110OMA3200

NEW FRONTIERS. NEW DREAMS

OPERATION & MAINTENANCE MANUAL

BD50

BULLDOZER

(WITH BEML BS6D105 ENGINE, WET CLUTCH STEERING & STRAIGHT TILT DOZER BLADE ATTACHMENT)



BEML LIMITED

INDIA

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 properly aquired and is completely reinforced into personal habit.
- This manual describes the basic techniques. Operation or maintenance skill is improved as the operator or anyone get the correct knowledge and operates 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 are indicated 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.**

PLACING NEW MACHINE IN INITIAL OPERATION

Each machine is carefully tested and adjusted before it is shipped out from factory. However, careful attention to the following instructions during the first 100 hours of operation will add much to performance, economy and long life of the machine.

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

1. Check and ensure diesel in fuel tank and if less top up diesel with care
2. Check and ensure engine cooling water level & if less top up soft water or with suitable anti-freeze solution if temperature below freezing are likely to be encountered.
3. Check and ensure Hydraulic oil level in hydraulic tank
4. Check and ensure Main clutch Oil level
5. Check and ensure Transmission oil level
6. Check and ensure mounting bolts and nuts pertaining to air intake and exhaust pipe, air clener etc.
7. Check and ensure discontinuity, short circuiting and loose electrical terminals
8. During the initial operation, check and retighten bolts and nuts pertainig to the track, blade arm linkage, hydraulic system, etc., which are subjected to continuous stress.
9. Perform periodical lubrication and maintenance operation faithfully

- 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 during first 250hours of operation.
- At the first **250** hours of operation, the machine should be maintained in the following manner in addition to usual service:
  - ✚ Changing all Oils and oil Filters fuel filter elements.
  - ✚ Checking and adjustment of engine valve Clearances.

    For replacement procedure and details, see maintenance table in the maintenance section.
- When replacing oil filter elements (cartridges). check their interiors for dirt and dust. If heavily collected, check for possible cause before starting operation.
- Hours of operation are indicated by the service meter.

CONTENTS AT A GLANCE

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SAFETY HINTS

OPERATION

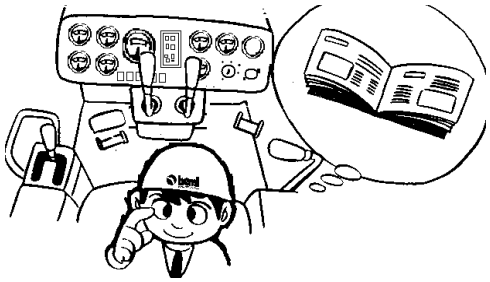
GENERAL



- Wear well-fitting helmet, safety shoes and working clothes. If the nature of the work requires safety, wear protective goggles or mask, thick gloves, earplugs 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 before hand 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
  - Roller-Over Protective Structures
  - Seat Belts, etc.



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



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



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

BEFORE STARTING OPERATION

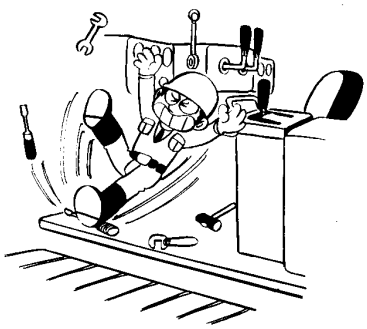
- Examine the lay of the land and the kind of soil at the work site to determine the dangerous points and the best method of operation.

  Proceed with the work only after making safety arrangements about the dangerous points.

- Inspect leakages from the fuel, lubricating and hydraulic systems. Check that the shoe bolts are not loose, and that no other parts are damaged or missing. Machines having such failures should not be operated.



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

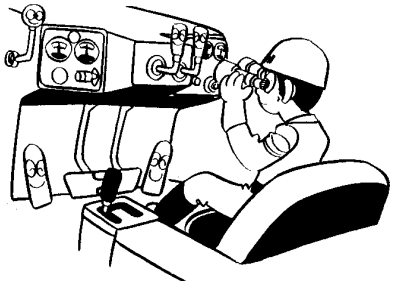


- Do not leave parts or tools lying around in the vicinity of or on the floor of the operator's compartment. Keep everything in its proper place.
- Wipe off thoroughly any grease, oil or mud on the step, handrail, floor or control levers. Failure to do this may cause you to slip.
- Check the level of 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. Always sit in the seat while operating. Do not operate the machine from any other position.
- Adjust the seat so that the brake pedal can be depressed all the way with the operator's back against the backrest.
- Before operating the machine, check and fasten the seat belt (If equipped).
- Inspect the seat belt and fittings, replace any damaged or worn parts (If equipped).

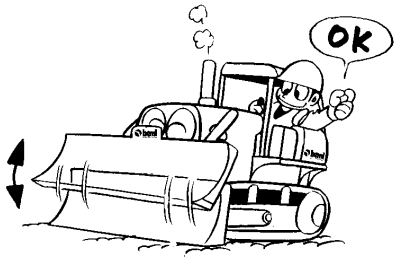


- To ensure the safety of workers near the machine, always sound the horn to warn them before starting the engine and moving the machine. Be particularly careful to check that the rear is clear before backing the machine.
- Inspect the inside of the engine room and remove any dead leaves or paper. Dead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

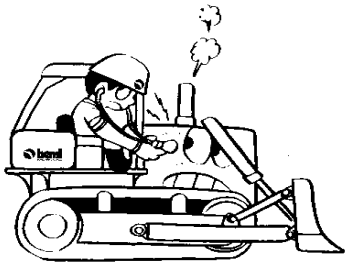
AFTER STARTING THE ENGINE



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

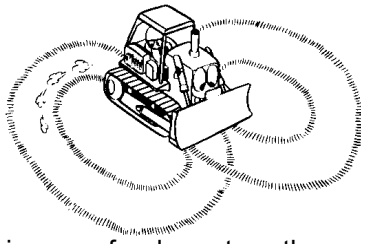


✚ Operate the blade to confirm that it is functioning normally.



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

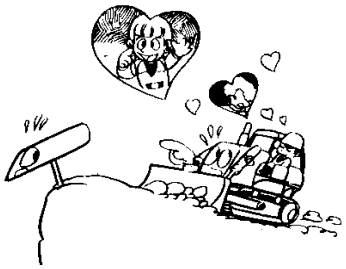
✚ Operate the gearshift lever to confirm that the travel speeds for forward and reverse are functioning normally. Also carry out a brake test at each travel speed.



✚ Choosing a safe place, turn the machine to the left and right to confirm that the steering devices are functioning normally.

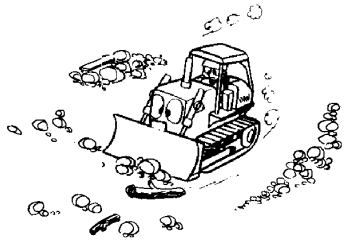
✚ If these tests reveal anything wrong, however slight it may be, contact the man in charge of the machine and operate the machine only after obtaining his permission.

DURING OPERATION

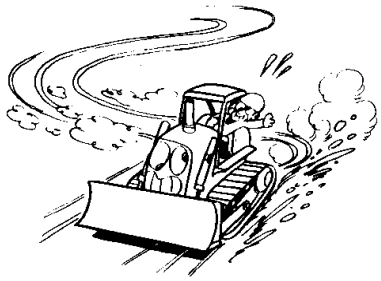


✚ Always concentrate. It is extremely dangerous to allow yourself to be distracted or to think of other things when operating a machine.

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.

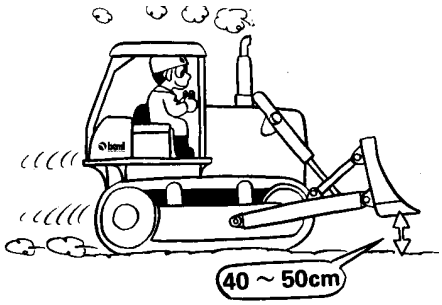


✚ The machine should always be operated at a speed where it can be correctly controlled. Never do the following:

- ❼ Speeding
- ❼ Sudden starting, sudden breaking, sudden turning.
- ❼ Snaking
- ❼ Coasting



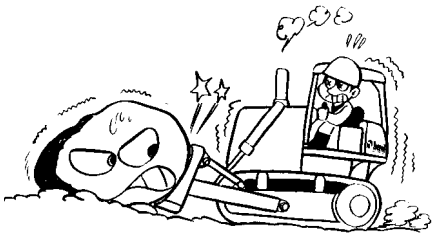
✚ Be careful of those around you, and always confirm that there is no person or obstacle in the way before driving or turning the machine.
Always operate slowly in crowded places. On haul roads or in narrow places, give way to loaded vehicles



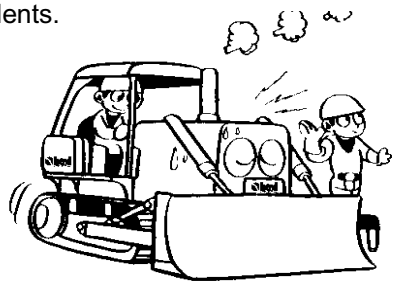
✚ When driving the machine, keep the blade 40 to 50cm above the ground.



✚ Do not allow unauthorized persons into the work area.



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



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



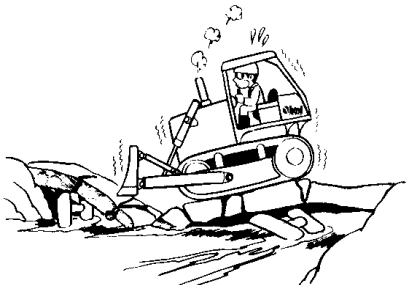
✚ If the machine breaks down and needs to be towed, first confirm that the brakes are working properly, and then tow, using a wire rope or any other suitable towing equipment.

✚ When parking the machine after discontinuing work, put the gearshift lever into "NEUTRAL", apply the brake lock, lower the blade to the ground, and put all safety levers into the "LOCK" position. Never leave the operator's seat without switching the engine off.



✚ When continuing operations after rain, remember that conditions will have changed from those before the rain started, so proceed with caution.

Be particularly careful when approaching the shoulder of the road or cliffs, as they may have been loosened by the rain.



✚ Check the load limits of bridges before crossing.

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

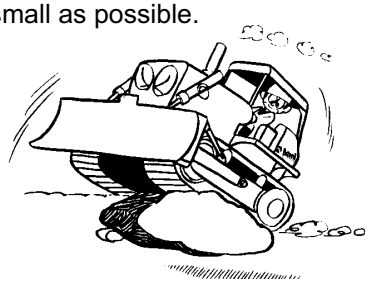
✚ When operating on uneven ground or in places where there are obstacles, remember the following points:

③ When operating on uneven ground, drive at as low a speed as possible and avoid sudden changes in direction.



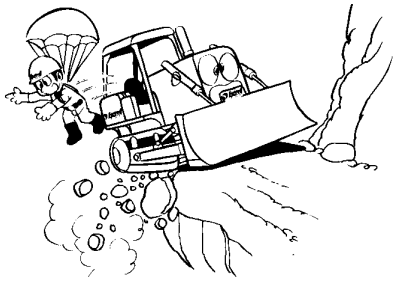
③ Wherever possible, avoid traveling over large rocks, fallen trees, tree stumps and other such obstacles. Either use the working equipment to remove them, or travel rounds them.

③ When it is impossible to avoid traveling over them, put the gearshift lever into a low speed, reduce speed and mount over the obstacle. Just before the front of the machine tips down, reduce speed even more to make the shock of hitting ground as small as possible.



③ Never mount over an obstacle at an angle; never disengage one steering clutch to travel over an obstacle.

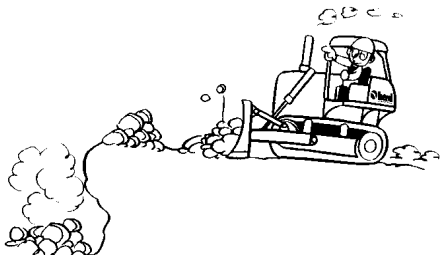
✚ When operating at the edge of a cliff or on the shoulder of a road, remember the following points:



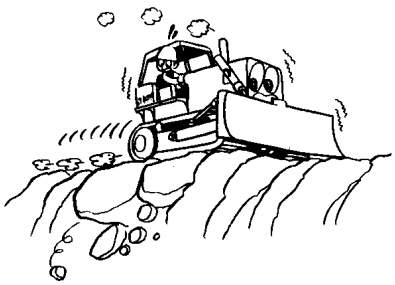
❼ When operating in a place where there is danger of the machine falling over the side, be doubly careful. Do not approach the edge of the cliff or road shoulder by mistake.



③ At the instant when the soil is dumped over the cliff, or when the machine passes the summit of a slope, the machine speed suddenly increases. This is dangerous, so press the decelerator pedal or use the fuel control lever to reduce the speed, and at the same time return the gearshift lever to "NEUTRAL".

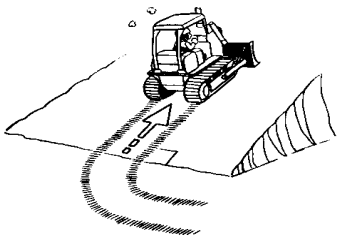


③ When dumping soil over a cliff, dump the first excavated soil without dumping it over, and use each succeeding excavated sol to push the previous excavated soil over. Be sure not to approach the edge by mistake.

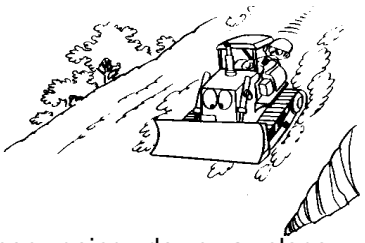


③ When working on river embankments or other places made of piled soil, there is the danger that the weight or vibration of the machine may cause the machine to sink into the piled soil, so be extremely careful when operating in such places.

✚ When operating on slopes, remember the following points:

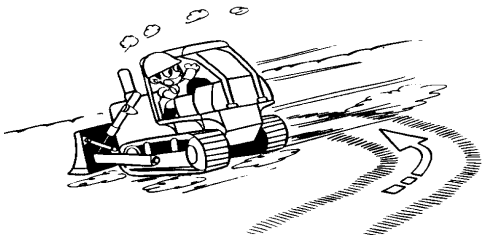


③ When driving on a slope, always drive directly up or down it. Never drive horizontally or diagonally across the slope, as this may cause the machine to roll over or slip sideways.

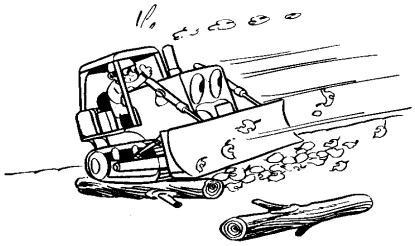


③ When going down a slope, use the engine as a brake. If this is not enough to control the speed of the machine, use the steering brake as well.

③ Never coast down a slope with the gearshift lever in "NEUTRAL".



③ As far as possible, avoid turning the machine on a slope. It may cause the machine to roll over or slip sideways.

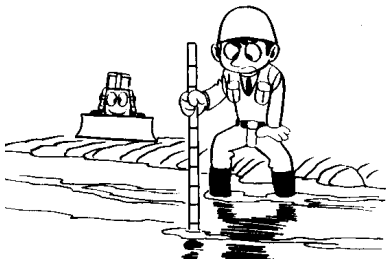


③ In forest areas, do not mount fallen trees or logs. Piles of leaves or branches are also very slippery, so proceed with caution.

③ Before going up or down a slope, select a travel speed most suited to the slope. Do not change gear on the slope.

③ If the engine stalls on a slope, first use the brake to stop the machine, then return the gearshift lever to "NEUTRAL " before starting the engine again.

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



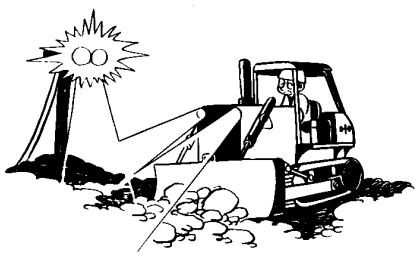
③ When operating in water or when crossing shallows, first check the bed soil condition and the depth and flow speed of water, then proceed, taking care not to go beyond the permitted depth.



③ If the machine gets stuck in mud, it is completely useless to increase the engine speed, causing the tracks to spin, or to rock the machine backwards and forwards. In such a case, raise the blade to reduce the load, and drive out slowly.

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

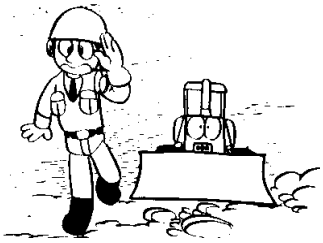
✚ When operating at night, remember the following points:



③ Be sure to arrange an adequate lighting system.



③ At night it is very easy to make mistakes in assuming the distance and height of objects and land.

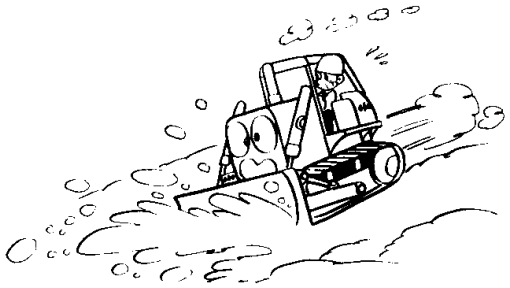


✚ When operating in fog, mist or smoke, where visibility is bad, be especially careful to confirm first whether operation is safe.

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:

③ Even slight slopes can cause unexpected side slipping, so in such places, operate with extreme caution.



③ Never use the steering brake to stop suddenly on slopes. Lowering the Working equipment is a far more effective way to stopping.

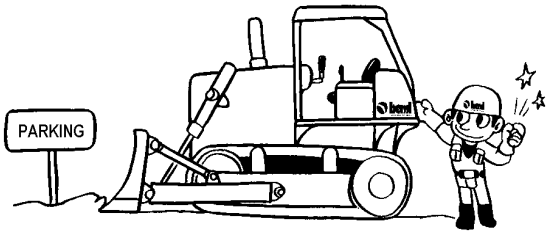
✚ During Operation, use the seat belt.

PARKING

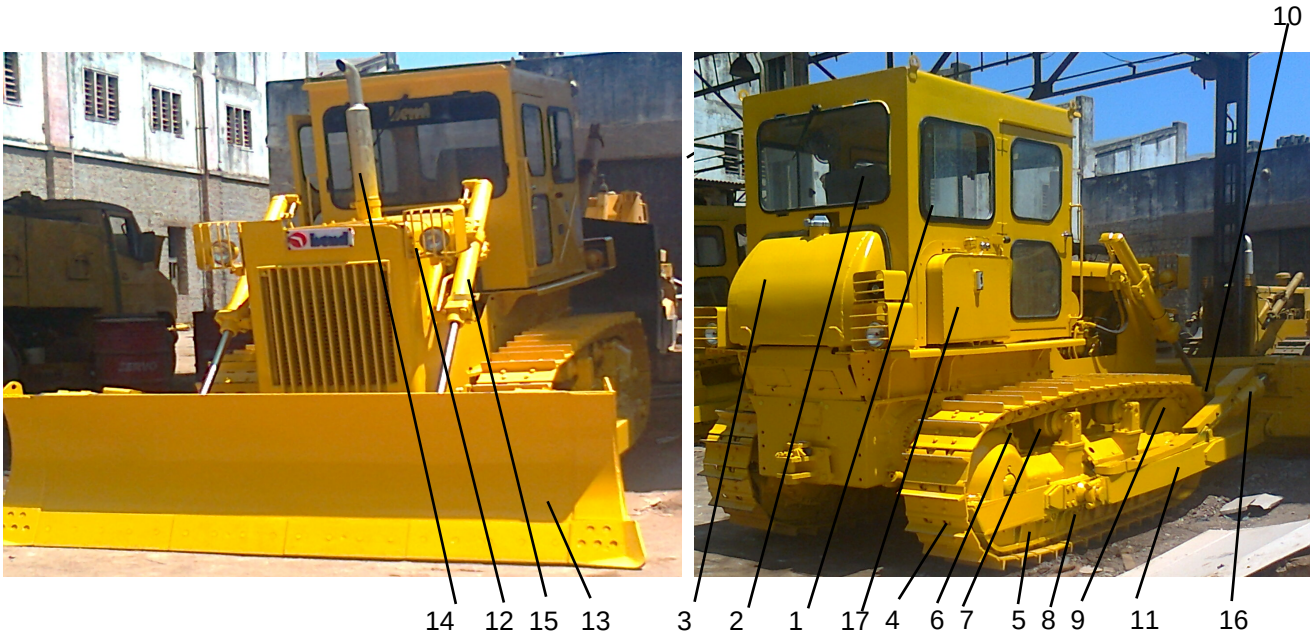
✚ When parking the machine, park it in a safe place out side the working area, or in the specified place.

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

✚ When parking the machine, return the gearshift lever to "NEUTRAL", apply the brake lock, lower the blade and ripper (if equipped) to the ground, and put all safety levers in the "LOCK" position. Switch off the engine (After keeping the Engine idle for 5 minutes) and remove the key.



GENERAL LOCATIONS



1. Cabin
2. Operator's seat
3. Fuel tank
4. Track shoe
5. Track roller guard
6. Sprocket
7. Carrier roller
8. Track roller
9. Idler
10. CrossBrace
11. Side arms
12. Front lamp
13. Blade
14. Exhaust pipe
15. Lift cylinder , Blade
16. Tilt cylinder, Blade
17. Hydraulic oil tank

SPECIFICATIONS

OPERATING WEIGHT : 11450 kg

PERFORMANCE:

Travel speed:

Forward	Max.	:	9.4 kmph
Reverse	Max.	:	8.0 kmph
Max. drawbar pull		:	10340 kg

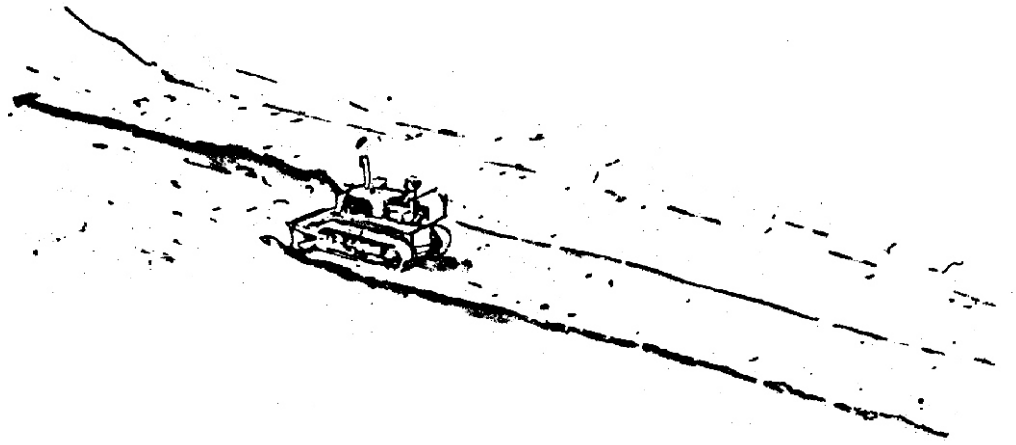
ENGINE:

Model	:	BEML'S BS6D105
Flywheel horsepower	:	90 HP (67 kW) @ 1750 rpm

DOZER EQUIPMENT:

Weight	:	1470 kg
Blade Tilt	:	250mm

JOB APPLICATIONS



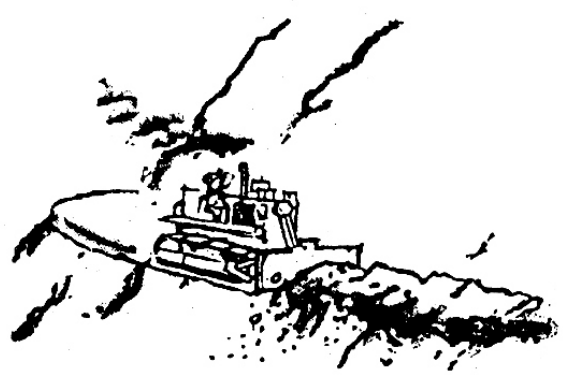
The bulldozer is a versatile equipment and can be used to scrape, pile, haul, level, roll, etc., and these functions are extensively utilized in such jobs as clearing land, felling trees, grubbing tree stumps and loading dirt.

DOZER OPERATION

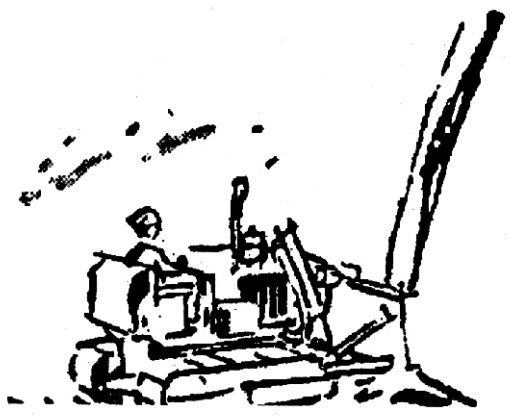
The Bulldozer shows maximum effectiveness in grading the ground surface, flat and level and also in short distance hauling of material where the distance is not more than 50 meters.

SIDE CASTING OPERATION

To push the dirt while casting it on one side as in terracing a hill side or in spreading loose dirt to and along the edge of a road being built, angle the blade for increased work efficiency. In this type of operation, one side of the blade is under greater load than the other side, causing the machine to swing to the side with greater load. The operator, therefore, must operate the steering levers more frequently to compensate for this tendency.

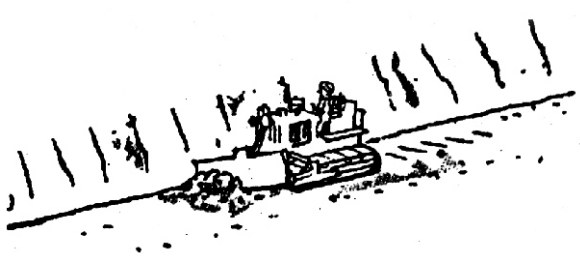


CUTTING HARD GROUND AND DITCHING



The break loose hard ground or make a ditch, till the blade in order to use the blade end bit in digging into the ground. Where unusually hard ground is encountered, it is advisable to use a hydraulic ripper first to loosen the ground surface before applying the bulldozer in the above manner.

FEELING TREES AND GRUBBING STUMPS IN LAND CLEARING OPERATION

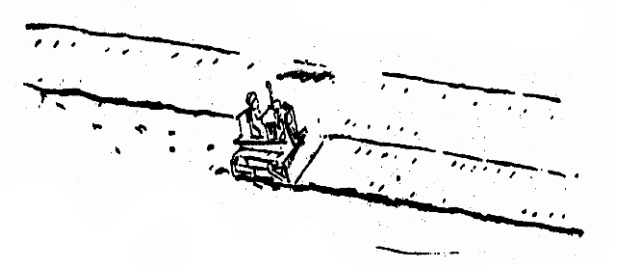


Trees up to 25 cm (9.8 inch) in diameter can be speedily felled by pushing against the tree with the blade held up high and then by backing off and digging its roots off ground. In felling trees, no attempt should be made to utilize an impact of clashing the blade against the tree.

LEVELING OPERATION

Place a full load of dirt on the ground to be leveled and manipulate the control lever to lower or raise the blade slightly to compensate for irregularities, filling holes with dirt and cutting off high spots. This method is more effective than pushing an empty blade.

To finish the leveled ground surface, drive the machine backward, with the blade being dragged in float condition This method, however, must be avoided on ground full of rock in order to protect the blade against damage.





MACHINE AND ENGINE SERIAL NUMBERS

In a machine, model serial no. is found on the plate attached to the arm rest on the left side of the operator's seat with the engine no. These numbers are used as references in making machine registration and their markings must be carefully preserved so as to be identified clearly.

Location of machine serial number is on left hand steering compartment. Location of engine serial number is on the front gear cover.

OPERATION

CAUTION

During operation the following practice should be discouraged.

1. Continuous driving at a high speed on rough or sticky ground.
2. Continuous resting your foot on the brake pedal.
3. Rapid acceleration, sudden braking and sharp turning.
4. Making hurry for job with your machine without warming up the engine.

INDEX

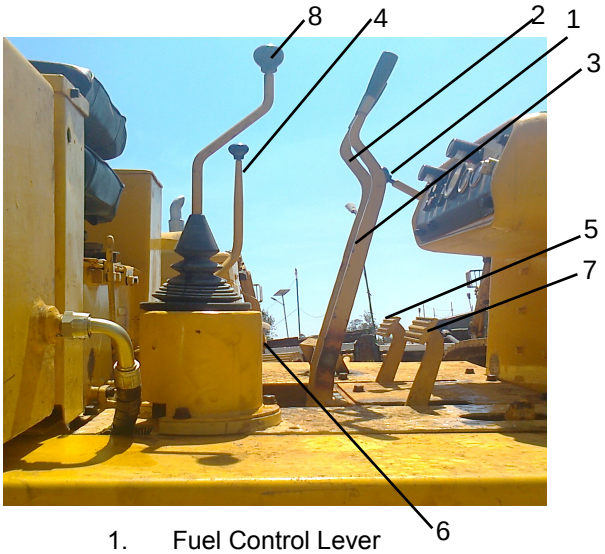
Starting and Stopping the engine

Operation Instruction

Driving Instruction

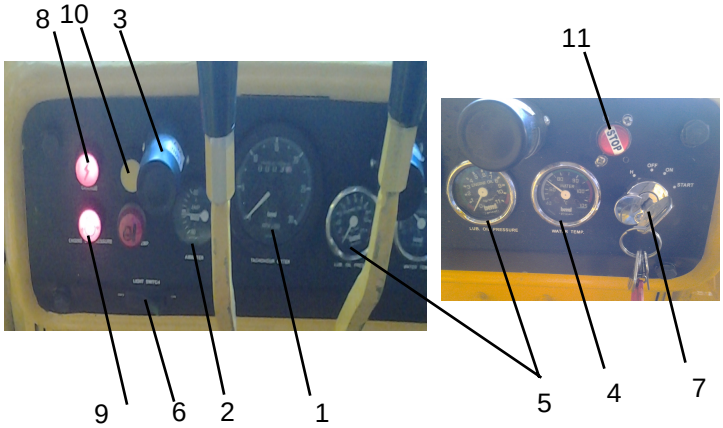
Blade Operation

IDENTIFICATION OF CONTROLS



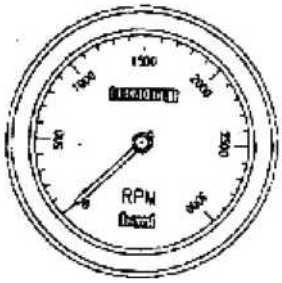
1. Fuel Control Lever
2. Steering Clutch Lever LH
3. Steering Clutch Lever RH
4. Gear Shift Lever
5. Main Clutch Pedal
6. F4 Lever
7. Brake Pedal
8. Blade Control Lever

INSTRUMENT PANEL



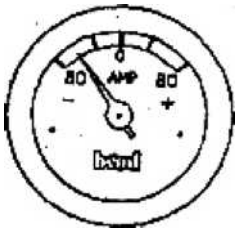
1. Tacho Hour Meter
2. Ammeter
3. Dash lamp
4. Water Temperature Gauge
5. Lub Oil Pressure Gauge
6. Light Switch
7. Key switch
8. Charge Lamp
9. EOP Indicator
10. Pre Heat Indicator
11. Engine Stop Button

TACHO HOUR METER



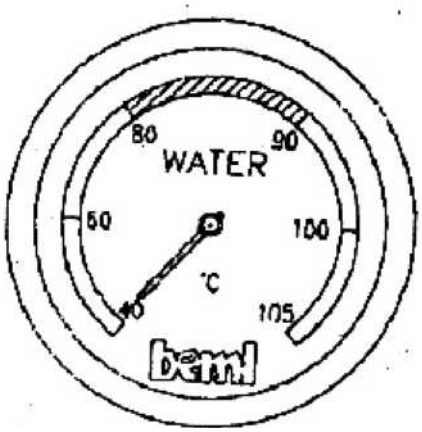
This indicates speed in RPM and also number of hours of engine operated.

AMMETER



If the pointer is in 0 and + sign, the battery is being charged. The pointer between 0 and - sign indicates discharging. Pointer in the 0 region indicates battery/alternator is in good condition.

WATER TEMPERATURE GAUGE

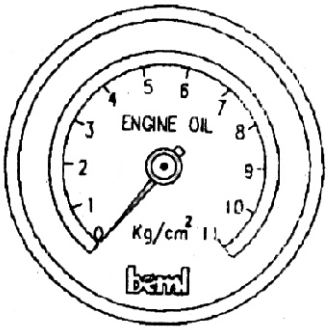


When indicator is in the green range during operation, Water temperature is normal. After engine start-up, warm-up the engine until indicator moves into green range.

PREHEAT LAMP

When key switch is put to "H EAT" lamp glows.

LUB OIL PRESSURE GAUGE



Normal engine oil pressure at idle speed at 107°C should be 0.34 kg/cm^2 minimum. Normal engine oil pressure at rated speed 3 to 5 kg/cm^2.

LIGHT SWITCH



With the lamp switch in ON position lamps light
With the position OFF, lamps off

STARTING AND STOPPING THE ENGINE

BEFORE STARTING

1. Check and correct fuel, cooling water, oil, etc., accordingly to the topic check before starting. Radiator water should be golden yellow.
2. Correctly position control levers .. Gear shift lever and lever in NEUTRAL.

STARTING THE ENGINE

Turn the starting switch key to START position so as to rotate the starting motor for a few seconds, then release the key to ON position. Place the fuel control lever in HALF-OPEN position.

1. In temperature of 10^C C (50^{O}F) and above: Turn the starting switch key to START position. Then the starting motor will crank the engine, the engine will start. Then release the key to return it to ON position.
2. **In temperature below 10^{o}C (50^{o}F):** Ref. "COLD WEATHER OPERATION".

AFTER STARTING THE ENGINE

After starting the engine, do not move the machine immediately. Observe the following instructions, before doing so.

i. Push the fuel control lever to HALF OPEN position to warm up the engine for about 5 minutes.

I This is called a "warm up" run. If the engine is cold after it is started, the pointer of the oil pressure gauge swings beyond 5 kg/cm^2 range, i.e., the oil would raise above the normal operating pressure. Wait for the pointer to come down between 2 ~ 5 kg/cm^2 range and then continue the warm up run for further 5 minutes or so

ii. When the engine has been warmed up, Observe the following points.

1. Whether the pointers of the engine oil pressure gauge and water temperature gauge stay in their respective ranges.

   Normal operating oil pressure are:
   At Idle: 0.35 kglcm^2 (Min.)
   At Rated speed : 3 to 5 kg/cm^2

The water temperature should be between 65° C to 90° C.

2. Whether the ammeter deflection on the plus (charge) side.
3. Whether the engine oil level kept within proper range.
4. Whether the exhaust gas colour and the exhaust sound are normal
5. Whether there is any strange noise or vibration.
6. Whether there is any leakage of lubricant, fuel, coolant or gas.

STOPPING THE ENGINE

Allow the engine to idle for about 5 minutes to give it a chance to gradually cool down. TO STOP, proceed as follows.

1. Push the fuel control lever all the way up.

OPERATIONAL INSTRUCTIONS

STARTING OFF THE TRACTOR

i. Depress the brake pedal to unlock the brake lock lever.

ii. Push the fuel control lever down slowly to increase the engine speed.

iii. Raise the blade about 400 mm above the ground surface.

iv. Depress the main clutch pedal and place the gear shift lever or F4 lever into the desired speed position. Diagram of the shift pattern is found on the dashboard.

- If the gear shift lever or F4 lever cannot be shifted properly, shift either lever into Neutral and repeat the above step. Do not try to force the lever into the position.

v. Slowly release the main clutch pedal and the machine begins to roll off.

STOPPING THE TRACTOR

With the main clutch pedal depressed fully, slowly depress the brake pedal to stop the machine. Shift the gear shift lever and F4 lever into Neutral and release the pedals. After stopping the machine, if it is not to be operated again immediately, let the engine idle and lower the blade to the ground. While parking the machine on a slope, put the blocks against the track.

GEAR SHIFTING

Before shifting gears, bring the machine into a complete stop.

STEERING

The machine may be steered by pulling the steering clutch lever on the side of desired direction of travel. Pulling the lever halfway causes the steering clutch to disengage, allowing the machine to turn slowly.

Pulling the lever all the way backward causes the machine to make a sharp turn, by applying the steering brakes.

DRIVING INSTRUCTIONS

GOING DOWNHILL

In case of driving on s steep downgrade, be sure to push the fuel control lever forward to drop the engine speed and shift the gear shift lever into a low speed and allow the tractor to go down slowly by the use of engine as a brake.

CAUTIONS:

1. If the main clutch is disengaged while the tractor is going downhill, its speed will increase as it goes and accidents may occur.

2. While going downhill use the engine as a brake. If the tractor goes faster than the normal travel speed chosen by the gear shift lever, depress the brake pedal sparingly to prevent the engine from overrunning.

DRIVING ON ROUGH GROUND

Drive slowly. Avoid sharp and repeated turns.

Drive the machine with the track tension rather tight so as to prevent the track shoes from a rapid wear.

GOING BACK ON A SLOPE

While going back up a slope, follow the above instructions for DOWNHILL travel. That is shift the gear shift lever to REVERSE and use the engine as a brake.

CAUTION:

Do not allow the machine to go backward downhill with the gear shift lever in FORWARD and the main clutch disengaged. Otherwise, if the main clutch which has been disengaged is engaged in the course of descending the hill, the engine would be made to run in reverse direction. This would send blasts of gas back into the intake line, thus striking and burning the air cleaner element. If such a case is encountered, stop the tractor immediately and check the air cleaner for condition. Change the element if found discoloured or burnt due to "back fire" and clean the air cleaner interior thoroughly.

machine moves forward, over and down, stop the machine by releasing steering clutches. Then engage clutches gradually to start the machine slowly. Never climb in an oblique direction, nor disengage the steering clutch on one side only.

DRIVING IN DEEP MUD OR WATER

While operating in wet swamp, sharp turns should be absolutely avoided. Drive the machine straight as much as possible.

While operating in water, the level of water should not be allowed to be above the lower side of the carrier rollers.



While the work is in suspension or after it has been completed, remove mud from the various parts of the machine and check the engine oil pan, main clutch case, transmission case, final drive cases for.

1. oil leakage and
2. oil level increases

to determine whether there is any water in oil. If necessary, drain a sample of oil for checking.

BLADE OPERATION

CONTROLLING THE BLADE

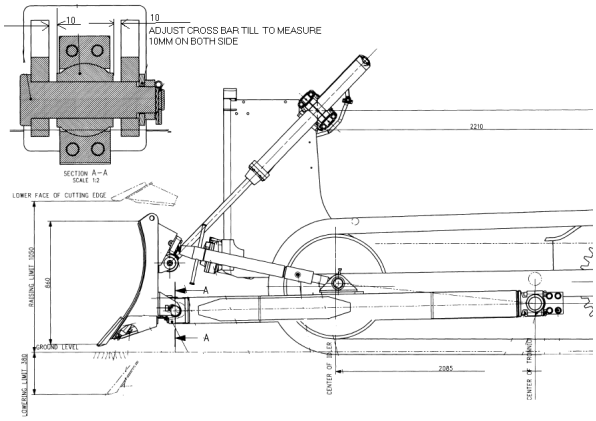
The blade is controlled by means of the control lever located to the right side of the operator's seat. The lever has the following four positions that can be distinctly felt.-

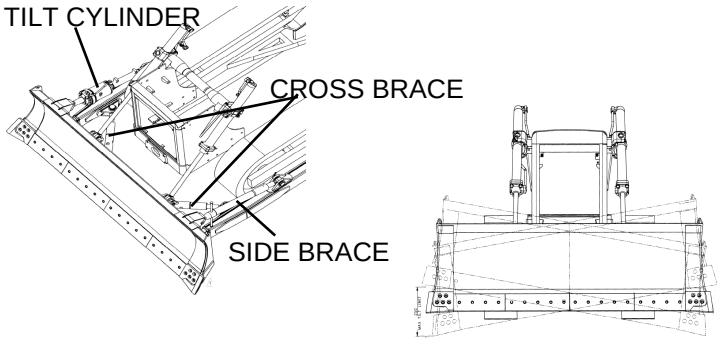
1. RAISE: To raise the blade, pull the lever backward.
2. HOLD: Release the lever from either RAISE or LOWER position to allow it to return to HOLD position, when the blade reaches any desired height above the ground.
3. LOWER: To lower the blade, push the lever forward half the way.
4. FLOAT: Push the lever forward to the extreme end to allow the blade to come down under its own weight and the lever get lock in this position due to detent in float, to release float detent full lever backward.
5. RIGHT TILT: To tilt the blade to the right pull the lever towards the right. The right end of the blade will fall.
6. LEFT TILT: To Tilt the blade to the Left pull the lever towards the left. The left end of the blade

BLADE TILT ANGLE ADJUSTMENT

The blade may be tilted up to 250mm by operating blade hydraulic tilt cylinder. The side brace adjustment restrict the blade tilt angle. The cross braces should be adjusted to maintain the blade side frame mounting ball bearing in centre position.







CARE AFTER DAILY OPERATION

Before parking the machine for overnight carry out the following instructions:

1) Thoroughly clean mud and water 'from the machine. Park it on the floor paved with concrete, or on the lumber such as rail road ties or the like to prevent the track shoes from being frozen to the ground.
2) Drain off the condensed water from fuel tank and fill up the fuel tank.
3) If anti-freeze coolanf is not available in the radiator, drain the cooling system.
4) Protect the battery completely against being frozen.

STORAGE

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

- Place the fuel control lever in LOW IDLING.
- Shift the gearshift lever and F4 lever in brake pedal unlocked.

BEFORESTORAGE

- Thoroughly clean mud and dust from the machine. Park the machine in a warm enclosure that will protect it against rusting. If the machine is to be left standing out doors, select a high spot free from the possibility of becoming flooded.
  Cover up the entire tractor to prevent entry of moisture.
- Lubricate the machine thoroughly as per the instructions given in the topic PERIODICAL MAINTENANCE.
- Give a thin coat of grease to metal surfaces (hydraulic piston rods and front idler adjusting rods) exposed to weather.
- If atmospheric temperature is constantly below 0° C and an antifreeze compound is not available, drain the cooling system. Be sure to hang up a caution tag reading "NO WATER".
- Disconnect the cables from battery terminals. Keep the battery in a cool dry place.

DURING STORAGE

- Once a month, start the engine and drive the machine over a short distance so as to wet the running parts of the engine or other components with oil.
- Recharge the battery. Never leave In unattended overa month.

AFTER STORAGE

- Thoroughly drain out water and sediment from the engine oil pan and other reservoirs
- Lubricate the valves and rocker arms. Check for function. To gain access to these parts, remove the rocker housing, covers.
- Start the engine and allow it to be idle for about 5 minutes and inspect the engine for any abnormal indications.

CHECK BEFORE STARTING

NOTE:-

1. FIGURES IN THE CIRCLE "0" SHOWS THE NUMBER OF POINTS TO BE LUBRICATED.
2. ALL TIME INTERVALS ARE BASED ON THE SERVICE METER READINGS.
3. SYMBOL Ⓢ APPLIES TO THE TRACTOR ONLY WHEN IT IS USED IN DEEP MUD AND WATER OR EXTREMELY DUSTY CONDITIONS.
4. THIS LUBRICATION CHART IS ALSO AVAILABLE ON THE EQUIPMENT.

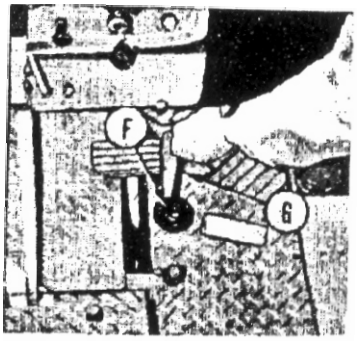
NOTES:

1. Clean the· pre-cleaner everyday while operating the machine in dusty, misty or dampish conditions (In case of dry air cleaner).
2. Perform operations on items a, b & c at the beginning of the day's run.
3. Top up the fuel tank at the end of day's run.
4. Drain water from fuel tank at the end of the day's run when the freezing temperature is expected and at the beginning of the day's run during rainy and wet months.

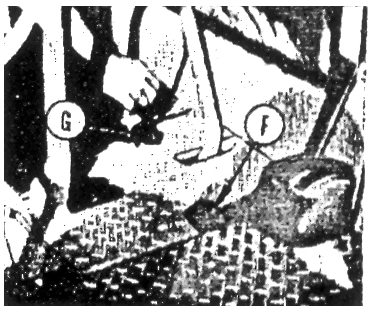
HOW TO SERVICE

a) Check and correct Oil LEVEL of the following units. Use the oil level gauge (G) to check the oil level. If necessary, replenish oil, through the oil filter (F) up to the proper level.

1. Engine oil pan. Please refer engine manual.



2. Main clutch case. Add oil through the gauge guide (F) - Engine oil.



3. Transmission case (including bevel gear case). engine oil.

HOW TO SERVICE

Carry the servicing as detailed below.

a. Clean Pre cleaner

Remove the pre cleaner from the air intake pipe. Clean the dust from it and replace it.

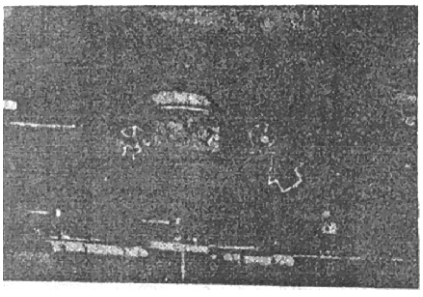
b. Drain water from fuel filter.

Remove drain plug at the bottom of fuel filter and drain any accumulated water and sediment.

c. Drain water from fuel tank.

Open the drain cock or drain plug to drain out the water and sediments which may have accumulated in the bottom of the fuel tank.

After draining, check fuel connections for tightness. Do this every day before starting the engine.



PERIODICAL MAINTENANCE

Periodical maintenance is essential to keep the machine in the top running condition· and to determine to a great extent the serviceability of parts and machine.

All service intervals indicated in this section are based on the service meter readings for normal use of the machine.

NOTE:

It is recommended that for the periodical maintenance of engine please refer to Engine operation and maintenance manual supplied with the equipment.

The periodical maintenance about the equipment given under this chapter is as what is generally advised and applicable for normal operating conditions.

CAUTION :

It is recommended that the oils conforming to the specifications in this book should be used.

INDEX

General Instruction
Lubrication Chart
10- Hours service operations
50- Hours service operations
250 - hours Service Operations
500 - hours Service Operations
1000 - hours Service Operations
2000 - hours Service Operations
Special Service Operations

GENERAL INSTRUCTIONS

For replacement parts, be sure to use only genuine parts.

Always use good quality lubricants such as those recommended in this manual.

Before applying lubricant, wipe clean the area around the lubricating point with wire brush or rag.

While checking the oil level or while draining the oil, keep the machine on level ground.

Drain oil after the engine is shut down, while the oil is still hot.

FUEL HANDLING INSTRUCTIONS

WATER AND DUST ARE AN ENEMY AGAINST FUEL. Before filling the tank from the drum, be sure to clean the exterior of the drum not to allow dirt or dust to get into the tank.

Always fill the tank through the strainer provided. If the strainer is clogged, thoroughly clean foreign particles from it.

Top up the fuel tank at the end of each day's run. This will not only drive out the moisture laden air, but also help prevent condensation of fine particles during overnight.

To check the fuel level in the tank, remove the filler cap and check the fuel level with the level gauge provided therein. .

Note:

If freezing temperatures are expected during overnight parking of tractor, drain the water from radiator and water and sediments out of fuel tank and fuel filter immediately after the engine is stopped.

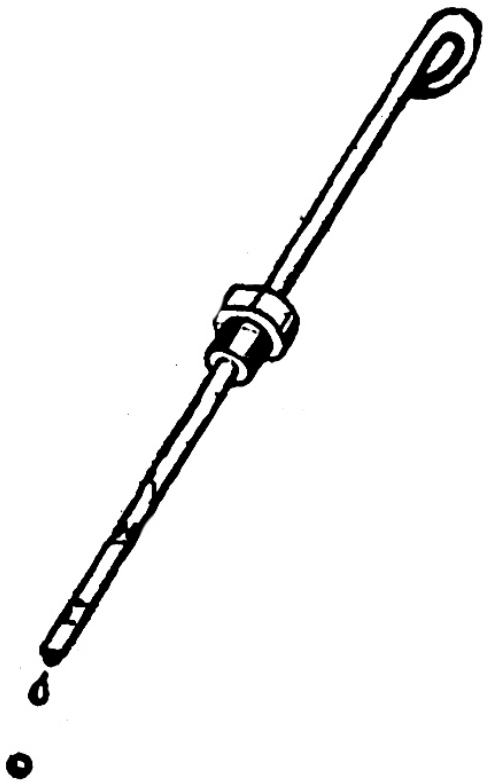
COOLING WATER

Use nothing but clean, soft water or if necessary a permanent anti freeze, in the cooling system.

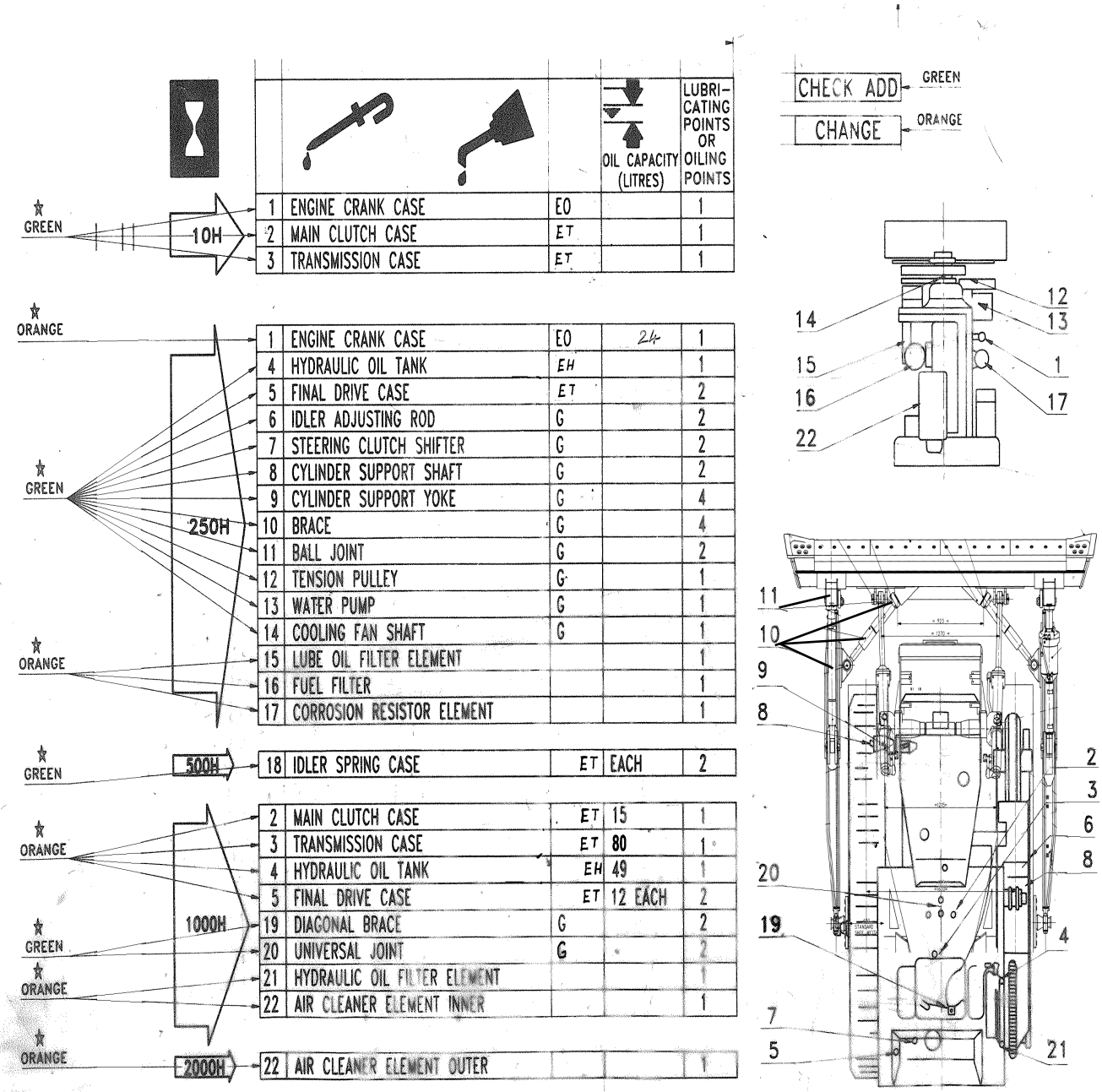
USE OF OIL LEVEL GAUGE

The oil level is correct when the oil is maintained between "H" (upper) and "L" (lower) marks provided on the oil level gauge. Check level before starting the engine.

When the machine is placed on a slope over 20°, the oil level should be kept up to H mark on the gauge.



BD50 LUBRICATION CHART



EO ET	**BEML ENGINE OIL (15W40)** **BEML TRANSMISSION/FINAL DRIVES/STEERING AND MAIN CLUTCH OIL (ET30CD)**	EH	**BEML HYDRAULIC OIL (EH10CD)**	G	**LITHIUM GREASE (EP-2)**

10 HOURS SERVICE OPERATIONS

OPERATIONS	REMARKS
a) Check and correct oil level of the following units. Engine oil pan Main clutch case Transmission case (including wet steering case) Hydraulic tank oil level	 Beml engine oil Beml main clutch oil Beml transmission oil Beml Hydraulic system oil
b) Check and correct fuel level	
c) Check and correct cooling water level	
d) Check floating seals for any sign of oil leakage	
e) Check wiring for discontinuity, short circuiting and loose terminals	
f) Check mounting bolts and nuts for tightness	Intake and exhaust pipe, air cleaner etc.

NOTES

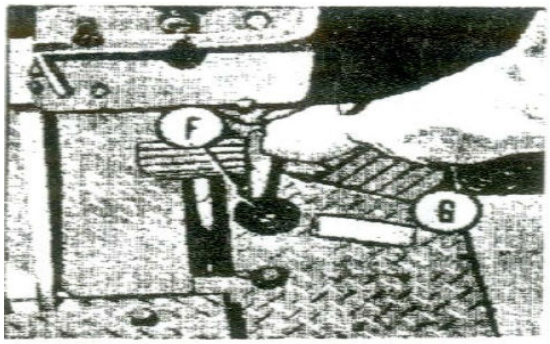
1. Clean the pre cleaner every day while operating the machine in dusty, misty or dampish conditions (see the “ 50 HOURS SERVICE OPERATIONS” for details) (In case of dry air cleaner)

2. Perform operations on items a, b, c at the beginning of the day’s run.

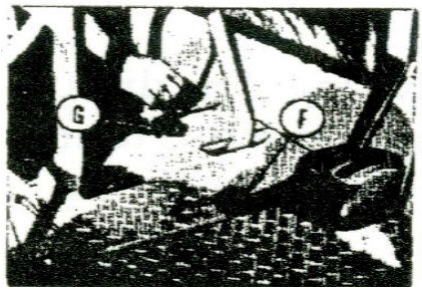
3. Top up the fuel tank at the end of day’s run

4. Drain water from fuel tank at the end of the day’s run when the freezing temperature is expected and at the beginning of the day’s run during rainy and wet months. (see the “ 50 HOUR SERVICE OPERATIONS” for details of draining)

1 .Engine oil pan. Please refer engine manual



2. Main clutch case. Add oil through the gauge guide (F) – Engine oil



3.Transmission case (including bevel gear and steering case) – engine oil

a). Check and correct OIL LEVEL of the following units.

Use oil level gauge (G) to check the oil level. I f necessary, replenish oil, through the oil filter (F) up to the proper level.

50 HOURS SERVICE OPERATIONS

OPERATIONS	REMARKS
a) DRAIN WATER FROM FUEL FILTER b) DRAIN WATER FROM FUEL TANK	

50 HOUR SERVICE OPERATION

OPERATIONS

a) Drain water from fuel filter

b) Drain water from fuel tank

HOW TO SERVICE

Carry the servicing as detailed below

a. **Clean pre cleaner**

   Remove the pre cleaner from air intake pipe. Clean the dust from it and replace it.

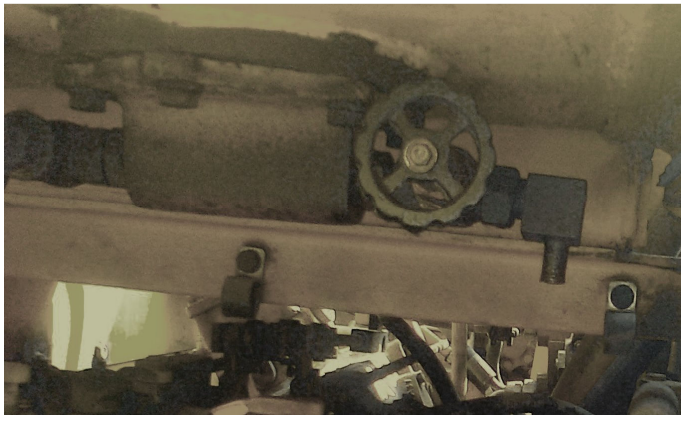
b. **Drain water from fuel filter**

   Remove drain plug at the bottom of fuel filter and drain any accumulated water and sediment.

c. **Drain water from fuel tank**

   Open the drain cock or drain plug to drain out the water and sediments which may have accumulated in the bottom of the fuel tank.

   After draining, check fuel connections for tightness. Do this every day before starting the engine



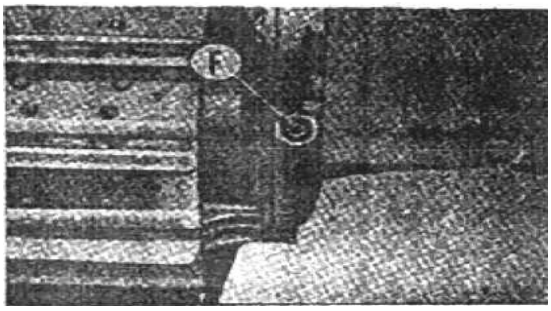
250 HOUR SERVICE OPERATIONS

OPERATIONS	REMARKS
a) Check and correct oil level of the following units.	
1) Final drive case	BEML FINAL DRIVE OIL
2) Hydraulic tank	BEML HYDRAULIC OIL
b) Lubricate the following parts with grease.	
1) Steering clutch shifter	2 points
2) Idler adjusting rods & track frames	18 points
3) Cylinder support yoke	4 points
4) Cylinder support shaft	3 points
5) Brace	6 points
6) Hydraulic cylinder pins	4 points
c) Check and correct electrolyte level in batteries.	
d) * Change engine oil	BEML ENGINE OIL
e) Change fuel filter	
f) * Change engine oil filter element	
g) Check and adjust fan belt tension.	
h) Check and adjust track tension.	
i) Check and clean air cleaner outer element.	
j) Drain water from steering clutch case.	
k) Drain water and sediments from hydraulic line.	* please refer engine manual
m) Check track shoe bolts for tightness.	
n) Check and clean oil filters & strainers	Hydraulic filter, steering suction strainer(magnetic) Steering pressure filter, main clutch strainer

NOTES:

1. Reduce the service interval of the air cleaner outer element to half, while operating the machine in dusty conditions (in case of dry type air cleaner).
2. Change the hydraulic oil filter element and oils in all reservoirs after the first 250 hours of operation of a new machine.
3. Oil to be used in the hydraulic tank should be of BEML HYDRAULIC OIL EH10 CD only.
4. In case of wet type air cleaner service intervals of oil change should be reduced, in dusty operating conditions.

HOW TO SERVICE





a. Check and correct oil level of the following units.

1) Final drive case - BEML FINAL DRIVE OIL ET30CD.

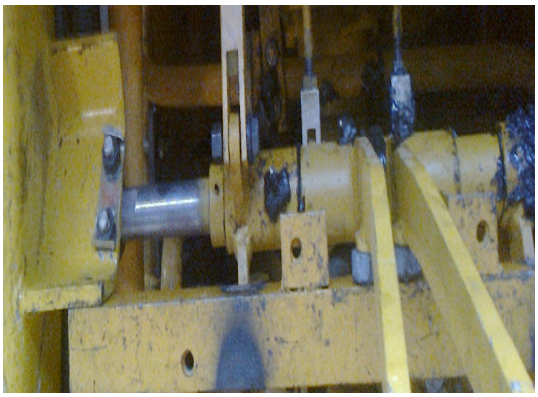
The oil level is correct if the oil is even with the plug hole (F). Add oil, if necessary, through the hole (F).

2) Hydraulic Tank BEML - HYDRAULIC OIL EH10CD.

Lower the blade to the ground allow the oil to settle down. Check for the oil level in the tank to be above the centre of the sight gauge if not add oil.

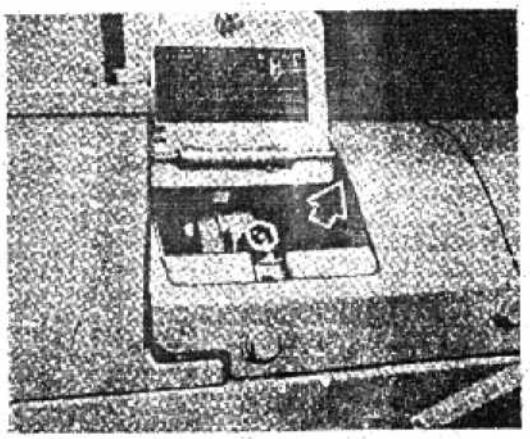
3) Air cleaner pan - BEML ENGINE OIL.

Check the level. Add oil, if necessary to bring it to the correct level. Change if necessary.

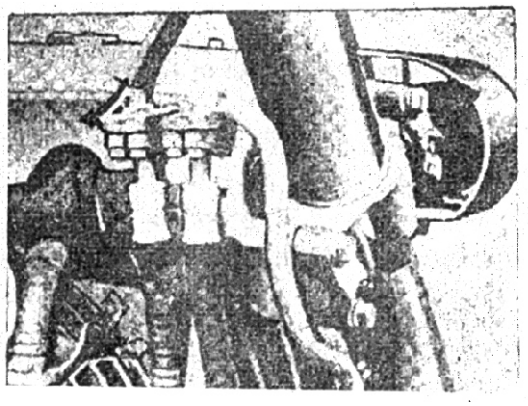


b. Lubricate the following parts with grease.

Steering clutch shifter-2 points



Idler adjusting rod -2 points



Cylinder support yoke - 4 points



Cylinder support shaft - 2 points

Brace - 6 points

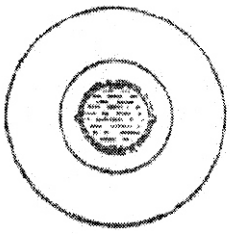
Hydraulic Tilt cylinder pins - 2 points

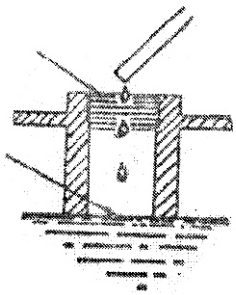
c. Check and correct electrolyte level in batteries.

Maintain the electrolyte level at 10 mm to 12 mm above the top of the plate by adding distilled water only. Should any of the acid be spilled out replenish with acid of the correct specific gravity.

Also clean the air vent hole on battery cap.

DON'T USE A METALLIC FUNNEL.





d. Change engine oil * - BEML ENGINE OIL 15W40.

Run the engine for some time and stop it. Drain the oil when it is hot. Pour the fresh oil and bring it to correct level.

e. Change fuel filter element.

Thoroughly drain the fuel from the filter, by unscrewing the drain plug at the bottom. Detach the filter body by removing the bolt. Take out the dirty element from the body. Clean the fuel filter body from sediments and dirt. Install a new genuine filter element and the new gasket. Secure the filter body to its original position. Fill the filter case with clean fuel to aid in faster pick up of fuel.

f. Change engine oil filter element.

Thoroughly drain the existing oil in the oil filter by removing the drain plug. The element may be taken out after removing the bolt and the cover. Thoroughly clean the sediments & unfiltered oil which may have accumulated in the bottom of the filter.

Install a new genuine filter element.

* Please refer Engine manual.

g. Check and adjust fan belt tension.

The fan belt tension is Correct if the belt can be depressed approximately 25 to 30 mm midway between the generator pulley and the crank pulley. TO ADJUST, loosen the nut and move generator toward or away from engine. If the belt shows elongation beyond the specified value or cracks or damage, replace it with a new genuine one.

h.Check and adjust track tension.

Keep the machine in level ground. Place a straight straight edge on and along the track span between the idler and the sprocket. The standard clearance ranges from 25mm to 40mm at the midpoint.

i. Check and clean air cleaner outer element

As illustrated, lift the element by holding it between both hands and drop it lightly on a wooden board to shake off dust. Then, proceed to cleaning by any of the following methods.

Tapping

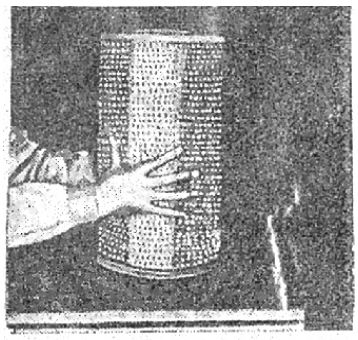
Using a bar, as illustrated, carefully tap the element on one end with the element rotating by degrees. 10 minute cleaning operation will suffice to loosen almost all dust deposited on the surface of the element.

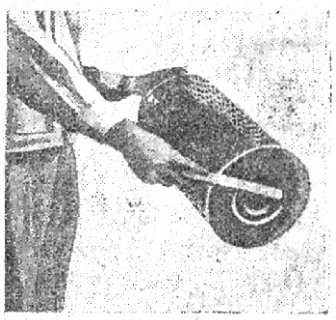
1.Compressed Air

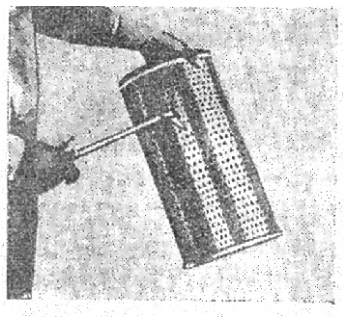
Using a dry compressed air at a pressure not exceeding 3 kg/cm^2, first roughly remove dust from outside the element. Then, direct the same compressed air from the inside towards the outside along the complete length of each pleat to thoroughly blow off dust from the element.

Cleaning Agent

To remove oily or greasy material from the element, rinse it in a mixture of good quality non foaming, household cleaning agent and luke warm water. Then, rinse it in clean water and dry.







2. Washing

Where clean dry compressed air is not available, dust must be removed from the element by flushing with clean pressurized water or by rinsing it in clear water. Apply service water or pressurized water at a pressure not exceeding 3 kg/cm^2 to the element in the same manner as described in the "COMPRESSED AIR" above, excepting that a nozzle must not be used on the hose. After cleaning, check to see there is no trace of dust inside the element and then dry it thoroughly.

500 HOUR SERVICE OPERATIONS

OPERATIONS REMARKS

a. Clean and check radiator fins for condition.

b. Change cooling water.

c. Clean breather in the main clutch and transmission cases, hydraulic tank.

d. Check and adjust engine valve clearances. *

* Please refer Engine manual.

* Under dusty conditions, service the air cleaner inner element. (See the "250 HOUR OPERATIONS" for detail).

HOW TO SERVICE

a. Change oil of the engine oil pan.

Thoroughly drain the engine oil pan by removing the drain plug when the engine is still hot. Refill the oil pan through the oil filler up to the prescribed level. Replace the filter elements.

Note: Please refer engine manual for further details.

b. Change fuel filter element. *

Thoroughly drain the fuel from the filter, by unscrewing the drain plug at the bottom. Detach the filter body by removing the bolt. Take out the dirty element from the body. Clean the fuel filter body from sediments and dirt. Install a new genuine filter element and the new gasket. Secure the filter body to its original position. Fill the filter case with clean fuel to aid in faster pick up of fuel.

c. Clean and check radiator fins. *

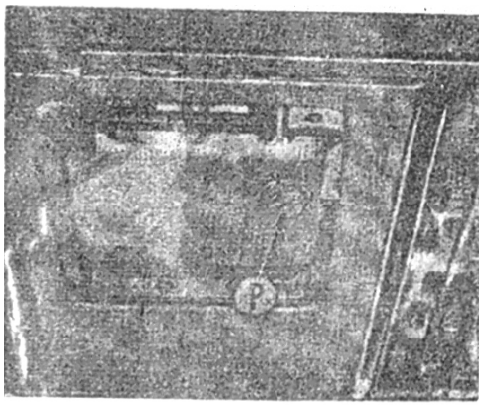
Thoroughly clean oil, dirt and any other obstructions from the fins by means of an air, steam or water blast.

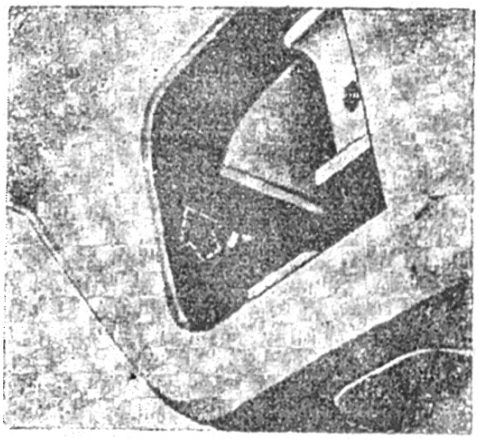
* Inspect and clean all radiator parts thoroughly, removing all dirt and any other deposits. Closely examine rubber hoses and connections for cracks or damage. Replace, if necessary. Also check the clamps for tightness.

d. Change cooling water. *

Remove the radiator filler cap and open two drain cocks (one is located at the bottom of the radiator and the other is on the left side of the cylinder block). Run the engine. Keep adding clean water to the filler opening while draining off the system until it is thoroughly cleaned.

While changing the cooling water be sure to keep the machine level.





e. Check and adjust engine valve clearence. *

* Please refer Engine manual for details.

1000 HOUR SERVICE OPERATIONS

OPERATIONS	REMARKS
a. **Change oil of the following units.**	
1. Main clutch case (18 litres)	BEML MAIN CLUTCH OIL.
2. Transmission case + Steering case (80 litres)	BEML TRANSMISSION OIL.
3. Final drive case (14litres) each side.	BEML FINAL DRIVE OIL.
4. Hydraulic tank (50 litres)	BEML HYDRAULIC OIL.
b. **Lubricate the following parts with grease.**	
1. Universal joint	2 points
2. Brace (3 No.s)	6 points
c. **Flush cooling system**	
d. **Clean main clutch strainer.**	
e. **Change hydraulic filter element, steering filter element & steering magnetic strainer**	
f **Check generator- and starting motor for condition.**	
g. **Check undercarriage components for lubrication.**	See the "250 HOUR SERVICE OPERATIONS".
h. **Check and clean air cleaner inner element.**	

NOTE: oil to be used in the hydraulic tank should be of BEML Hydraulic oil EH 10 CD only

HOW TO SERVICE

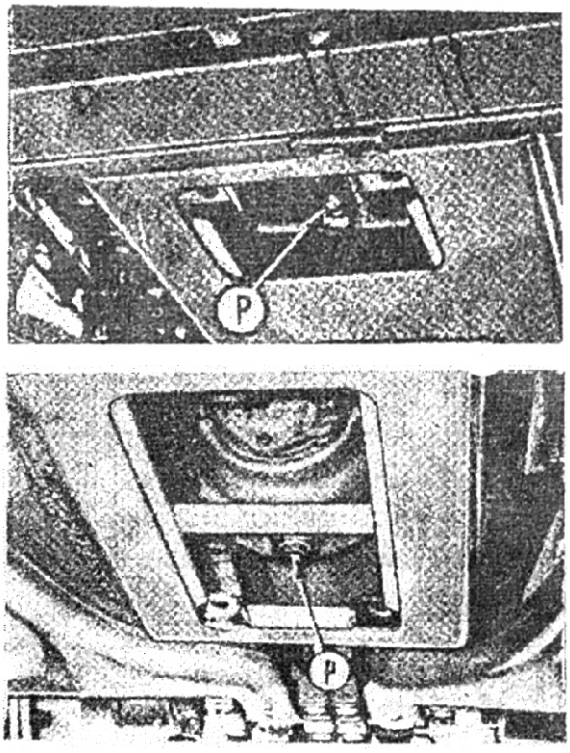
a. Change oil of the following units.

Thoroughly drain the existing oil through the drain plug (P) and refill the oil filler (F) up to the level.

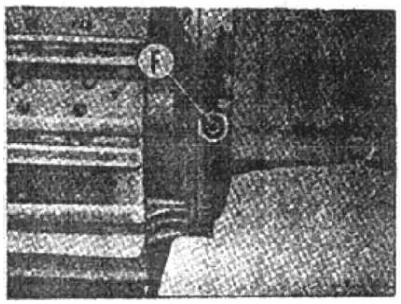
1) Main clutch case - BEML MAIN CLUTCH OIL (For the location of the oil filler, see the "10 HOUR SERVICE OPERATIONS").

2) Transmission case (incl. bevel gear case) - BEML TRANSMISSION OIL.

(For the location of the oil filler, see "10 HOUR SERVICE OPERATIONS").



3) Final drive case - BEML FINAL DRIVE OIL ET30CD.



4) Hydraulic Tank BEML - HYDRAULIC OIL EH10CD.



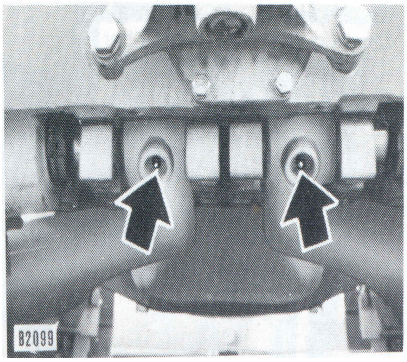
b. Lubricate the following parts with grease.

Grease to each grease fitting

1. Universal joint -2 points



2. Diagonal brace -2points



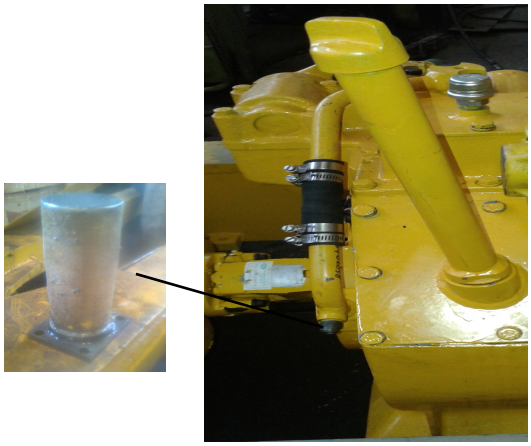
c. Flush cooling system

After draining the cooling system

(see "500 HOUR SERVICE OPERATIONS"), pour in 5 to 10 percent water solution of radiator cleaner and run the engine for one hour. Then, replace the solution with clean water and run the engine for 4 to 5 minutes. During the engine running, drain the system by opening the drain cock/plug while filling clean water through the water filler in the radiator.

d. **Clean main clutch strainer.**

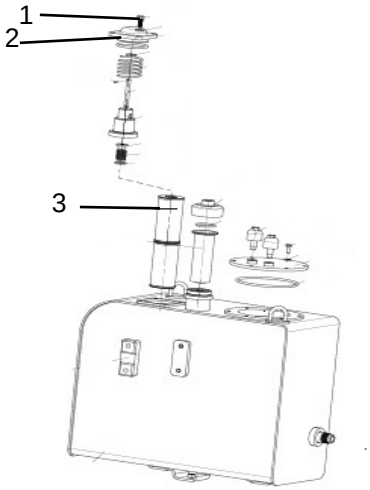
After draining the main clutch, detach the guard located on the bottom side of the machine. Detach the strainer by removing the pipe bolts. Thoroughly clean the strainer and check for condition. If necessary replace with new one.



e. Change hydraulic filter element.

Renewal of oil filter element should be done simultaneously with an oil change of· the hydraulic tank.

Remove the bolts(1) and detach cover (2). Lift out the element (3). Clean the removed parts as well as the inside of the filter. Install a new element in place.



f. Check generator and starting motor for condition.

ALL SERVICE WORKS ON THESE UNITS SHOULD BE PERFORMED BY AN AUTHORISED PERSON.

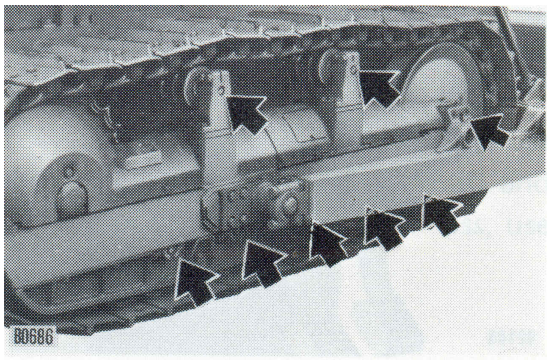


g. **Check undercarriage components for lubrication.**

Set the machine on a level ground surface. Check the track rollers, carrier rollers and idlers for oil decrease in the following manner.

i) Slowly loosen the seal bolts. If oil oozes out through the threads, it may be assumed that oil is not short.

ii) If, on the other hand, no oil comes out when the seal bolts have been removed, the oil is apparently short. Consult BEML for service.



2000 HOUR SERVICE OPERATIONS

OPERATIONS	REMARKS
a. **Check and clean air cleaner inner element.**	

HOW TO SERVICE

a. Change air cleaner outer and inner element.

(See the "250 HOUR SERVICE OPERATIONS" for details).

SPECIAL SERVICE OPERATIONS

OPERATIONS	REMARKS
a. Lubricate the following parts with grease	
1) Steering clutch case cover	10 points
2) Steering clutch lever shaft	5 points
3) Blade control lever	1 point

Note: Those points normally require no greasing, but if the machine is used under adverse operating conditions (in an environment liable to cause corrosion) they should be greased at intervals recommended. The following are included in such adverse operating conditions requiring the special service operations.

1) Where a machine is to remain at rest outdoors for more than 3 months or indoors for more than 6 months.
2) Where a machine has been operated in water.
3) Where a machine is in operation on seashore.
4) Where a machine is in operation in volcanic area or copper mines where sulphurous anhydride is developed.

Amount of greasing: 1 or 2 shots by means of a grease gun. Do not overfill with excessive quantities of grease.

FUNCTIONS AND ADJUSTMENTS

TROUBLE SHOOTING GUIDE

Troubles and mal-conditions that can occur in the machine are listed, together with the possible causes and the remedial measures to be taken, in the following chart. Whenever a trouble occurs in your machine, see the chart so as to save time and labour in determining the remedial measure to be taken.

ENGINE

SYMPTOM	PROBABLE CAUSE	REMEDY
Oil pressure gauge pointer will not return to "0" when the engine is shut down.	Defective oil pressure gauge.	Renew.
Oil pressure gauge pointer fluctuates.	Insufficient oil in oil pan.	Add.
Oil pressure gauge pointer indicates pressure below normal operating range.	• Insufficient oil in oil pan. • Clogged oil filter element. • Oil leakage due to broken piping, loose oil piping joints or connections. • Defective oil pressure gauge. • Defective oil pressure regulating valve. • Defective oil pump, clogged oil pan strainer, broken piping, etc.,	Add Renew Check and correct Renew Check and adjust. Check and replace if necessary.
Oil pressure gauge pointer indicates pressure above normal operating range.	• Use of improper oil. • Defective oil pressure gauge. • Defective oil pressure regulating valve.	Use oil of proper viscosity Renew Check and replace if necessary.

SYMPTOM	PROBABLE CAUSE	REMEDY
Steam spurts out through pressure valve on the radiator.	• Insufficient coolant or coolant leakage.	Check and correct.
	• Loose fan belt.	Check and adjust.
	• Dust or scales accumulated in the cooling system.	Change coolant and flush cooling system.
Water temperature gauge indicates above 90° C	• Clogged radiator fins or fins out of place.	Clean or repair.
	• Defective water temperature gauge.	Renew.
	• Defective thermostat.	Renew.
	• Loose radiator filler cap. (While operating at high altitude).	Tighten or renew packing as necessary.
Water temperature gauge indicates below 65° C.	• Defective thermostat.	Renew.
	• Defective water temperature gauge.	Renew.
	• Overcooled engine.	Install radiator mask and suction fan.
Engine fails to start.	• Insufficient fuel in fuel tank.	Add.
	• Air in fuel line.	Tighten fuel connection & bleed air from F.I. pump.
	• Defective F.I. pump or injectors.	Renew.
	• Insufficient torque of starting motor to crank engine.	See "Electrical system" trouble shooting.
	• Poor compression due to :	
	▪ Valve clearance out of adjustment.	
	▪ Leaking valves.	
	▪ Worn piston rings or cylinder.	Refer Engine manual.
	▪ Gas leakage around cylinder.	
	• Restricted air intake.	Check.
	• Poor quality fuel.	Change.

SYMPTOM	PROBABLE CAUSE	REMEDY
Engine fails to start.	• Fuel shut off valve defective. • Plugged injector spray holes. • Water in fuel. • Air leaks in suction line restricted fuel line.	Check electric. Shut down valve and replace. Check and clean. Drain water. Check and clean and tighten connections.
Engine emits white or blue white exhaust gas.	• Excess oil in oil pan. • Use of improper fuel.	Drain excess oil. Use fuel of proper rate.
Engine emits black exhaust smoke.	• Clogged air cleaner elements. • Defective injectors.	Clean, renew as necessary. (Refer Engine manual.)
Engine runs but operates erratically.	• Defective injectors. • Defective fuel injection pump.	Refer Engine manual.
Engine Issues abnormal noise.	• Use of improper fuel. • Overheat. • Internal breakage of muffler. • Excess valve clearance. • Worn main bearings or connecting rod bearings.	Change to proper fuel. See the instruction under "Water temperature gauge indicates high operating temperature" . Renew. Adjust. Refer Engine manual.
	• Defective water pump or fan shaft ball bearing.	
Engine lacks power.	• Check and locate the cause of trouble by referring it to the above information.	Refer Engine manual.
Timing gears chatter.	• Worn gears or loose key.	Refer Engine manual.
Engine runs at excessively high speed.	• Governor out of adjustment.	Refer Engine manual.

ELECTRICAL SYSTEM

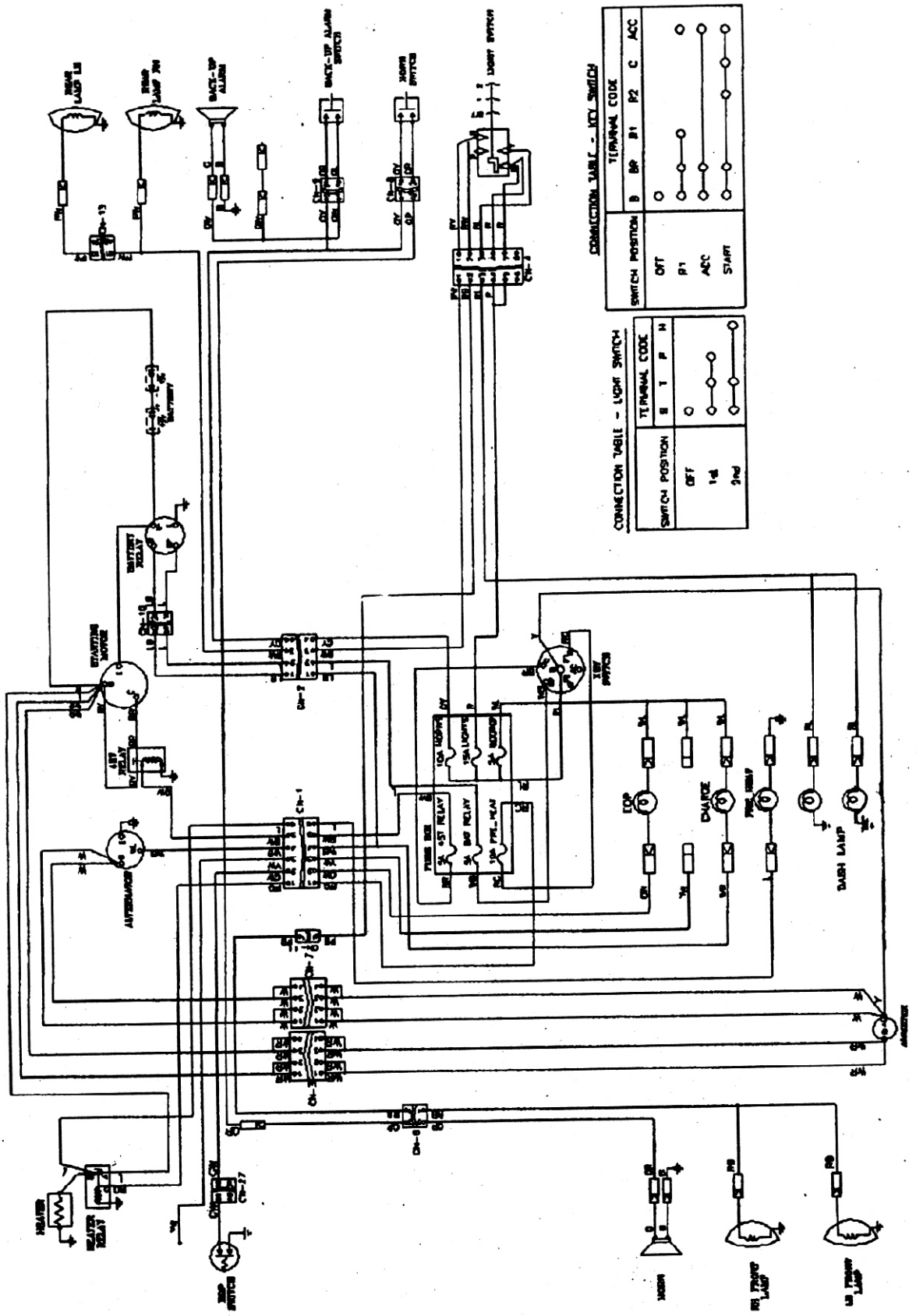
SYMPTOM	PROBABLE CAUSE	REMEDY
Ammeter pointer fluctuates considerably as the engine is running at constant speed.	• Faulty wiring.	Check and repair or tighten loose terminals, if any.
Lamps dim as the engine is running at high speed or Lamp wiggle.	• Defective generator or regulator.	Check and repair.
Ammeter pointer will not deflect at all as the engine runs normally.	• Defective ammeter. • Faulty wiring. • Defective generator or voltage regulator.	Renew. Check and repair. Check and repair and replace if necessary.
Generator Issues abnormal noise	• Defective generator.	Check and repair or replace if necessary.
Starting motor will not crank up engine as the starting switch key is turned to START.	• Faulty wiring. • Defective starting switch. • Battery not fully charged. • Defective starting motor.	Check and repair. Renew. Recharge. Check and repair and replace if necessary.
Pinion rattles. Starting motor will rotate at full speed before the pinion is engaged properly. Starting motor will not stop as the starting switch key is turned to OFF.	• Defective engage combination switch.	Check and repair and replace if necessary.
Starting motor will not crank up the engine instantly.	• Defective wiring. • Battery not fully charged. • Defective starting motor.	Check and repair. Re-charge. Check and repair.
Starting motor disengages before cranking the engine.	• Faulty wiring. • Battery not fully charged.	Check and repair. Re-charge.
Starting motor fails to disengage after cranking the engine.	• Defective engage combination switch.	Check and repair and replace if necessary.

CHASSIS

SYMPTOM	PROBABLE CAUSE	REMEDY
Main clutch slips.	• Cover to flange clearance out of adjustment.	Adjust.
	• Worn lining.	Check and repair.
	• Weakened or broken spring.	Check and repair.
Transmission gears are not easily meshed in. (Clutch shaft doesn't stop).	• Oil of high viscosity.	Use oil of proper viscosity.
	• Over tightened adjusting ring.	Adjust.
	• Mal-functioning of inertia brake.	Adjust.
	• Distorted disc or plate.	Check and repair and replace if necessary.
Main clutch pedal operates heavily.	• Friction on link bushing.	Lubricate
	• Mal-functioning booster due to:	
	❖ Insufficient oil in main clutch case.	Add.
	❖ Oil leakage around cracked piping.	Check and repair.
	❖ Defective gear pump or insufficient oil pressure.	Check and repair.
Gear shifting is difficult.	• Inertia brake out of adjustment.	Adjust.
Transmission makes excessive noise.	• Insufficient oil in transmission case.	Add.
	• Defective bearing.	Check and repair.
Machine will stop or engine RPM varies as the steering clutch lever on either side is pulled.	• Steering clutch (applied) not disengaged properly.	Check and adjust steering clutch. Repair when air is leaking into oil pump.
	• Steering clutch (not applied) slips due to improper adjustment.	Adjust steering linkage. Replace oil pump.
Machine moves on forward as the steering clutch lever on either side is pulled.	• Steering clutch not disengaged properly.	See Above.
	• Brake out of adjustment.	Adjust.
Machine will not stop as the brake pedal is depressed.	• Brake mal-functioning.	Adjust.
	• Lining wet with oil.	Check and repair if necessary.
Oil leaks around sprocket	• Worn or damaged seal ring.	Check and replace.
Track runs to either side.	• Loose track tension.	Tighten.
	• Defective track roller flange.	Check and repair if necessary.

SYMPTOM	PROBABLE CAUSE	REMEDY
Wear occurs on the sprocket rapidly.	• Loose track tension.	Tighten.
Oil leaks around front idler, carrier roller or track roller.	• Worn or defective seal ring.	Check and replace.
Proper track tension adjustment will not be effected.	• Rusty idler adjusting rod. • Leakage of grease through the plug.	Check and repair. Check and repair.
Blade will rise slowly or not rise at all.	• Insufficient oil in hydraulic system. • Defective or damaged relief valve, gear pump or piston packing. • Worn or defective control valve.	Add. Check and repair. Replace if necessary.
Blade lowers quickly by its own weight.	• Defective control valve. • Damaged hydraulic cylinder. • Worn or damaged piston packing.	Check and replace if necessary.
Oil leaks around piston rod.	• Worn or damaged piston packing.	Check and replace.

ELECTRICAL SYSTEM



ELECTRICAL SYSTEM

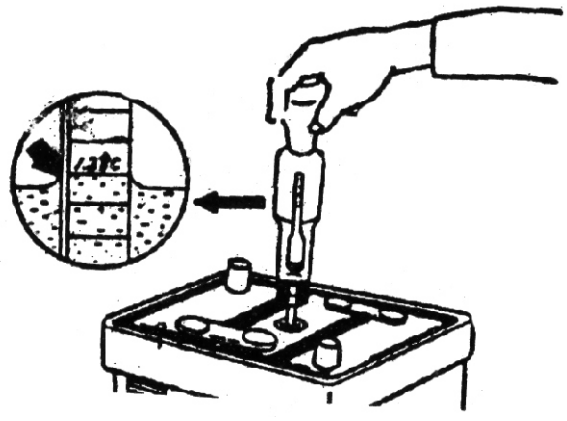
GENERAL INSTRUCTIONS AND PRECAUTIONS

The essential items of daily care to be carried out faithfully are as follows:

- Inspect the wiring for condition. The wiring should show no indication of chafing, sharp bends, kinks, or other damage.
- Before replacing any electrical component or repairing the cables, be sure to pull out the starting switch and disconnect earth cable for insuring safety. Also, wrench or any tool should be put on battery.
- Cables, when disconnected at terminals, should be identified and accounted for as to their locations, so that they may be put back to their original positions and in the same condition as before.

Battery

- The cranking performance of the starting depends much on the conditions of the battery. For this reason, it is highly . essential that the battery in service be looked after with greater care, particularly in cold weather. KEEP IN MIND A RUNDOWN BATTERY RESULTS IN HARD ENGINE STARTING OR DESTORY THE CELL PLATES OF THE BATTERY.



Maintain the battery in a fully charged state at all times. Periodical checks on the battery for electrolyte level· and specific gravity (S.G) must not be neglected.

The electrolyte S.G. chart below service as a quick reference in determining the state of charge.

Under no circumstances, should the battery be used under 70% charged condition.

Battery terminals and connections should be prevented from corroding by cleaning the cable clamp and terminal post separately, using medium steel wool. After cleaning, clamp them together firmly; then, coat with Vaseline. The connections should be kept free of water and dirt.

Before placing the battery in storage, raise the electrolyte a little above the normal level and charge it fully. Select a dry and cool place to keep the battery in.

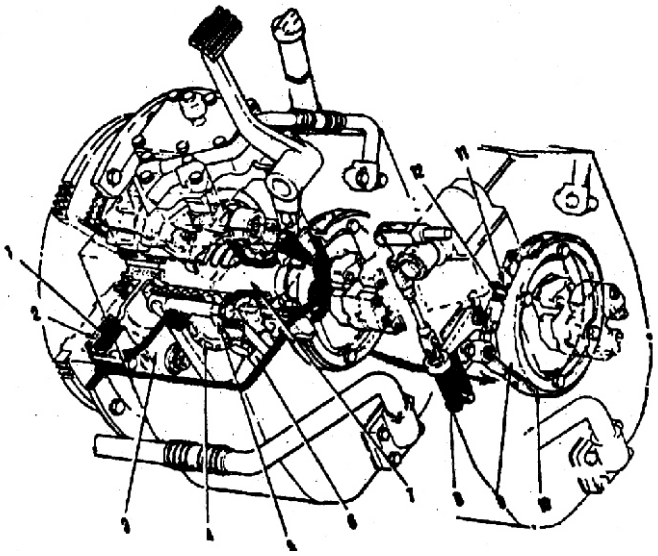
Starting circuit

When the key is turned to START position, current from the battery. energizes the solenoid switch, which operates on the drive pinion of the starting motor to mesh with the flywheel ring gear, thus cranking up the engine. The drive pinion disengages as the engine starts up normally.

As long as the engine is running normally, the starting switch should not be closed, which will result in the damage of starter pinion.

Charge rate	Atmospheric Temperature		
	20°C (68°F)	0°C (32°F)	-10°C (14°F)
100%	1.28	1.29	1.30
90%	1.26	1.27	1.28
80%	1.24	1.25	1.26
75%	1.23	1.24	1.25
70%	1.22	1.23	1.24

MAIN CLUTCH



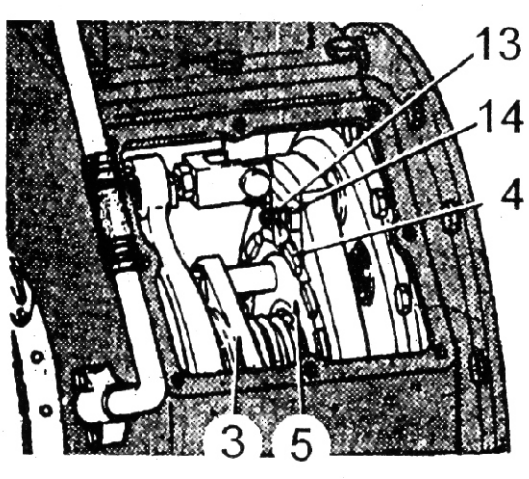
1. Lock Plate	4. Adjusting Ring	7. Clutch Shaft	10. Lining
2. Disc	5. Flange	8. Spring	11. Lock Nut
3. Clutch Cover	6. Release Yoke	9. Brake Drum	12. Turn Buckle

The main clutch is of wet type design equipped with a hydraulic booster. The oil in the main clutch case is delivered under pressure by the gear pump to the clutch lining to prevent it from overheating at the time of clutch operation, to the hydraulic booster for smooth operation of the clutch pedal, and to the various parts which require lubrication in the system.

ALWAYS KEEP THE OIL IN THE CASE WITHIN THE PROPER RANGE.

Insufficient oil or use of an oil of poor quality will result in an undue wear on the lining, gear grating, increased operating effort of the clutch pedal etc.

- In cold weather, when oil temperature is low, the main clutch will not disengage smoothly, but this should be of no concern since this condition may be· corrected as the engine reaches its operating temperature.



3. Clutch Cover
4. Adjusting ring
5. Flange
13. Nut
14. Lock Plate

The main clutch pedal adjustment is correct when there is a 20mm to 25mm of free movement from the top of the clutch pedal. Whenever it becomes necessary to adjust the pedal play, detach the access cover by removing the bolts in place, and proceed as follows:

i. Flange position

The main clutch pedal adjustment is correct when there is a clearance of 35mm to 40mm between the clutch cover (3) and the flange (5).

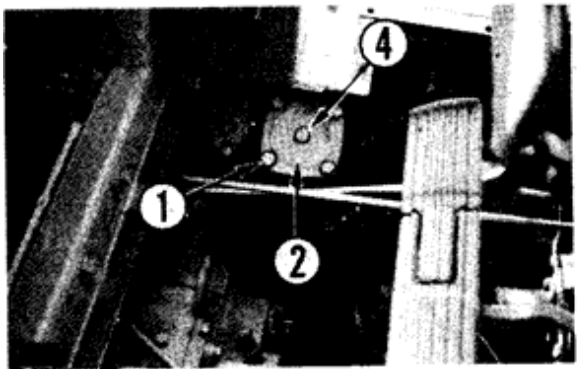
TO ADJUST, loosen the nut (13) detach the lock plate (14), and turning ring (4) in either direction until correct clearance (35mm) is obtained.

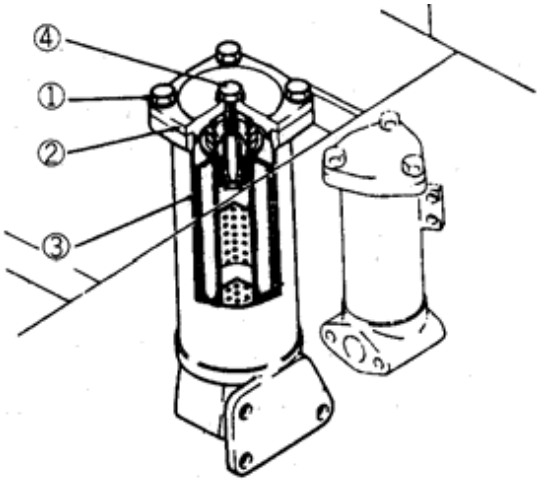
- In absolutely no case, should the clearance be below 34mm, since this will be sure way of causing trouble in system.
- Before turning the adjusting ring, depress the clutch 'pedal and, using a bar or the like, between the pedal arm and the floor so that the pedal will not return. Turning the adjusting ring about .75 threads will vary the clearance by 1mm..
- Adjust the booster linkages to get free play of the clutch pedal.

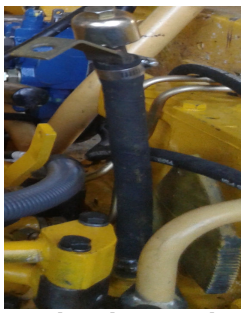
Inertia Brake

Where the clutch shaft is stilt rotating due to inertia even with the clutch disengaged, the gear shifting is difficult. In this case, depress the pedal all the way to apply the braking force to the clutch shaft. Inertia brake adjustment is correct if, with the engine running at rated speed, the clutch shaft is stopped within 4 seconds after the main clutch pedal is depressed fully. TO ADJUST, loosen the lock nut (11), turn in the turnbuckle (12) fully until the brake drum closely touches the lining (make Sure the spring will not be deformed), turn out the turnbuckle about 3½ to 4 rotations, and tighten the lock nut securely.

STEERING CLUTCH CASE OIL FILTER	
1.Remove floor plate. 2.Remove bolts (1) and cover (2), and take element (3) out from case. 3.Clean inside of case and removed parts, and install a new element. Fill case with oil and fix cover (2) with bolts (1).	4. After replacement of element, loosen air vent plug (4) and start engine. Overflow oil until no air bubble comes out from plug (4) and tighten plug (4). Use genuine BEML element

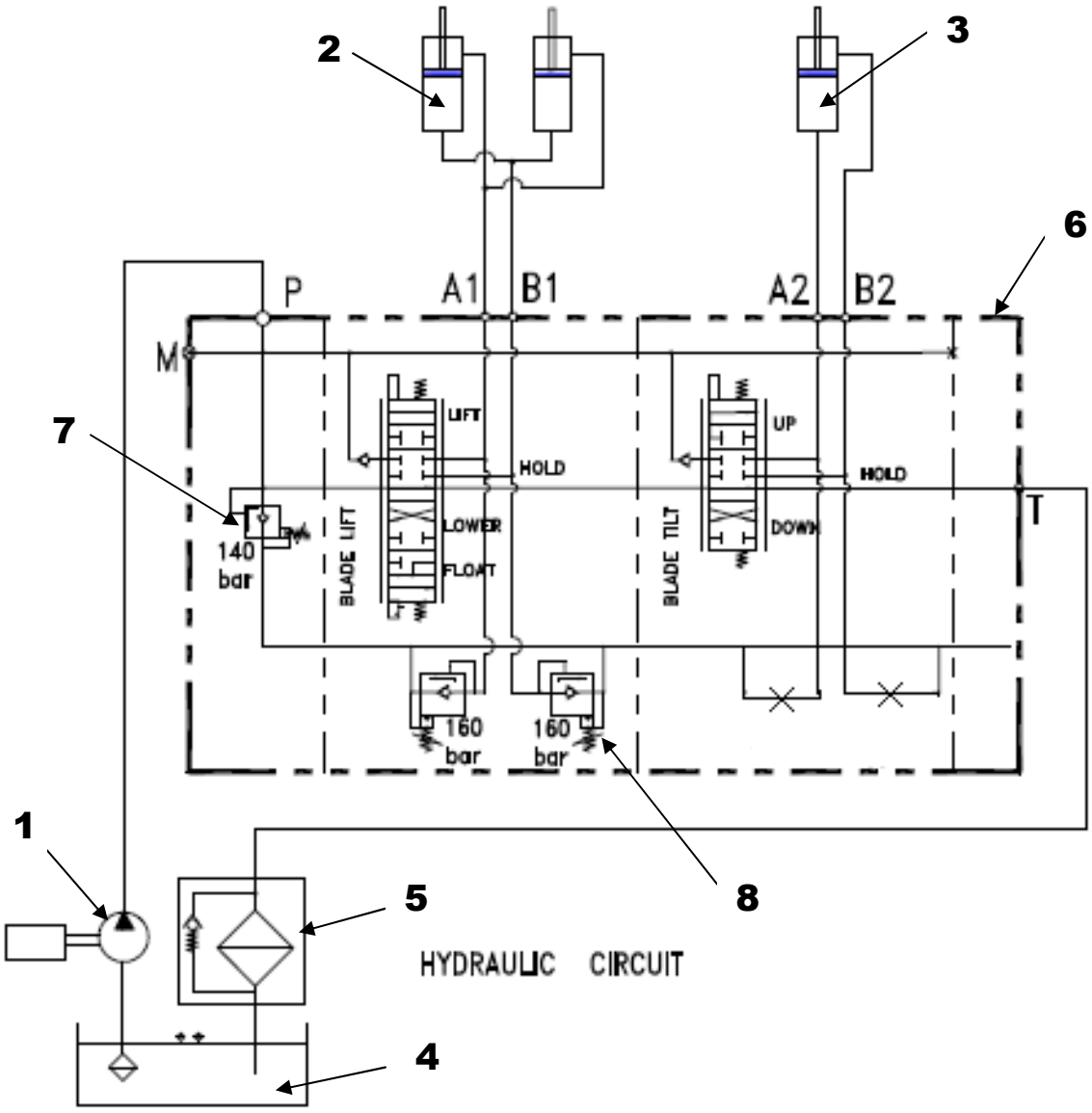




C. BREATHERS Remove the breather and wash out dust remaining inside with diesel fuel oil.	
 **Main clutch case breather**	 **Transmission case breather**
 **Hydraulic tank Breathers.**	 **Steering clutch case breather**

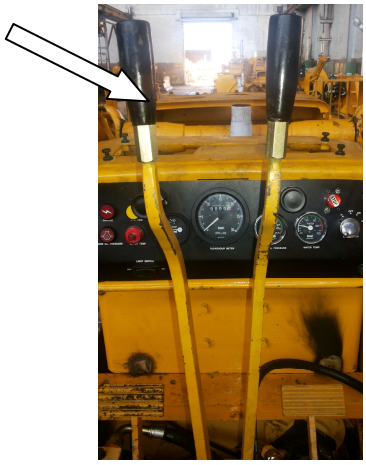
HYDRAULIC SYSTEM

1. Gear Pump
2. Hydraulic lift Cylinder
3. Hydraulic tilt cylinder
4. HydraulicTank
5. Hydraulic Filter
6. Control Valve
7. Pressure relief Valve (primary)
8. Pressure relief valve (secondary)

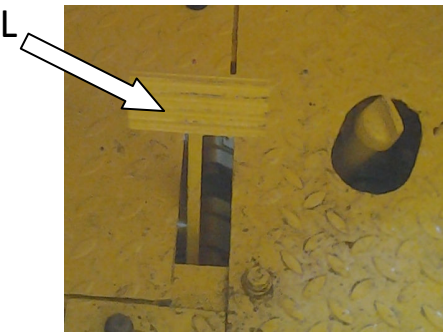


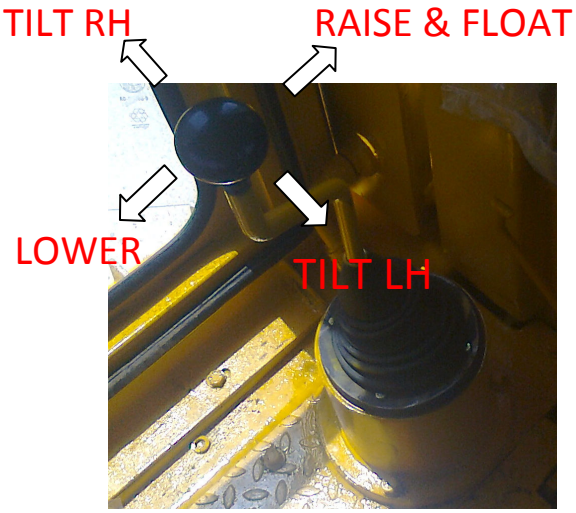
PRECAUTIONS FOR MACHINE OPERATION **Hydraulic steering and Brake Hydraulic Steering** • Do not operate machine in such a depth that carrier are submerged. Further, be careful so that the cooling fan will not come in contact with the water.	• If the steering clutch one side is used frequently or if many gradual turns are made with steering clutch half-engaged, the steering clutch will wear out in a short time. Design the travel road well and steer the machine properly. • When going downhill, shift gear shift lever into low speed to run engine at slow speed and travel down slope using the engine as a brake. If there is danger of over running the engine, slow the machine by braking.	• When the engine stops on a slope, immediately depress brake pedals and stop the machine with the work equipment lowered. Then, lock the brake pedals by applying the brake lock lever. Thereafter, move the gear shift lever to neutral position and proceed to the engine starting procedure again. **Brake** When brake pedals are depressed by stepping on the pedal both right and left brakes are actuated. ⚠Do not place your foot on pedals unnecessary.

STEERING LEVER



BRAKE PEDAL





The blade is placed in the RAISE, HOLD, LOWER and FLOAT and also right , left condition by the movement of the control valve located.
When the control valve is moved to the RAISE position, the blade cylinder piston will retract to allow the blade to be raised.
When the control valve is moved to the LOWER position, the blade cylinder pistons will extend to allow the blade to be lowered. In the HOLD position, blade will be held in its applied position. If the control valve is moved to the FLOAT position, the blade will be moved freely by external force.

When the control valve lever is moved to the RIGHT position, the Tilt blade cylinder piston will retract to allow the blade to tilt right side. When the control valve lever is moved to the LEFT position, the blade cylinder pistons will extend to allow the blade to Tilt left side.

Too low pressure in the system will result in poor lifting and lowering action of the blade. Too high a pressure in the hydraulic system would result in rapid wear or damage to gaskets and rubber hoses.

* ALL SERVICE WORKS ON THE HYDRAULIC SYSTEM SHOULD BE PERFORMED BY THE AUTHORISED PERSON.

* Use a proper grade of oil.

* When pouring oil into the tank, take care not to allow water and any other foreign particles to get into the tank. Sludge and rusty chips will progressively accumulate in the tank, thus causing damage to tank.

* When hydraulic oil has been changed or when the system has been overhauled for reconditioning, bleed air out of the system by extending and retracting the cylinder pistons several times with the engine running at a moderate speed.

For air bleeding operation on the hydraulic filter element, refer to the "1000 HOUR SERVICE OPERATIONS".

FUEL AND LUBRICANTS

Capacities

Fuel	Fuel Tank	240 lit.
Engine Oil	Engine Oil Pan	24. lit.
	Main Clutch Case	15 lit.
	Transmission Case (incl. Bevel Gear Case)	34 lit.
	Final Drive Case (each)	14 lit.
Hydraulic Oil	Hydraulic system	50 lit.
Water	Cooling system	32 lit.

DIESEL FUEL OIL

The fuel oil recommended for use in this machine are as follows:

ASTM 975 No. 2D- When the atmospheric temperatures are above

_100 C (140 F)

Ignition quality 50 centane (min.) Sulphur contents 1.0% (max.)

ASTM 975 No. 1D- When the atmospheric temperatures are consistently below -100 C (140 F)

Ignition quality 45 centane (min.)

Sulphur contents 1.0% (max.)

Fuel Handling Instructions

The following instructions should be strictly followed regarding fuel and storage.

* Always keep the fuel handling equipment clean.

* Clean fuel storage tanks periodically to remove any contamination.

* Keep the fuel storage tanks indoors to prevent entry of dirt and dust into fuel oil.

* If the fuel storage tank is to be left outdoor storage, be careful not to allow foreign . matters to get into fuel.

RECOMMENDED LUBRICANTS

In the table shown below the brand names of some typical commercial lubricants and grease suitable for this machine are enumerated. SAE number should be selected according to the atmospheric temperatures (unless otherwise specially noted in the topic "SERVICE OPERATIONS") at which the machine is to be operated.

MAIN CLUTCH, TRANSMISSION AND FINAL DRIVE

The lubricating oil meeting the class CD, Series 3 is recommended for Main Clutch, Transmission and Final drives. If class CC oil is used the oil change period Should be reduced to a half

Following grades of oils are recommended for the normal climatic temperatures:

SAE 10W between temperatures -40°F and 50°F (-20°C and 10°C)

SAE 30 for temperatures -32°F and above (0°C and above)

For the extreme climatic conditions below 0°C (-17.8°C), SAE 5W oil is recommended.

Hydraulic System: The oil to be used in the hydraulic system should be SAE 10W, Class CD-oil only, irrespective of above recommendations for temperature variations.

RECOMMENDED OILS AND LUBRICANTS WITH BRAND NAME

Specification and Grade	Classification	Company standard	Recommended Oils & Lubricants with brand name (Revised 2008)				
			BEML Genuine Oils				
SAE30 (Eng & T/M Oil)	API-CD	C6002-03	TRANSMISSION OIL ET30CD				
SAE10 W (Hydraulic Oil)	API-CD	C6002-02	HYDRAULIC OIL EHI0CD				
15W40-CF4 (Multi Grade)	API-CD	C6002-30	ENGINE OIL 15W40				
			INDIAN OIL CO.	SHEVARON	BALMER LAWRIE	BPCL	TIDE WATER OIL CO.
80W 90LS	API-GL5	E6002-34	Servo Gear Super 90 LS	Turbo GL-5 SAE 80W 90LS	Balmerol Protomac HP 80W 90 SPL LS	MAK SPIROL LS 80w 90	Veedol Multi Gear LS 90
SAE 90 Gear Oil	GL4	C6002-04	Servo Gear HP 90	Turbo GL-4 SAE 90	Balmerol Protomac HP 90	SPIROL EP 90	Veedol Multi Gear LS 90
	GL5			Turbo GL-5 SAE 90	Balmerol HP 90 SPL	SPIROL HD 90	Veedol Multi Gear 90 HD
SAE 140 Gear Oil	GL4	C6002-05	Servo Gear HP 140	Turbo GL-4 SAE 140	Balmerol Protomac HP 140	SPIROL EP140	Veedol Multi Gear 140
	GL-5		Servo Gear Super 140	Turbo GL-5 SAE 140	Balmerol Protomac HP 140 SPL	SPIROL HD 140	Veedol Multi Gear 140 HD
SAE J1703 Brake fluid	DOT 3 IS : 8654	C6002-07	Servo Gear Fluid DOT-3	Brake Clutch Fluid DOT-3	------	MAK BRAKE FLUID	VEEDOL DOT-3
VG-68	IS : 10522	C6002-19	Servo System 68	ERATO 8/AW	Protomac H-68	Hydrol 68	Avalon 68
T 20 Axle Oil	J20 A	C6002-33	Servo T/M T 20	J20 C Trans. fluid	Balmerol Protomac T20	MAK SPIROL BHT	------
Lithium Base Grease	NLGI 2	C6003-04	Servo Gem EP2	EP-2 Grease	Liprex EP-2	Lanthex EP-2	------
Lithium Base Moly Grease	NLGI 2	C6003-02	Servo Grease Molex	------	Liprex EP-1	MAK Moly Grease	Veedol Alimoly-20