Operation & Maintenance Manual

SEAMG5110104

GD511A-1
GD521A-1
GD523A-1

MOTOR GRADER

SERIAL NUMBERS GD511A-10243
GD521A-10075 and up
GD523A-30099

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.
- This operation & maintenance manual may contain attachments and optional equipment that are not available in your area. Please consult your local Komatsu distributor for those items you may require.
  Materials and specifications are subject to change without notice.

BREAKING IN YOUR NEW MACHINE

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

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

- After starting, let the engine idle for 5 minutes to allow proper engine warm-up prior to actual operation.
- Avoid operation with heavy loads or at high speeds.
- Sudden starting or acceleration, unnecessarily abrupt braking and sharp turning should be avoided.
- If the machine is delivered without any cooling water in the radiator, flush the cooling system with ample clean water to clean the system, then fill the radiator with cooling water.
- ★ When replacing oil filter elements (cartridges), check their interiors for dirt and dust. If heavily collected, check for possible cause before starting operation.
- ★ Hours of operation are indicated by the service meter.

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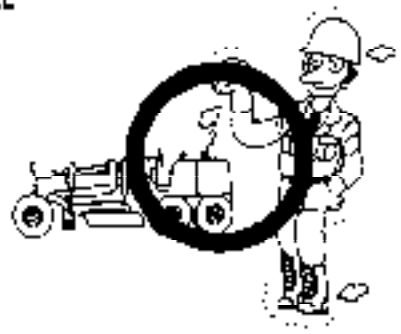
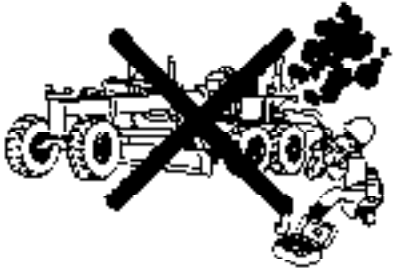
OPERATION
GENERAL



- Wear proper clothes
  Loose clothes, ornaments or other things that may possibly contact the control lever or other machine parts must not be worn. Do not let you clothes get caught on protruding parts of the machine. Do not wear oily clothes since they may catch fire.
- 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 extinguishers and how to use them. It is also important to know the emergency contact system.
- Learn about the safety devices on your own machine and about how to use them. Confirm that they are correctly attached in the prescribed position.
  Such safety devices include:
  - ★ Guards
  - ★ Canopies
  - ★ Protective Devices
  - ★ Roll-Over Protective Structures
  - ★ Seat Belts, etc.

- Take care not to get caught by protruding parts of the machine. Do not wear oil-stained clothing because it is likely to catch fire.

- Keep fire away from stored fuel, lubricants and anti-freeze.

- Exhaust gas is dangerous. When running the engine for long periods in a poorly ventilated area, there is a danger of gas poisoning, so open the windows or doors to ensure a good supply of fresh air.

- Read the Operation and Maintenance Manual carefully.Learn how to use the control devices, gauges and warning devices. Be sure you understand the meaning of the Caution plates. Remember the check points and checking method for engine oil, fuel, cooling water and hydraulic oil levels.

- When working on a road, pay attention to the safety of passing vehicles and pedestrians. If necessary, assign a signalman or provide temporary barricades.

- Before starting the machine, perform all necessary checks as stated in the Operation and Maintenance Manual.

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. Repair any fuel or oil leakage, and wipe off all dirty oil. Check that tire inflation pressure is standard, that hub nuts 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.

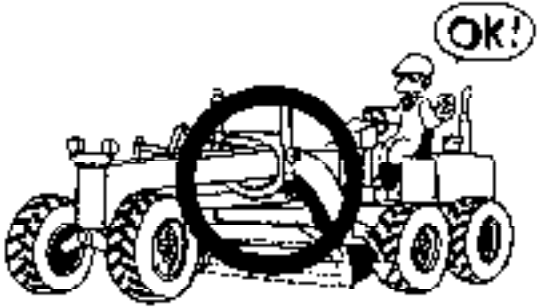
- Do not leave parts or tools lying around in the vicinity of or on the floor of the operator's compartment. Keep everything in its proper place.
- Wipe off thoroughly any grease, oil or mud on the step, handrail, floor or control levers. Failure to do this may cause you to slip.
- Check the level of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

- If a seat belt is provided, always use it. If the belt is damaged or worn, replace it with a new one.

- 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.
- Combustible objects such as pieces of wood, dead leaves, and pieces of paper may cause fire, so inspect the inside of the engine room and remove them.
- Before starting the engine, confirm that all control levers are in "NEUTRAL" or "HOLD" position.

AFTER STARTING 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 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.

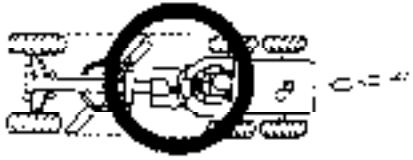
DURING OPERATION

- 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.

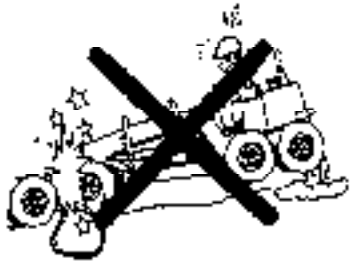


- Raise each work piece of equipment as high as possible and keep the blade within the machine width while traveling. Maintain the specified traveling posture.
- Do not control the vehicle speed by pressing the brake as it will overheat the brake disc.

- 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, scarifier 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.

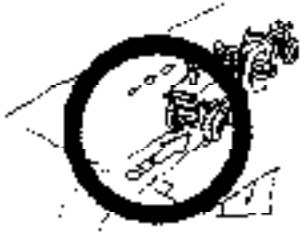
- Check the load limits of bridges before crossing.

- When operating on uneven ground, drive at as low a speed as possible and avoid sudden changes in direction.
- 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.

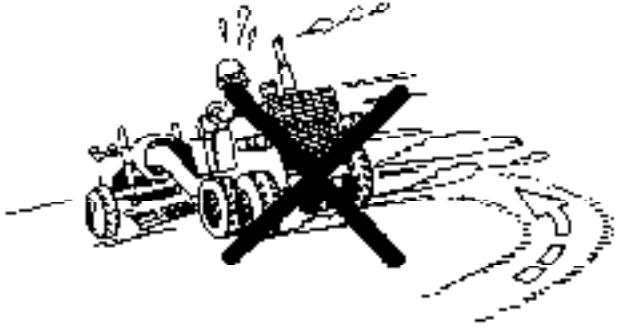
○ When working on river embankments or other places made of piled soil, there is the danger that the weight or vibration of the machine may cause the machine to sink into the piled soil, so be extremely careful when operating in such places.

● 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 wheel brake as well.
Never coast down a slope with the gear shift lever in "NEUTRAL" or with clutch disengaged.

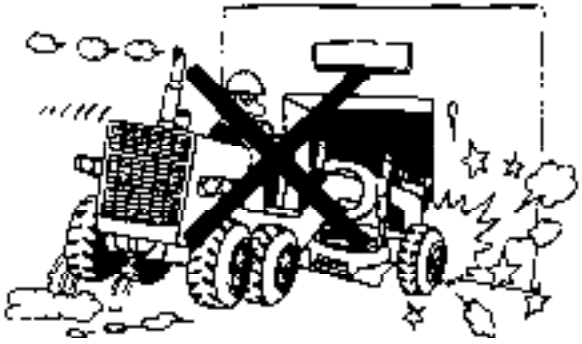


○ As far as possible, avoid turning the machine on a slope. It may cause the machine to roll over or slip sideways.

- 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 using the articulation system, be particularly careful not to let the blade damage the rear tires. (In articulate frame model)
- Operating the articulation system when traveling at high speed may cause the machine to overturn. Always perform this operation at a speed below 10 km/h. (In articulate frame model)

- Always observe the traffic regulations and leave margin for emergencies.
- When operating in a city area, be sure to locate underground pipes and cables before starting the machine to prevent them from being broken.



- 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.

- 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

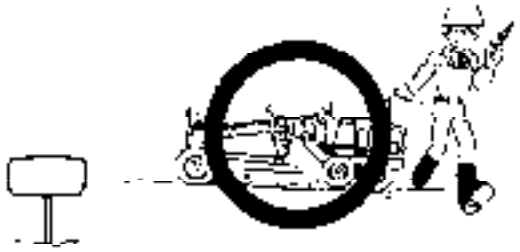
○ At night it is very easy to make mistakes in assuming the distance and height of objects and land.

- 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.
  ○ When snow is thrown to one side of the machine, take enough caution to obstacles covered under the snow.

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

- During operation, use the seat belt.

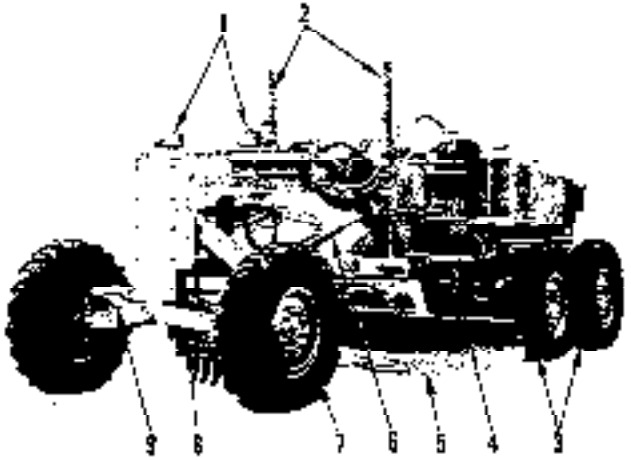
PARKING



- 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 tires. 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, scarifier and ripper to the ground, and put all safety levers in the "LOCK" position. Switch off the engine and remove the key.

GENERAL LOCATIONS AND SPECIFICATIONS

1. Head lamp
2. Blade lift cylinder
3. Rear tire
4. Articulation cylinder
5. Blade
6. Drawbar side shift cylinder
7. Front tire
8. Scarifier
9. Leaning cylinder



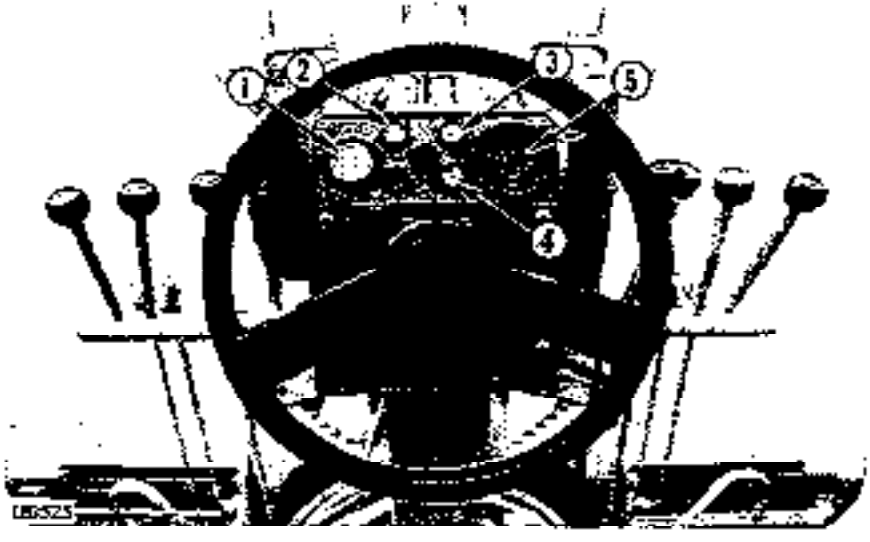
MACHINE MODEL		
PERFORMANCE	1. Travel speeds (km/h)	Forward
		Reverse
	2. Minimum turning radius (m)	
	3. Gradeability	
	4. Stability	
OPERATING WEIGH	(kg)	
ENGINE	1. Model	
	2. Flywheel horsepower (HP)	

NOTE: Specifications are subject to change without notice.

GD511A-1	GD521A-1	GD523A-1
44.5	44.6	44.6
54.4	54.4	54.4
6.8	6.6	6.6
24°	24°	24°
30°	30°	30°
10900	10800	10900
Komatsu S6D95L diesel engine	Komatsu S6D105 diesel engine	
135 (at 2900 rpm)	135 (at 2500 rpm)	135 (at 2500 rpm)

INSTRUMENTS AND CONTROLS

METERS, GAUGE AND PILOT LAMPS



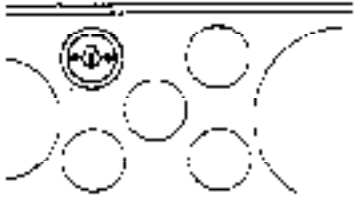
1. ENGINE COOLING WATER TEMPERATURE GAUGE

Engine is normal when indicator is on green range during operation.

After starting engine, continue to warm up engine until indicator points green range.

If indicator is over green range, keep engine in low idling and wait till temperature drops.

2. ENGINE OIL PRESSURE PILOT LAMP

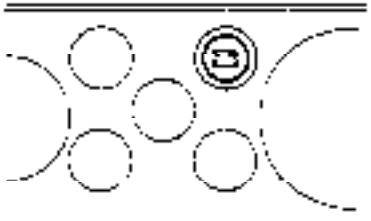


This lamp indicates a low engine oil pressure.

If the lamp goes off, the engine oil pressure is normal.

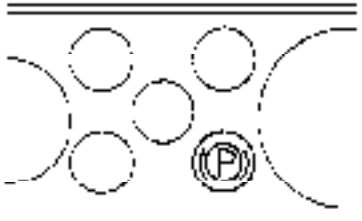
When engine is cool, this lamp lights up. In this case warm up engine until this lamp goes off.

3. BATTERY CHARGING LAMP



This lamp is used to indicate the generating condition of the alternator. Normally, when the starting switch is turned ON, the lamp will light up and then go out as the engine speed rises.

4. PARKING BRAKE PILOT LAMP



When the parking brake lever is pulled, this lamp lights up. Before starting the machine, release the parking brake lever and check that the lamp goes out.

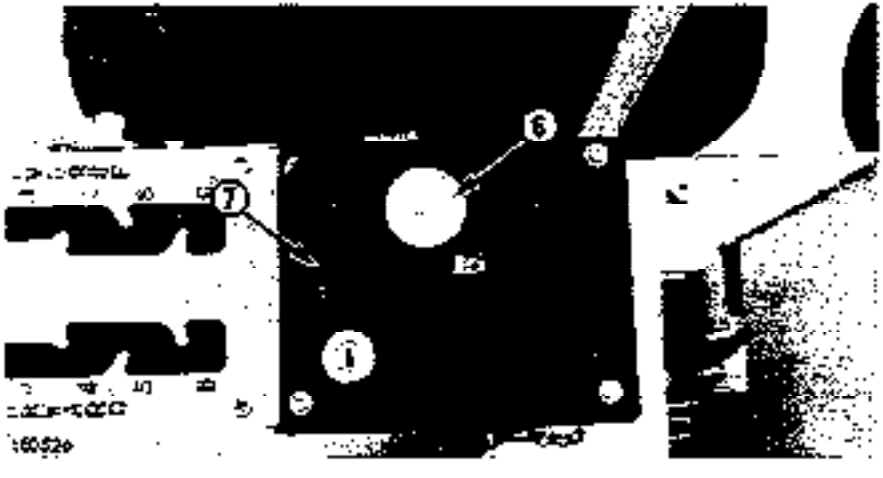
5. SPEEDOMETER

Indicates the running speed of the machine. It also contains an odometer.

6. SERVICE METER

The service meter indicates the total number of operating hours of the machine.

While the engine is running, the indicator of the meter will rotate to indicate that the meter is turning over.



7. HEATER SIGNAL

When the starting switch is set to the HEAT position, the heater signal will glow red after about 30 seconds or so, indicating that both the ribbon heater and coil heater are on.

* The preheating time will vary depending upon the ambient temperature. Accordingly refer to the section COLD WEATHER OPERATION.

SWITCHES

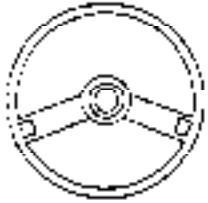
1. DIMMER SWITCH

This switches the head lamp between high beam and low beam.

①: High beam.

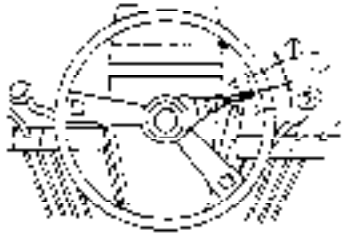
②: Low beam

2. HORN BUTTON



When the button in the center of the steering wheel is pressed, the horn will sound.

3. TURN SIGNAL LEVER

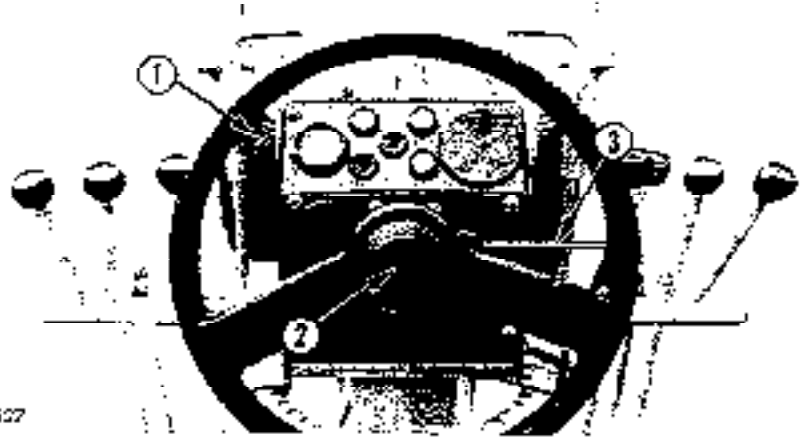


This lever operates the turn signal lamps.

① LEFT TURN:
Push lever upper

② RIGHT TURN:
Push lever lower

★ The turn signal is not canceled when the steering wheel is returned. Return the lever by hand.



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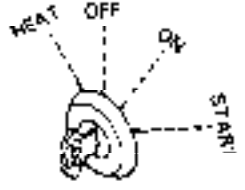
4. STARTING SWITCH



This switch is used to start or stop the engine.

OFF

At this position, the key can be inserted or removed. When the switch is turned to this position, the electrical circuits are switched off and the engine stops.

ON

When this position (ON) is reached by rotating clockwise for one step, the charging circuit and the lamp circuit are electrified.

This position (ON) shall be held after the engine is started.

START

Starting motor starts revolution by rotating the switch clockwise further for one step. And the engine is started.

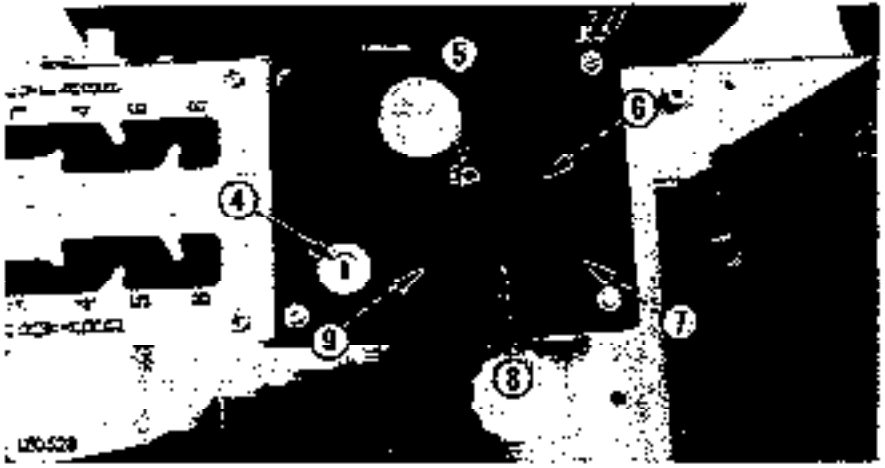
The key will be automatically restored to the position ON by releasing the key. So, you shall release the key once the engine is started.

HEAT

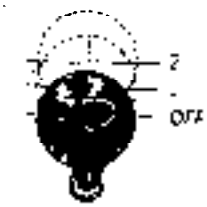
Use this position when starting in cold weather.

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

- ★ Never place starting switch key in OFF position while engine is running. This will damage the alternator.
- ★ When starting, be sure to use the starting key.



5. HEAD LAMP SWITCH



When the switch is pulled, the side marker lamps, tail lamps, panel lamp and head lamps will light up.

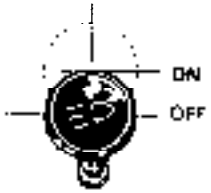
Position (1):

Side marker lamps, tail lamps, and panel lamp light up.

Position (2):

Head lamps light up in addition to above lamps

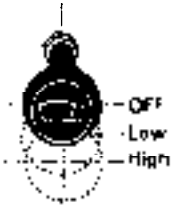
6. WORKING LAMP SWITCH



ON: Working lamps light

⚠ When traveling on public roads, turn the working lamps off.

7. REAR WIPER SWITCH



The wiper is actuated at low speed, when the switch is pulled as far as the first stop.

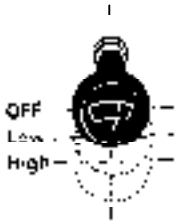
The wiper works at high speed, when it is pulled as far as the second stop.

8. CAR HEATER SWITCH

After starting the engine, pull this switch to operate the heater.

The temperature can be adjusted to three levels.

9. FRONT WIPER SWITCH



The wiper is actuated at low speed, when the switch is pulled as far as the first stop.

The wiper works at high speed, when it is pulled as far as the second stop.

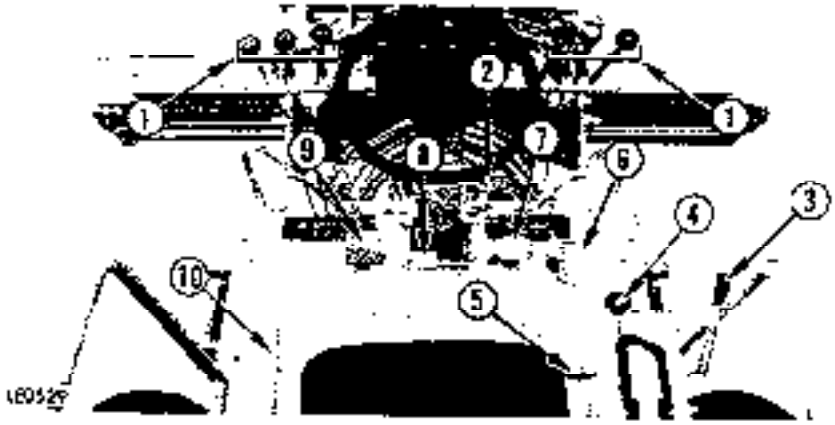
Turn the switch clockwise to spray solvent on the glass.

CONTROL LEVERS AND PEDALS

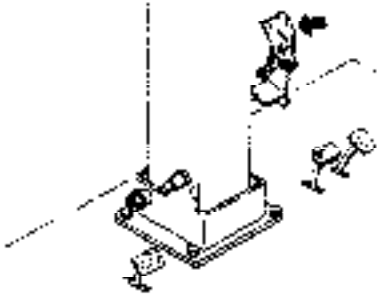
1. WORK EQUIPMENT CONTROL LEVER

These levers operate the work equipment.

1. Left blade lift lever
2. Blade slice shift lever
3. Power tilt control lever
4. Blade rotation control lever
5. Drawbar side shift lever
6. Articulation control lever
7. Leaning lever
8. Scarifier lift lever
9. Right blade tilt lever



2. STEERING POST TILT PEDAL



Depress the pedal, and the steering post can be tilted.

Adjust to give a suitable operating position for your physique

3. FUEL CONTROL LEVER

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

① Low idling position:
Push the lever fully.

② High idling position:
Pull the lever from low idling position ① fully.

★ When the gear shift lever is in the 5th or higher speed position in either forward or reverse, it becomes interconnected with the fuel control lever to prevent overrun and acts to reduce engine speed.

★ Use the fuel control lever only during actual work. When running the machine along a road, use the accelerator pedal.

4. GEAR SHIFT LEVER

This lever is used to change the transmission gear.

6-speed forward and 6-speed reverse transmission can be performed by simply moving this lever to desired speed positions. When the lever is left placed in any position other than neutral, the engine is prevented from starting. When the lever is moved to a reverse position, the back-up buzzer sounds.

5. GEAR SHIFT LOCK LEVER

This is the lever for locking the gear shift lever. Pull the lever up to lock the gear shift lever.

⚠ **When parking the machine, be sure to place the gear shift lever in neutral and lock with this lever.**

6. ACCELERATOR PEDAL

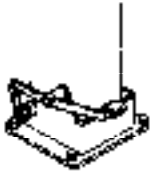
This pedal controls the engine speed and output. The engine speed can be freely controlled between low idling and full speed.

7. BRAKE PEDAL

The brakes are applied on the four rear wheels when this pedal is depressed.

⚠ **Do not put your foot on this pedal unnecessarily.**

8. PEDAL FOR BANK LOCK-PIN CONTROL



This pedal is used for controlling the blade to the bank cut position and shoulder reach position.

9. INCHING PEDAL

Depressing this pedal cuts the power to the wheels.

The pedal is used for smooth stopping or starting, or when changing between Forward and Reverse. When used in 1st, 2nd or 3rd speed, it enables fine control of the machine. (However only when the blade, etc. has no load and is on flat ground.)

⚠ **The inching pedal can be used in Forward and Reverse, but should not be used for starting in 4th speed or above.**

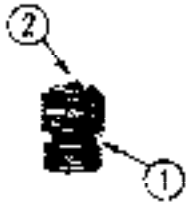
⚠ **Continuous use of the inching pedal to give a partially engaged clutch condition should be limited to 10 seconds.**
Never use the inching pedal in this way continuously for more than 10 seconds.
If the inching pedal is used in this way for more than 10 seconds, the life of the machine will be markedly reduced.

10. PARKING BRAKE LEVER

The brake is applied to the output shaft of the transmission by pulling this lever to the limit.

⚠ **When parking or leaving the machine, be sure to apply the parking brake.**

DUST INDICATOR



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

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

ARTICULATE LOCK PIN

This pin is used to lock the front frame and rear frame to prevent the machine from bending when servicing or transporting the machine.

⚠ **When servicing or transporting the machine always use this lock pin.**

⚠ **For normal traveling, always remove the lock pin.**

OPERATOR'S SEAT

(For GD511A, GD521A)

Forward-backward Adjustment

Move lever (1) to the left, set the seat in the desired position, then release the lever.

Range of adjustment:
125 mm (6 stages)

(For GD523A)

Forward-backward Adjustment

Move lever (1) to the left, set the seat in the desired position, then release the lever.

Range of adjustment:
125 mm (6 stages)

Seat height adjustment

To LOWER seat, turn knob (2) to RIGHT.

To RAISE seat, turn knob (2) to LEFT.

Range of adjustment:
190 mm (Free stages)

FUSE BOX

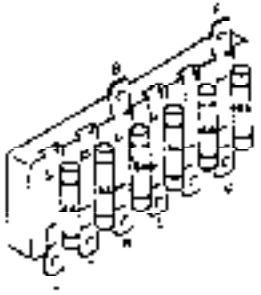
The fuses protect the electric devices and wiring from burning out.

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

* Replace a fuse with another of the same capacity.

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

Fuse arrangement and circuit



Terminal mark	Fuse capacity	Circuit
L	10 A	Lamps
r	10 A	–
R	10 A	Working lamp, Rear lamp, Turn signal lamp, Back-up buzzer, Back-up lamp
I	10 A	Instruments, Horn, Articulation lock pilot lamp
	10 A	Stop lamp
II	40 A	Lamps

CHECK BEFORE STARTING

The check before starting shall never be neglected as troubles are prevented beforehand by the check.

a. Walk around the machine body and check whether there is any trace of leakage of oil or water. In particular, the joint of high pressure hose and hydraulic cylinder should be paid special attention.
In case leakage is found, inspect the leaking location and stop the leakage. When leakage is not stopped, you are begged to request repair to Komatsu distributor.

b. Inspect the tightening of bolts and nuts on every section. When loosened ones are found, apply increased tightening. In particular, attachment positions of air cleaner and muffler should be paid specia. attention.

c. **CHECK ELECTRICAL WIRING**
Check for damage of the fuse and any sign of disconnection or short circuit in the electric wiring. Check also for loose terminals and tighten any loose parts.
Check the following points carefully.
- Battery
- Starting motor
- Alternator

⚠ **If the fuse is damaged or there is any sign of shortcircuiting in the electric wiring, always investigate the cause and correct it.**

★ Please contact your Komatsu distributor for investigation and correction of the cause.

d. **CHECK AND REFILL COOLANT**

Remove radiator cap (1) at the top rear of the machine and check that the cooling water reaches the area marked by shaded lines. Add water if necessary.

★ If the volume of coolant added is more than usual, check for possible water leakage.

⚠ Do not remove the cap while cooling water is hot. Hot water may spout out.
When removing radiator cap, lift the lever to relieve inner pressure.

e. CHECK OIL LEVEL IN ENGINE OIL PAN

(For GD511A)

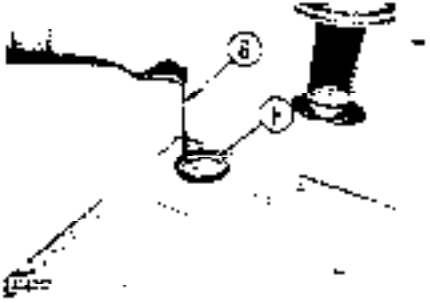
(For GD521A, GD523A)

1. Use dipstick (G) to check the oil level.
2. The oil level should be between mark L and H. If necessary, add oil at oil filler (F).

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

★ When checking the oil level, park the machine on a level surface, stop the engine and wait for 15 minutes before checking.

1. CHECK AND REFILL FUEL TANK



1. Use of dipstick (G) to check the fuel level.
2. Top up the tank through the filler (F) after the day's work is over.

* A clogged cap breather hole (1) may stop the fuel flow to the engine.
  Check it from time to time and clean.
* Fuel capacity: 227ℓ
* When adding fuel, never let the fuel overflow. This may cause a fire.

2. DRAIN WATER AND SEDIMENT IN FUEL TANK

(For GD611A)

(For GD521A, GD523A)

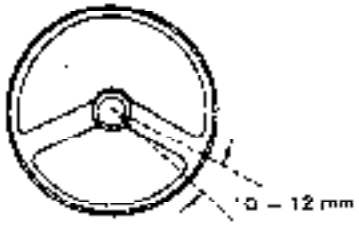
Loosen fuel tank drain valve (1) and drain sediment and water accumulated at the bottom, together with fuel.

h. CHECK AND REFILL BRAKE FLUID

1. Check the fluid level of the brake fouid supply tank in the operator's compartment
2. Add brake fluid through the filler (F), if necessary.
   If the brake fluid has to be topped up every frequently, an oil leak is indicated. Check the pipings for the leak.

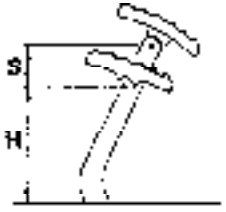
* Keep the brake oil always at the MAX level.
* Use caution to prevent the mixing of the mineral oil with the brake fluid when refilling, as this will cause the rubber part of the brake oil line to perish, leading to defective brake operation. The special vessel must be used only for refilling the brake fluid.
* When refilling with brake fluid, be careful not to splash fluid about on the painted surfaces. Brake fluid, if splashed, will affect the painted surfaces.

i. CHECK AND ADJUST STEERING WHEEL



When checking steering wheel play, start engine and raise front wheels off ground. The standard steering wheel play is 10 to 12 mm. If the play is beyond standard or steering is abnormal, contact your Komatsu distributor.

j. CHECK AND ADJUST TRAVEL OF BRAKE PEDAL



The standard pedal play is 5 mm. The standard height (H) from the floor is 200 to 210 mm, and the standard depressing height (S) is more than 75 mm with a force of 30 kg.

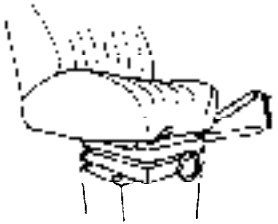
★ If the travel is excessive, adjust it using the procedure given in EVERY 250 HOURS SERVICE.

k. CHECK AND ADJUST BRAKING ABILITY

The braking ability is enough if the braking distance is 14 m or below at the initial speed of 35 km/h.

For insufficient braking ability, refer to EVERY 250 HOURS SERVICE (WHEEL BRAKE).

l. CHECK PARKING BRAKE FOR NORMAL LEVER TRAVEL



The lever travel is found normal if the brake is normally applied when the lever grip is pulled until two or three ratchet clicks are felt. If six or more clicks are counted before the parking brake comes into effect, refer to the EVERY 250 HOURS SERVICE for inspection and adjustment procedures.

* If the machine is started in travel with the parking brake lever left in pulled position, brake lining will be burnt and braking effect will be greately deteriorated. Mostly, this will be accompanied with discoloration of the brake drum.
* If a brake lining is once burnt, normal braking effect will not recover unless very thin, burnt layer on the lining surface is polished with sandpaper.

m. CHECK AND ADJUST TIRE PRESSURE

Standard pressure
(13.00-24—8PR)

Front wheel	1.8 kg/cm²
Rear wheel	1.8 kg/cm²

Make sure that tire and rim is free from wear and damage, and that hub nuts are not loose.

n. **CHECK DUST INDICATOR**
(For GD511A)

(For GD521A, GD523A)

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

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

After cleaning element, push button to return red piston.

o. **CHECK LAMPS FOR SWITCHING, DIRT AND DAMAGE.**

p. **CHECK HORN.**

q. **IS THE COLOR OF EXHAUST GAS NORMAL?**

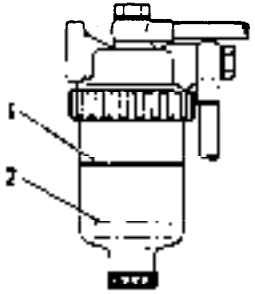
r. **DO THE INSTRUMENTS FUNCTION NORMALLY?**

s. **HAVE ANY DEFECTS WHICH WERE FOUND DURING THE PREVIOUS DAY'S OPERATION BEEN CORRECTED?**

t. **CHECK THE DOOR LOCK FOR NORMAL FUNCTION. (MOTOR GRADER WITH CAB)**

u. **CHECK THE WINDSHIELD WIPER, WINDOW WASHER AND DEFROSTER FOR NORMAL FUNCTION. CHECK FOR SUFFICIENT WASHER FLUID LEVEL. (MOTOR GRADER WITH CAB)**

v. CHECK FOR SEDIMENT AND WATER IN THE WATER SEPARATOR



The water separator separates water mixed in the fuel. If float (2) is at or above red line (1), drain the water. For the draining procedure, see section "WHEN REQUIRED".

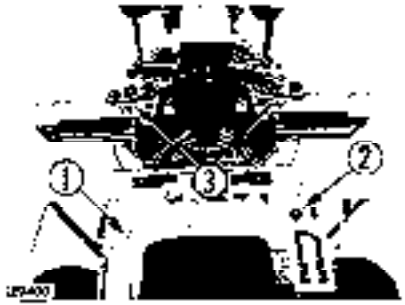
* Even if a water separator is installed, be sure to check the fuel tank to remove water and sediment in the fuel.

OPERATING YOUR MACHINE

BEFORE STARTING THE ENGINE

⚠ If the control levers are touched by accident, the work equipment may move suddenly. When leaving the operator's compartment, always set the lock lever securely to the LOCK position.

⚠ Before starting the engine, use a damp cloth to wipe off the dust accumulated on the top surface of the battery.



1. Before starting the engine, check the position of all levers.
★ Carry out an initial inspection. (For details of the inspection see CHECK BEFORE STARTING.)
2. Is parking brake lever (1) in lock position?

3. Is gear shift lever (2) in the NEUTRAL position and locked?
★ Engine will not start unless gear shift lever is in NEUTRAL.

4. Is work equipment control levers (3) at the neutral (HOLD) position?

TO START THE ENGINE

1. To start the engine, put the key (2) to the START position and turn over the starting motor.

★ Put the fuel control lever (1) in the low idling position.

2. As soon as the engine starts, release the starting switch key (2) to allow it to return automatically to ON position.

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

Special starting

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

Refer to FUEL FILTER in EVERY 500 HOURS SERIVCE.

CHECKS AFTER STARTING

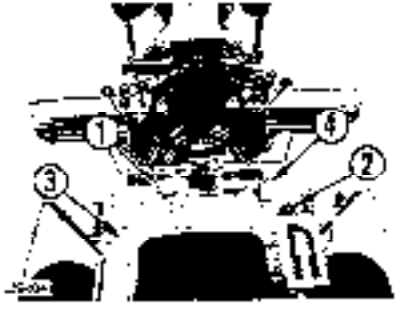
After starting the engine, do not operate the machine immediately. First carry out the following operations and checks.

1. Pull fuel control lever (1) and run the engine at medium speed for about 5 minutes with no load.

2. Run engine with light load until engine water temperature gauge indicator (2) moves into green range.
3. After warm-up run, check all gauges and warning lamps for proper operation.
4. Check for normal coloration of exhaust, any abnormal sound or vibration.

* Do not run the engine at low idling or high idling for more than 20 minutes. If it is necessary to run the engine at idling, apply a load from time to time or raise the engine speed to a midrange speed.

TO MOVE THE MACHINE OFF



1. Depress inching pedal (1) and set gear shift lever (2) to 1st, 2nd and 3rd speed.

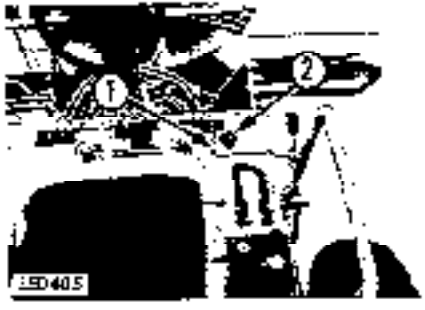
★ Do not start with the gear shift lever in 4th speed or above.

2. Free parking brake lever (3) and check that parking brake pilot lamp goes off.

3. Release inching pedal (1), depress accelerator pedal (4), and the machine will start.

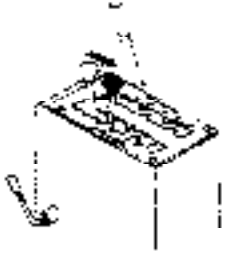
★ When starting the machine, check that the parking brake pilot lamp goes out.

CHANGING GEAR SPEED



Acceleration

Partially release accelerator pedal (1) and shift gear shift lever (2) to the next stepped-up position.

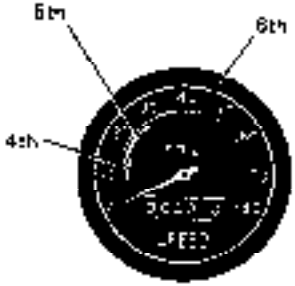


Deceleration

Release accelerator pedal (1) to decrease traveling speed and shift gear shift lever (2) to the next stepped-down position.

* When shifting gear, always shift one speed at a time.

- Speedometer range
  White ranges on the speedometer are for the 6th speed, 5th speed and 4th speed from the right to the left. They are mainly used for guessing the time at which stepped-down shifting is to be made.



On deceleration, watch the speedometer pointer. When the pointer reaches the right end of a white range corresponding to the gear speed next the current gear speed, move the gear shift lever to the stepped-down position.

* When losing speed going uphill, etc., follow this method, but when changing down on downhill slopes, shift gear just before the indicator reaches the right end of the white range.
* When traveling downhill, use the engine brake or wheel brake to keep the indicator within the white range for that speed.

FORWARD·REVERSE SHIFTING

Always stop the machine when switching between FORWARD and REVERSE.

1. Depress brake pedal (1) to reduce the travel speed, then depress inching pedal (2) to stop the machine.

2. Set gear shift lever (3) to the desired position, then depress accelerator pedal while slowly releasing inching pedal (2) to start the machine.

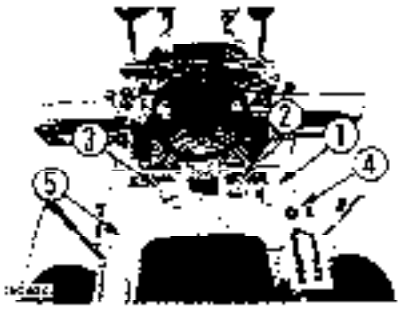
TURNING

The grader turns to the desired side by turning the steering wheel (1) to that side.

★ Leaning to the turning side will minimize the turning radius.
In case the grader turns while reversing, leaning to the opposite of the turning side will minimize the turning radius.

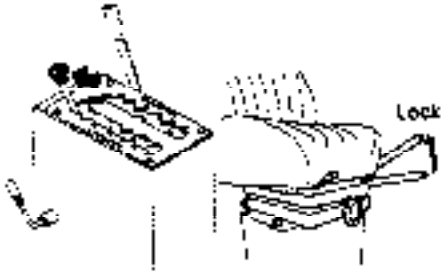
★ In case the leaning was used for turning, return the steering wheel after the leaning was returned.

TO STOP THE MACHINE



1. Release accelerator pedal (1).
2. Depress brake pedal (2). Before the machine come to a stop, depress inching pedal (3).

3. Set gear shift lever (4) to neutral position, then pull parking brake lever (5) to apply the parking brake.



⚠ Stop the machine on hard and even ground to prevent it from falling down or slipping.

⚠ When the machine is to be left stopped for a while, leave the engine in low idling or stop the engine. Apply the gear shift lever lock and the parking brake.

⚠ Emergency brake
If an emergency stop has to be made when the machine is traveling, use the parking brake together with the wheel brake. When the emergency brake has been used, check the parking brake lining, then replace the lining.

TO STOP THE ENGINE

1. Idle the engine at low speed for about 5 minutes to cool it.
2. Turn the key of starting switch (1) to the OFF position to stop the engine, and remove the key.

★ Do not attempt to stop a hot engine immediately unless it is necessary. Such unreasonable operation will cause remarkable shortage of life of the various engine parts.

★ Specially when stopping an overheated engine, be sure to cool the engine gradually by idling it at a middle idling speed.

CAUTIONS FOR OPERATING

- Drive the machine straight during uphill or downhill traveling. Specially, turning the machine on the gravelly or clayey slant will cause the machine to slip easily.
- If the engine stops, depress the brake pedal immediately with full force, and at the same time, pull the parking brake lever to stop the machine. Then place the gear shift lever in N (neutral) and start the engine again.
- Do not attempt to shift the gear shift lever to the neutral position or depress inching pedal during downhill traveling.
- When tires get stuck while working in swamp or mud, travel with repeated articulation to simplify getting out of the poor ground.
- This machine has two brake control systems. If one breakes down the other is still effective. However because braking capacity is reduced drive slowly when traveling.
- Operating the articulation system when traveling at high speed may cause the machine to overturn. Always perform this operation at a speed below 10 km/h. (with articulated)
- Use the parking brake as necessary to compensate insufficient effect of the wheel brake.

⚠ **If the engine stops, the brake booster will not work, so the pedal will become heavier and the braking effect will drop even if the brake is depressed with the same force.**

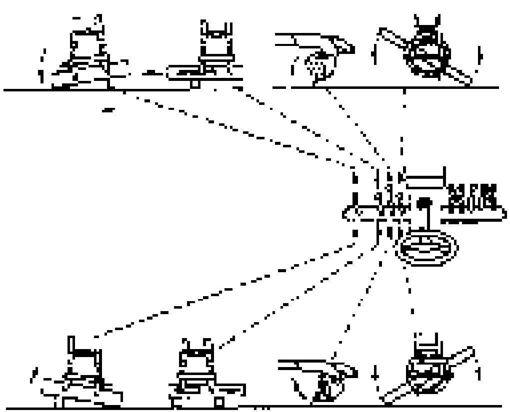
OPERATING OF WORK EQUIPMENT

OPERATION METHOD OF THE WORK EQUIPMENT CONTROL LEVER

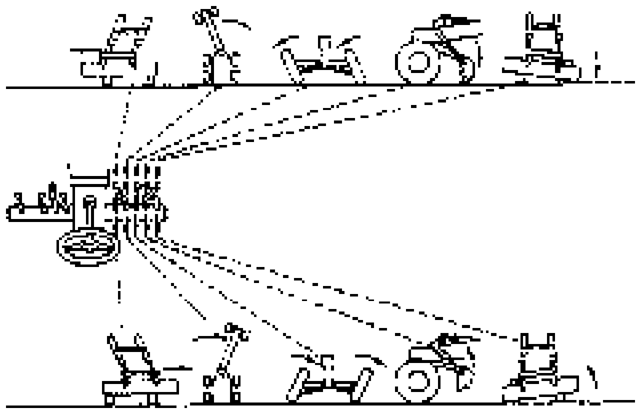
There are provided nine work equipment control levers, which are operated as are indicated in the following figures.

★ When operating the work equipment control lever, sufficient attention is required for the movement of the work equipment and its movement range must be limited, as the work equipment or the hydraulic cylinder possibly hit against parts, damaging them.

Left-side Control Lever



Right-side Control Lever



CAUTIONS IN OPERATION OF WORK EQUIPMENT

- When the work equipment is operated, special attention should be given to contacts at the following parts.

Front wheel and blade

Blade and step

Rear wheel and blade

Blade and frame

ADJUSTMENT IN SHIFTING OF WORK ATTACHMENT

It is essential to shift the work attachment to an optimum position for each work, to allow high job efficiency.

BLADE PROJECTION

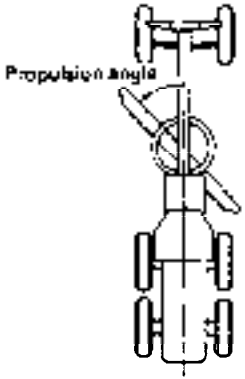
The degree of projection is controllable by the control lever during operation. If further projection is needed, stop the grader for a while and change the installing position of the blade horizontal shifting cylinder piston rod, as follows.

- Projection to left Position (1)

PROPULSION ANGLE OF BLADE

Angle of blade and body center line is called the blade propulsion angle.

In the normal scraping work, set the angle at 60°, more or less. Set at a lesser angle when the scraping resistance is great, or when the soil is hard, or when the soil in front of the blade is difficult to carry or throw to the side.



ADJUSTMENT OF BLADE CUTTING ANGLE

In hard soil cutting, it is advisable to lean the blade forward. As the soil becomes softer, lean the blade more backward. This operation will improve job efficiency.

It is essential to adjust the blade cutting angle, depending on the soil condition.

The range through which the blade cutting angle can be adjusted is 26.5° to 75.5°. This range is stepless, so any angle within the range can be chosen freely.

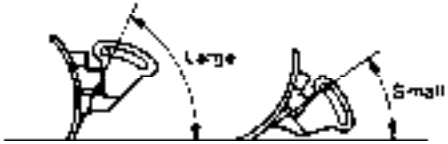
Adjustment

1. Turn the blade so as not to touch the grader body and set the blade in the same direction to the body. Then, place the blade on the ground.
2. Using an accessory tool, loosen nut (1) until lock plate (2) does not lock and is loose.
   Release the lock plate on the opposite side, too. The adjuster cannot be rotated unless both lock plates are relieved from locking.

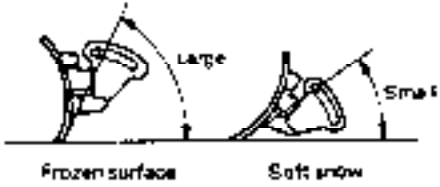
3. Operate simultaneously both right and left lift cylinders and lock when the blade has the required angle.

★ Installation of this power tilt blade gives the following advantages.

1. Optimum blade cutting angle can be obtained by operating the control lever for soil quality.



2. Since the cutting edge can be set to the desirable angle, a powerful breaking is available to cut the frozen surface during snow removal.



3. If the blade is operated with the hydraulic tip control, the distance between the cutting edge and the excavation surface changes. This means that fine adjustment of the excavation surface is possible.

4. In the low-banking position when raising the dirt and snow, the optimum blade cutting angle can be selected to increase operating efficiency.

SAFETY DEVICE OF BLADE

(For GD511A)

(For GD521A, GD523A)

A shear pin (1) is provided on the CIRCLE to prevent the blade from unexpected failure, because of abnormal impact load placed on the blade edge during operation. If the shear pin is broken during operation, remove bolt (2) and lock plate and pull out the shear pin to replace by new one.

BANK-CUTTING POSTURE (RIGHT SIDE)

1. Fully protrude the blade and the drawbar to the right so that the blade angle shown in the figure can be obtained.
2. Depress lifter lock pin pedal (1) on operator's compartment to remove pin (2).

* If the pin cannot be removed because of interference with lifter (3), operate the blade lift cylinders as necessary.

3. Rotate lifter (3) by protruding the right-hand blade lift cylinder piston rod and retracting the left-hand blade lift cylinder piston rod. When top hole (A) in lifter approaches pin (2), release lifter lock pin pedal (1) and slowly rotate the lifter until pin (2) enters hole (A).

4. Retract the right-hand lift cylinder and protrude the left-hand cylinder. Repeat this several times so that the circle is rotated with the blade raised on the right-hand side, and desired bank-cut posture can be attained.

★ When bringing the blade into bank-cut posture, be careful not to clash the blade against various protions of the machine.

★ When bringing the blade into bank-cut posture on the left-side of the machine, change every "left-hand" and "right-hand" in the above mentioned description with each other.

★ Relocating the blade side-shift cylinder piston rod mounting position to the right (when right-hand bank cutting is made) or to the left (when left-hand bank cutting is made) will improve bank cutting efficiency.
(See side-shifting of the Blade.)

⚠ **Do not attempt to depress the bank control lock pin removing pedal unless the blade is rested on the ground. If the pin is removed with the blade raised off the ground, dangerous falling of the blade with rotation of the circle may result.**

G-00804

SHOULDER REACH POSTURE (RIGHT SIDE)

1. Rotate lifter (1) in a similar manner to the bank cutting posture, and lock it using bank control lock pin (2).
2. Rotate the circle to the desired position.

★ Put the machine in the left hand side shoulder reach posture using the same procedure as the above.

★ When increasing the size of the shoulder reach, change the mounting position of the piston rod of the blade horizontal feed cylinder. (See section on BLADE PROJECTION.)

★ The banking performance is improved, if the mounting position for the piston rod of the blade horizontal feed cylinder is changed as follows:

- When banking to right, to a position where the blade is thrusted left.
- When banking to left, to a position where the blade is thrusted to right.

ARTICULATED OPERATIONS

When performing operations with the machine articulated, remove the lock link on the left side of the machine.

The machine can be articulated, giving a minimum turning radius of 6.6 m.

1. Take off lock link (1).
2. Set the lock link to the bracket (2) in the rear.

★ When the lock link is removed, the articulation lock pilot lamp on the instrument panel will light up.

⚠ **For normal traveling operations, do not remove the lock link.**

PRECAUTIONS WHEN USING ARTICULATION

If the machine is articulated when in the travel posture, the blade will interfere with rear frame.

This is dangerous, so when using the articulation, lower the blade until it goes under the rear frame, or set the blade to a suitable propulsion angle.

ADJUSTMENT OF SCARIFIER

a. ADJUSTMENT OF CUTTING ANGLE

As the soil becomes harder, a wider cutting angle increases job efficiency.

Adjustment

Remove bolt (1) and select a bolt hole adequate to the cutting angle. The cutting angle is adjustable from 61°, 68° (standard) 74°.

b. ADJUSTMENT OF CUTTING DEPTH

As the cutting depth is adjustable from tooth, adjust the tooth to job property.

Adjustment

Remove the cotter pin, pull wedge (1) and change the notch of tooth (2).

PRECAUTIONS FOR SCARIFIER OPERATION

- When the machine body is raised by using the blade as a jack, while the scarifier is left lifted to the top position, the drawbar will come into collision with the scarifier. This will cause damage to the drawbar.

- When turning the blade, with it several cm off the ground, the blade may touch the scarifier. This may damage the upper part of the blade.

REVERSING AND REPLACEMENT OF CUTTING EDGE AND END BIT

Replace cutting edges and end bits before their blade's end faces wear out (Be sure to replace cutting edges and side edges before they wear down to a width of less than 10 mm from blade base).
When wear is extended to the mounting faces, their repair must be done prior to replacing.

TURNING AND REPLACING

1. Lift the blade to a suitable height and put a block underneath the blade rail to prevent its falling.

⚠ **Do not raise the blade unnecessarily high.**
Be sure not to put your body underneath the blade when blocking it.

2. Clean the mounting face after detaching the cutting edge and the end bit.
3. Mount the cutting edges after inverting it, or replacing it with a new one.
4. Mount the end bits after inverting and switching right for left or replacing with new ones.

★ Tightening torque for the mounting nuts. 26.5 ± 3.5 kgm
★ Tighten the nuts again after several hour's operation.
★ If both ends of the cutting edge and side edges are worn out, replace them with new ones.

CHANGING TIRES

HOW TO CHANGE TIRES:

1. Front wheel

1) Lower the work equipment to the ground, set the gear shift (parking brake) lever to the P position to apply the parking brake.
2) Then, attach the socket wrench (accessory machine tool) to the hub nuts and loosen all the hub nuts by 3/4 to 1 turn.
3) Depress the lift cylinder. If the front tires are lifted, lock the control lever, remove the hub nuts and change all the tires.

4) In installing new tires, tighten lightly with the tires lifted and tighten the tires to the specified torque in the order shown in the photos, after placing the tires on the ground.

★ Coat the threaded part with molybdenum disulphide grease (NLGI No. 1) before tightening.

★ Tightening torque: 40 ± 5 kgm

⚠ Whenever the front tires are raised off the ground, support the front axle center frame on the block to assure safety.

2. Rear wheel

1) Repeat the front wheel change procedures 1) and 2).
2) Depress fully the right and left lift cylinders and the front tires are lifted about 50 cm off ground. Retract the lift cylinder on the side where the tire is not removed, to lift the rear wheels.
3) Install new tires according to the procedure 4) of the front wheel tire change.

★ Coat the threaded part with molybdenum disulphide grease (NLGI No. 1) before tightening.

★ Tightening torque: 40 ± 5 kgm

⚠ Whenever the rear wheels are raised off the ground, stably support the tandem on the block to assure safety.

When a front tire punctures, do not attempt to travel the machine by temporarily applying a pad to the swing stopper. If it is necessary, travel the machine slowly only within the minimum necessary distance. In this case, be sure to securely keep the punctured tire off the ground with chains, etc.

HOW TO USE LEANING STOPPER

When the leaning pipe is damaged, temporarily prevent the front wheels from leaning so that the machine can be successfully self-propelled to the nearest repair shop.

How to apply the leaning stopper

Fix the leaning rod to the front axle using the bolts provided in the tool box.

If the machine is travelled with the leaning cylinder piston rod fluctuating or the front wheels leaning on one side, because of damaged leaning piping, dangerously unstable steering and excessively worn tires will result. Have the faulty leaning pipe repaired by mechanics quickly.

DRIVING ALONG ROAD

In addition to strict observance of traffic laws and rules concerned, keep the following in mind:

POSITION OF BLADE WHEN TRAVELING

When traveling, set the blade at the minimum propulsion angle and raise the blade fully.

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★ Be careful to keep a clearance between the blade and front tires.

PRECAUTIONS WHEN TRAVELING ON ROADS

To relieve operator's fatigue, take a rest by 30 minutes — 1 hour — 30 minutes mode, every 80 kilometers or every 2 hours of traveling (whichever term expires earlier).

TOWING

TOWING THE MACHINE

This machine must not be towed except in emergencies. When towing the machine, take the following precautions.

When engine can be used.

* Always keep the engine running when towing the machine, so that the steering and braking can be used.

When engine cannot be used.

* When transporting a disabled machine by towing, the transportation distance should be within 600 m at a speed of 8 km/h or less. (When towing more than 600 m, remove the drive shaft.)

★ If the distance is more than the above mentioned, or if more than one day has elapsed since the engine trouble, be sure to use the trailer for transportation.

★ If the machine is towed without the engine running, no lubrication oil will be supplied to the transmission. The gears and bearings are rotated, so this may cause them to be damaged.

★ When the engine cannot be used or the steering booster cannot be used, operation of steering wheel is difficult, so run the machine slowly.

TRANSPORTATION

In addition to strict observance of traffic laws and rules concerned, it is desirable to provide a special platform for loading and unloading of the motor grader. If it is necessary to use a ramp when loading a motor grader on a trailer or unloading it from a trailer, observe the following instructions to assure safety:

1. Securely brake the trailer and chock trailer tires. Securely fix the ramp boards in place so that the center of motor grader being loaded coincides with the center line of the trailer.

★ Width, length and thickness of ramp boards must large enough to assure safe loading and unloading of the motor grader.

⚠ **Remove the mud from the undercarriage to prevent the machine from slipping to the side on slopes.**

2. Slowly travel the motor grader on the ramp straight.

⚠ **Never attempt to change the direction of travel on the ramp. If it is necessary to change the direction of travel, once return the machine to the original position.**

3. Properly load the motor grader on the trailer at the specified position. To prevent the grader on the trailer from moving back and forth during transportation, apply a chock to front and rear of each wheel and fix the motor grader with chains and wire ropes. Pay special care to prevent the motor grader from slipping sideward.
4. Rest the work equipment on the trailer deck and observe the following:
   - Pull the parking brake lever.
   - Place the gear shift lever in the neutral position.
   - Place work equipment control lever in hold position.
   - Apply safety locks.
   - Pull the starting switch key out.

★ Determine the optimum transportation route, taking width of road and permissible overhead clearance and weight limitation into consideration.

★ Lock the articulation lock pin in the same way as for normal travel.

⚠ **Do not leave the front wheels raised off the trailer deck using the blade as a jack. The front wheels will fall gradually during transportation.**

⚠ **When loading the machine, choose a firm level road surface.**
Be sure that you are well clear of the road shoulder.

★ When transporting this machine, check with your Komatsu distributor for advice.

HANDLING OF BATTERY

⚠ **Before starting the engine, use a damp cloth to wipe off the dust accumulated on the top surface of the battery.**

PRECAUTIONS FOR CHARGING BATTERY

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

REMOVAL AND INSTALLATION OF BATTERY

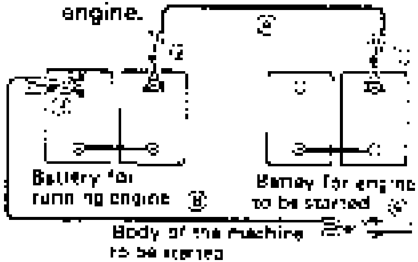
- When removing battery, first disconnect the cable from the ground (normally, from the negative (−) terminal). If a tool touches a cable connecting the positive terminal and the chassis, there is danger of sparks being emitted.
- When installing battery, the ground cable should be connected to the ground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

STARTING ENGINE WITH A BOOSTER CABLE

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

1. Before connecting the booster cable
   1) Size of booster cable and clip should be suitable for the battery size.
   2) Check cables and clips for breaks, corroded surfaces, etc.
   3) Make sure cables and clips are firmly secured.
   4) Keep the starting switch 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.
   2) Connect the other clip to the positive (+) terminal to the engine which is running.
   3) Connect one clip of booster cable B to the negative (−) terminal of the engine which is running.
   4) Connect the other clip to the body of the machine to be started.

   * Make sure the clips are firmly connected to battery terminals. Then, start the engine.



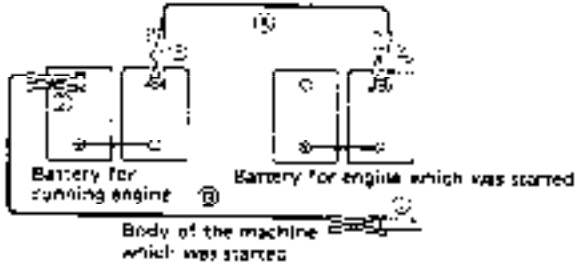
⚠ **When connecting the cables, never contact the positive (+) and negtive (−) terminals.**

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

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 body of the machine which was started.
   2) Disconnect the other clip from the negative (−) terminal of the running engine.
   3) Disconnect the clip of booster cable A from the positive (+) terminal of the running engine.
   4) Disconnect the other clip from the positive (+) terminal of the engine which was started.



COLD WEATHER OPERATION

PREPARATION FOR LOW TEMPERATURE

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

FUEL AND LUBRICANTS

Change to fuel and oil with low viscosity for all components.

For details of the specified viscosity, see the TABLE OF FUEL, COOLANT AND LUBRICANTS.

COOLANT

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

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

Care in using Antifreeze

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

Standard requirements for permanent antifreeze

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

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

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

BATTERY

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

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

Temp. of fluid / Rate of charge	20°C	0°C	– 10°C	– 20°C
100%	1.28	1.29	1.30	1.31
90%	1.26	1.27	1.28	1.29
80%	1.24	1.25	1.26	1.27
75%	1.23	1.24	1.25	1.26

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

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

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

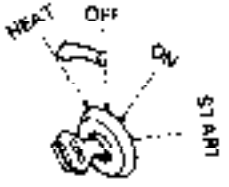
STARTING IN COLD WEATHER

For attention of engine starting, refer to section "OPERATING YOUR MACHINE".

TO START THE ENGINE

1. Set fuel control lever (1) at the HALF OPEN position.

2. Put starting switch (2) in the HEAT position to red-hot heater signal (3).



★ Never put the fuel control lever or the accelerator pecal in the full speed position when starting the engine.

Necessary preheating time is as follows.

Ambient temperature	Preheat time
Above 0°C	-
0°C to -10°C	20 seconds
10°C to -20°C	30 seconds

★ If the preheating time is too short or too long, the engine will be difficult to start, so always keep to the

3 When heater signal (3) glows red, turn the key to the START position to start the engine.

4. Release the key of starting switch (2), and the key will return automatically to ON.

5. Put fuel control lever (1) in LOW IDLING position.

- If the engine does not start up despite carrying out the above operations, leave it for about 2 minutes and then repeat the above procedure 2 and 3.
- Once the engine starts up, thoroughly warm up the engine before putting the machine into operation. Initially, put the gear shift lever in the lowest position, and then gradually apply the load.

⚠ **Never use starting aid fluids as they may cause explosions.**

CAUTIONS AFTER COMPLETION OF WORK

1) Mud and water attached on the machine.
   Mud can easily be removed soon after it has adhered to the machine. Dried or frozen mud will not only become difficult to remove, but also cause various defects.
   In particular, water drops collected on the surface of the piston rod of the hydraulic cylinder shall be fully wiped out. When water drops is frozen on the surface of the piston rod, the seal may be broken.
2) When washing the machine, be careful not to throw water on the alternator and breathers.

AFTER COLD WEATHER

When weather becomes warm, perform the following without fail:

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

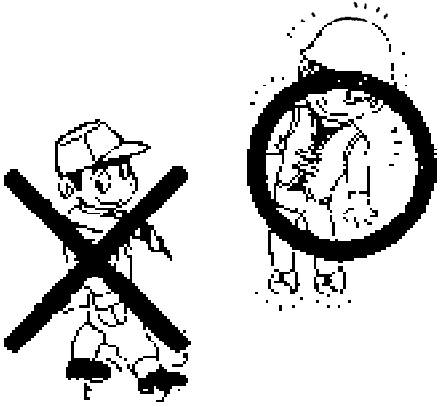
PERIODIC MAINTENANCE

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

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

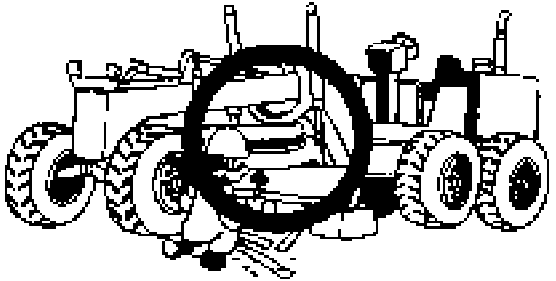
PRECAUTION FOR MAINTENANCE

GENERAL



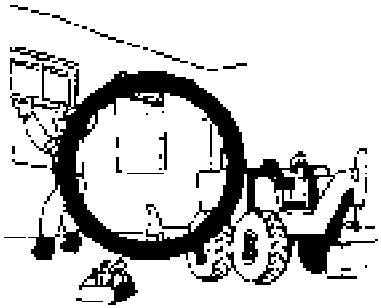
- Wear proper clothes
  Loose clothes, ornaments or other things that may possibly contact the control lever or other machine parts must not be worn. Do not let you clothes get caught on protruding parts of the machine. Do not wear oily clothes since they may catch fire.
- Wear well-fitting helmet, safety 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.
- Always stop the engine before cleaning the machine or adding fuel.

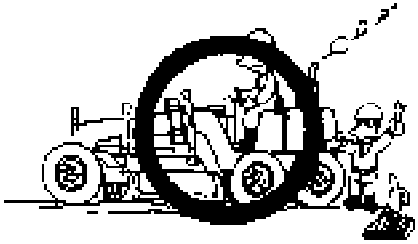


- When working with others, choose a group leader and work according to his instructions. Do not perform any maintenance beyond the agreed work.

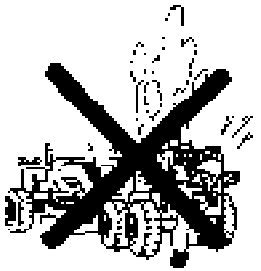
- Do not handle electrical equipment while wearing wet gloves, or in wet places, as this can cause electric shock.
- During maintenance do not allow any unauthorized person to stand near the machine.



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

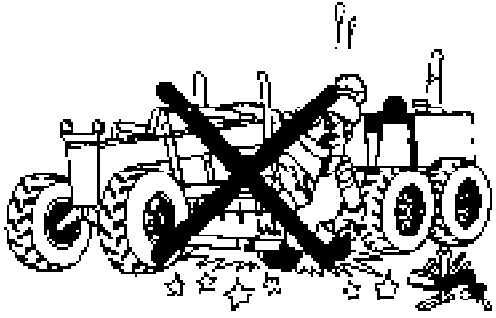


- Unless you have special instructions to the contrary, maintenance should always be carried out with the engine stopped. If maintenance is carried out with the engine running, there must be two men present: one sitting in the operator's seat and the other one performing the maintenance. In such a case,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

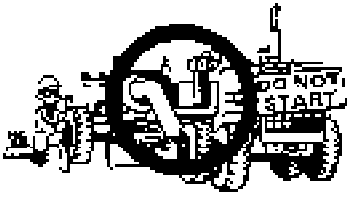


- Always remember that the hydraulic oil circuit is under pressure. When feeding or draining the oil or carrying out inspection and maintenance, release the pressure first.
  The procedure for releasing the hydraulic pressure is as follows: lower the blade, scarifier and ripper to the ground, and stop the engine; move the control levers to each position two or three time 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.

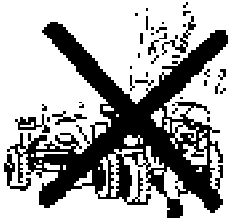
DURING MAINTENANCE



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

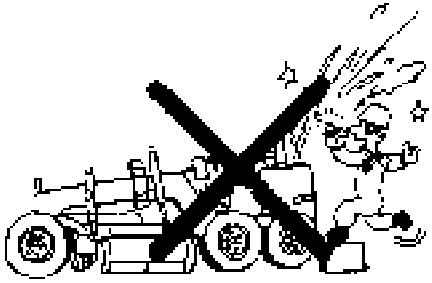


- Hang a caution sign in the operator's compartment (for example "Do not start" or "Maintenance in progress").
  This will prevent anyone from starting or moving the machine by mistake.

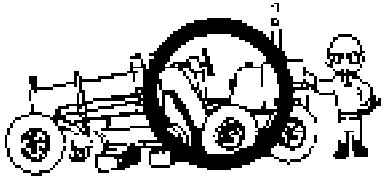


- Flame should never be used instead of lamps. Never use a naked flame to check leaks or the level of oil, fuel, anti-freeze or electrolyte
- Immediately remove any oil or grease on the floor of the operator's compartment, or on the handrail. It is very dangerous if someone slips while on the machine

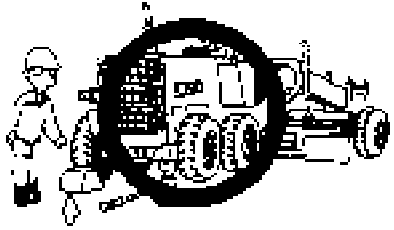
- When check an open gear case there is a risk of dropping things in. Before removing the covers to inspect such cases, empty everything from your pockets. Be particularly careful to remove wrenches and nuts.
- Before draining the oil, warm up it to a temperature of 20 to 40°C.



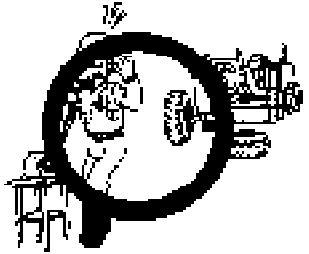
- Be particularly careful when removing the radiator cap or the hydraulic oil tank filler cap. If this is done immediately after using the machine, there is a danger that boiling water or oil may spurt out.
- After replacing oil, filter element or strainer, bleed the air from the circuit.
- When the 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.
  When adding oil or fuel, do not let the oil or fuel overflow.
- If oil or water are spilled, always wipe it up. Spilled oil or water may cause people to slip; spilled oil may cause fire.
  If soil is piled on top of a place where fuel has been spilled, remove the soil.
- 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.



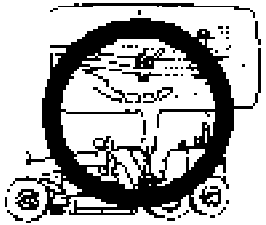
- When the work equipment is raised for inspection or repair, always place blocks underneath to prevent falling.



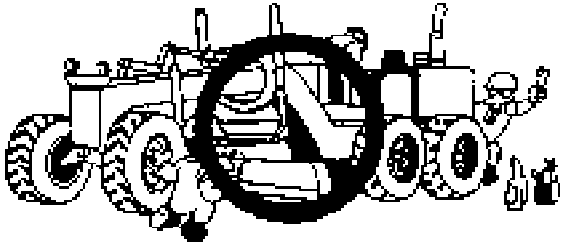
- When the machine is jacked up, always put chocks against the wheels on the opposite side. After jacking up, place blocks to prevent the machine from falling.



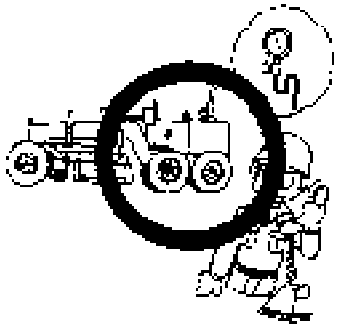
- Disassembly, repair and assembly of tires require special equipment and high skill. Always consult a specialized tire repair shop.



- Always lock the front and rear frames before inspecting and servicing the machine. (In articulate frame model)



- When handling the cutting edges always wear gloves.



- Special measuring apparatus is needed for testing hydraulic pressure.

- Remove the minus terminal from the battery in maintaining the electrical system.
- 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 it out.

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	31
e	Engine oil pan	Check and supply	32
f	Fuel	Check and supply	33
g	Fuel tank	Drain water and sediment	33
h	Brake fluid	Check and supply	34
i	Steering wheel play	Check	35
j	Brake pedal travel	Check and adjust	35
k	Braking ability	Check and adjust	35
l	Parking brake lever travel	Check and adjust	36
m	Tire pressure	Check and adjust	36
n	Dust indicator	Check	37

No.	ITEM	SERVICE	PAGE
o	Lamps	Check	37
p	Horn	Check	37
q	Exhaust gas color	Check	37
r	Instruments	Check	37
s	Previous day's defects	Check	37
t	Door lock	Check	37
u	Wiper, window washer and defroster	Check	37
v	Water separator	Inspect for operation	38
	EVERY 50 HOURS SERVICE		
a	Lubricating		84
1	Circle	Lubricate	84
2	Blade guide rail	Lubricate	84

No.	ITEM	SERVICE	PAGE
	EVERY 250 HOURS SERVICE (The items marked * are carried out after the first 250 hours only for new machines.)		
*	Fuel filter	Replace cartridge	85
*	Transmission case and filter	Change oil and replace element	85
*	Final drive case	Change oil	85
*	Circle reverse gear case	Change oil	85
*	Tandem drive case	Change oil	85
*	Hydraulic tank and filter	Change oil and replace element	85
*	Engine valve clearance	Check and adjust	85
a	Lubricating		85
-1	Leaning cylinder pin	Lubricate 2 points	85
-2	Leaning rod end	Lubricate 2 points	85
-3	Tire rod	Lubricate 2 points	85
-4	Knuckle arm/knuckle king pin	Lubricate 4 points	86
-5	Leaning pin	Lubricate 2 points	86
-6	Steering cylinder	Lubricate 2 points (GD511A, GD621A) Lubricate 4 points (GD523A)	86

No.	ITEM	SERVICE	PAGE
-7	Front axle center pin	Lubricate 1 point	86
-8	Drawbar ball joint	Lubricate 1 point	87
-9	Scarifier ball joint	Lubricate 4 points	87
-10	Scarifier cylinder pin	Lubricate 2 points	87
-11	Blade lift cylinder yoke	Lubricate 6 points	87
-12	Blade lift cylinder ball joint	Lubricate 2 points	88
-13	Drawbar side shift cylinder ball joint	Lubricate 2 points	88
-14	Bank cutter guide	Lubricate 3 points	88
-15	Articulation center pin	Lubricate 2 points	88
-16	Articulation cylinder pin	Lubricate 4 points	88
b	Transmission case	Check and supply	89
c	Engine oil pan and filter	Change oil and replace cartridge	89
d	Final drive case	Check and supply	91
e	Tandem drive case	Check and supply	91
f	Circle reverse gear case	Check and supply	92
g	Hydraulic tank	Check and supply	92
h	Fan belt	Check tension	93

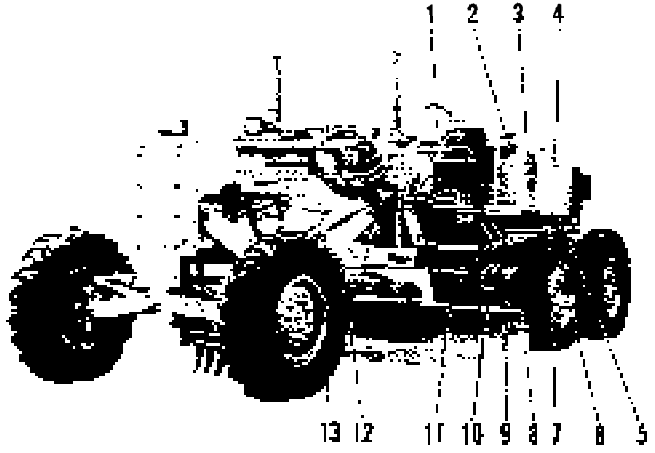
No.	ITEM	SERVICE	PAGE
i	Ball joint	Check clearance	95
j	Battery electrolyte level	Check	95
k	Wheel hub nut	Check and retighten	96
l	Parking brake lever	Check travel	96
m	Wheel brake	Check and adjust	98
	EVERY 500 HOURS SERVICE		
a	Fuel filter	Replace cartridge	99
b	Transmission filter	Replace element	100
c	Circle guide	Check clearance	100
d	Radiator fin	Clean	102
	EVERY 1000 HOURS SERVICE		
a	Lubricating		103
	Drive shaft	Lubricate 2 points	103
b	Transmission case	Change oil and clean strainer	103

No.	ITEM	SERVICE	PAGE
c	Final drive case	Change oil	104
d	Circle reverse gear case	Change oil	106
e	Tandem drive case	Change oil	106
f	Hydraulic tank and filter	Change oil and replace element	107
g	Drawbar front ball joint	Check looseness	108
h	Toe-in	Check and adjust	108
i	Front wheel bearing play	Check and adjust	110
j	Corrosion resistor	Replace cartridge	111
k	Turbocharger rotor	Check play	112
	Turbocharger various fasteners	Check and retighten	112
	EVERY 2000 HOURS SERVICE		
a	Front wheel bearing	Lubricate (both right and left sides)	114
b	Engine breather	Clean	114
c	Alternator and starting motor	Check	115
d	Engine valve clearance	Check and adjust	115
e	Vibration damper	Check	115
f	Turbocharger	Check and clean	115

No.	ITEM	SERVICE	PAGE
	EVERY 4000 HOURS SERVICE		
a	Water pump	Check	116
	WHEN REQUIRED		
a	Cooling system	Clean	117
b	Air cleaner element	Check, clean or replace when required	120
c	Electrical intake air heater	Check	123
d	Water separator	Drain water	123

OIL FILLER AND LEVEL GAUGE POSITIONS

1. Fuel tank level gauge and oil filler
2. Hydraulic tank oil filler
3. Hydraulic tank level gauge
4. Cooling water inlet
5. Final drive case oil filler
6. Tandem drive case oil filler
7. Engine oil pan oil filler and level gauge
8. Tandem drive case drain plug
9. Tandem drive case level gauge plug
10. Transmission case oil filler
11. Transmission case drain plug
12. Circle reverse gear case drain plug
13. Circle reverse gear case oil filler



EVERY 50 HOURS SERVICE

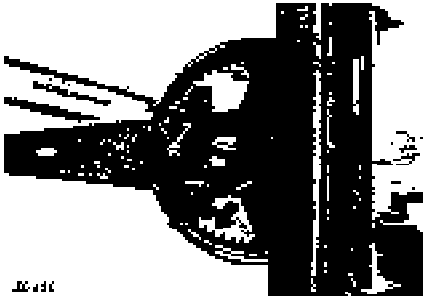
B. LUBRICATING

Apply grease to the grease fittings shown by arrows.

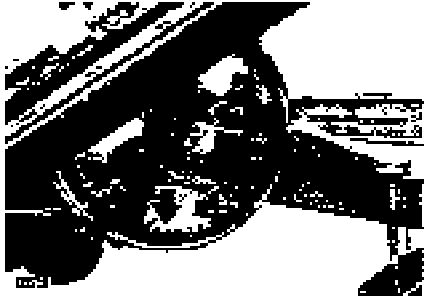
1. Circle

   Apply grease all around the circle part.

(For GD511A)



(For GD521A, GD523A)



2. Blade guide rail

   Apply grease all over the guide rail.

(For GD511A)

(For GD521A, GD523A)

EVERY 250 HOURS SERVICE

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

Carry out the following maintenance only after the first 250 hours.

- FUEL FILTER, REPLACE CARTRIDGE
- TRANSMISSION CASE AND FILTER, CHANGE OIL AND REPLACE ELEMENT
- FINAL DRIVE CASE, CHANGE OIL
- CIRCLE REVERSE GEAR CASE, CHANGE OIL
- TANDEM DRIVE CASE, CHANGE OIL
- HYDRAULIC TANK AND FILTER, CHANGE OIL AND REPLACE ELEMENT
- ENGINE VALVE CLEARANCE, CHECK AND ADJUST

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

a. LUBRICATING

Apply grease to the grease fittings shown by arrows.

1. Leaning cylinder pin (2 points)
(For GD511A, GD521A)

2. Leaning rod end (2 points)

3. Tie rod (2 points)
(For GD511A, GD521A)

(For GD523A)

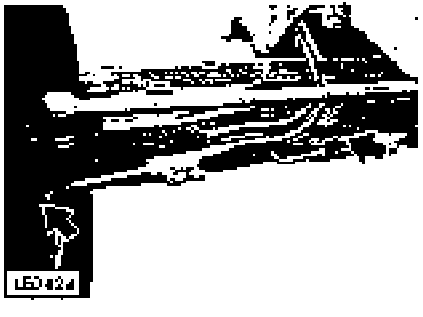
(For GD523A)

5. Leaning pin (2 points)

(For GD523A) (4 points)

4. Knuckle bracket king pin (4 points)

6. Steering cylinder
(For GD511A, GD521A) (2 points)



7. Front axle center pin
(For GD511A, GD521A) (1 point)

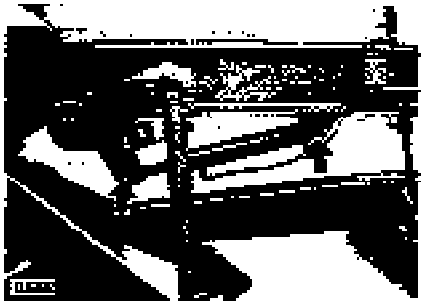
(For GD623A)

8. Drawbar ball joint (1 point)
(For GD511A, GD521A)

(For GD623A)

9. Scarifier ball joint (4 points)

10. Scarifier cylinder pin (2 points)



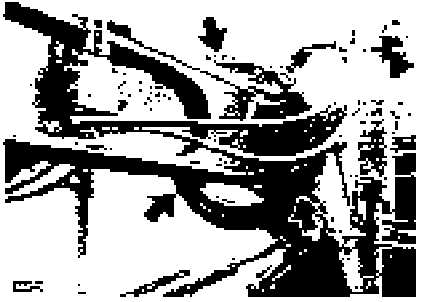
11. Blade lift cylinder yoke (8 points)

12. Blade lift cylinder ball joint (2 points)

13. Drawbar side shift cylinder ball joint (2 points)
(For GD511A)

(For GD521A, GD523A)

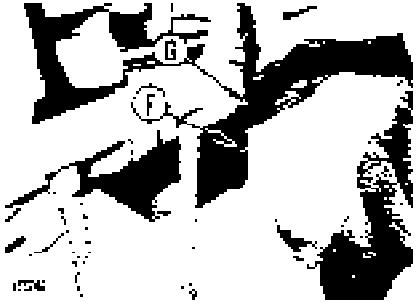
14. Bank control guide (3 points)



15. Articulation center pin (2 points)

16. Articulation cylinder pin (4 points)

b. TRANSMISSION CASE

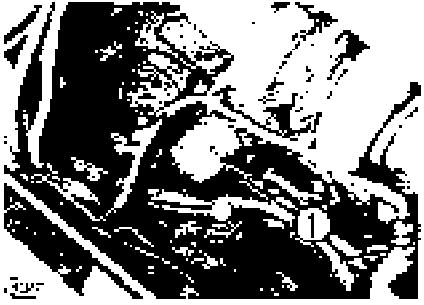


Check the oil level with oil level gauge (G). If necessary, add oil through filler (F).

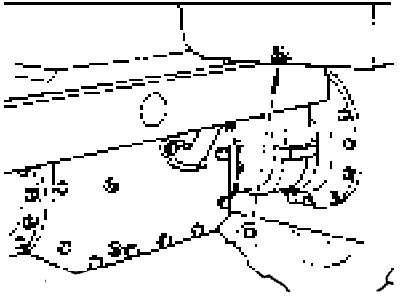
* Make an oil level check 5 minutes after the engine is stopped.
* The type of lubricant used depends on the ambient temperature. Select according to the table "FUEL, COOLANT AND LUBRICANTS".

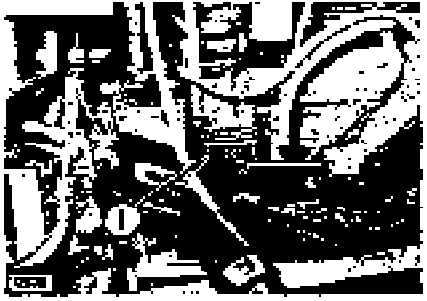
c. ENGINE OIL PAN AND FILTER

(For GD611A)



(For GD621A, GD523A)





1. Loosen drain plug (P) to drain oil. After draining, tighten it.
2. Using a filter wrench, remove cartridge (1) of the engine oil filter by turning it counterclockwise.

★ If filter cartridge (1) is removed immediately after stopping the engine, oil will spill. Wait at least 10 minutes after stopping the engine before replacing the filter cartridge.

★ (For GD511A)
To install cartridge, bring its packing surface into contact with sealing surface of filter base and then tighten cartridge a further 1/2 of a turn.

★ (For GD521A, GD523A)
To install cartridge, bring its packing surface into contact with sealing surface of filter base and then tighten cartridge 3/4 to 1 of a turn.

3. After replacing cartridge, fill with engine oil through oil filler (F). After refilling with oil, start the engine and idle it for a while. Then, stop the engine and check the oil level.

★ Refill capacity: GD511A: 9 ℓ
GD521A, GD523A: 24 ℓ

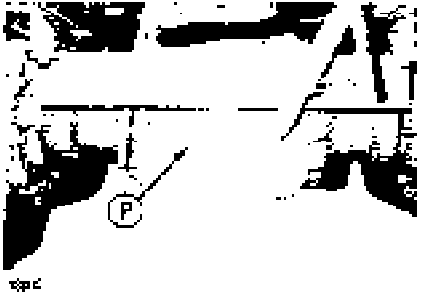
★ The type of lubricant used depends on the ambient temperature. Select according to the table "FUEL, COOLANT AND LUBRICANTS".

★ Replace once every 6 months, regardless of the number of hours operated.

★ Use API category CD class oil. If CC class oil must be used, change the oil and replace the oil filter at half the usual interval.

d. FINAL DRIVE CASE

(For GD511A)



(For GD521A, GD523A)

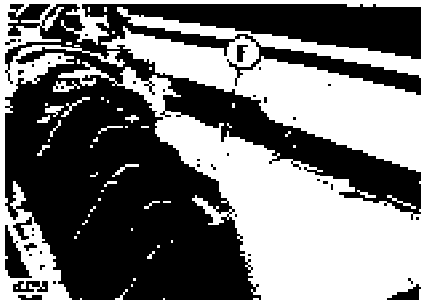
Check the oil level with oil level plug (F) 3 minutes after stopping the engine. If necessary, add oil through filler (F).

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

e. TANDEM DRIVE CASE

(For GD511A)

(For GD521A, GD523A)



Check the oil level with oil level plug (G). If necessary, add oil through filler (F).

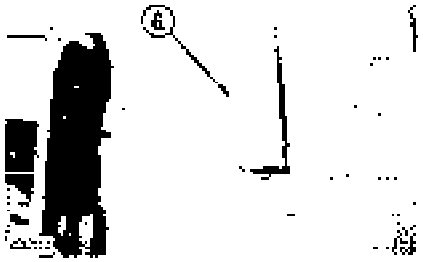
★ The type of lubricant used depends on the ambient temperature. Select according to the table "FUEL, COOLANT AND LUBRICANTS".

f. CIRCLE REVERSE GEAR CASE

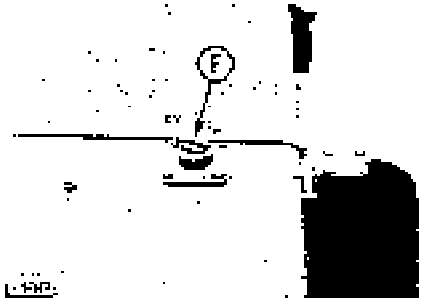
Remove plug (F). Check if the oil level is at the gear upper face. Add the gear oil through filler (F), if necessary.

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

g. HYDRAULIC TANK



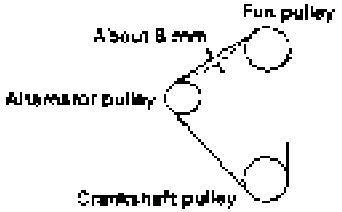
1. Set the machine in position as follows to check the oil level.
   - Return the leaning of the front tires to the upright position and face the wheels straight to the front.
   - Set the front frame and rear frame facing straight (articulated angle).
   - Return the drawbar sideshift and blade sideshift to the center of the machine, set the blade at right angles to the chassis and lower it lightly to the ground.
   - Raise the scarifier fully.
2. Check the oil level with sight gauge (G). Add engine oil through filler (F), if necessary.



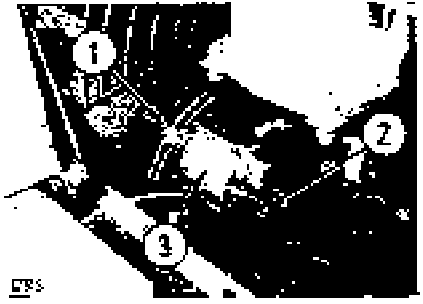
* The type of lubricant used depends on the ambient temperature. Select according to the table "FUEL, COOLANT AND LUBRICANTS"

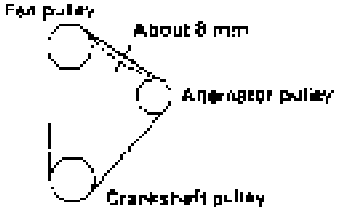
⚠ **When oil temperature is high, do not remove cap. Hot oil sometimes spouts out.**
When removing the cap, turn it slowly to relieve inner pressure.

h. FAN BELT
(For GD511A)



[For GD521A, GD623A]





1. The belt tension should normally deflect by about 8 mm when pressed with the finger at a point midway between the alternator pulley and the fan pulley (approx. 6 kgf).
2. To adjust the belt tension, loosen bolt (1) and nut (2) and shift alternator (3) slightly.
3. After adjustment, tighten bolt (1) and nut (2) securely.

* Check for the damage to each pulley, wear of the V groove, and wear of V belt. In particular, check if the V belt contact with the bottom of the V groove.
* If the belt is so over-extended that no adjustment allowance exists, or if cuttings or cracks are found, replace both belts.

i. BALL JOINT

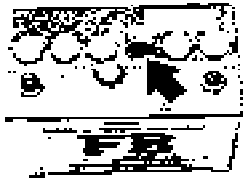
(For GD511A)

(For GD521A, GD623A)

Remove all shims. Tighten the cap in such a manner that the clearances (shown in the picture) on both sides are the same. Measure the clearance with a thickness gauge, and place the shims which are thicker than the measured clearance by one shim. Then, retighten the cap. One shim is equal to 0.2 mm thickness.

* Repeat this procedure for each ball joint in the work equipment linkage.

j. BATTERY ELECTROLYTE LEVEL



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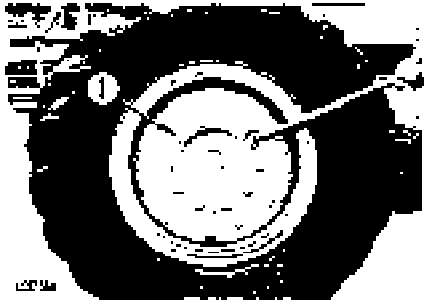
If the electrolyte level is below the prescribed level of 10 to 12 mm above the plate, add distilled water. Should any of the acid be spilt, have it replenished by the nearest battery shop with acid of the correct specific gravity.

* Clean the air hole of battery cap along with the level check.
* Never use metal funnel for electrolyte supply.

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

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

k. WHEEL HUB NUT



Loose wheel hub nuts (1) will result in shortened life of tires or troubles. Carefully check loosening of the nuts.

- ★ Coat the threaded part with molybdenum disulphide grease (NLGI No. 1) before tightening.
- ★ Tightening torque: 40 ± 5 kgm
- ★ Check all the nuts for loosening. Also, check the rim for damage. If a hub bolt is broken, replace the total unit of the wheel stud.
- ★ When checking for loose nuts, always turn the nut in the tightening direction to check.

l. PARKING BRAKE LEVER TRAVEL

Check

If the normal braking grip is effective by pulling the brake lever 2 to 3 ratchets from the brake release position, the brake lever travel is considered normal.

If six or more ratchets are counted before the parking brake comes into effect, perform the following adjustment.

Adjustment

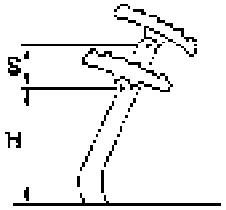
1. Move the machine as necessary until adjustment hole (1) is located to approx. 15 mm right side from the center bottom of the brake drum. The brake drum rotates one complete turn with every 29 cm of movement of the machine.
2. Insert the screwdriver into the adjustment hole. Using the driver blade, rotate the adjusting screw in the "shoe expanding" direction (lower the screwdriver grip) to bring the shoe into close contact with the drum. Then, back the adjustment screw eight clicks. (0.23 mm of shoe clearance will result.)
3. Then, adjust the yoke nut on each end of the cable until proper lever travel (135 mm) can be obtaind.

* After adjustment, by traveling the machine for about 500 meters and confirm that the brake drum is free from trailing. (If some trailing exists, the brake drum will become hotter than the drive shaft next to the drum.)
* Wear of parking brake, if any, is caused by failure of releasing of the parking brake lever. Most of wear will be accompanied with burning of the lining and discoloration of the drum.
  As burnt brake lining causes deterioration of braking effect, remove the drum and clean the burnt lining surface with sandpaper.
* Keep the lining surface free from oil and grease. If soiled with oil or grease, wipe off it and polish the surface with sandpaper.
* To check the parking brake for normal function, pull the parking brake and start the engine. Depress the inching pedal, place the gear shift lever in the forward 3rd position, and run the engine at full speed.
  The effect of the parking brake can be considered normal if the engine is stopped when the pedal is gradually released. In this case, it should not be regarded as abnormal if the machine is moved slightly.
* Do not attempt to repeat the above-mentioned parking brake test unnecessarily, as this test gives undue stress to the various parts in the power train.

m. WHEEL BRAKE

Check

If the height from the floor (H) is not within a range of 200 to 210 mm with the foot brake pecal fully depressed, and the depressing height (S) is more than 80 mm, or if the braking effect is poor, adjust as follows.



Adjustment

1. Turn the adjusting gear, with the screwdriver inserted into the hole on the lower side of back plate, until the brake lining comes into close contact with the brake drum.
2. Back the adjusting gear 4 to 5 clicks.
3. Fit a 0.6 mm gauge in one side of the inspection window on the left and right and check that the clearance on the other side is less than 0.4 mm.
4. After adjusting, check that the depressing height of the brake pedal is within 80 mm.

★ If deterioration of braking efficiency is suspected, check it as follows:
1) While the machine travels at about 20 km/h of traveling speed, try lightly braking the machine so as not to cause wheel locking three times.
2) Touch each brake drum by hand to see whether heating of drums is felt or not.
3) Cold drums, if any, may be assumed ineffective.

★ Brake lining with black surface due to burning or lining soiled with oil causes insufficient braking effect. Polish such a lining with sandpaper.

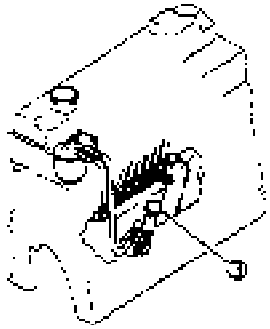
★ After adjusting, travel the machine about 500 meters and confirm that four brake drums are free from overheating caused by trailing.

EVERY 500 HOURS SERVICE

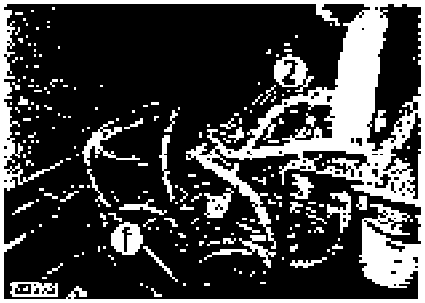
* **Maintenance for every 50 and 250 hours should be carried out at the same time.**

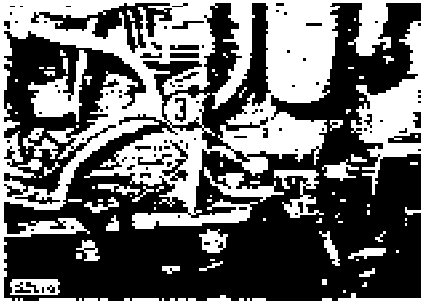
a. FUEL FILTER

(For GD511A)



(For GD521A, GD523A)





1. Close the fuel valve of the fuel tank.
2. Using a filter wrench, remove cartridge (1) by turning it counterclockwise.

* Clean the filter base, and check that there is no filter seal still stuck to the filter base. If there is any old seal still stuck to the filter base, there will be a gap when the new gasket is installed and this will cause oil leakage.

3. Fill the new cartridge with fuel and refit it after applying a dab of oil to the gasket face.

* To refit the cartridge, place the gasket face in contact with the seal face of the filter stand, then screw up the cartridge about 2/3 of a turn.

4. After replacing filter cartridge (1), open fuel valve of the fuel tank.

5. Loosen air bleed plug (2) of the fuel filter
6. Loosen feed pump knob (3) and move the pump up and down to drew off fuel until air ceases to come out of vent plug (2)
7. Tighten air vent plug (2).
8. Push in feed pump knob (3) and tighten it.

* After replacing the cartridge, start up the engine and check the filter seal face possible oil leakage.
* Be sure to use a genuine Komatsu cartridge.

b. TRANSMISSION FILTER

1. Remove bolts (1) (4 bolts on the outside) fastening the filter case (2); remove case.
2. Remove the element and discard. Thoroughly clean the case interior and removed parts. Install a new element.

* Use genuine Komatsu element.

d. CIRCLE GUIDE

Checking

With the blade raised from the ground, check the circle guide clearances at the portions (P) and (Q), using the feeler gauge.

Standard clearance at portion (P) is 1.5 ±0.5 mm

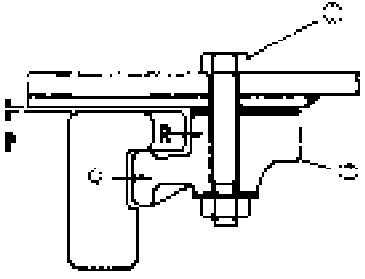
Standard clearance at portion (Q):

$(Q)_F = 0$ and $(Q)_R = 2.5$ mm or $(Q)_F$ (average clearance when rotating circle) $= (Q)_R = 1$ mm

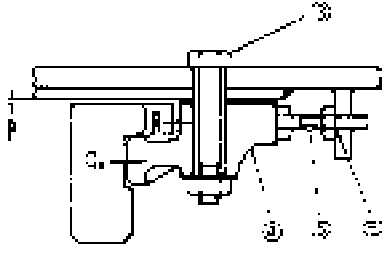
F: Front

R: Rear

Section A-A
(Two places on the front side)



Section B-B
(Two places on the rear side)



Adjustment

Rest the blade on the ground.

1. To adjust the clearance at portion (P), loosen bolt (1) and (3) and adjust thickness of shims for the circle guide (2) and (4). Two kinds of shims different in thickness (1 mm and 0.5 mm) are provided.
2. To adjust the clearance at portion (Q), first loosen bolt (1), push circle guide (2) rearward to make the clearance $(Q)_F$ zero, and temporarily tighten bolt (1). (Slightly move the machine forward, with the blade rested on the ground, to make the clearance $(Q)_F$ zero.)
3. Then, loosen the bolt (3). Loosen locknut (5) fastening bolt (6) and turn in the bolt to push circle guide (4) until the clearance $(Q)_R$ becomes zero. Be sure to equally tighten right and left bolts (6).
4. With the clearance $(Q)_R$ kept in zero, back bolt (6) half rotation, and tighten locknut (5). Back circle guide (4) until it comes into contact with bolt (6) and tighten bolt (3).

★ When either of the following conditions arises, replace the circle guide.

1. Clearance at portion (R) has decreased to zero.
2. Clearance between the circle tooth top ends circle reverse pin gear tooth bottom land has decreased to zero or clearance between the circle tooth bottom land and the circle reverse pin gear tooth top has decreased to zero.

d. RADIATOR FIN

Dust, mud, or leaves sticking to, and blocking, the radiator are to be blown off by compressed air. Steam or water may be used instead of the compressed air.

* Be careful not to bend the fin.
* Check the rubber hose also. If any broken, or defective fixtures, or deteriorated parts are found, replace with new one. Check that the hose clamp is tight.

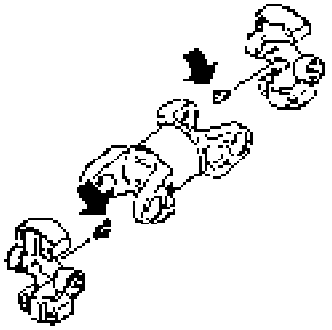
EVERY 1000 HOURS SERVICE

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

a. LUBRICATING

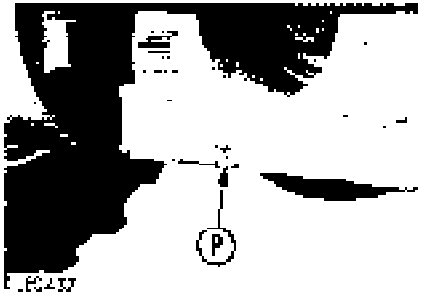
Apply grease to the grease fittings shown by arrows.

1. Drive shaft (2 points)

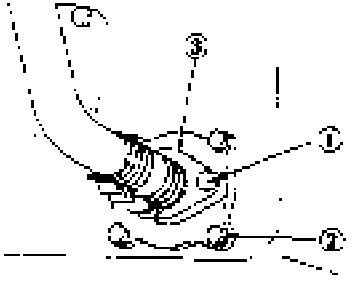


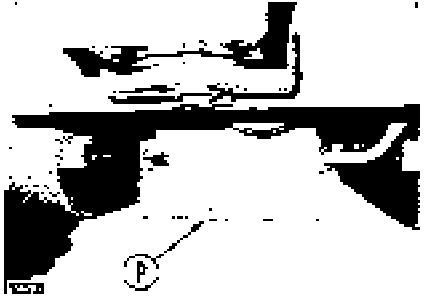
b. TRANSMISSION CASE

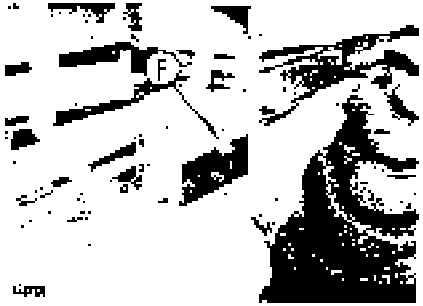
(For GD511A)



(For GD521A, GD523A)







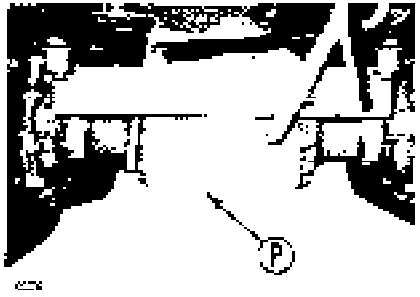
1. Remove drain plug (P). After draining oil, tighten drain plug.
2. Remove bolt (1), (2) and cover (3).
   Take out strainer and wash out dust with diesel fuel.
3. After cleaning it, install strainer.
4. Refill engine oil in specified amount through filler (F).
   For refilling procedure see the section EVERY 250 HOURS SERVICE.

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

★ Refill capacity: 34 ℓ

c. FINAL DRIVE CASE

(For GD511A)



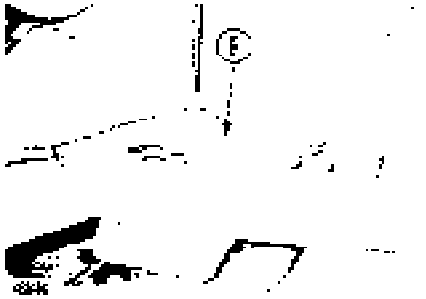
(For GD521A, GD523A)

1. Remove drain plug (P) to drain oil. After draining, tighten it.
2. Refill the engine oil through filler (F) up to the prescribed level.
3. For the refilling procedure, see the item "EVERY 250 HOURS SERVICE".

* The type of lubricant used depends on the ambient temperature. Select according to the table "FUEL, COOLANT AND LUBRICANTS".
* Refill capacity:
  GD511A: 12 ℓ
  GD521A, GD523A: 24 ℓ

d. CIRCLE REVERSE GEAR CASE

1. Remove drain plug (P) to drain oil. After draining, tighten it.
2. Refill the gear oil through filler (F) up to the predetermined level.
3. For the refilling procedure, see the item "EVERY 250 HOURS SERVICE"



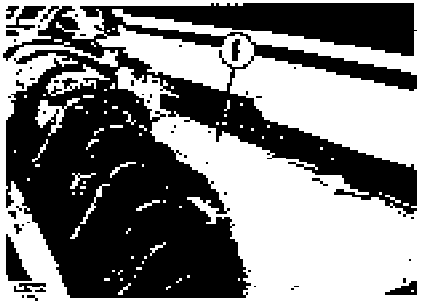
★ The type of lubricant used depends on the ambient temperature. Select according to the table "FUEL, COOLANT AND LUBRICANTS".
★ Refill capacity: 4 ℓ

6. TANDEM DRIVE CASE

(For GD511A)

1. Remove drain plug (P) to drain oil. After draining, tighten it.

(For GD521A, GD523A)



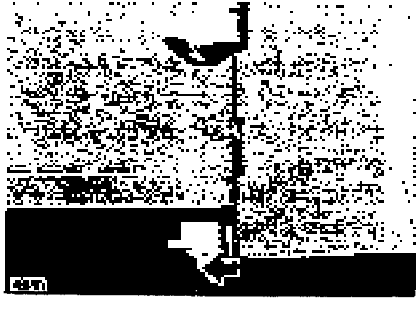
2. Remove oil level plug (G), then add engine oil through oil filler (F) until oil comes out from level plug (G).
3. For the refilling procedure, see the item "EVERY 250 HOURS SERVICE".

★ Refill capacity: 39 ℓ (each side)
★ The type of lubricant used depends on the ambient temperature. Select according to the table "FUEL, COOLANT AND LUBRICANTS".

E. HYDRAULIC TANK AND FILTER

(For GD511A)

(For GD521A, GD523A)



1. Set the machine in position as follows to check the oil level.
   - Return the leaning of the front tires to the upright position and face the wheels straight to the front.
   - Return the drawbar sideshift and blade sideshift to the center of the machine, set the blade at right angles to the chassis and lower it lightly to the ground.
   - Raise the scarifier fully.
2. Stop the engine and remove the drain plug. After draining oil, tighten drain plug.
3. Remove bolts (1) to (4) each and cover (2) and take out element.
   Then, clear the inside of the filter housing together with the other removed parts and replace with a new element.
4. Refill engine oil in specified amount through filler (F).
5. For refilling procedure, see the item "EVERY 250 HOURS SERVICE".

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

★ Refill capacity: 30 ℓ

★ Use genuine Komatsu elements.

g. DRAWBAR FRONT BALL JOINT

(For GD511A, GD521A)

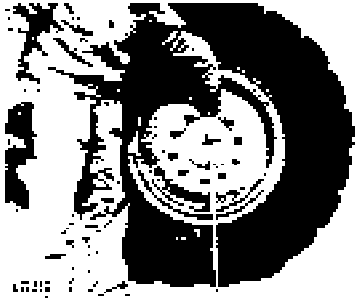
(For GD523A)

Check ball joint connecting nuts (1) at the front of the drawbar for loosening. If the connecting portions are loose, retighten them.

h. TOE-IN

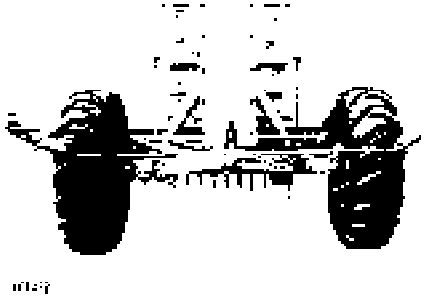
Check toe-in and adjust it so that no side slip is caused. When no side slip tester is available, use the following procedure.

How to measure toe-in:



1. Park the grader on a level ground without steering and leaning the wheels. Be sure to drive straight at least a few meters before parking.
2. Measure the height from the ground to the center of the front wheel axle.

3. Mark on the front tire surfaces with the same measure taken by the above procedure.



4. Measure the distance between the two marks on the right and left tires. This distance is named "A".

5. Drive the grader at a low speed and shift backward the mark on the tire. Stop the grader when the mark's height from the ground surface has become equal to the same value measured in the procedure 2.
6. Measure the distance between the two marks.
   This distance is named "B".

How to Adjust Toe-in:

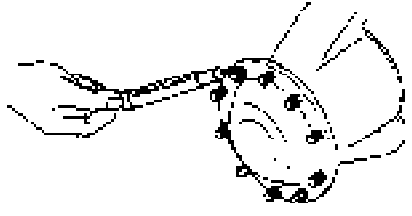
When toe-in (B — A) is adjusted to −5 ± 1 mm of standard range, side slip is decreased to zero. If any value other than the standard range is measured, adjust toe-in using the following procedure:

1. Loosen nut (1). Turn the tie rods with a wrench put on square portion (2). Then, tighten the locknuts.
2. Toe-in increases when the wrench is turned in the direction shown by the arrow, and vice versa. The value of toe-in varies by 6 mm when the tie rods are turned 1/3 rotation in the opposite direction to each other.

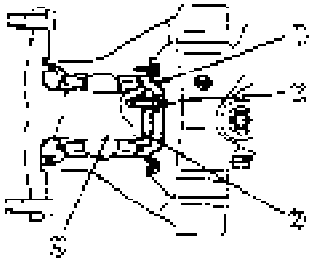
★ Keep the front axle horizontally without any leaning.

i. FRONT WHEEL BEARING PLAY

Raise the front wheels off the ground, using the blade or scarifier as a jack. Check hub turning torque with a spring balance hooked to a hub bolt.



1. The bearing play is normal if the front wheel is rotated smoothly with 8 to 12 kg of pulling force.
2. If the inspection shows that there is play, or that the rotating force is small, adjust as follows.



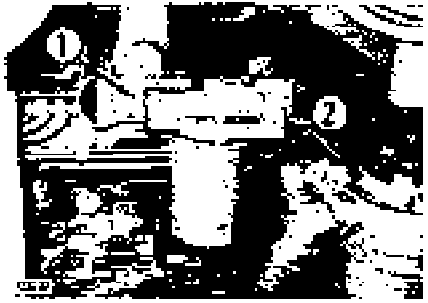
3. Remove cover (1). Select proper shims (2) and set them temporarily. Tighten bolt (3) and rotate the shaft by more than 3 revolutions each for clockwise and counterclockwise directions.

4. Loosen bolt (3). Reduce the number of shims (take out a t = 0.1 or t = 0.3 shim), and decide the thickness of shims properly so that the pulling force of the spring balance becomes to 8 to 12 kg.
   This measurement of the pulling force should be done after shaft (4) has been rotated by more than 3 turns and after the bearing has ceased rotating.

★ Also wait until the bearing gets down to normal room temperature for adjustment.

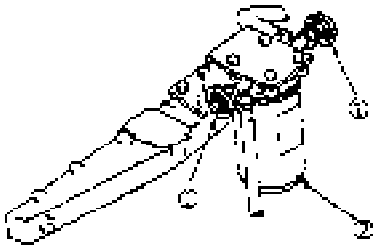
j. CORROSION RESISTOR

(For GD511A)



1. Close valves (1).
2. Using the filter wrench provided, remove cartridge (2) by turning it counterclockwise.
3. Fit a new cartridge after applying a dab of engine oil to the seal face.

(For GD521A, GD523A)



★ To fit the cartridge, put the seal face in contact with head, then screw it up about 2/3 of a turn

4. After replacement, open valve (1).

★ Be sure to use a genuine Komatsu cartridge.

★ Be careful not to screw in more than required.

k. TURBOCHARGER ROTOR PLAY

Have the turbocharger inspected by Komatsu to check it by yourself using the following procedure:

Remove the intake and exhaust pipes and hoses from the turbocharger.

1. Play in the axial direction
   Move the rotor and check for rotor play in the axial direction.
   Standard axial play:
   0.025 – 0.100 mm
2. Play in the radial direction
   Move the rotor in the radial direction in parallel by holding it with your hands on both ends and measure radial play.
   Standard radial play:
   0.075 – 0.180 mm

★ If necessary play cannot be obtained, have the turbocharger repaired by Komatsu distributor.

★ If the rotor is excessively soiled with dust or carbon or if any oil leakage caused by turbocharger trouble is noted, have the turbocharger repaired by Komatsu distributor.

l. TURBOCHARGER VARIOUS FASTENERS

The performance of turbocharger will be deteriorated when air or gas leakage exists at the joint section of intake and exhaust pipings. Further, when leakage exists at oil feed piping, oil pressure may drop and bearings may be seized.

Periodically inspect all joints for looseness and, if necessary, retighten.

If any fault is detected, ask Komatsu distributor to disassemble and repair or replace.

- Turbine housing mounting bolt
  Tightening torque:
  1.84 – 2.19 kgm
- Blower housing mounting bolt
  Tightening torque:
  1.15 – 1.50 kgm
- Turbocharger mounting bolt (for securing the exhaust manifold and turbine housing together)
  Tightening torque:
  8.0 – 7.5 kgm
- Turbocharger oil feed pipe (inlet fmel
  Tightening torque:
  2.8 – 3.5 kgm
- Turbocharger oil feed pipe (outlet fmel
  Tightening torque:
  GD511A: 2.8 – 3.5 kgm
  GD521A, GD523A:
  8.0 – 7.5 kgm

EVERY 2000 HOURS SERVICE

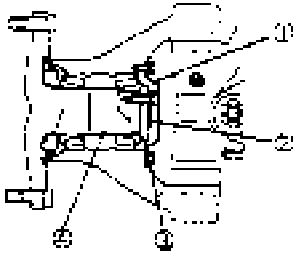
★ Maintenance for every 50, 250, 500 and 1000 hours should be carried out at the same time.

a. FRONT WHEEL BEARING GREASE (ON BOTH RIGHT AND LEFT SIDES)

1. Support the front axle on a block to raise the front wheel off the ground. Remove the wheels.

★ When raising the front wheels, securely apply the parking brake and rest the blade and scarifier on the ground.

2. Take off cover (1), remove lock (2) and holder (3), then remove hub shaft (4).



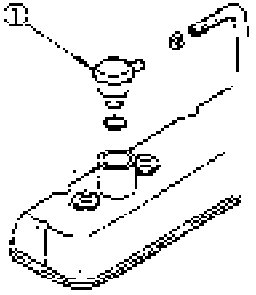
3. Clean the axle and bearing, and clean out all the old grease from inside the hub. Fill the grease pan about half full with new grease.
4. Replace the hub seal and spacer with new parts.

★ Coat the lip surface of the hub seal and the surface of sliding parts with grease, fill the spacer between the lip with grease, then assemble.

★ Fill with grease so that grease is pushed between the axle and bearing. Make sure that grease also comes up around the bearing (also the outside bearing) before installing the hub shaft.

5. After installing the hub shaft, adjust the rotating force. For details, see Inspecting and Adjusting Play of Front Wheel Bearing.
   When carrying out this maintenance, please contact your Komatsu distributor.

b. ENGINE BREATHER (For GD521A, GD523A)



1. Remove breather (1) from the cylinder head.
2. Rinse the whole breather in diesel oil or flushing oil, dry with compressed air, then install again in the cylinder block.

★ Before taking the breather out of place, wipe the dust off the surrounding area.

★ When restoring the element to its original position, be sure to coat the new O-ring with engine oil.

c. ALTERNATOR AND STARTING MOTOR

The brush may be worn, or the bearing may have run out of grease, so please contact your Komatsu distributor for inspection or repair.

* If the engine is started frequently, carry out inspection every 1000 hours.

d. ENGINE VALVE CLEARANCE

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

e. VIBRATION DAMPER

Check that there are no cracks in the damper rubber. If there is any abnormality, contact your Komatsu distributor for repairs.

f. TURBOCHARGER

Excessive carbon or oil sludge adhering to turbocharger blower impeller may lead to deterioration of normal charger performance, and possible damage. Have turbocharger cleaned by Komatsu distributor.

1. Remove the turbocharger oil filler pipe and drain pipe, then remove the intake air pipe connector and blower housing so that the blower impeller can be seen.
2. Using light oil as a cleaning agent, remove the carbon, sludge and other dirt from the blower impeller. Do not use a wire brush or other tool which may damage the impeller.
3. Pour in light oil through the turbocharger oil filler and rotate the blower impeller several times to wash out the sludge.
4. Rotate the impeller by hand at least one turn at speed to check that there is contact noise or catching inside.
   If the impeller does not turn smoothly, contact your Komatsu distributor for repair or replacement.
5. If there is no abnormality, dry off the light oil with compressed air after inspection, then add engine oil.

EVERY 4000 HOURS SERVICE

★ Maintenance for every 50, 250, 500, 1000 and 2000 hours should be carried out at the same time.

a. WATER PUMP

Check that there is no play in the pulley, grease leakage, water leakage, or clogging of the drain hole. If any abnormality is found, please contact your Komatsu distributor for disassembly and repair or replacement.

WHEN REQUIRED

8. CLEAN INSIDE OF COOLING SYSTEM

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

* Stop the machine on level ground when cleaning or changing the coolant.
* Use a permanent type of antifreeze.
  If, for some reason, it is impossible to use permanent type antifreeze, use an antifreeze containing ethylene glycol.
* Be sure to replace the corrosion resistor cartridge.
* Use city water for the cooling water.
  If river water, well water or other such water supply must be used, contact your Komatsu distributor.

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

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

* Add antifreeze in the cooling water.
  When deciding the ratio of antifreeze to water, check the lowest temperature in the past, and decide from the mixing rate table given below.
  It is actually better to estimate a temperature about 10°C lower when deciding the mixing rate.

Mixing rate of water and antifreeze

Min. atmospheric temperature (°C)	−6	−10	−15	−20	−25	−30
Amount of antifreeze (ℓ)	8	10	12	14	16	17
Amount of water (ℓ)	26	24	22	20	18	17

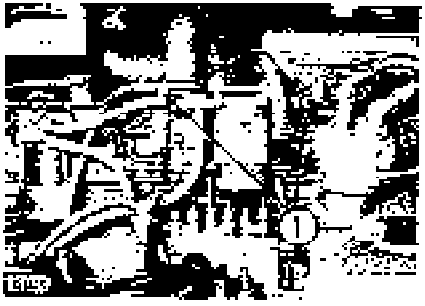
* We recommend use of an antifreeze density gauge to control the mixing proportions.

Corrosion resistor

(For GD511A)

1. Stop the engine and tighten up corrosion resistor valve (1).
2. Turn cap (2) slowly until it comes off.
3. Open drain valve (3) at the bottom of the radiator and plug (4) on the side of cylinder block to drain off the cooling water.
4. Drain off all the water, then close up drain valve (3), plug (4), and pour in soft water (ex. city water) up to the vicinity of the water filler.

(For GD521A, GD523A)



5. When the water reaches the vicinity of the water filler, put the engine at low idling, open drain valve (3) and plug (4), then pass water through the cooling system for 10 minutes.

* When doing this, adjust the inflow and outflow of water so that the radiator is always full.

6. After flushing with water, stop the engine. Close drain valve (3) and drain plug (4) after draining water.

Water filler

7. After draining water, use a flushing agent to clean.

* We recommend the use of Komatsu genuine goods as the flushing agent. Follow the instructions on the label of the flushing agent to clean the system.

8. After washing the cooling system, drain off all the water, then close up drain valve (3) and plug (4), and pour in soft water (ex. city water) up to the vicinity of the water filler.

Drain valve (bottom of radiator)

9. When the water reaches the vicinity of the water filler, put the engine at low idling, open drain valve (3) and plug (4), then pass water through the cooling system until clean water comes out from drain valve (3) and plug (4).

★ When doing this, adjust the inflow and outflow of water so that the radiator is always full.

10. When the water becomes completely clean, stop the engine, close drain valve (3) and plug (4).

Drain plug (cylinder block)
(For GD511A)

11. Replace the corrosion resistor cartridge and open corrosion resistor valve (1) (See EVERY 1000 HOURS SERVICE).
12. Supply water up to the vicinity of the water filler.
13. Run the engine for 5 minutes at low idling to eliminate air trapped in the cooling system, and run the engine for 5 minutes at high idling. (Leave water filler cap (2) off during this operation.)

(For GD521A, GD523A)

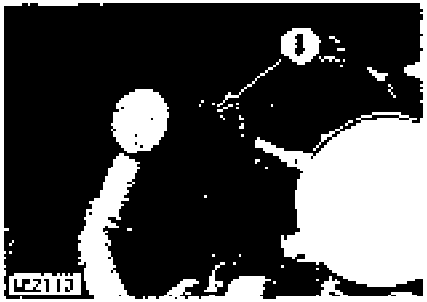
14. Stop the engine and 3 minutes later supply water again up to vicinity of the water filler and tighten water filler cap (2).

⚠ **Do not remove the cap while cooling water is hot. Hot water may spout out.**
When removing radiator cap, lift the lever to relieve inner pressure.

b. CHECK, CLEAN AND REPLACE AIR CLEANER ELEMENT

Checking

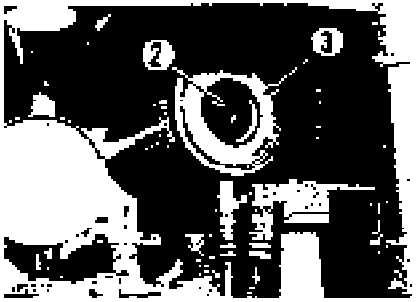
(For GD511A)



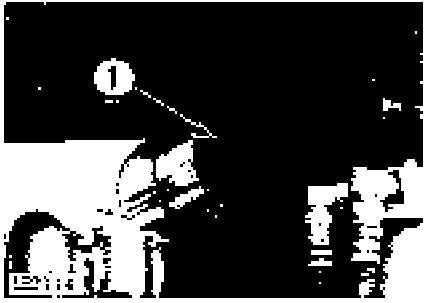
Whenever the red piston in dust indicator (1) appears, clean the air cleaner outer element. Stop the engine when cleaning the element.

Cleaning or replacing outer element

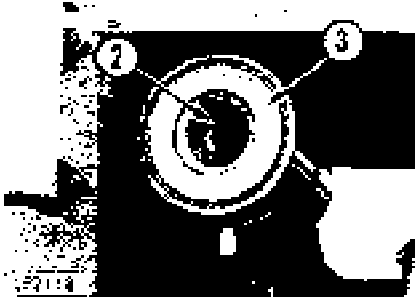
(For GD611A)



(For GD621A, GD623A)



(For GD521A, GD523A)

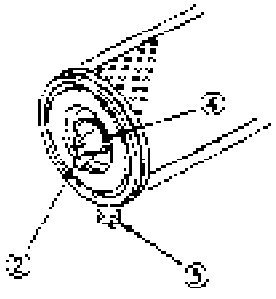


1. Loosen wing nut (2), remove cover (3) and outer element.
2. Clean the air cleaner body interior and the removed cover.
3. Clean and inspect the element. (See the item "Cleaning outer element" for cleaning procedure.) Install the cleaned element.
4. Push the dust indicator reset button to return the red piston to the original position.

★ Replace the outer element which has been cleaned 6 times repeatedly or used throughout a year. Replace the inner element at the same time.

★ Replace both inner and outer elements when the dust indicator red piston appears soon after installing the cleaned outer element even though it has not been cleaned 6 times.

★ Remove one seal from the outer element. The number of times the outer element has been cleaned can be seen by the number of removed seals.



★ Replace seal washer (4) or wing nut (2) if they are broken.

★ When inspecting or cleaning the air cleaner, remove evacuator valve (5) and clean with compressed air.

Replacing the inner element

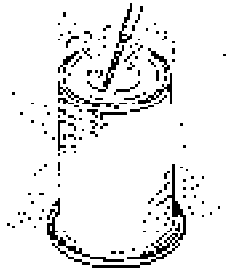
1. After removing the cover and outer element, remove the inner element.
2. Cover the intake opening.
3. After cleaning inside the body remove the intake opening cover.
4. Fix a inner new element to the connector and tighten the nut.
5. Fix on the outer element and cover and return the dust indicator red piston to its place.

NOTE: Do not attempt to re-install 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 7 kg/cm²) 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 3 kg/cm²) 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 7 kg/cm²) 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.

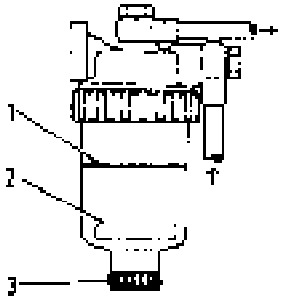
c. ELECTRICAL INTAKE AIR HEATER

Check electrical intake air heater once a year before commencing work in the cold season.

Remove electrical intake air heater from the engine intake connection, and check it for possible open-circuits and dirt.

When inspecting and replacing electrical intake air heater, replace the gasket with new one.

d. WATER SEPARATOR



When float (2) is at or above red line (1), drain the water according to the following procedure:

1. Loosen drain plug (3) and drain the accumulated water until the float reaches the bottom,
2. Tighten drain plug (3).
3. If the air is sucked into fuel line when drain the water, be sure to bleed air in the same manner as for the fuel filter.

   (See Fuel Filter Cartridge in EVERY 500 HOURS SERVICE section.)

ADJUSTMENT

ADJUSTMENT OF INCHING PEDAL

When any abnormal pedal condition such as mentioned below in noticed, consult your Komatsu distributor for checking, readjustment or repair of the inching pedal system.

1. At full engine speed, the machine moves when the inching pedal (1) is depressed and the gear shift lever (2) is placed in the forward 1st speed position (The parking brake lever (3) is left released).
2. With parking brake lever (3) applied, the brake pedal (4) depressed and the gear shift lever placed in the forward 6th (or reverse 6th) position, the engine does not stop within 3 seconds when the inching pedal is released from the depressed position.

* These abnormal conditions concerning inching pedal operation are sometimes caused by transmission troubles. Therefore, careful inspection of faulty conditions must be made by your Komatsu distributor not only about the inching pedal control system, but also about the transmission.

TROUBLE SHOOTING GUIDE

ENGINE

The pointer of engine oil pressure gauge is in red range on left hand side of the gauge when engine speed is raised after completion of warm-up.
- Add the oil to the specified level
- Replace the oil element
- Check oil leakage from the pipe or the joint.
- Replace the pressure gauge.

Steam is emitted from the top part of the radiator (the pressure valve).
The pointer of the water temperature gauge is in red range on right hand side of the gauge.
- Supply the cooling water and check leakage
- Adjust fan belt tension.
- Wash out inside of cooling system.
- Clean or repair the radiator fin.
- Replace the thermostat.
- Tighten the radiator cap firmly or replace the gasket of it.
- Replace the water temperature gauge.

The pointer of the water temperature gauge is in white range on left hand side of the gauge.
- Replace the thermostat.
- Replace the water temperature gauge

The engine does not start when the starting motor is turned over.
- Add fuel.
- Repair where air is leaking into fuel system
- Replace the injection pump and the nozzle.
- Check the valve clearance.
- Check engine compression pressure
- Refer to the section of electrical system

Exhaust gas is white or blue.
- Adjust to specified o l quantity
- Replace with specified fuel

Exhaust gas occasionally turns black.
- Clean or replace the air cleaner element.
- Replace the nozzle.
- Check engine compression pressure.

Combustion noise occasionally changes to breathing sound
- Replace the nozzle.

Unusual combustion noise or mechanical noise.
- Replace with specified fuel.
- Check over-heating.
- Replace the muffler.
- Adjust valve clearance.

ELECTRICAL SYSTEM

Unusual noise is emitted from the alternator.
- Replace the alternator.

Starting motor does not turn when starting switch is turned on.
- Check and repair wiring.
- Charge the battery.

The pinion of the starting motor keeps going in and out.
- Charge the battery.

Starting motor turns the engine sluggishly.
- Charge the battery.
- Replace the starting motor.

The starting motor disengages before the engine starts up.
- Check and repair wiring.
- Charge the battery.

The heater signal does not glow red.
- Check and repair wiring.
- Replace the heater relay.
- Replace the heater signal.

Outside the ribbon heater and the coil heater is not warm when touched with the hand.
- Check and repair wiring.
- Replace the ribbon heater and the coil heater.
- Check and repair the heater switch.

CHASSIS

Tractive force is lacking. (Insufficient travel speed)
- Refer to item "Engine".
- Inspect and adjust transmission valve.
- Release parking brake lever.

Machine fails to start at any gear shift lever position.
- Add oil to the specified level.
- Inspect and adjust transmission valve.

Loud noise in the power transmitting system.
- Add oil to the specified level.

Excessive wear of front wheels
- Adjust toe-in.

Heat generation at front wheel hub
- Apply grease.

Front wheels sway while travelling.
- Adjust toe-in and tie rod.
- Equalize tire pressure on each side.
- Check wheel installation.
- Tighten front wheel bearing nut.

Steering wheel feels heavy.
- Add air to front tire to the specified pressure.
- Apply grease to steering linkage.
- Check engagement of ball nut.
- Correct piping.

Parking brake does not operate satisfactorily.
- Adjust brake shoes.
- Polish the lining with sand paper.
- Clean the interior of brake drum.

Excessive blade swing during work.
- Adjust shims of ball joint and circle guide.
- Replace side bushing.
- Correct blade rake.

Excessive vibration of the blade when adapting during work.
- Adjust position of circle guide.

Work equipment is slow to move by operating the control lever.
- Add oil to the specified level.

Wear of parking brake lining.
- Adjust clearance between lining and drum.

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 sufficient quantity of grease and oil replacement.
- Lower the air pressure in the tires to about 80% of the standard operating pressure.
- Give a thin coat of grease to metal surface (hydraulic piston rods and oil seal).
- As to batteries, remove the terminals and place cover on them, or remove them from the machine and store separately.
- In case the atmospheric temperature may drop below 0°C, add antifreeze in the cooling water.
- Set the gear shift lever to neutral position, set the fuel control lever to engine stop position, and apply the parking brake.

DURING STORAGE

- Operate the engine and move the machine for a short distance once a month so that new oil film will be generated and exhaustion of oil film in a long period will be prevented.
- Before using work equipment, wipe off the grease from the pressure cylinder rod.

When it is unavoidably necessary to carry out rust-preventive operation indoors, open all windows and doors to circulate the air and prevent the accumulation of poisonous gases.

AFTER STORAGE

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

- Loosen the drain plugs on oil pan and other cases and drain mixed water.
- You should request Komatsu distributor for following service.
  - ○ Remove the cylinder head cover and lubricate sufficiently valves and rocket arms. And inspect the valve operation.

Engine with turbocharger only

Remove the oil pipe flange on the turbocharger oil inlet, fill with 0.5 to 1 ℓ engine oil, and leave the flange lightly loosened. Then, rotate the engine by the starting motor without fuel injection and decompression so that the discharge of oil is confirmed. Then, tighten the flange and start the engine.

- To bleed the air from the hydraulic cylinders or hydraulic piping, run the engine at low idling and do as follows.
  1) Operate each hydraulic cylinders 4 to 5 times, stopping 100 mm from stroke end.
  2) Next, operate each cylinder 3 to 4 times to the stroke end.

  ★ If the engine is run at high speed at first, or if the cylinder is moved to the end of its stroke, the air in the cylinder may damage the piston packing, etc.
- 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 hour, regardless of the engine speed.

Consequently, if the engine is running, the service meter will advance even if the machine does not move.

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.

● **Location of the machine serial number mark**

. . . on the left side of the frame

● **Location of the engine serial number mark**

(For GD511A)

(For GD521A, GD523A)

. . . on the left side of the engine cylinder block

FUEL, COOLANT AND LUBRICANTS

PROPER SELECTION OF FUEL, COOLANT AND LUBRICANTS

RESERVOIR	KIND OF FLUID	AMBIENT TEMPERATURE (14 / 32 / 50 / 68 / 86°F; −10 / 0 / 10 / 20 / 30°C)	CAPACITY (ℓ) Specified	CAPACITY (ℓ) Refill
Engine oil pan	Engine oil	SAE 30 SAE 10W SAE 10W-30 SAE 15W-40	11 (27)	9 (24)
Transmission case Tandem drive case (each) Final drive case	Engine oil	SAE 30 SAE 10W	42 45 13 (24)	34 39 12 (24)
Hydraulic system	Engine oil	SAE 10W	68	30
Circle reverse gear case	Gear oil	SAE 90	4	4
Brake	Brake fluid	SAE J-1703	0.8	–
Fuel tank	Diesel fuel	ASTM D975 No.2 *	227	–
Cooling system	Water	Add antifreeze	34	–

* ASTM D975 No.1 ( ): GD521A, GD523A

NOTE:

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

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

ASTM: American Society of Testing and Material
SAE: Society of Automotive Engineers
API: American Petroleum Institute

(2) When starting the engine in an atmospheric temperature of lower than 0°C, be sure to use engine oil of SAE10W, SAE10W-30 and SAE15W-40, 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.

(4) There is no problem if single grade oil is mixed with multigrade oil (SAE10W-30, 15W-40), but be sure to add single grade oil that matches the temperature in the table on the left.

(5) We recommend Komatsu genuine oil which has been specifically formulated and approved for use in engine and hydraulic work equipment applications.

Specified capacity: Total amount of oil including oil for components and oil in piping.
Refill capacity: Amount of oil needed to refill system during normal inspection and maintenance.

No.	Supplier	Engine Oil (CD or CE) SAE10W, 30, 40 10W30, 15W40 (The 15W40 oil marked * is CE.)	Gear Oil (GL-4 or GL-5) SAE80, 90, 140	Grease (Lithium-Base) NLGI No. 2	Anti-freeze Coolant (Ethylene Glycol Base) Permanent Type
1	KOMATSU	EO10-CD EO30-CD EO10-30CD EO15-40CD	GO90 GO140	G2-LI G2-LI-S	AF-ACL AF-PTL AF-PT (winter, one season type)
2	AGIP	Diesel sigma S Super diesel multi-grade * Sigma turbo	Rotra MP	GR MU/EP	-
3	AMOCO	* Amoco 300	Multi-purpose gear oil	RYKON premium grease	-
4	ARCO	* Arcofleet S3 plus	Arco HD gear oil	Litholine HEP 2 Arco EP moly D	-
5	BP	Vanellus C3	Gear oil EP Hypogear EP	Energrease LS-EP2	Anti-freeze
6	CALTEX	* RPM delo 400 RPM delo 450	Universal thuban Universal thuban EP	Marfak all purpose 2 Ultra-duty grease 2	AF engine coolant
7	CASTROL	* Turbomax * RX super CRD	EP EPX Hypoy Hypoy B Hypoy C	MS3 Spheerol EPL2	Anti-freeze
8	CHEVRON	* Delo 400	Universal gear	Ultra-duty grease 2	

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No.	Supplier	Engine Oil (CD or CE) SAE 10W 30, 40 10W30, 15W40 (The 15W40 oil marked * is CE)	Gear Oil (GL 4 or GL-5) SAE80, 90, 140	Grease (Lithium-Based) NLGI No. 2	Anti-freeze Coolant (Ethylene Glycol Base) Permanent Type
9	CONOCO	* Fleet motor oil	Universal gear lubricant	Super-duty grease	–
10	ELF	Multiperformance 3C Performance 3G	–	Tranself EP Tranself EP type 2	Glacelf
11	EXXON (ESSO)	Essolube D3 * Essolube XD-3 * Essolube XD-3 Extra * Esso heavy duty Exxon heavy duty	Gear oil GP Gear oil GX	Beacon EP2	All season coolant
12	GULF	Super duty motor oil * Super duty plus	Multi-purpose gear lubricant	Gulfcrown EP2 Gulfcrown EP special	Antifreeze and coolant
13	MOBIL	Delvac 1300 * Delvac super 10W-30, 15W-40	Mobilube GX Mobilube HD	Mobilux EP2 Mobilgrease 77 Mobilgrease special	–

No.	Supplier	Engine Oil [CD or CE] SAE10W, 30, 40 10W30, 15W40 (The 15W40 oil marked * is CE.)	Gear Oil [GL-4 or GL-5] SAE80, 90, 140	Grease [Lithium-Base] NLGI No. 2	Anti-freeze Coolant [Ethylene Glycol Base] Permanent Type
14	PENNZOIL	* Supreme duty fleet motor oil	Multi-purpose 4092 Multi-purpose 4140	Multi-purpose white grease 705 707L White – Bearing grease	Anti-freeze and summer coolant
15	PETROFINA	FINA kappa TD	FINA pontonic N FINA pontonic NE	FINA marson EPL2	FINA tamidor
16	SHELL	Rimula X	Spirax EP Spirax heavy duty	Alvania EP grease	–
17	SUN	–	Sunoco GLS gear oil	Sunoco ultra prestige 2EP Sun prestige 742	Sunoco antifreeze and summer coolant
18	TEXACO	* Ursa super plus Ursa premium	Multigear	Multifak EP2 Starplex 2	Code 2055 startex antifreeze coolant
19	TOTAL	Rubia S * Rubia X	Total EP Total transmission TM	Multis EP2	Antigel antifreeze
20	UNION	* Guardol	MP gear lube LS	Unoba EP	–
21	VEEDOL	* Turbostar * Diesel star MDC	Multigear Multigear B Multigear C		Antifreeze

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