oil filler (F).

★ Use a genuine Komatsu element.
★ Use CLASS-CD SAE10W engine oil for all seasons.
★ Refill capacity: Angledozer 70ℓ
Tiltdozer 70ℓ







e. RADIATOR FIN

Mud, dust, or leaves blocking the fin shall be blown off by compressed air. Steam or water is also employed instead of the compressed air.

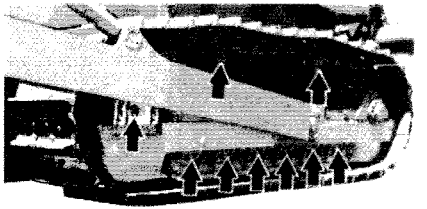
★ Check the rubber hose on this occasion and replace such hose as is cracked or fragile. Further, also inspect loosened hose clamps.

f. UNDERCARRIAGE COMPONENTS

Stop the machine on a flat land, and check the oil level of track roller, carrier roller, and idler **(gear oil SAE 140)** according to the following procedure.

1) Gradually loosen the seal bolt. When it is found that oil is oozing through screws, it is the proof that oil is not low. So, immediately re-tighten the screw.

2) When oil does not ooze out by loosening the bolt it is the proof that oil level is low indicating repair is needed.



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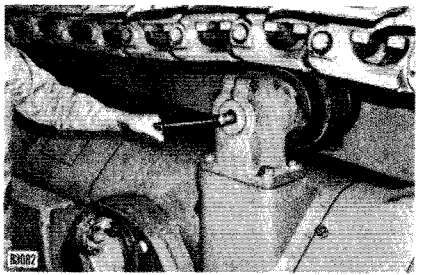


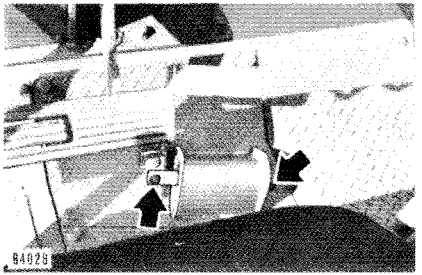
EVERY 2000 HOURS SERVICE

★ **The maintenances for every 250, 500, and 1,000 hours should be carried out at the same time.**

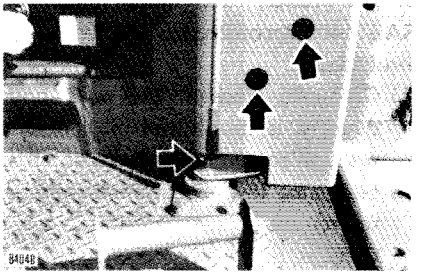
a. LUBRICATE THE FOLLOWING PARTS:

Grease to each point indicated by arrows.

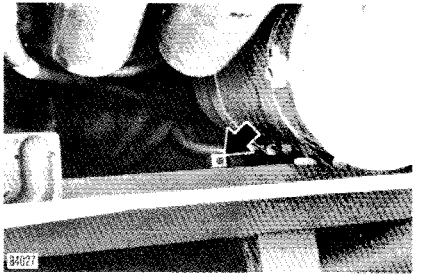
1. Decelerator pedal shaft (2 points)



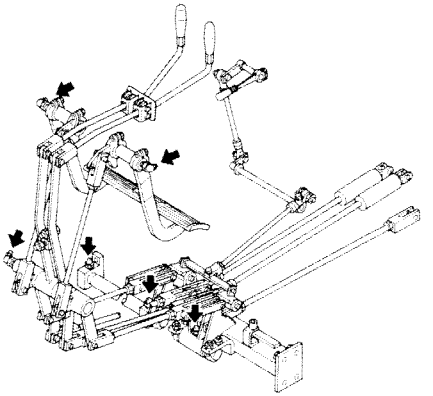
2. Gear shift lever shaft (3 points)



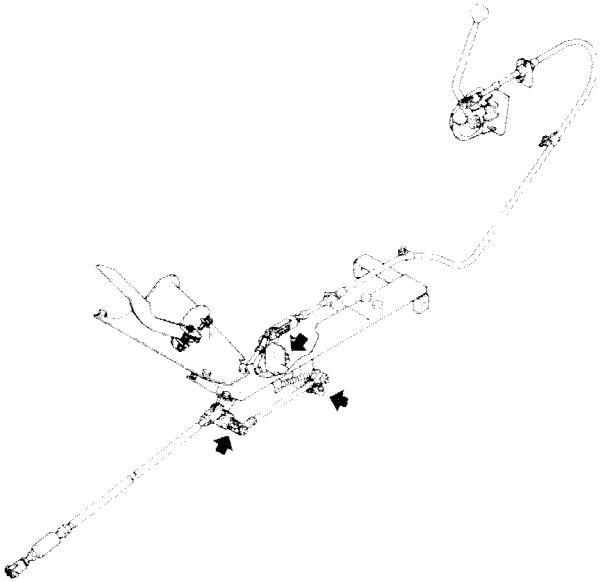
3. Equalizer bar shaft (1 point)



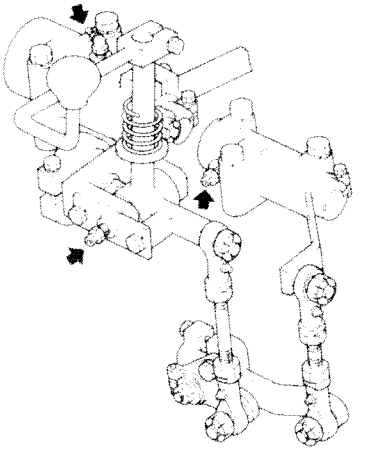
4. Brake pedal lever shaft (6 points)



5. Fuel control lever shaft (3 points)



6. Blade control lever shaft (3 points)



b. ALTERNATOR AND STARTING MOTOR

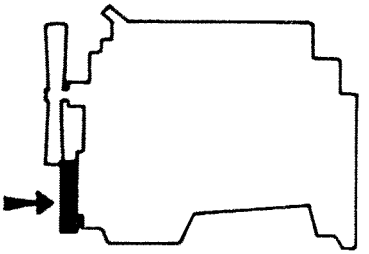
As the hours of engine employment indicate that the brushes are already worn out, you should request repair from a Komatsu distributor.

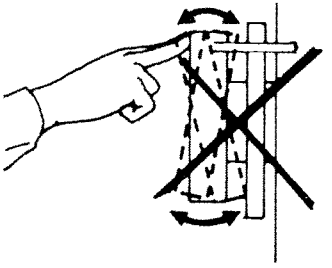
When it is disassembled without proper care, the drip-proof function may be damaged resulting in the intrusion of water. So, you shall contact a Komatsu distributor for repair.

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

c. VISCOUS DAMPER

Check damper for distortion, run-out and damper fluid reduction. If you find any defects, have your Komatsu distributor repair it.





d. CHECK INJECTOR ADJUSTMENT SCREW TIGHTENING TORQUE

e. RETIGHTEN INJECTOR MOUNTING BOLT

f. CHECK AND ADJUST ENGINE VALVE CLEARANCE

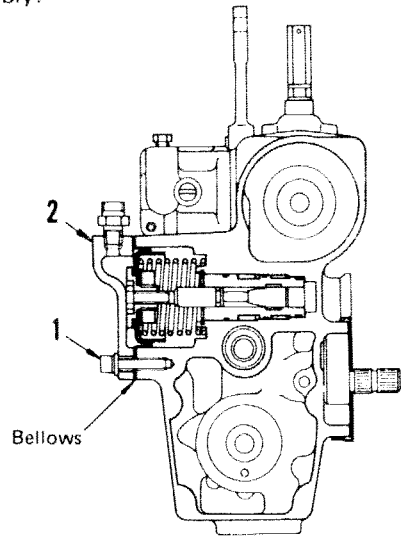
As special tool is required for removing and adjusting the parts, you shall request Komatsu distributor for service.

EVERY 4000 HOURS SERVICE

★ Perform EVERY 250, 500, 1,000 and 2,000 HOURS SERVICE at the same time.

a. PT PUMP AFC BELLOWS

After removing the tube connecting the intake manifold, remove bolt (1) and cover (2) and replace the bellows together with the plunger assembly with a new bellows and plunger assembly.



★ Clean the contact surface of the bellows before reinstalling a new one.

b. RETIGHTEN BOLTS AND NUTS THAT FIT INTAKE AND EXHAUST MANIFOLDS.

c. CLEAN, CHECK AND ADJUST INJECTOR.

d. CLEAN TURBOCHARGER'S BLOWER IMPELLER.

e. CHECK AND ADJUST PLAY OF TURBOCHARGER ROTOR.

f. CHECK AND ADJUST PT PUMP.

g. REPLACE FILTER SCREEN AND MAGNET OF PT PUMP.

h. CHECK AND ADJUST PT PUMP AFC.

i. CHECK AND ADJUST END CLEARANCE OF CRANKSHAFT.

Request check and adjustments to your Komatsu distributor because special tools are required.

j. CHECK WATER PUMP

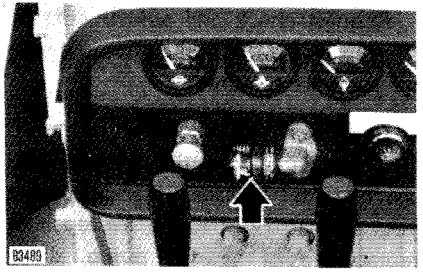
Check for loose pulley, grease leakage or water leakage. If any, contact your Komatsu distributor for repair or replacement of the water pump.

WHEN REQUIRED

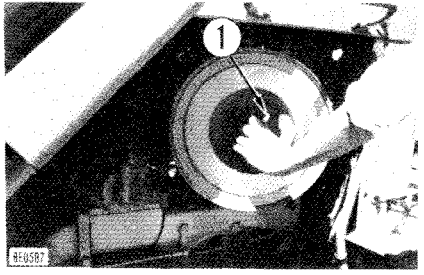
a. AIR CLEANER ELEMENTS

Checking

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



Cleaning or replacing outer element



1. Remove cover (1) and the outer element.
2. Clean the air cleaner body interior and the removed cover.
3. Clean and inspect the element. (See the next page for cleaning procedure.) Install the cleaned element.
4. Push button of dust indicator to return red piston.
   - ★ Replace an outer element cleaned as many as 6 times. In this case, replace together with an inner element.
   - ★ Even when an outer element has been cleaned less than 6 times, a dust indicator shows a red signal soon after a cleaned outer element is installed, replace both the outer and inner elements at the same time.
   - ★ When both outer and inner elements have been used for more than one year, replace the both elements, even though the outer element has not cleaned as many as 6 times.

Replacing inner element

1. First remove the cover and the outer element, and then remove the inner element.
2. Cover the air outlet with clean cloth or the like.
3. Fit a new inner element to the connector and tighten it with nuts.
4. Install the outer element and the cover. Push the dust indicator reset button.

NOTE: Do not attempt to reinstall a cleaned inner element.

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

Cleaning outer element

With compressed air

Direct dry compressed air (less than 7kg/cm^2) 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.**

The following methods require spare parts.

With water

Dash city water (less than 3kg/cm^2) on element from inside along folds, then from outside and again from inside. Dry and check it.

With cleaning agent

For removing oils and fats as well as carbon etc. attached on the element, the element may be cleaned in lukewarm solution of mild detergent, then rinsed in clean water and left to drip dry.

★ Drying can be speeded up by blowing dried compressed air (less than 7kg/cm^2) from the inside to the outside of the element.
Never attempt to heat the element.

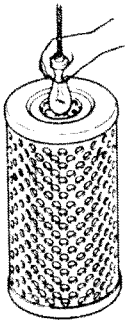
★ Using warm water (about 40°C) instead of soapy water may also be effective.

★ 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.

★ If element is usable, wrap it and store it in dry place.

★ Do not use element whose folds or gasket or seal are damaged.

★ When cleaning element, do not hit it or beat it against something.

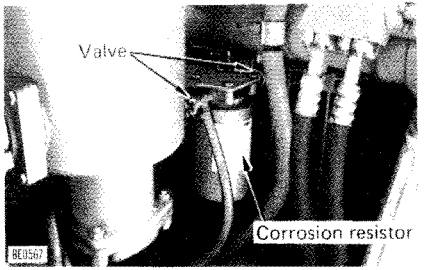


b. CHANGE COOLING WATER

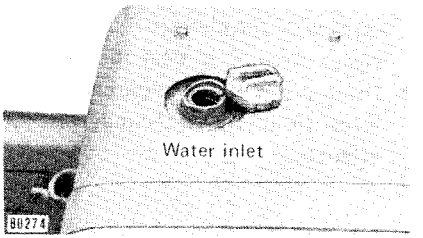
Perform twice a year in spring and autumn (when changing antifreeze solution).
In case antifreeze solution is not used, perform every 1000 hours.

Change

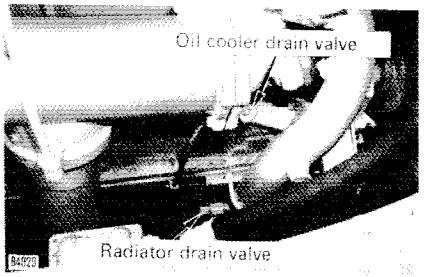
1. Stop engine, tighten corrosion resistor valve and remove feed water cap from radiator.
2. Drain coolant from radiator and oil cooler completely by opening drain valves.
3. Then clean, using a wash sold on the market. Follow the maker's instructions.
4. Drain all water, close drain valves and feed clean water (For example, city water) through water filler.
5. When water is filled up to the filler, open drain valves while keeping engine at low idling and keep feeding water until clear water comes out from drain valves.
6. When water becomes clear, close drain valves. Stop feeding water temporarily when water is filled up to water filler.
7. Replace corrosion resistor element and open the two valves.



Water filler



Drain valves



8. After opening valves, in order to let out air mixing in cooling water, run the engine for five minutes at low idling, then another five minutes at high idling. (During this time, the feed water cap is removed.)
9. Stop engine, and after three minutes, again feed water up to water filler and close cap.

★ Be sure to replace the corrosion resistor element (cartridge) at the same time.
★ Change while parking the machine on level ground.

⚠ **Never remove the cap when the water temperaure is high.**
When the temperature drops, turn cap slowly to allow pressure to be relieved.

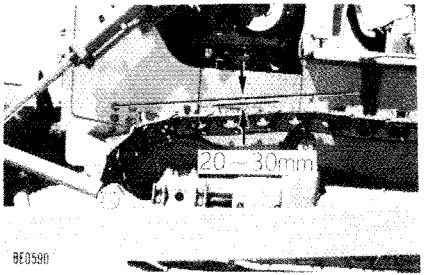
c. TRACK TENSION

Inspection

Stop the machine on a flat land, and put a straight rod on the carrier roller and the idler as shown on the Photo. When the distance between the rod and the shoe grouser is 20 to 30mm at the center, the tension is the standard one.

Adjustment

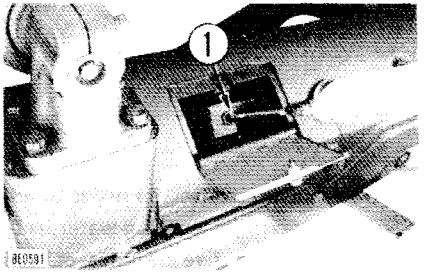
For tightening the tension, pressurize grease through grease fitting (1). On the other hand, for loosening the tension, extract grease by reversely rotating the plug (2) for "1 rotation".

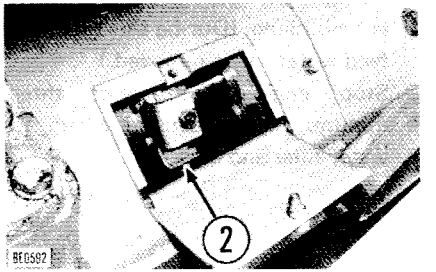


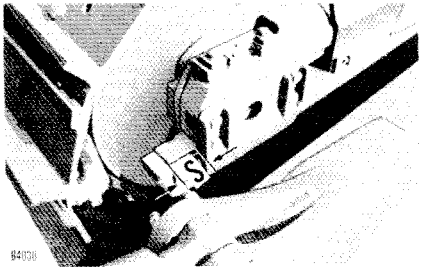
Grease may be pressurized till S will be 0mm. In case the tension is yet loose after applying pressurized injection of grease till the abovementioned limit, it indicates that the pin bush is reduced by too much abrasion. So it is necessary either to turn or replace the pin and bushings. Consult your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

⚠ **Do not loosen the plug (2) over one complete rotation. Also, be careful not to loose any part other than the plug (2).**

If the plug (2) 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. CHECKING GLOW PLUG

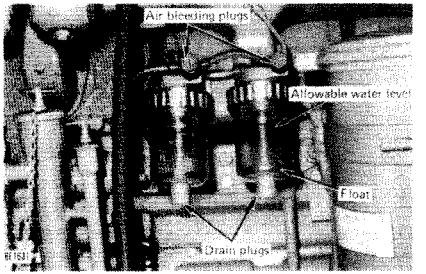
Before using starting aid, check glow plug once a year. Remove glow plug from air intake connection and discontinuity or adhering dirt.

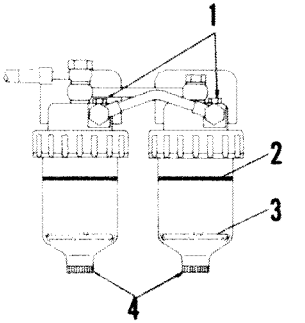
★ When checking or installing glow plug, replace the gasket with a new one.

e. WATER SEPARATOR (OPTION)

When the float is at or above the red line, drain the water according to the following procedure:

1. Loosen either of the two air bleeding plugs.
2. Loosen the two drain plugs and drain the accumulated water until the float reaches the bottom.
3. Tighten the drain and air bleeding plugs.





1. Air bleeding plug
2. Allowable water level (red line)
3. Float
   (floats on water to indicate the water level)
4. Drain plug

f. ENGINE COMPARTMENT

Check inside the engine compartment, and remove any flammable things such as pieces of wood, dead leaves, or paper.

g. FUSES

Check that fuses of specified capacity are being used. If the fuse repeatedly blows or there is a short circuit, always check for the cause and repair it.

h. TRANSMISSION CASE

Remove all mud and dirt on the transmission case.

ADJUSTMENT

ADJUSTMENT OF STEERING BRAKES

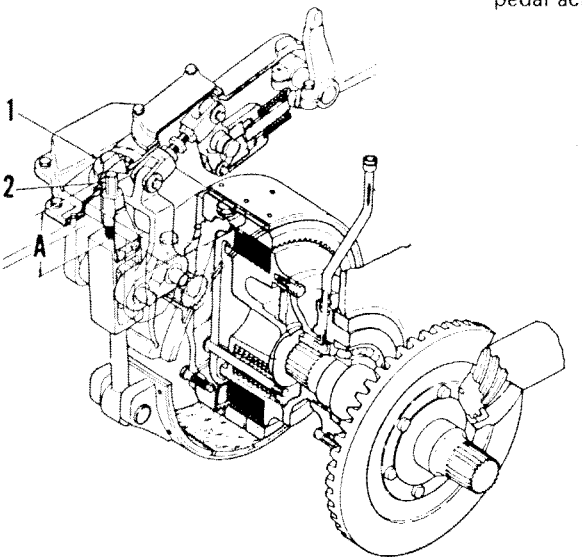
When brake lining wears, travel of steering pedal will increase, making steering difficult.

When travel exceed 200mm, (Be carefull, braking force decreased) adjust travel as follows:

Standard travel: 110 ~ 130mm
(operating force under engine is low idling: 15kg)
: 75mm (when engine is stopped.)

Adjustment

1. After removing rear cover, remove inspection cover (1).
2. Tighten adjustment bolt (2) to a tightening torque of 5kg.m, so that the lining comes into tight contact with drum. (The contact should be confirmed by depressing the brake pedal.)
3. Then, turn the adjustment bolt (2) in reverse direction for 7/6 rotation.



★ Adjust so that both left and right pedals will have same travel. If there is a difference in travel between the pedals, brake on one side only will give effective response to pedal action.

As the steering clutch is interlocked with the steering brake, you should also adjust the travel of the steering lever at the same time when the steering brake is adjusted.

★ When the A dimension of the brake adjusting bolt becomes smaller than 71mm, you should replace the lining with new one.

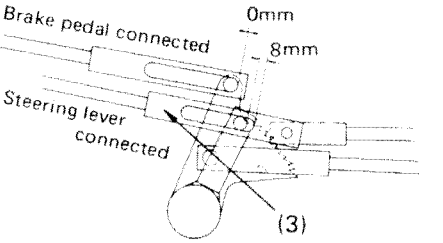
ADJUSTMENT OF STEERING LEVER TRAVEL

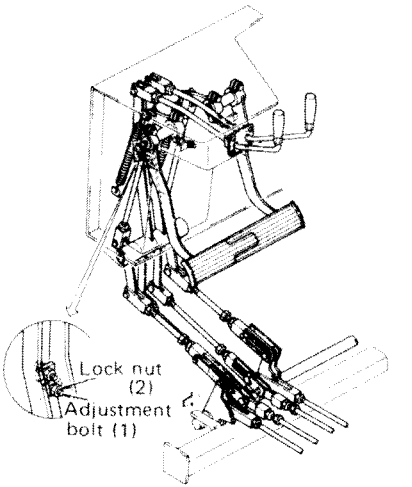
When the travel of the lever becomes larger because of abrasions and the play of the pin and the yoke connecting the lever with the rod, you should adjust the travel.

ADJUSTMENT

Loosen the lock nut (2), and adjust the adjustment bolt (1) so that the travel is adjusted to the standard value. Provided, however, that a play of 8mm should be provided at the tip of the rod yoke (3) slit to the brake pedal.

The standard travel is 140 to 150 mm at the lever tip. (When the engine is stopped.) At this state, the play of the lever is 1 to 6mm.



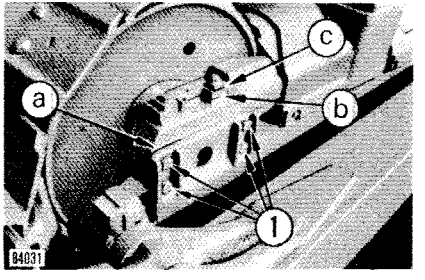


ADJUSTMENT OF IDLER

Since the idlers are forced to move forward and backward as long as the machine is in operation, the side guides (7), up-and-down guides (4), and guide plates (3) will be worn out gradually. Excessive wear of these guides, if left unattended, will cause the vibration of idlers from side to side or inclination of the idlers, and running off of track links from the idlers or unevenly worn idler and links may result. Therefore, it is necessary to adjust the idlers from time to time according to the following procedure so that they are always maintained in good running condition:

i) Adjustment of the side guides
Run the machine 1 or 2 meters on level ground to give its tracks even tension and then stop the machine. Check the clearance "A" between the track frame and side guide (7) (there are a total of 4 clearances: left, right, top, and bottom for each side guide).
If any clearance exceeds 4mm, loosen the bolts (1) and remove the required number of shims (a) to adjust the clearance to the standard value of 0.5 to 1.0mm. The thickness of shim are 0.5mm and 1.0mm.

When loosening the bolts (1), be careful not to turn them more than 3 turns. Otherwise, sheet (8) may fall down out of place, causing the troublesome reassembly of it.

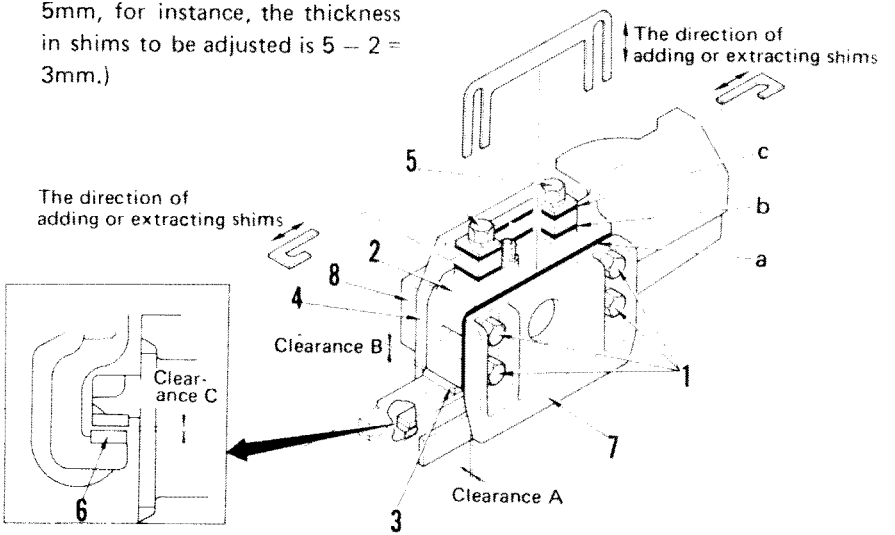


ii) Adjustment of the guide plates and the up-and-down guides

Measure the clearance "B" between the support (2) and guide plate (3) and the clearance "C" between the up-and-down guide (4) and track frame wear plate (6). If the sum of two clearances "B" and "C" exceeds 5mm, reduce it to 2mm by deducting the necessary thickness in shims from the extracting shims (c) and adding the same thickness in shims to the extracting shims (b).

This adjustment should be performed according to the following procedure:

1) Measure the clearance "B" and subtract 2mm from the value "B". The result corresponds to the thickness in shims to be adjusted. (In the case of B = 5mm, for instance, the thickness in shims to be adjusted is 5 – 2 = 3mm.)



★ The succeeding steps 2) and 3) are to release the up-and-down guides (4), which is necessary to remove a required thickness in shims from the extracting shims (c) and add it to the extracting shims (b).

2) Loosen the bolts (5) (there are a total of four inside and outside bolts) until no spring force is felt.

3) Loosen the bolts (1), taking care not to loosen them more than 3 turns.

4) Pull the up-and-down guide (4) upward with a bar so that the clearance "C" becomes zero (0mm). Remove the necessary thickness in shims determined by step 1) from the extracting shims (c).

5) Add the removed shims (c) to the extracting shims (b). (This procedure must be performed at a total of 8 positions, inside and outside for each of the left-hand and right-hand sides.)

★ The total number of shims obtained as the sum of shims (c) and (b) should not be varied before and after the adjustment. Careless reduction or addition of the total number of shims would be the cause of improper preload of springs built in the guide.
(Both the shims (b) and (c) are composed of several of two kinds of shims, 1mm thick and 2mm thick.)

6) Tighten the spring set bolts (6).

7) Tighten the bolts (1) to a torque of 50 to 62 kgm.

★ The maximum quantity of adjustment of 6mm is allowed for the up-and-down guides.

ADJUSTMENT OF DECELERATOR PEDAL

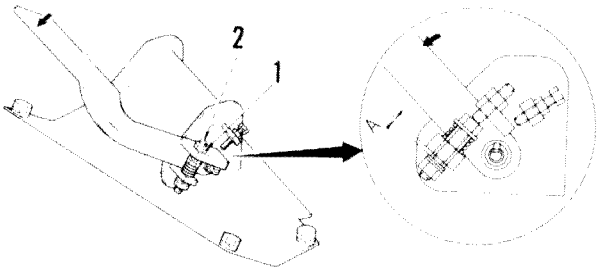
When the engine speed is not within the range of 800 to 850 rpm by setting the fuel control lever to 1/2 stroke and depressing the decelerator pedal (clearance A; zero), the following process shall be followed.

i) Loosen the lock nut (1), and adjust by rotating the screw (2) so that the engine speed will be 800 to 850 rpm at the position of pedal depressed (clearance: zero).

ii) Tighten the lock nut (1) after completing the adjustment.

★ When the decelerator pedal is forcefully depressed, the spring is forced over so that the engine operates low idling revolution.

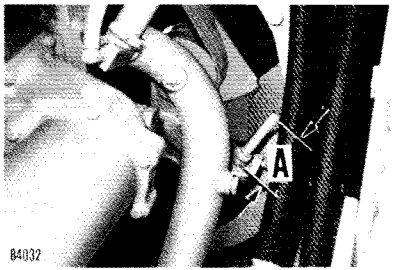
★ Tachometer is required for setting the engine revolution with precision. So, you shall consult Komatsu distributor.



ADJUSTMENT OF FAN BELT

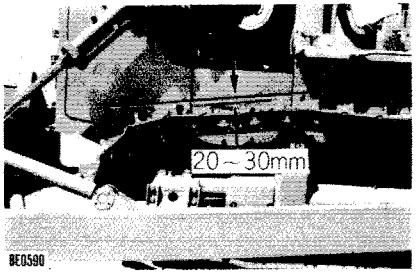
A device is employed by which the tension of the fan belt is kept constant regardless the elongation of the V belt, there is no need for adjustment till the belt is broken. However, when the belt is replaced by new one, you should check that the A dimension is 106 ± 5 mm, and adjust it when the value is not within the abovementioned range.

★ When V belts are replaced, you should replace both them at the same time.



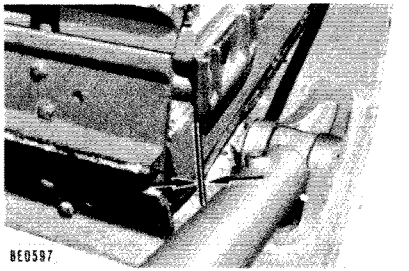
INSPECTION AND ADJUSTMENT OF UNDERCARRIAGE

- Properly adjust track tension. Tension should be measured at clearance shown in photograph -- usually 20 to 30mm at this point. For rocky terrain, tighten tracks slightly. In clay or sandy areas, slightly loosen them. (For inspection and adjustment procedures, refer to WHEN REQUIRED.)



- Check idler rollers for oil leakage, and check tightness of bolts and nuts. If any defect is noticed, repair immediately.

- Check idler guide plate for clearance. If it increases, idler may develop side motion and tracks may come off.



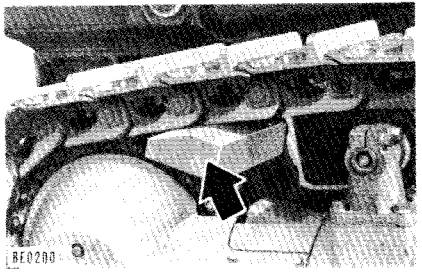
INSPECTION AND REPAIR

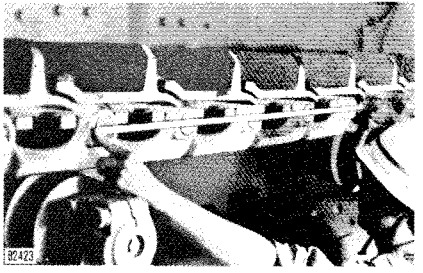
Frequent inspection and prompt repair will reduce repair costs. Inspection of the following items will serve as a guide for maintenance service of each undercarriage part. Perform periodical inspection and contact the Komatsu distributor in your area when machine has approached repairable limits and reversing limits.

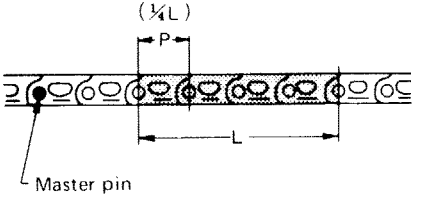
- Measuring Link Pitch

1. Insert a wooden block between link and sprocket to take up the slack in track.
2. Measure pitch length of **4** links in stretched portion at more than **2** links away from master pin. Of length obtained, 1/4 is the link pitch.

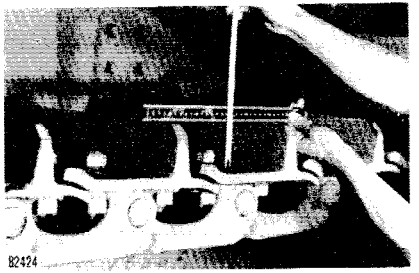
★ Link pitch **216.25**mm
★ Turning limit
impact loading **219.25**mm
Normal loading **221.25**mm
★ A center hole is provided on both end of master pin.



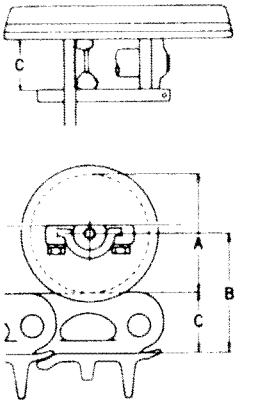


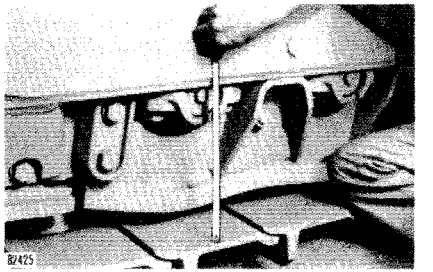


- Measuring Height of grouser
  After taking up slack in track, measure height at center of shoe as shown below.
- ★ Standard height: **72** mm
- ★ Repair limits: **25** mm



- Measuring Outside Diameter of Track Roller
  1. Measure height (size C) of link tread as shown.
  2. Stop machine at position where link tread, whose size C has been measured completely, contacts roller tread. Then measure size B.
  3. Calculate outside diameter of tread (size A):
     A = (B − C) × 2
- ★ Standard size: **222** mm
- ★ Repair limits: **198** mm





TROUBLE SHOOTING GUIDE

This guide is not intended to cover every conditions, however many of the more common possibilities are listed.

ENGINE

Oil pressure gauge indicator will not return to zero "0" when the engine is shut down.
- Defective oil pressure gauge.

Oil pressure gauge indicator fluctuates abnormally.
- Insufficient oil in oil pan.

Oil pressure gauge indicator stays within the black range (left) on dial.
- Insufficient oil in oil pan.
- Oil leakage due to damaged piping, loose piping joints or connections.
- Defective oil pressure gauge.
- Mal-assembling of full-flow filter retainer.

Oil pressure gauge indicator stays within the black range (right) on dial.
- Oil of too high viscosity.
- Defective oil pressure gauge.

(1) Steam spouts out through the pressure valve on the radiator.
(2) Water temperature gauge indicator stays within the red range (right) on dial.
- Insufficient coolant or coolant leakage.
- Loose fan belt.
- Accumulated dust or foreign material in the cooling system.
- Clogged radiator fins or fins out of place.
- Defective water temperature gauge.
- Defective thermostat or its seal.
- Loose radiator filler cap.
  (When operating at high altitude)

Water temperature gauge indicator stays in the white range (left) on dial during engine running.
- Defective thermostat.
- Defective water temperature gauge.
- Too cooled engine.

Engine fails to start.
- Insufficient fuel in fuel tank.
- Air in fuel line.
- Defective fuel pump or injector.
- Insufficient torque of starting motor to crank up engine.
- Water in fuel system.
- Mal-functioning fuel injection timing.

Engine emits white or blue-white exhaust gas.
- Excessive oil in oil pan.
- Improper fuel use.
- Oil leaks out of turbocharger piping.

Engine emits black exhaust smoke.
- Clogged air cleaner elements.
- Defective nozzle.

Engine runs but operates erratically, (Hunting)
- Air in fuel supply line.
- Defective nozzle.

Engine creates knocking
- Use of improper fuel.
- Overheat.

ELECTRICAL SYSTEM

(1) Lamps dim as engine runs at high speed.
(2) Lamps wiggle.
(3) Ammeter deflects excessively even at engine runs constantly.
- Defective wiring.

Alternator issues abnormal noise.
- Defective alternator.

Starting motor will not crank up engine as the starting switch key is turned to START.
- Faulty wiring.
- Defective starting switch.
- Battery is not fully charged.
- Defective battery relay switch.

Heater signal fails to glow red.
- Faulty wiring
- Discontinued glow plug.

Heater signal becomes white-hot.
- Too long preheat time.
- Glow plug short-circuited.

Ammeter will not deflect when engine runs normally
- Defective ammeter.
- Faulty wiring

Starting motor pinion disengages before engine start.
- Defective wiring.
- Battery is not fully charged.

CHASSIS

Oil pressure of torque converter will not rise
- Mixture of air or oil leakage due to insufficient tightening or breakage of oil pipe, pipe joint.
- Abrasion or scuffing of gear pump.
- Insufficient oil in transmission case
- Blockage of transmission case oil filter element, strainer

Torque converter overheats.
- Loose fan belt.
- Overheated cooling water.
- Clogged oil cooler.
- Low oil pressure.
- Restricted flow of lubricating oil due to worn gear pump.

Machine will not start by engaging the gear shift lever.
- Insufficient oil in steering clutch case
- Hydraulic pressure of transmission is not raised
- Steering clutch slides
  Worn out gear pump or scuffing
  Blocked steering clutch case oil strainer element

Machine moves straight when steering clutch lever on either side is pulled.
- Steering clutch brake (applied side) fails.

Steering clutch lever will drag.
- Out of adjustment of steering clutch and steering brake.

Machine will not stop when brake pedals are stepped on.
- Brakes out of adjustment.

Track runs to either side.
- Loose track tension.

Abnormal wear occurs on sprocket.
- Improper track tension.

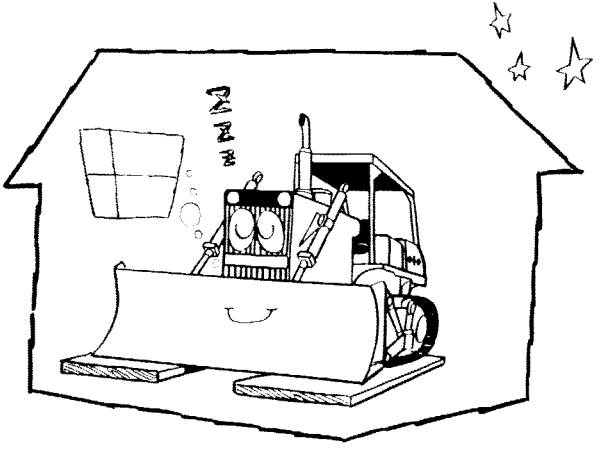
Blade rises too slowly or it does not rise.
- Insufficient hydraulic oil

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 atmospheric temperature is anticipated to drop below 0° C. (Refer to COLD WEATHER OPERATION about mixing rate of water and antifreeze.)
- The gear shift lever shall be set to neutral and locked by the safety lever, and the brake pedal shall not be locked.



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.

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.

- Remove the drain plugs on oil pan and other cases and drain mixed water.
- Remove the rocker housing cover and lubricate sufficiently valves and rocker arms. And inspect the valve operation.
- Remove the oil pipe flange on the turbocharger oil inlet, fill with 0.5 ~ 1ℓ engine oil, and leave the flange lightly loosened. Then, rotate the engine by the starting motor without fuel injection and compression release so that the discharge of oil is confirmed. Then, tighten the flange and start the engine.
- After the engine is started, operate it until it is warmed up completely.

SERVICE METER

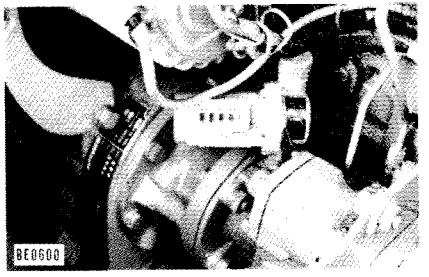
This meter indicates the integrated work hours. So, use it according to the following instructions.

- 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**

The service meter progresses by 1 when the engine is operated for one hours at the mean rpm under the conditions with which it is actually employed (about 80% of the rated rpm).

Therefore, the service meter progresses when the engine is rotated even when the machine does not travel.

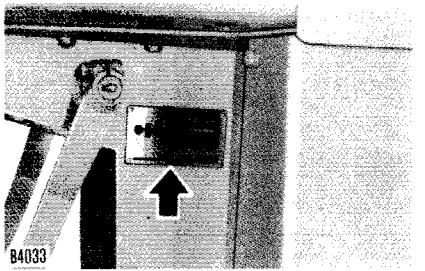


The meter is installed on the PT fuel pump.

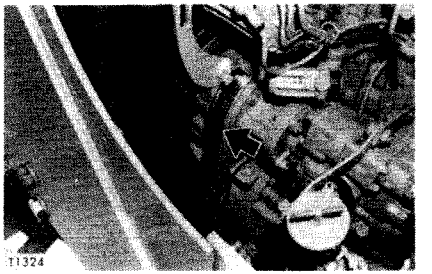
MACHINE AND ENGINE SERIAL NUMBERS

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

- **Machine serial number plate**



- **Engine serial number plate**



WEAR PARTS

Change wear parts such as filter elements and cutting edges at the time of periodic maintenance or before the wear limit is reached. Change wear parts without fail to utilize the machine more effectively.
Use only genuine Komatsu parts.

List of wear parts

Item	Product	Unit	Change interval
Fullflow filter	Element ass'y	1	Every 250 Hrs.
Transmission and steering oil filter	Element	2	Every 250 Hrs.
	O-ring	2	
Fuel filter	Cartridge	2	Every 500 Hrs.
By-pass filter	Element ass'y	1	Every 500 Hrs.
Corrosion resistor	Cartridge ass'y	1	Every 500 Hrs.
Hydraulic oil filter	Element	1	Every 1,000 Hrs.
	O-ring	1	
Air cleaner	Element ass'y	1	When required
Blade	Cutting edge	1	
	Cutting edge	2	
	End bit (left)	1	
	End bit (right)	1	
	Bolt	32	
	Nut	32	
	Washer	32	

SPECIFICATIONS

D85A, E-18 ( ): D85E

Operating Weight: 23510kg (23970kg)

Performance

1. Travel speed:

Forward	1st	0 ~ 3.6km/h
	2nd	0 ~ 6.5km/h
	3rd	0 ~ 11.2km/h
Reverse	1st	0 ~ 4.3km/h
	2nd	0 ~ 7.7km/h
	3rd	0 ~ 13.2km/h

2. Gradeability 30°

Blade

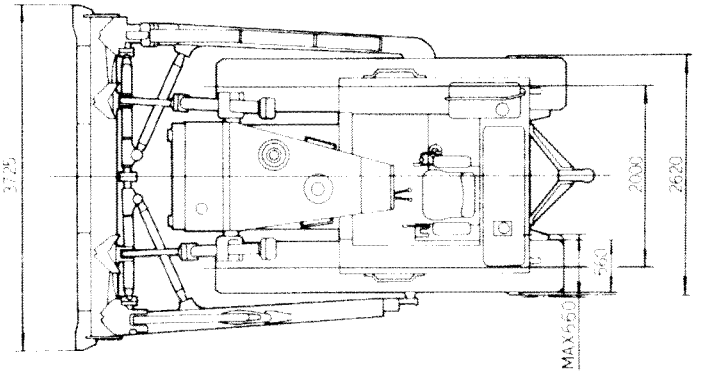
- Attachment weight (incl. brace and frame) 3630kg (3640kg)
- Max. tilting adjustment 735mm

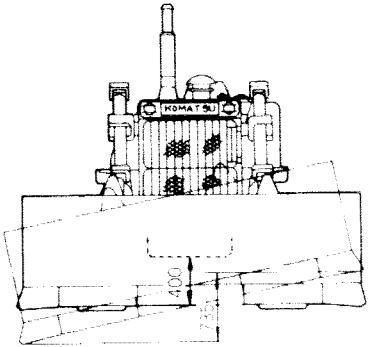
Engine

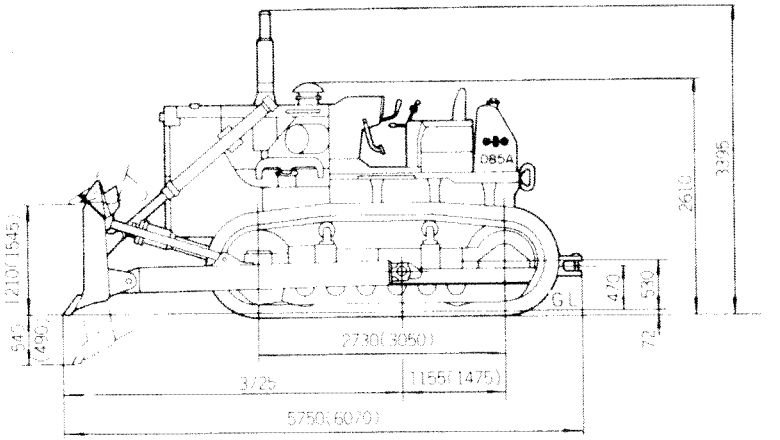
1. Model
   KOMATSU CUMMINS NT855 type diesel engine
2. Rated rpm 1800 rpm
3. Flywheel horsepower 220HP
4. Maximum torque (at about 1250 rpm) 105kgm
5. Start system:
   Starting motor 24V 11kW

Battery 12V 170Ah x 2

( ): D85E


3725
2000
2620
470
MAX.550


KOMATSU
400
730


D85A
2610
3205
1210(1545)
540
490
470
530
72
2730(3050)
1155(1475)
3725
5750(6070)

FUEL AND LUBRICANTS

PROPER SELECTION OF FUEL AND LUBRICANTS

RESERVOIR	KIND OF FLUID	AMBIENT TEMPERATURE 14 32 50 68 86°F / −10 0 10 20 30°C	CAPACITY (ℓ) Specified amount	CAPACITY (ℓ) Refill capacity
Engine oil pan	Engine oil	SAE 30	43	23
Steering clutch• transmission and torque converter case	Engine oil	SAE 10W	122	90
Hydraulic system 1. Angle dozer	Engine oil	SAE 10W	110	70
2. Tilt dozer	Engine oil	SAE 10W	110	70
Final drive case	Engine oil	SAE 30	36(each)	36(each)
Fuel tank	Diesel fuel	ASTM D975 No.2 / ※	450	—
Cooling system	Coolant	Add antifreeze	79	79

※ 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

(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.

SPEC. & GRADE / NAME OF SUPPLIER	ENGINE OIL	GEAR OIL	GREASE
	Class CD	Class GL-4, GL-5	
	SAE 30 SAE 10W	SAE 90 SAE 140	NLGI 2
CALTEX	RPM DELO 300 RPM DELO 400	Universal Thuban 90	Marfak All Purpose Marfak Multi-Purpose 2
CHEVRON	RPM DELO Super 3	RPM Multi-Service Gear Lubricant 90	RPM Multi-Motive Grease 2 RPM Automotive Grease Medium
TEXACO	Ursa Oil S-3 Ursa Oil LA-3	Universal Gear Lubricant EP 90	Marfak All Purpose Marfak Multi-Purpose 2
ESSO WORLD-WIDE ESSO AFFILIATES	Essolube D-3	Esso Gear Oil GP	Esso Multi-Purpose Grease Nebula EP
SHELL	Shell Rimula CT	Shell Spirax BP 90	Shell Alvania Grease EP 2
MOBIL	Mobil Mobil Delvac 1330 Delvac 1310	Mobilube H.D. 80-90	Mobilplex 47 (Mobilplex 48)
PENNZOIL	Zoildeez S-3	Penzoil M.P.P. Gear Lube 4090	Pennz Lube 310 Cha-Z-Lube 315 M.P. Lube 705
CASTROL	CRD 10, 30	Hypoy 90	
BP	BP Vanellus C-3	BP Hypo gear oil 80EP, 90EP, 140 EP	BP Energrease L2 BP Energrease LS-EP2
GULF (for sever cold districts)	Gulf Dieselube Super S-3 Motor Oil 10W	Gulf Gearlube HT75	