1160MA3106

NEW FRONTIERS. NEW DREAMS

OPERATION & MAINTENANCE MANUAL

BD80

BULLDOZER

(WITH BEML BS6D125-1/B6D125-1 ENGINE)

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 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 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.**

BREAKING IN YOUR NEW MACHINE

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

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

- After starting, let the engine idle for 5 minutes to allow proper engine warm-up prior to actual operation.
- Avoid operation with heavy loads or at high speeds.
- Sudden starting or acceleration, unnecessarily abrupt braking and sharp turning should be avoided.
- At the first 250 hours of operation, the machine should be maintained in the following manner in addition to usual 250 hours 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

SAFETY RULES (OPERATION)

GENERAL

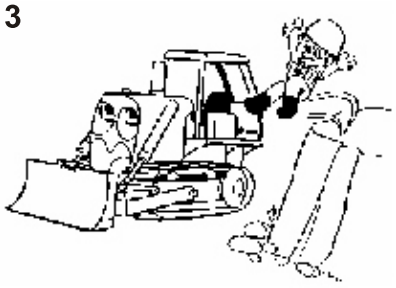
1. "Wear well-fitting helmet, safety shoes and working clothes. If the nature of the work requires safety, wear protective goggles or mask, thick gloves, ear plugs or other protection.

1

2. 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.

3. Take care of your health. Do not drive when tired, or after drinking.

3



4. 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.

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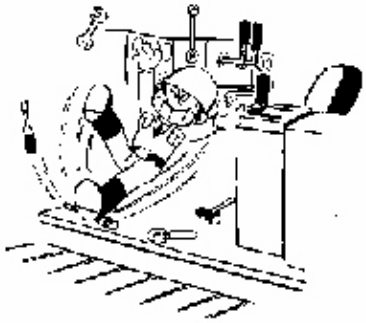

5. If there should be an accident or fire 01' any other such unexpected mishap, deal with it quickly, using the nearest apparatus.

   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.

5

6. 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 Protective devices
   - Roller-Over protective Structures
   - Seat belts, etc..

7. 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.

7

8. 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.

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9. When operating inside a building always be sure of the clearances of the ceiling, entrances, aisles, etc.. and the load limit of the floor.

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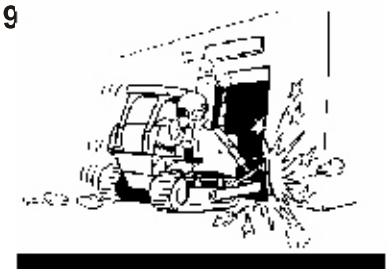


10. Never allow any person other than the operator to ride on the machine during operation.

BEFORE STARTING ENGINE

1. 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.

2. 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.

3. When getting on or off the machine, use the handrail and step provided. Do nut jump up or down from the machine.

4. 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.

5. 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.

6. 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.

7. 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.

8. Adjust the seat so that the brake pedal can be depressed all the way with the operator's back against the back rest.

9. Before operating the machine, check and fasten the seat belt.

10. Inspect the seat belt and fittings, replace any damaged or worn parts.

11. 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.

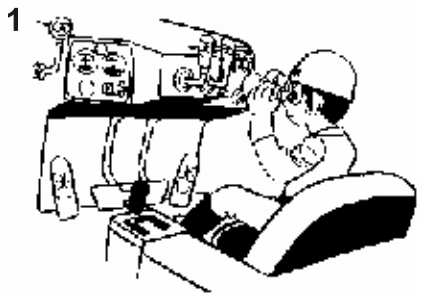
11

12. 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.

13. Before starting the engine, confirm that all control levers are in NEUTRAL or HOLD.

AFTER STARTING THE ENGINE

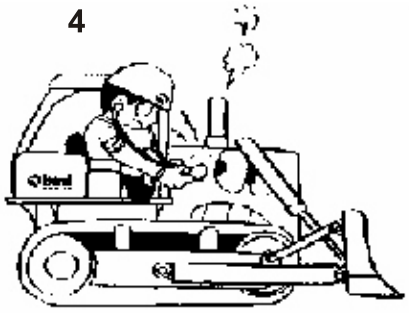
1. Confirm that all gauges and warning devices are functioning correctly, and that the gauge readings are within the prescribed range.



2. Check the play and travel of each lever and pedal.

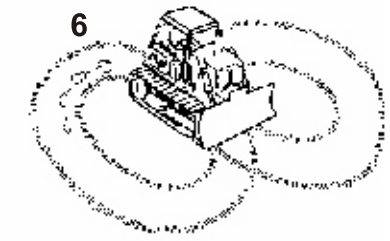
3. Operate the blade and ripper to confirm that they are functioning.

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



5. 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.

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

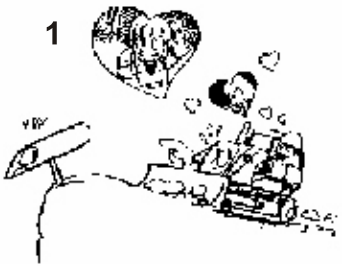


7. If these tests reveal anything wrong, however slight it may be, contact the man incharge of the machine and operate the machine only after obtaining his permission.

DURING OPERATION

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

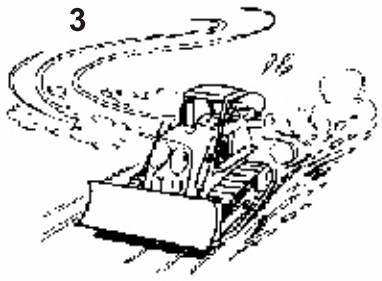
   In dangerous places, or where there is restricted visibility, it is important to get down from the machine and confirm whether it is safe before continuing work.



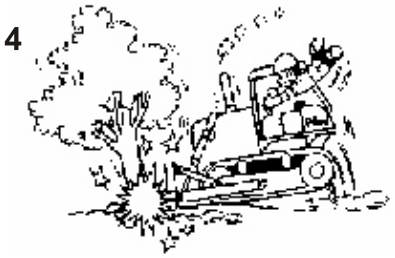
2. The work area should be made as flat as possible. If the work area is flat, operation is made much easier and this reduces operator fatigue.

3. 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" .

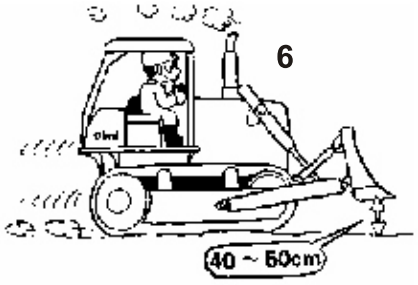


4. Be careful of those around you, arid always confirm that there is no person or obstacle in the way before traveling or turning the machine.

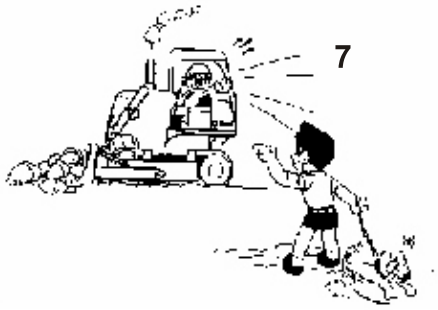


5. Always operate slowly in crowded places. On haul roads or in narrow places, give way to loaded vehicles.

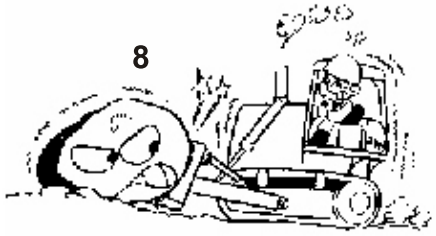
6. When travelling the machine, keep the blade 40 to 50 cm above the ground.



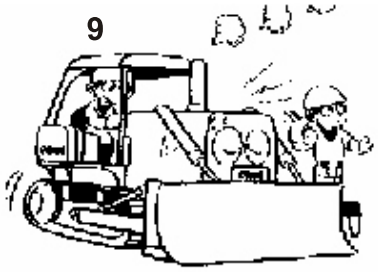
7. Do not allow unauthorized persons into the work area.



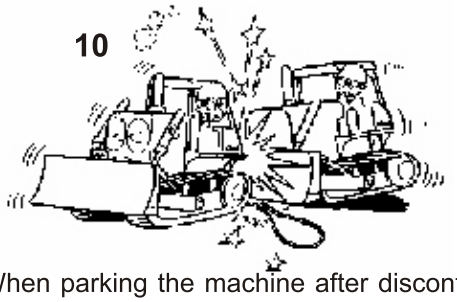
8. Always be aware of the operating capacity of the machine. Using the machine to do work beyond its capacity will not only damage the machine, but may even cause unexpected accidents.



9. The machine condition can be judged from many factors. Changes in the gauges, sound, vibration, exhaust gas colour 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 a danger of fire.



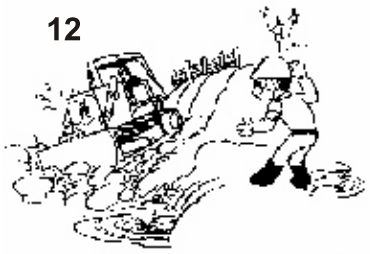
10. If the machine breaks down and needs to be towed, first confirm that the brakes are working properly, and then tow, using a wire rope or any suitable towing equipment.



11. When parking the machine after discontinuing work, put the gear shift 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.

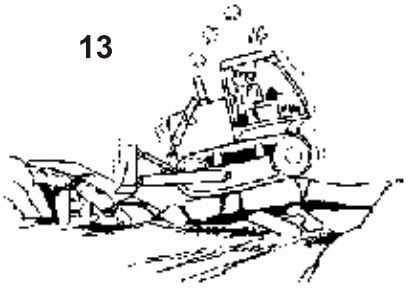
12. When continuing operations after rain, remember that conditions will have changed from those before the rain started, so proceed with caution. Be particularly careful when approaching the shoulder of the road or cliffs, as they may have been loosened by the rain.

12



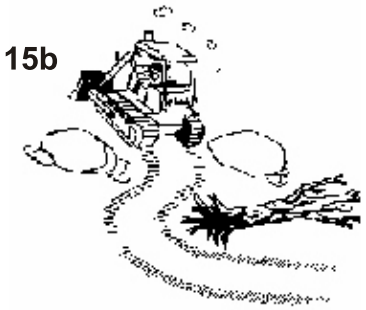
13. Check the load limits of bridges before crossing.'

13



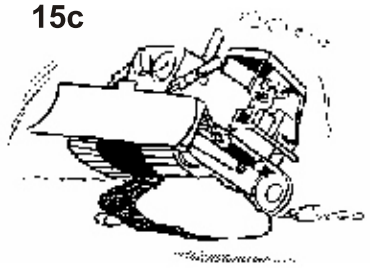
14. After earthquakes, confirm that the ground is still firm, after blasting, confirm that there are, no unexploded charges remaining.
15. When operating on uneven ground or in places where there are obstacles, remember' the following points:
    a. When operating on uneven ground, travel at as lowa speed as possible and avoid sudden changes in direction.
    b. Wherever possible, avoid traveling over large rocks, fallen trees, tree stumps and other such obstacles. Either u, fallen trees, equipment to remove them, or travel round them. When it is impossible to avoid traveling over them, put the gear shift lever into a low speed, reduce speed and mount over the obstacle. Just before the front of the machine tips down, reduce speed even more to make the shock of hitting ground as

15b



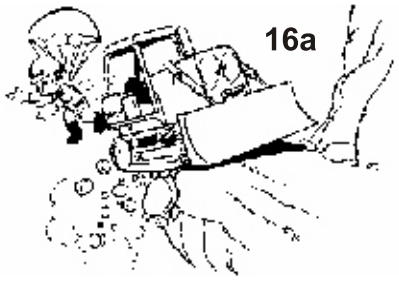
    c. Never mount over an obstacle at an angle, never disengage one steering clutch to travel over an obstacle.

15c



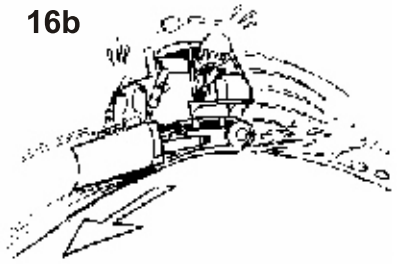
16. When operating at the edge of a cliff or on the shoulder of a road, remember the following points:
    a. When operating in a place where there is a danger of the machine falling over the side, be doubly careful. Do nut approach the edge of the cliff or road shoulder by mistake.

16a



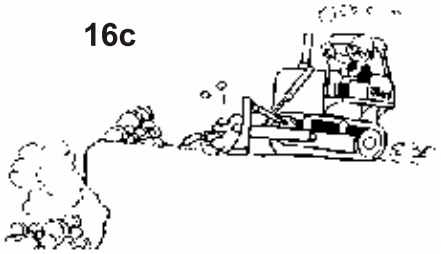
    b. At the instant when the soil is dumped over the cliff, or when the machine passes the summit of a slope, the machine speed suddenly increases. This is dangerous, so press the decelerator pedal or use the fuel control lever to reduce the speed.

16b



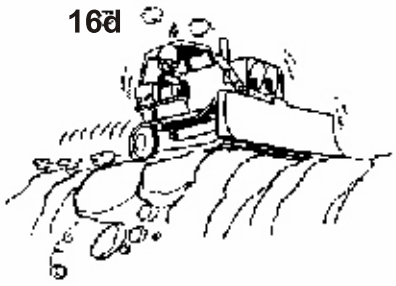
    c. When dumping soil over a cliff, dump the first excavated soil without dumping it over, and use each succeeding excavated soil to push the previous excavated soil over. Be sure not to approach the edge by mistake.

16c



    d. 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.

16d

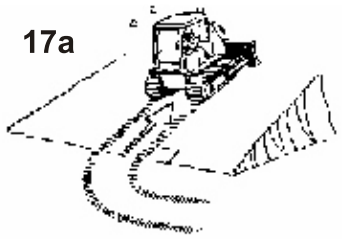


17. When operating on slopes, remember the following points:

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

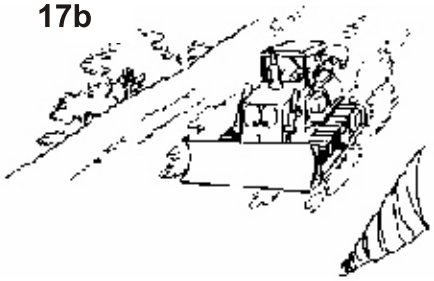
Never coast down a slope with the gear shift lever in "NEUTRAL"

17a



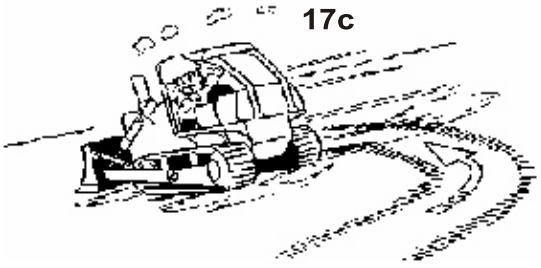
b. When going down a slope, use the engine as a brake. If this is not enough to control the speed of the machine, use the steering brake as well.

17b



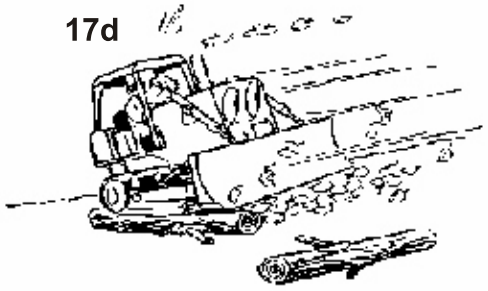
c. As for as possible, avoid turning the machine on a slope. It may cause the machine to roll over or slip sideways.

17c



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

17d



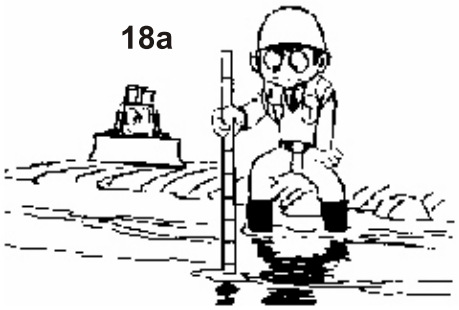
e. Before going up or down a slope, select a travel speed most suited to the slope. Do not change gear on the slope.

f. 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.

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

a. When operating in water or ~hen 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.

18a



b. 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.

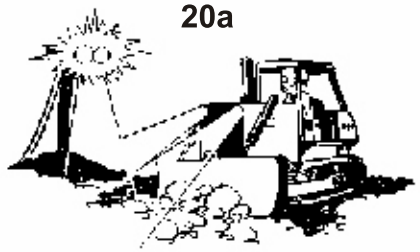
If the machine gets stuck in mud, it is completely useless to increase the engine speed, causing the tracks to spin, or to rock the machine backwards and forwards. In such a case, raise the blade to reduce the load and drive out slowly.

18b

19. 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.

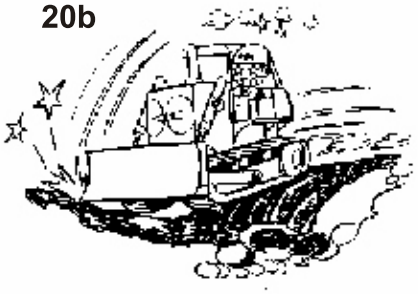
20. When operating at night, remember the following points:
    a. Be sure to arrange all adequate lighting system.

20a



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

20b



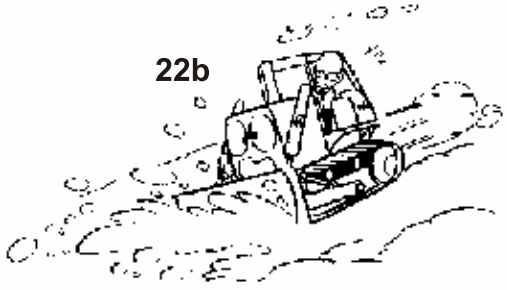
21. When operating in fog, mist or smoke, where visibility is bad, be especially careful to confirm first whether operation is safe.

    When visibility drops below safety level, stop work and wait for the visibility to improve.

21

22. When operating in snow, or cleaning snow, remember the following points:
    a. Even slight slopes can cause unexpected side slipping, so in such places, operated with extreme caution.
    b. Never use the steering brake to stop suddenly on slopes. Lowering the working equipment is a far more effective way of stopping.

22b

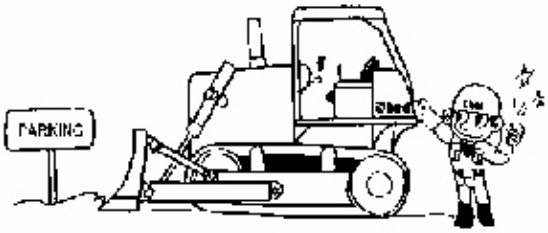


23. During operation, use the seat belt.

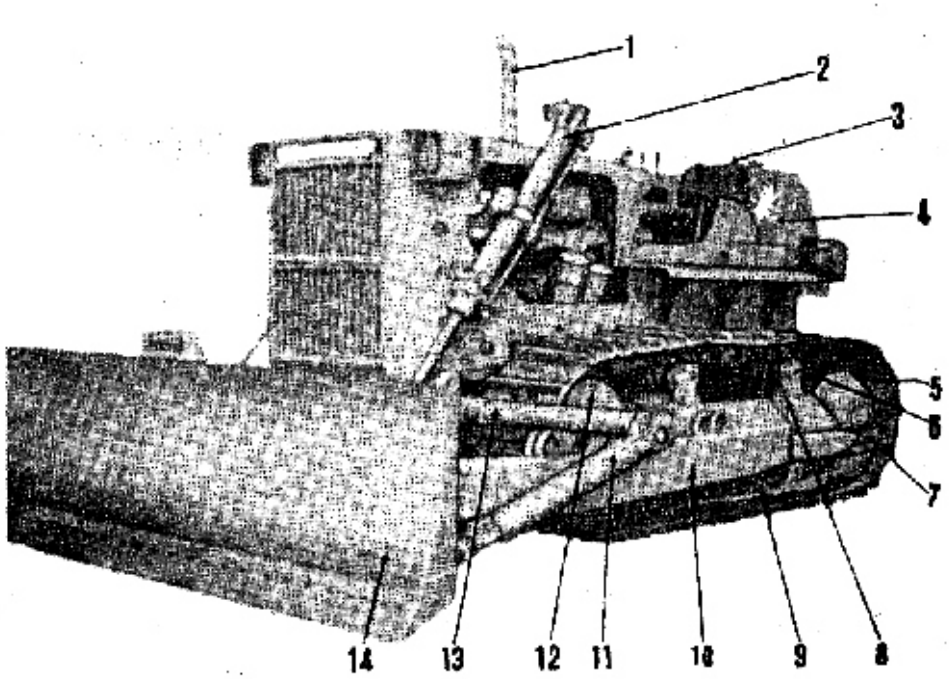
PARKING

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

1

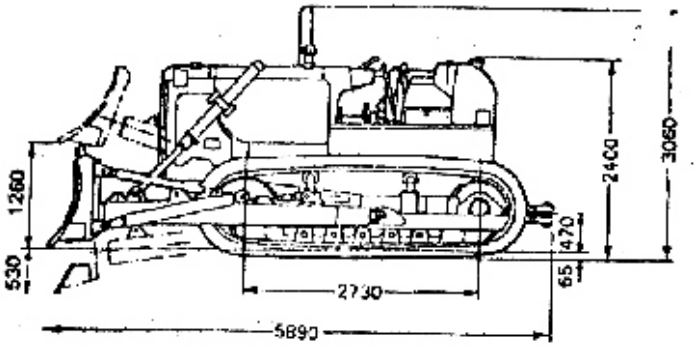


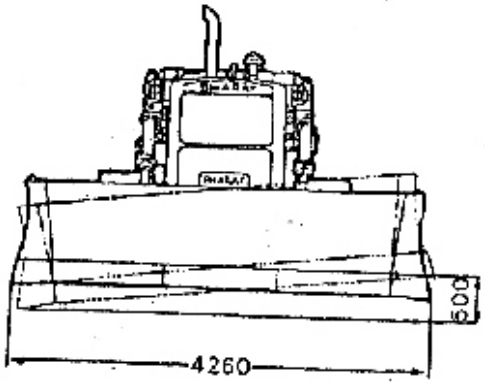
2. When parking the machine, return the gear shift lever to "NEUTRAL", apply the brake lock, lower the blade to the ground, and put all safety levers in the "LOCK" position. Switch off the engine and remove the key.



1. Exhaust Pipe
2. Hydraulic Cylinder
3. Operator's Seat
4. Fuel Tank
5. Track Shoe
6. Sprocket
7. Track Frame
8. Carrier Roller
9. Track Roller Guard
10. C-Frame
11. Arm
12. Idler
13. Brace
14. Blade

SPECIFICATIONS





BD80 ANGLE DOZER

OPERATING WEIGHT	21100 kg
ENGINE	
Model	BS6D125-1
Net FHP	180 HP @1850RPM
OPERATING WEIGHT	21100 kg

UTILIZATION

The bulldozer is a versatile equipment and can be used to scrape, pile, haul, level, roll etc. 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 hauling the material in short distance where the distance is not more than 50 meters.

SIDE- CASTING OPERATION

To push the dirt while casting it to one side as in terracing a hillside or in spreading loose dirt to and along the shoulder 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

To break loose hard ground or make a ditch, tilt the blade so that the blade end bit will cut into the ground. For unusually hard ground, a dozer ripper or hydraulic ripper is advisable to loosen the ground surface before applying the bulldozer in the above manner.

FELLING TREES AND GRUBBING STUMPS IN LAND CLEARING OPERATION

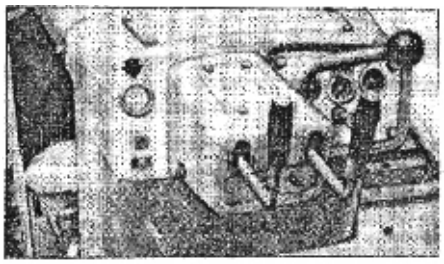
Trees up to 25 cm in diameter can be speedily felled by pushing against the tree with the blade held up high and then by backing off and digging its root off ground. In felling trees, no attempt should be made to utilize an impact of clashing the blade against the tree.

LEVELLING OPERATION

Push 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 depressions with dirt and cutting off high ridges. This method is more effective than pushing an empty blade.

To finish the levelled 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.

SERVICE METER



The service meter indicates directly how long the machine has been operated. It is located directly on the left side of the Dash board as shown. It is connected to a drive on FI Pump through a cable.

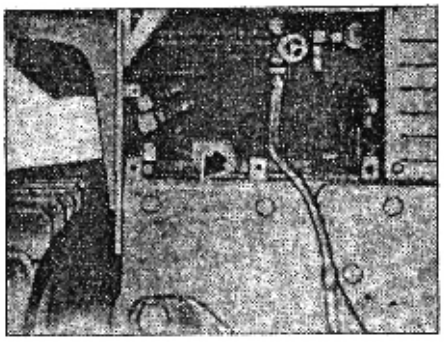
Every service meter dial reading is a value indicated by mechanical means, corresponding to the engine crankshaft revolution. In other words, when the crankshaft turns as many revolutions as are made in an hour at the average engine speed in the normal operation (80% of rated rpm), the indicator advances one number.

❊ Before or after the days run, record the meter readings on your operational report for future reference.

❊ All service intervals of the periodical maintenance are based on the service meter readings.

❊ When ordering parts or calling for services of a mechanic, furnish the total service hours of the machine to BEML Limited.

MACHINE AND ENGINE SERIAL NUMBERS



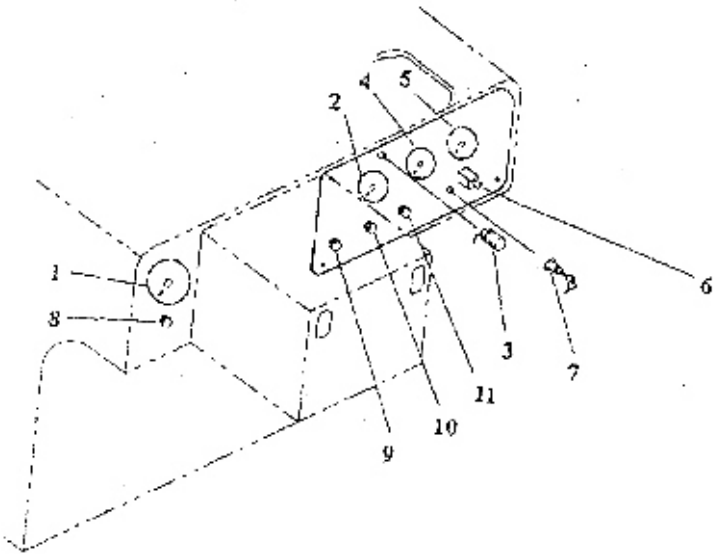
Location of machine serial number stamp

Location of machine serial number stamp

When calling for services of mechanic or when making parts orders, be sure to give the BEML Limited the machine and engine serial numbers.

Machine and engine serial numbers are found on the name plates attached on the machine. In addition, these numbers are stamped at the locations shown in the figures. These stamped numbers are used as references in making machine registration and, therefore, must be carefully preserved so as to be identified clearly.

IDENTIFICATION OF CONTROLS



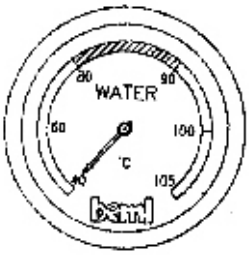
1. Tacho hour meter
2. Ammeter
3. Dash lamp
4. Water temperature gauge
5. Lub oil pressure gauge
6. Light switch
7. Key switch
8. Lamp indicator
9. Charging lamp
10. EOP indicator
11. EWT indicator

IDENTIFICAION OF GAUGES AND SWITCHES

TACHO HOUR METER

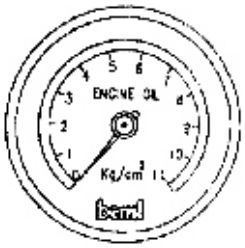
This indicates speed in RPM and also number of hours engine operated

WATER TEMPERATURE GAUGE



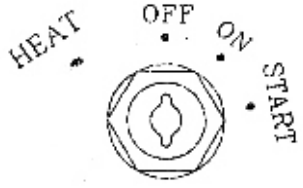
When indicator is in the green range during operation, water temperature is normal.
After engine start-up, warm-up the engine until indicator (moves into green range.

LUB OIL PRESSURE GAUGE



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

AMMETER



If the pointer is in 0 and + range, 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.

PRE- HEATER INDICATOR

When key switch is turned to “HEAT” this lamp glows.

KEY SWITCH

OFF

Key insertion-withdrawal position.

ON

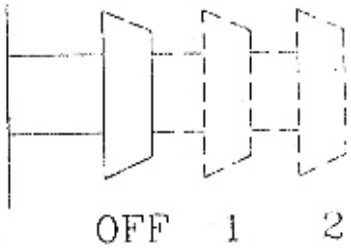
Charging and lamp circuits activate. Keep key at ON after starting.

At this key position, the starting motor will crank the engine. Release key immediately after starting, and key will return automatically to ON.

HEAT

At this key position the Pre-heater is ON.

LIGHT SWITCH



With the lamp switch in position 1, the dash lamps light. With the position 2, the dash lamps, front head lamps rear head lamps will light.

For further details refer engine Operation and Maintenance Manual

OPERATION

The Following actions are forbidden.

- Making hurry for job without warming up the engine.
- Repeated sudden braking and rapid starting the machine.
- Sharp turning at high speed on rough or hard ground.
- Continuously resting your feet on the brake pedals. engine.

INDEX

STARTING AND STOPPING THE ENGINE

Prior to starting the machine to daily operation, thoroughly check and correct fuel, cooling water, oil, etc. according to the topic CHECK BEFORE STARTING.

STARTING THE ENGINE

Before turning the starting switch, make sure that each control lever is correctly positioned as follows:

1. Main clutch lever is pushed all the way forward to declutch.
2. Fuel control lever is in LOW-IDLING position (push the lever all the way up).
3. Brake pedals are locked by the brake lock lever.

To start the engine, insert the key into the starting switch and turn it to START position. As the starting motor turns giving the engine sufficient momentum, release the switch key to allow it to return to ON position.

CAUTIONS:

1. If the engine fails to start, wait for two minutes before trying to start the engine again.
2. Do not turn the starting motor continuously for more than 20 seconds at a time.
3. If the starting key is turned to OFF by mistake during operation, wait for the engine to stop completely before turning the key again.

SPECIAL STARTING METHODS

a. INCASE THE SHUT -OFF VALVE DOES NOT OPERATE OWING TO ELECTRICAL FAILURE, open manually the shut-off valve by screwing in the knob before starting the engine, the engine should be stopped by turning the knob back.

b. STARTING AFTER FUEL EXHAUSTION. After refilling fuel, follow the following procedure before hand to avoid an air-locking in the fuel line.

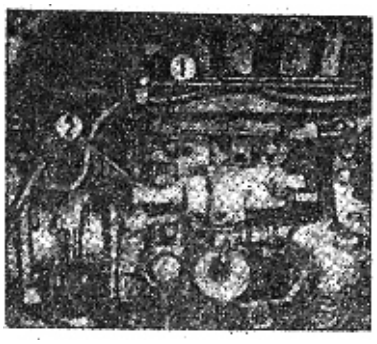
1. Wait for about 10 minutes to allow fuel to reach the float tank.
2. Uncover the fuel filter and fill with fuel.
3. Loosen the screw and bleed air out of FI pump with fuel.

AFTER STARTING THE ENGINE

After starting the engine, do not move the machine immediately, but observe the following instructions.

NOTE:

For the air pre-heater operation, refer to the opic "COLD WEATHER OPERATION".



1. Pull the fuel control lever to HALF OPEN position to idle the engine for about 5 minutes.

   This is called a "warm-up" run. If the engine is cold, after it is started, the pointer of the oil pressure gauge may swing beyond operating range. In this case, wait for the pointer to come down in between 3 to 5kg/cm^2 and then continue the warm-up run for additional five minutes or so.

2. When the engine has been warmed up, check the following points.

a). Whether the ammeter is registering the plus "CHARGE" side.

b). Whether the engine oil pressure gauge is registering the correct oil pressure. Normal operating pressure:

At idle speed - 0.35 kg/cm^2 (min). At Rated speed - 3 to 5 kg/cm^2.

c). Whether the engine water temperature gauge pointer is within operating range viz., within Green range on the gauge or 65°C & 90°C.

d). Whether the exhaust gas colour and sound are normal.

e). Whether there are any strange noise or vibrations.

f). Whether there are any leakages of lubricant, fuel, coolant or gas.

STOPPING THE ENGINE

Allow the engine to idle about five (5) minutes before stopping it. For stopping the engine turn the starting switch key to OFF position. Before stopping do not accelerate the engine.

DRIVING THE MACHINE

STARTING THE MACHINE

To start the machine, proceed as follows:

1. Push the main clutch lever forward and place the gearshift lever in a desired speed position and the forward-reverse lever in either FORWARD or REVERSE position. Diagram of the shift pattern is on the dashboard lever knob.

CAUTION

If the gears cannot be engaged in properly, shift the gearshift lever into NEUTRAL and repeat shifting the gears again moving the clutch lever forward and backwards slightly.

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

3. Raise the blade about 400 mm of the ground surface.

4. Depress the brake pedals to unlock the lock lever.

5. Slowly pull the main clutch lever. As the machine begins to move, pull the lever all the way to engage the clutch fully.

STOPPING THE MACHINE

First declutch by pushing forward the main clutch lever, and then slowly depress the brake pedals to stop the machine. After stopping shift the gearshift: lever into NEUTRAL and release the brake pedals.

If it is not to be operated again immediately, let the engine idle, lower the blade to the ground and lock the brake pedals.

GEAR SHIFTING

When gear, shifting bring the machine into a complete stop.

STEERING

Steering the machine is accomplished by pulling the steering clutch lever and by depressing the brake pedal on the side of the desired direction of travel.

CAUTION

I. When the machine is moving down a steep slope driven by its own weight or, when it is pushed down a slope by a machine it has been towing, pulling either steering clutch lever will result in turning the machine in the opposite direction.

2. Do not attempt to turn while running at a high speed. Also, a sharp turn on rocky ground or clay

will put much wear on the undercarriage components, and may even cause the track to run outside.

GOING DOWNHILL

In case of driving on a steep downgrade, be sure to push the fuel control lever forward to drop the engine speed and shift the gearshift lever into a low speed, and allow the vehicle 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 accident may result.

2. When going down-hill with the engine as a brake, if the tractor goes faster than the normal travel speed chosen by gearshift lever, depress the brake pedals sparingly to prevent the engine from overrunning.

GOING BACK ON A SLOPE

When going back on a slope, also, follow the above instructions for "going down hill" travel. That is, shift the forward reverse lever in REVERSE, and the gearshift lever into a low speed and use the engine as a brake.

CAUTION

Do not allow the machine to go back down the hill in careless state such as the forward ¸reverse lever in FORWARD and the main clutch disengaged. Otherwise, if the main clutch which was 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 hitting and burning the air cleaner element.

If such a case happens stop the vehicle 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.

DRIVING ON ROUGH GROUND OR IN WATER

DRIVING ON ROUGH GROUND

1. Travel slowly, and avoid abrupt or frequent turns. On rocky ground, take care not to damage the track shoes. On such ground, it is advisable to give more tension to the tracks to make the shoes last longer.
2. Do not lift the blade too high. Limit its height to about 400 mm (1 ft.) above ground for better machine stability.
3. To climb over an obstacle, slowly climb to the top, stop the machine right before it leans forward, and after it has swayed forward, carefully, start the machine again. Do not climb up an obstacle obliquely, nor climb over it with the steering clutch on one side disengaged.

WHEN WORKING IN WATER OR IN MUDDY AREAS, OBSERVE THE FOLLOWING INSTRUCTIONS:

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

★ During suspension of work or after completion of work, remove mud from machine exteriors and check engine oil pan, torque converter case, transmission case, steering case, hydraulic system, etc. for:

- ❍ Oil leakage
- ❍ Rise in oil level

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

NOTE:

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, steering clutch case, final drive case and P.C.U gear case for (a) oil leakage and (b) oil level increase, to determine whether the oil contains any water. If necessary, draw a sample of the oil for checking.

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.

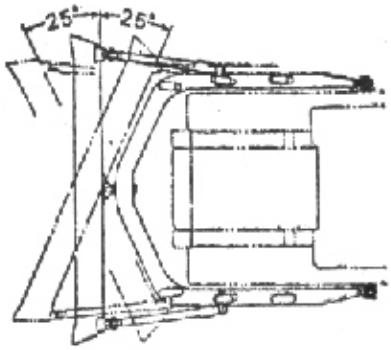
1. RAISE - To raise the blade, pull the lever to "RAISE" position.
2. HOLD - Release the lever from either "RAISE" or "LOWER" position to allow it to return to "HOLD" position, when the blade reached at any desired height above the ground.
3. LOWER - Move the lever to "LOWER" position to lower the blade.
4. FLOAT - Push the lever all the way to "FLOAT" position, and it will be placed in such a position to allow the blade to be moved by external force.

CAUTION:

The cable controlled blade will be lowered by its weight when the control lever is held to LOWER position. To prevent it from falling with acceleration, which may cause the cutting edge to be damaged, lower the blade by controlling the lever intermittently and sparingly.

The blade may be angled and tilted as required to suit for each job. This adjustment should be effected with the blade raised off the ground surface by 500 to 600 mm.

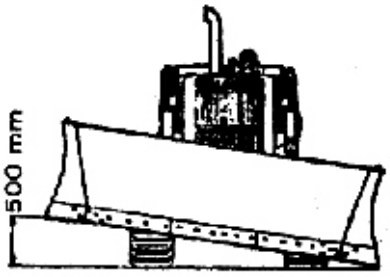
ANGLING ADJUSTMENT

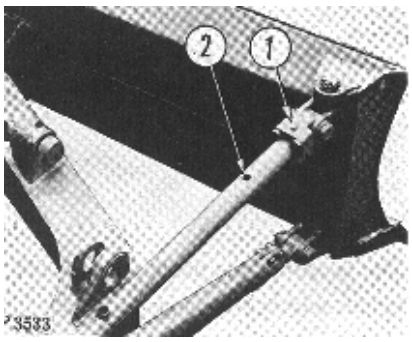


The blade may be angled to 25° to each side from the center of the blade. To angle, relocate the pin that is secured to the blade arm to the C- frame.

TILTING ADJUSTMENT

The blade may be tilted up to 500 mm. To ti lt, shorten the brace on one side and lengthen the one on the other. Shortening and lengthening adjustment may be effected as required by turning the brace at (2) with a bar. Be sure to loosen the bolt (1), before this adjustment.





COLD WEATHER OPERATION

PREPARATION FOR LOW TEMPERATURE

1. Replace lubrication oil by that with prescribed viscosity.

2. Fuel of low pour point shall be used. ASTM 0975 No.1 diesel fuel should be used at atmospheric temperature lower than -10o C.

3. Add antifreeze in the cooling water. When the atmospheric temperature drops lower than 0°C while the machine is stopped, prevent freezing by adding antifreeze to the cooling water. The mixing rate of antifreeze is determined according to the expected minimum temperature. The following table shall be used.

Mixing rate of water and antifreeze

Min.atmosph-eric temp (°C	-5	-10	-15	-20
Amount of antifreeze(ltre	38.5	49.5	59	68
Amount of water(litre)	126.5	121.5	106	97

Coolant capacity: 165 l

Cautions for using antifreeze

1. Permanent type antifreeze shall be used.

2. Soft water (ex: city water) shall be used as mixing water.

3. Cooling systems must be thoroughly flushed before filling with antifreeze mixture.

4. When the climate becomes warmer and antifreeze (except permanent type) is not needed, replace with soft water (ex: City water), after thoroughly cleaning the cooling system.

⚠ Take care for fire as antifreeze is inflammable.

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

- ★ SA J1034
- ★ FEDERAL STANDARD O-A-548D

- ★ Never use any antifreeze made from methyl alcohol or ethyl alcohol which may be a cause of engine trouble.
- ★ Where no permanent antifreeze is available, an ethylene glycol antifreeze without corrosion inhibitor may be used only for the cold season. In this case, coolant must be changed two times a year (at the beginning and at the end of the cold season).
- ★ Do not mix an antifreeze with one of different brand.
- ★ Absolutely avoid using any water leak preventing agent irrespective of whether it is used independently or mixed with an antifreeze.
- ★ 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 Rate of fluid		20°C	0°C	-10°C	-20°C
charge	100%	1.28	1.29	1.30	1.31
	90%	1.26	1.27	1.28	1.29
	80%	1.24	1.25	1.26	1.27
	75%	1.23	1.24	1.25	1.26

- ★ When electrolyte level is low, add distilled water in the morning before work instead of after the day's work. This is to prevent fluid from freezing at night.
- ★ When temperature rises, change lubricating oil in each unit to that of recommended viscosity.

  Completely drain antifreeze from cooling system and fill with soft water (for example, city water) after thorough flushing.

CARE AFTER DAILY OPERATION

Before parking the machine during overnight, take following cares:

1. Park the machine 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 precipitated water from the fuel tank and fill up the fuel tank.
3. If the anti-freeze coolant is not available in the radiator, drain the cooling system.
4. Protect the battery completely against the freezing temperatures.

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.

★ Drain antifreeze coolant, flush the inside of cooling system completely and fill with clean soft water (such as city water)

PERIODICAL MAINTENANCE

Periodical maintenance is essential to keep the machine in 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 ordinary use of the machine. However, more practical schedule should be developed for each work situation. For extreme conditions, reduce the time intervals by 2/3 or 1/2 or more as necessary.

NOTE:

It is recommended that for the periodical maintenance of the engine, please also refer the "Operation and Maintenance" Manuals of BEML Engine.

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

INDEX

GENERAL INSTRUCTIONS

a. For replacement parts, be sure to use only genuine parts, supplied by BEML Limited.

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

AGAINST FUEL

1. Before filling the tank from the drum, be sure to clean the exterior portion of the drum to avoid the dirt to get into the tank.
2. Pour fuel through the strainer provided.

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

d. When checking oil levels, set the machine on level.

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

FUEL HANDLING

1. WATER AND DUST IS AN ENEMY AGAINST FUEL. Before filling the tank from the drum, be sure to clean the exterior portion of the drum to avoid the dirt to get into the tank.
2. Pour fuel through the strainer provided.
3. 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 to prevent condensation of the moisture during overnight parking.
4. To check the fuel level in the tank, remove the filler cap and check the fuel level with the level gauge provided. However, open the drain cocks of fuel tank and fuel filter every morning before starting the engine, in order to drain out the dirt and condensed water if any. Drain float tank after every 1500 hours and clean.

COOLING WATER

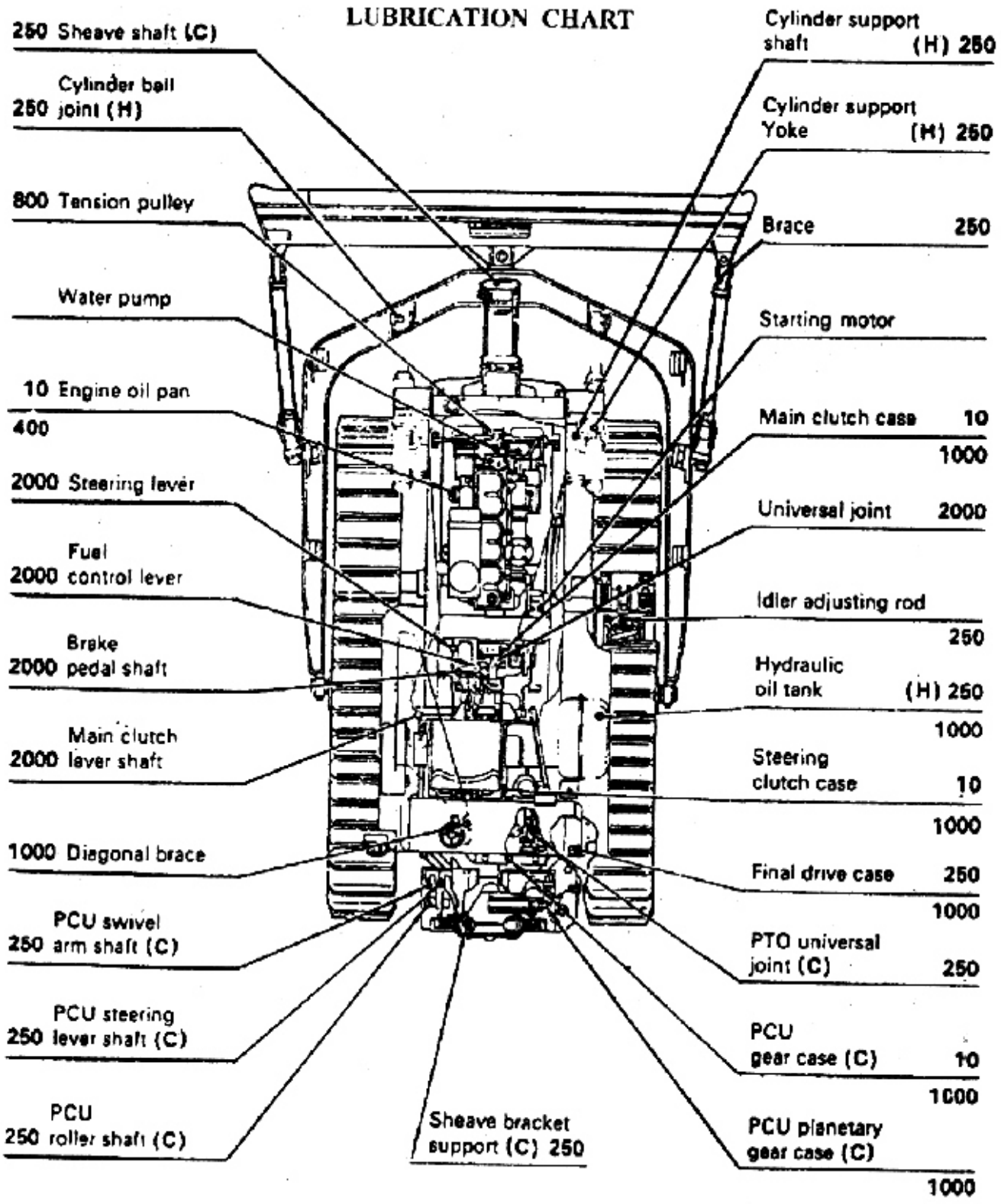
USE NOTHING BUT CLEAN, SOFT WATER OR, IF NECESSARY, A PERMANENT TYPE ANTI-FREEZE.

USE OF OIL LEVEL GAUGE

1. Always keep the oil level between "H" and "L" level marks provided on the level gauge, preferably upto "H" mark.
2. When checking the oil level, push the level gauge fully into the oil pan through the guide.
3. Check the oil level 30 minutes after the engine has been switched off or before starting the engine.

ENGINE ACCESSORY DRIVE V-BELTS

Where there are 2 or 3 loops, even if anyone of the 2 or 3 belts is damaged replace all the belts at time. Otherwise the old belts would slip and wear rapidly and new belts would be strained much. The belt tension should be kept as recommended. The belt slippage would cause engine over heat and decrease alternator out put.



NOTES:

a) Figure above a line indicates “oil or grease check and replenishment interwal.

b) Figure below a line indicates "oil change interval."

c) Abbreviations (C) ... Cable control type (H) ... Hydraulic control type.

LUBRICATION CHART

(A) BS6D125-1 Engine : As per Engine O&M Manual

Sl. No.	Lubrication point	No. of points and qty required	Service	Lubricant	Service Interval Hours				Remarks
					100 hrs	250 hrs	400 hrs	800 hrs	
1	Engine Crank Case	1 Point 34 litres	Check and correct oil level Change oil	EO EO		O			
2	Fan hub & tension pulley	2 points	Replenish with grease	G					

(B) TRACTOR AND DOZER ATTACHMENT

Sl No.	Lubrication point	No. of lubricating points and capacity	Service	Lubricant	Service Interval Hours				Remarks
					250 hrs	500 hrs	1000 hrs	2000 hrs	
1	Main clutch case	1 point 25 litres	Check and correct oil level Change oil	ET			O		
2	T/M case including steering clutch case	1 point 75 litres	Check and correct oil level Change oil	ET			O	O	
3	Final drive case (each 36 liters)	(2) points 72 litres	Check and correct oil level change oil	ET	O		O		
4	Recoil spring compartments (each 10 ltrs Note: If grease is used, replace after every six months)	2 points 20 liters 2 points	Check and correct oil level Replace grease	ET G	O		O		
5	Hydraulic Tank	(1) points 105 liters	Check and correct oil level Change oil	EH	O		O		
6	Universal joint	2 points	Grease	G				O	
7	Main clutch lever shaft	4 points	Gease	G				O	
8	Main clutch lever shaft	3 points	Grease	G				O	

9	Fuel control lever shaft	3 points	Grease	G				O	
10	Brake pedal shaft	3 points	Grease	G				O	
11	Diagonal brace	2 points	Grease	G			O		
12	Idler adjusting rod	2 points	Grease	G	O				
13	Hyd. Cylinder support yoke	4 points	Grease	G	O				
14	Hyd. Cylinder support shaft	4 points	Grease	G	O				
15	Cylinder ball joint	2 points	Grease	G	O				
16	Dozer, Brace	4 points	Grease	G	O				

CABLE CONTROL UNIT

17	RPCU reduction gear case	12.6 liters	Check and correct oil level Change oil	ET ET			O	
18	RPCU planetary gear case		Check and correct oil level change oil	ET ET			O	
19	RPCU swivel arm and roller shaft	8 points	Grease	G	O			
20	Sheave bracket support	6 points	Grease	G	O			
21	RPCU steering lever shaft	5 points	Grease	G	O			
22	P.T.O. Universal joint	2 points	Grease	G	O			
23	Sheave shaft	11 points	Grease	G	O			
24	Brace, side arm	4 points	Grease	G	O			

CHECK BEFORE STARTING

OPERATIONS	LUBRICANT
A. CHECK AND CORRECT OIL LEVEL OF THE FOLLOWING UNITS 1. Main clutch case 2. Steering clutch case (incl. transmission case) B. DRAIN WATER FROM FUEL TANK C. CHECK AND CORRECT FUEL LEVEL D. CHECK AND CORRECT COOLANT LEVEL E. CHECK FLOATING SEALS FOR ANY SIGN OF OIL LEAKAGE F. CHECK WIRING FOR DISCONTINUITY, SHORT CIRCUITING LOOSE TERMINALS, ETC. G. CHECK MOUNTING BOLTS AND NUTS FOR CONDITION	BEML MAIN CLUTCH OIL (ET30CD) BEML STEERING CLUTCH OIL (ET30CD)

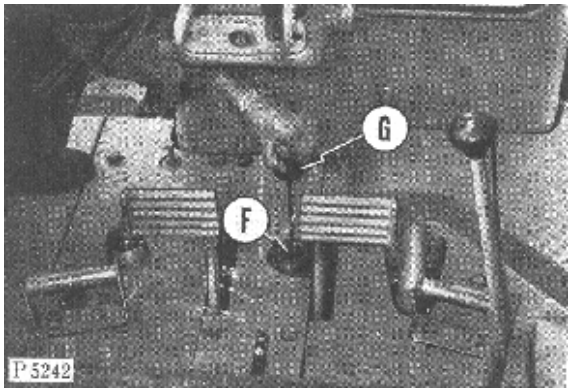
NOTE: Top up the fuel tank at the end of the day's run, to avoid condensation moisture in the air.

HOW TO SERVICE

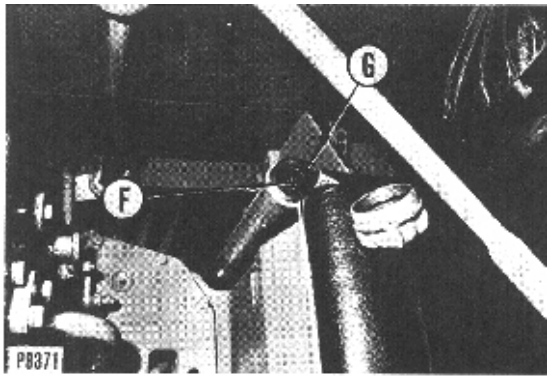
a. CHECK AND CORRECT OIL LEVEL OF THE FOLLOWING UNITS.

Use the oil level gauge (G) to check the oil level. Replenish oil, if necessary, through the oil filter (F) up to the proper level.

1. Main clutch case- BEML Engine oil

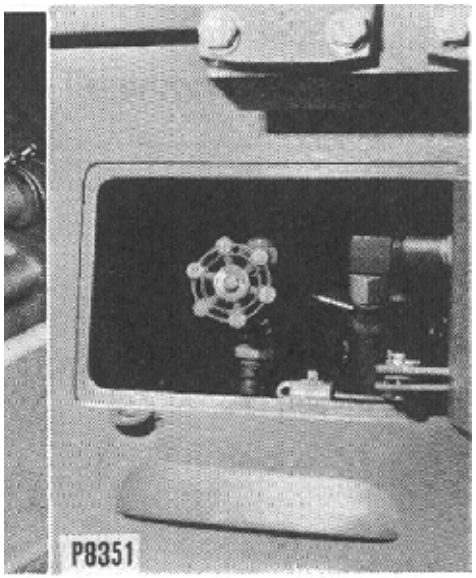


2. Steering clutch case (incl. transmission case) BEML Steering clutch oil.



b. DRAIN WATER FROM FUEL TANK

By opening each drain cock, drain any water and sediments which may have accumulated in the bottom 'Of the fuel tank and fuel filter housing at the beginning of the day's run.



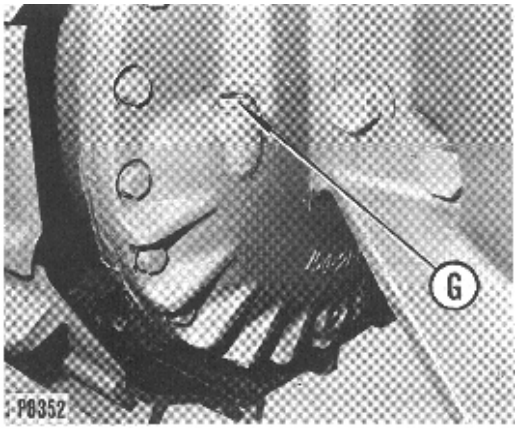
250-HOUR SERVICE DAILY)

OPERATIONS	LUBRICANT
A CHECK AND CORRECT OIL LEVEL OF THE FOLLOWING UNITS 1. final drive cases 2. Hydraulic tank	BEML Final Drive Oil (EnOCD) BEML Hydraulic Oil (EHI OCD)
B. LUBRICATE THE FOLLOWING PARTS WITH GREASE THROUGH EACH FITTING 1. Tension pulley 2. Idler adjusting rod 3. Cylinder support shaft 4. Cylinder support yoke 5. Cylinder ball joint 6. Brace	1 point 2 points 4 points 4 points 2 points 4 points
C. CHECK AND CORRECT ELECTROLYTE LEVEL IN BATTERIES	
D. CHECK AND ADJUST ALTERNATOR BELT TENSION	
E. CLEAN STRAINER ON THE BOTTOM OF THE FUEL TANK	
F. CHANGE STEERING CLUTCH OIL FILTER ELEMENT	
G. CHECK AND ADJUST TRACK TENSION 1. Check and tighten loose track shoe mounting bolts	

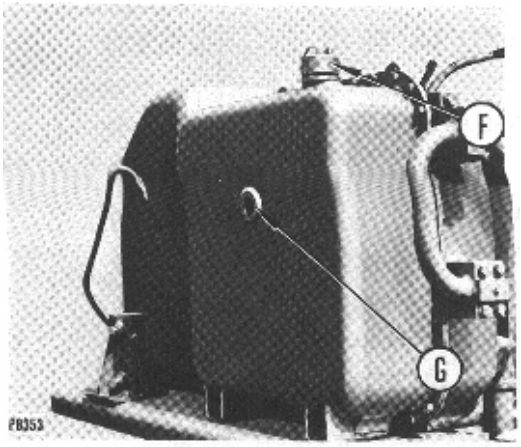
NOTE: Change the hydraulic filter element and oil In all the reservoirs after fit 250 hours of operation of a new machine.

HOW TO SERVICE

a. CHECK AND CORRECT OIL LEVELS OF THE FOLLOWING UNITS



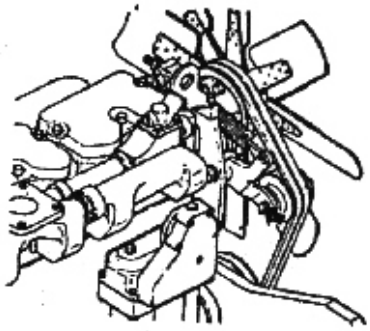
1) Final drive cases - Remove the plug (G). The oil level is correct when the oil is level with plug hole. Add oil if necessary. Be sure to check and correct in both cases.



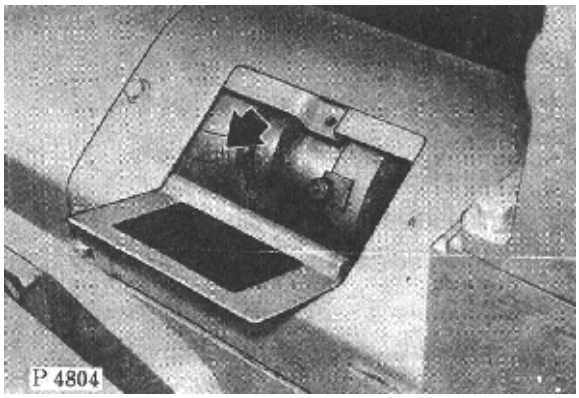
2. Hydraulic tank - Lower the blade to the ground. The oil level is correct when the oil is maintained between the H and L marks on the gauge (G) Add oil, if necessary, up to the level "H" through the filler (F).

b. LUBRICATE THE FOLLOWING PARTS WITH GREASE THROUGH EACH GREASE FITTING.

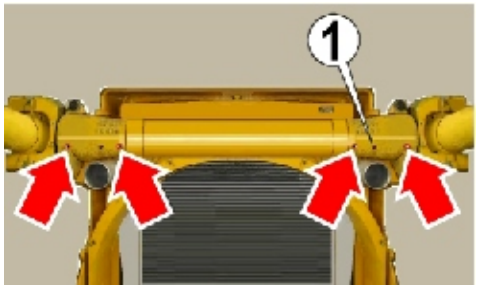
1. Tension pulley - 1 point



2. Idler adjusting rods - 1 point at each side

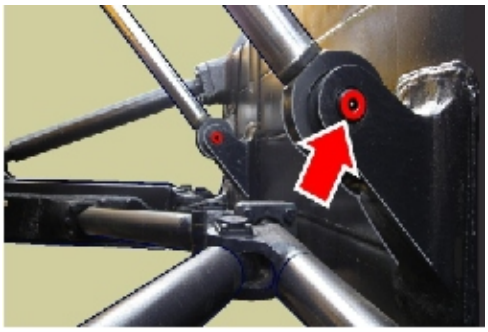


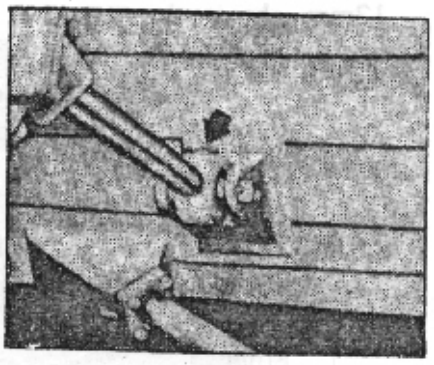
3. Cylinder support shaft (H) - 2 points at each side



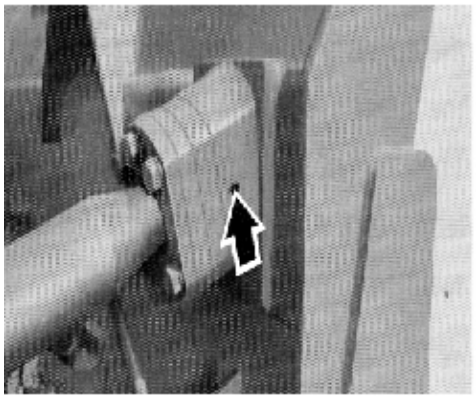
4. Cylinder support yoke (H) - 2 points at each side

5. Cylinder ball joint (H) - I point at each side.





6. Brace - 2 points at each side

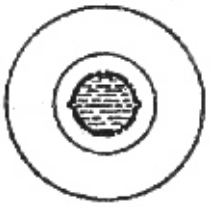


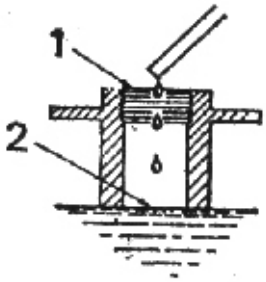
C. CHECK AND CORRECT ELECTROLYTE LEVEL IN BATTERIES

Maintain the electrolyte level at 10 mm to 12mm above the top of the plates by adding distilled water only. Should any of the acid be spilt, have it replenished by the nearest battery shop with acid of the correct specific gravity.

- Take care not to handle the acid by the use of a metallic funnel.

1. Filler
2. Electrolyte level





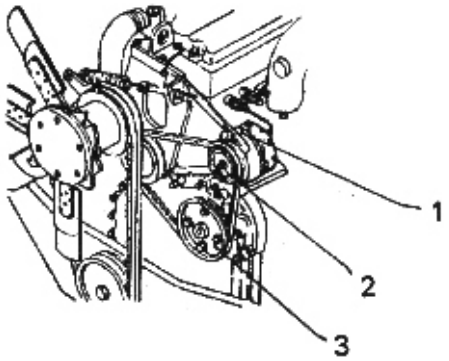
d. CHECK AND ADJUST ALTERNATOR BELT TENSION

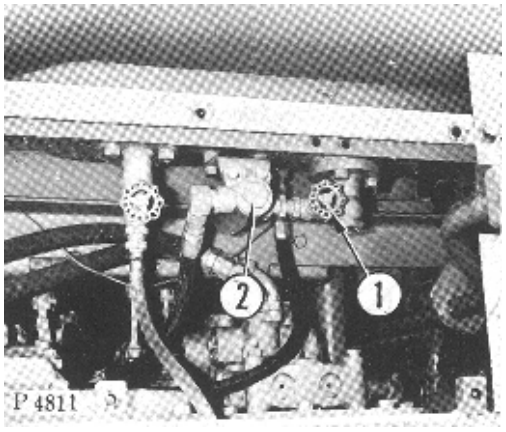
The belt tension is correct if the belt can be depressed approx. 10 mm (0.4 inch) midway between the drive pulley (3) and alternator pulley (2). To adjust, loosen the bolt (1) and move the alternator towards or away from the engine.

If belt shows elongation or defects, replace the belt. Readjust new belts after they have been operated for one hour.

e. CLEAN STRAINER ON TiIE BOTTOM OF THE FUEL TANK

Close the fuel shut off valve (1) and take off the cap (2). Then clean strainer thoroughly.



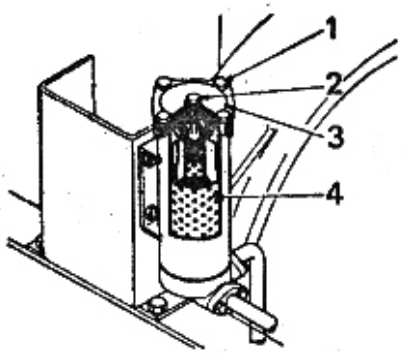


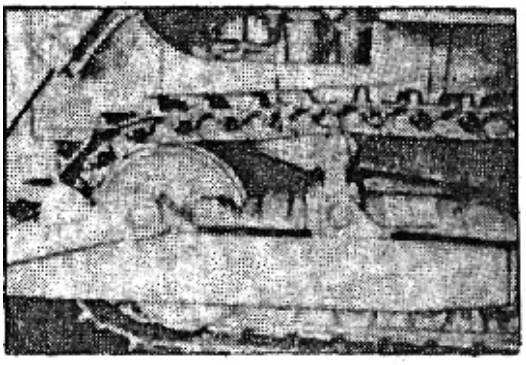
f. CHANGE STEERING CLUTCH OIL FILTER ELEMENT.

The oil filter is accessible by removing the floor board in front of the operator's seat. Remove the bo lts (I) securing the cover (3) in place, and detach the cover. Take the element (4) out of the filter housing. Thoroughly clean the parts, Install a new element in place securely. After completion of this replacement, Loosen the air vent bolt (2) and bleed air out of the filter housing with the engine running.

g. CHECK AND ADJUST TRACK TENSIONS.

Set the machine level. Place a straight edge on and along the track span between the front idler and roller as shown. Measure the clearance between the straight edge and the shoe grouser at the mid-part. The standard clearance ranges from 30 to 40 mm. (see the topic, "UNDERCARRIAGE" for adjustment).





500 HOUR SERVICING

OPERATIONS	LUBRICANT
A. CHECK AND CLEAN RADIATOR FIN **B. CHANGE COOLANT** **C. CLEAN STEERING CASE BREATHER**	

NOTE: Change the oil in final drive case every 500 hours when operating the machine in mud or in water.

HOW TO SERVICE

a. CHECK AND CLEAN RADIATOR FINS.

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

b. CHANGE COOLANT

While running the engine in idle speed open the drain cock located under the oil cooler. While draining off the system keep adding clean water at the filler until the cooling system is thoroughly flushed

NOTE: When changing the cooling water, be sure to keep the machine level.

1000-HOUR SERVICING

OPERATIONS	LUBRICANT
A. CHANGE OIL OF THE FOLLOWING UNITS	
1. Main clutch case	BEML MAIN CLUTCH OIL, 25 lit.
2. Steering clutch case (incl. transmission case)	BEML STEERING CLUTCH OIL, 75 lit.
3. Final drive cases.	BEML FINAL DRIVE OIL, 36 lit. each
4. Hydraulic tank	BEML HYDRAULIC OIL, 105 lit.
B. LUBRICATE THE FOLLOWING PART WITH GREASE THROUGH GREASE FIITING	
1. Diagonal brace	2 points
C. CHECK ALTERNATOR AND STARTING MOTOR FOR CONDITION	
D. CLEAN MAIN CLUTCH CASE OIL STRAINER	
E. CLEAN STEERING CLUTCH CASE OIL STRAINER	
F. CHANGE HYDRULIC FILTER ELEMENTS	
G. FLUSH COOLING SYSTEM	
H. CHECK UNDERCARRIAGE COMPONENTS FOR PROPER LUBRICATION	
I. CLEAN INSIDE OF FUEL TANK AND STRAINER	

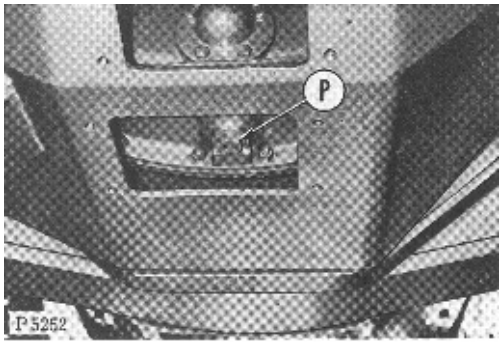
HOW TO SERVICE

a. CHANGE OIL OF THE FOLLOWING UNITS

Drain the oil by removing the drain plug (P). Replenish oil to the proper level through the oil filler (F).

1) Main clutch case - BEML MAIN CLUCTH OIL, 25 lit.

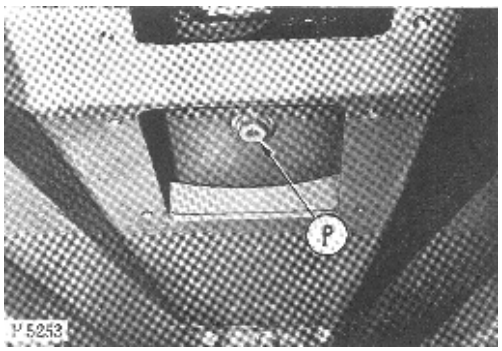
(See the CHECK BEFORE STARTING for the location of the filler).

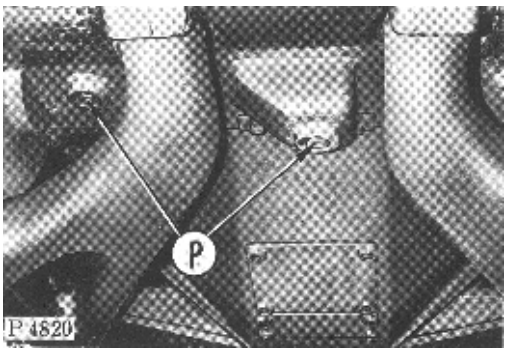


2) Steering clutch case (incl. transmission case) - BEML STEERING CLUTCH OIL, 75 lit.

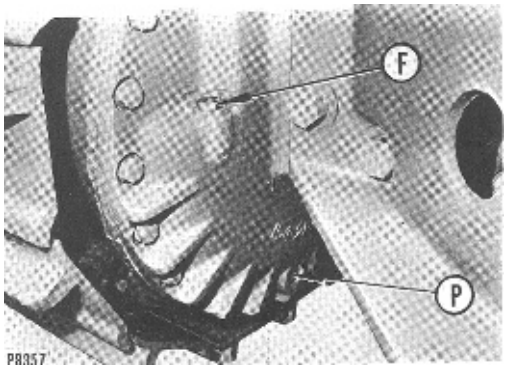
(See the CHECK BEFORE STARTING for the location of the fillers)

Change the oil after cleaning the strainer.



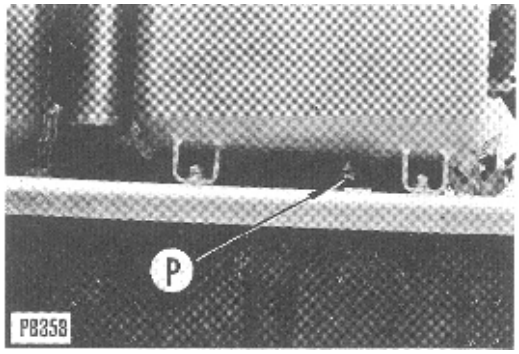


3). Final drive cases - BEML FINAL DRIVE OIL, 36 lit. each side

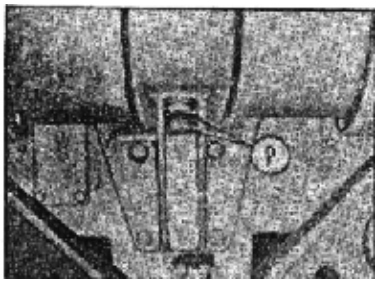


4). Hydraulic tank (H) - BEML HYDRAULIC OIL, 105 lit.

(See the "250 HOUR SERVICING" for the location of the oil filler)



5). P.C.U gear case(C) (See the “CHECK BEFORE STARTING” for the location of the filler)

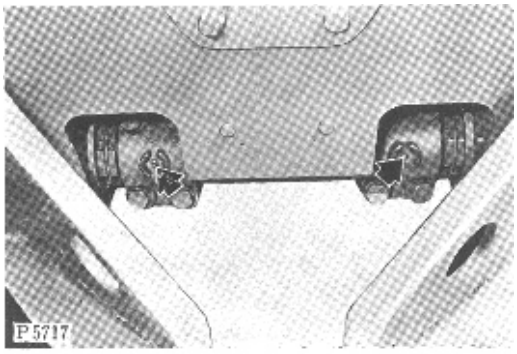


b. LUBRICATE THE FOLLOWING PART WITH GREASE THROUGH GREASE FITTING.

Diagonal brace - 2 points

C. CHECK ALTERNATOR AND STARTING MOTOR FOR CONDITION.

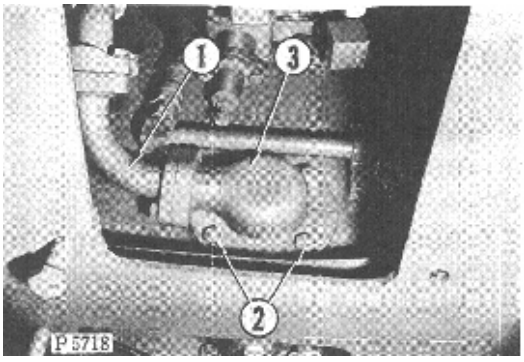
Around 1000 hours of operation, their brushes might have been worn out. Therefore, have been them repaired by a authorized service shop. Improper disassembling by an un experienced serviceman may deteriorate their drip proof characteristics.

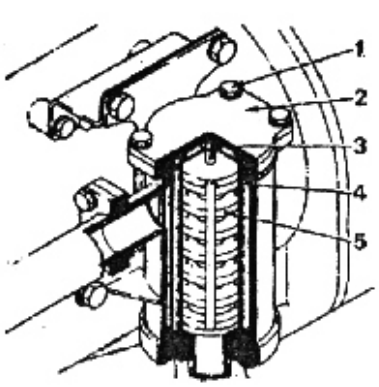


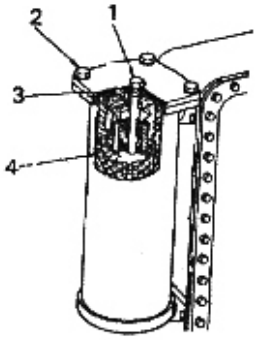
d. CLEAN MAIN CLUTCH OIL STRAINER.

Remove the guard cover located on the underside of the machine. Drain the case by removing the drain plug. Remove the strainer together with the cover (3) after disconnecting the bolts (2) attaching a pipe (1) to the cover. Thoroughly clean the inside of the case, plug and strainer. Check the strainer for condition and, if necessary, replace with a new one.

The cleaning of the strainer should be done simultaneously with oil change.







e. CLEAN STEERING CLUTCH OIL STRAINER

Remove the floor board on the left side of the machine. Thoroughly drain the case. Detach the cover (2) by backing off the bolts (I). Then take off the bolt (3). Now the strainer (4) and magnet (5) may be taken out of place. Wash clean the interior of the strainer, plugs and other parts in cleaning solvent. Check the strainer for condition and, if necessary, replace with a new one. This should be done simultaneously with oil change.

f. CHANGE HYDRAULIC FILTER ELEMENT (H)

Remove the bolts (2) securing the cover (3) in place, and detach the cover. Lift out the element (4). Thoroughly clean the inside of the filter housing and the parts, removed. Install a new element in place.

NOTE: Be sure to bleed air out of the hydraulic filter by removing the air vent plug (I), with the engine running.

g). FLUSH COOLING SYSTEM

Thoroughly drain the cooling system. (See the "500 HOUR SERVICING" for details). Pour the aqueous solution of radiator cleaner available into the radiator, and clean the interior of the radiator according to the instructions. Then, replace the solution with fresh water, and run the engine four to five minutes while adding water from the filler and draining the circulated water by opening the drain cock.

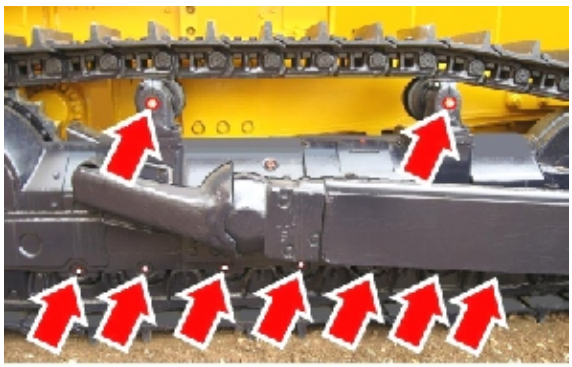
NOTE:

1. At the same time, be sure to renew the corrosion resistor element.
2. The radiator cleaner should be thoroughly drained out. Otherwise, this will result in the fast corrosion of the plate.

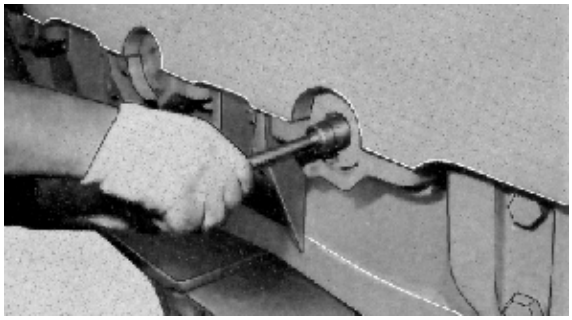
h). CHECK UNDERCARIAGE COMPONENTS FOR PROPER LUBRICATION.

Stop the machine on a flat land, and check the oil level of track roller, carrier roller, and idler (gear oil GO140) according to the following procedure.

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



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

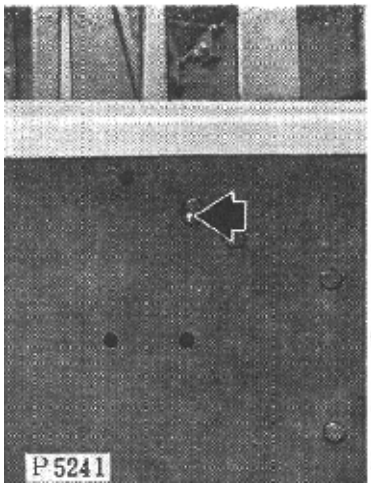


2000 HOUR SERVICING OPERATIONS

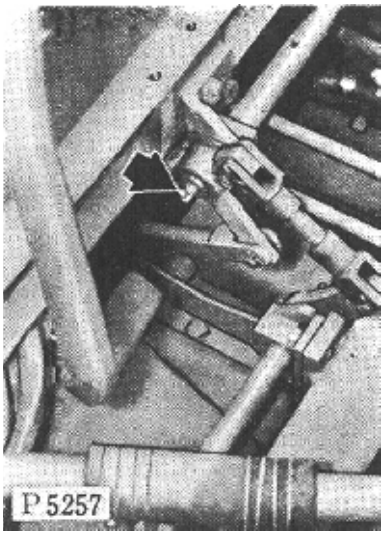
OPERATIONS	REMARKS
a. Lubricate the following parts with grease through each grease fitting:	
1. Main clutch lever	4 Points
2. Brake pedal shaft	3 Points
3. Steering clutch lever shaft	3 Points
4. Fuel control lever shaft	3 Points
5. Universal joint	2 Points

HOW TO SERVICE

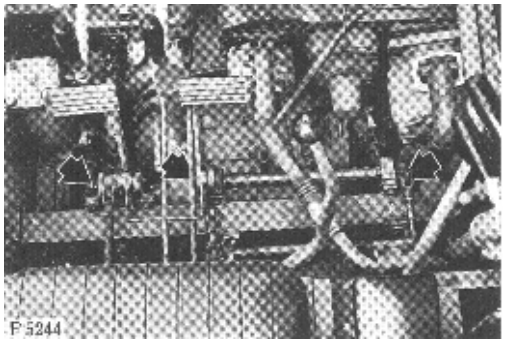
a. LUBRICATE THE FOLLOWING PARTS WITH GREASE THROUGH EACH GREASE FITTINGS



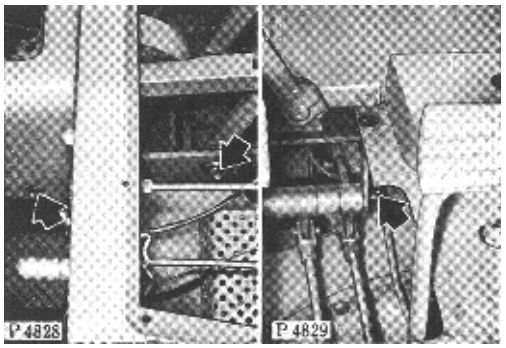
1. Main clutch lever – 4 Points



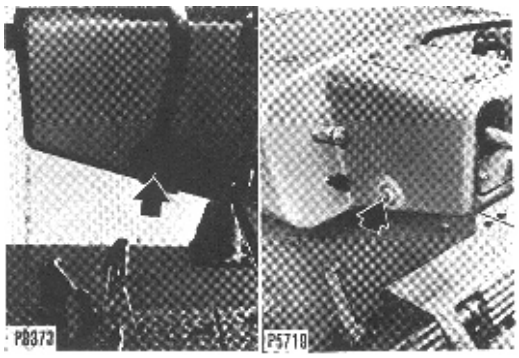
2. Brake pedal shaft – 3 Points



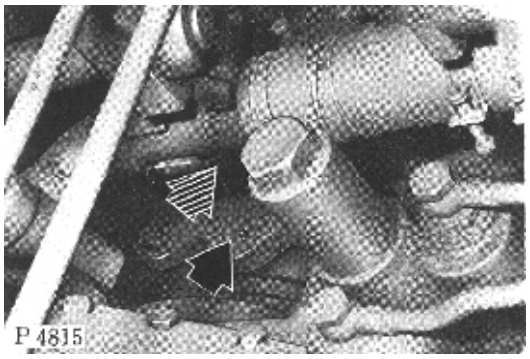
3. Steering clutch lever shaft – 3 Points.



4. Fuel control lever shaft – 3 Points



5. Universal joint – 2 Points



FUNCTIONS AND ADJUSTMENTS

TROUBLE SHOOTING GUIDE

Trouble and failures which may 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

TROUBLE	PROBABLE CAUSE	REMEDY
Oil pressure gauge pointer will not return to zero "0" when the engine is shut down.	❊ Defective oil pressure gauge	❊ Renew
Oil pressure gauge pointer fluctuates abnormally	❊ Insufficient oil in oil pan	❊ Add oil
Oil pressure gauge indicates low pressure	❊ Insufticient oil in oil pan ❊ Loose piping points or connections ❊ Oil leakage due to damaged piping ❊ Defective oil pressure gauge ❊ Defective oil pressure regulating valve ❊ Defective oil pump clogged oil pan strainer, etc.	❊ Add oil ❊ Check and correct ❊ Check and repair ❊ Renew ❊ Refer engine service manual ❊ Renew ❊ Refer engine service manual.
Oil pressure gauge indicates high pressure	❊ Use of improper oil ❊ Defective oil pressure gauge ❊ Defective oil pressure regulating valve	❊ Use oil of proper viscosity ❊ Renew ❊ Refer engine service manual
Steam spurts out through pressure valve on the radiator. Water temperature gauge indicates high temperature i.e., above 90°C	❊ Insufficient coolant or coolant leakage. ❊ Loose fan belt ❊ Accumulated dust or scales formation in the cooling system ❊ Clogged radiator fins or fins out of order ❊ Defective water temperature gauge * Defective thermostat ❊ Loose radiator filler cap (When operating at high altitude)	❊ Check and correct ❊ Check and adjust ❊ Change coolant and flush cooling system ❊ Clean or repair ❊ Renew ❊ Tighten or renew packing as necessary
Water temperature gauge indicates low temperature i.e. below 75°C	❊ Defective thermostat ❊ Defective water temperature gauge ❊ Over cooled engine	❊ Renew ❊ Renew ❊ Install radiator mask and suction fan

NOTE:

For troubles on engine, please also refer to engine "Operation and Maintenance" Manual.

Engine fails to start	✻ Insufficient fuel in fuel tank ✻ Air in fuel line ✻ Defective FI pump or Injector ✻ Insufficient torque of starting motor to crank engine ✻ Poor compression due to : ✻✻ Valve clearance out of adjustment ✻✻ Valve leaking ** Sticky piston ring ✻✻ Worn piston ring or cylinder	✻ Add fuel ✻ Bleed air out of fuel system ✻ Refer engine service manual ✻ See "Electrical System" trouble shooting ✻ Refer Engine (Service Manual)
Engine emits white or blue-white exhaust gas	✻ Exhaust oil in pan ✻ Use of improper fuel ✻ Sticky piston ring ✻ Worn piston ring or cylinder ✻ Poor compression	✻ Drain excess oil ✻ Use fuel of proper rating ✻ (Refer Engine Service Manual)
Engine emits black exhaust smoke	✻ Clogged air cleaner elements ✻ Injection timing out of adjustment	✻ Clean or renew as necessary ✻ (Refer engine service manual)
Engine runs but operates erratically	✻ Defective injectors ✻ Air leakage In fuel line (intake side)	✻ (Refer engine service manual) ✻ check and correct
Engine issues abnormal noise	✻ Use of improper fuel ✻ Overheat ✻ Internal breakage of muffler ✻ Excess valve clearance ✻ Worn main bearing or connecting rod bearing ✻ Defective water pump or fan shaft ball bearing	✻ Change to proper fuel ✻ See the instruction under "Water temperature gauge indicates high temperature." ✻ Renew ✻ Refer Engine Service Manual
Engine lacks power	* Check and locate the cause of trouble	* Refer Engine Service Manual
Timing gears charter	* Worn gears or loose key	* Refer Engine Service Manual
Engine over speeds	* Governor out of adjustment	* Refer Engine Service Manual
Fuel supply IS frequently stopped	* Clogged vent on a cap of tank. Clogged breather on Float Tank	* Check and clean

ELECTRICAL SYSTEM

Ammeter pointer fluctuates considerably as the engine is running at constant speed Lamps dim as the engine is running at high speed	* Faulty wiring * Defective Alternator	* Check and repair or tighten loose terminals, if any. * Check and repair or replace if necessary
Lamp wiggle		
Ammeter pointer will not deflect at all as the engine runs normally	* Defective ammeter * Faulty wiring * Defective alternator	* Renew * Check and repair * Check and repair or replace if necessary
Lamp light up abnormally or go out soon Battery electrolyte will spurt out	* **Defective Alternator**	* Check and repair or replace if necessary
Alternator Issues abnormal noise	* Defective alternator	* Check and repair
Starting motor will not crank the engine as the starting switch is turned to START.	* Faulty wiring * Defective starting switch * Battery not fully charged * Defective starting motor	* Check and repair * Renew * Re-charge * Check and repair
Starting motor rotates at full speed before the' pinion is engaged property	* Defective solenoid switch	* Check and repair or replace if necessary
Starting motor will not stop as the starting switch is turned off	* Faulty wiring.	* Check and repair
Pinion issues contacting noise as the starting switch is turned to START inadvertently with the engine running	* Defective starter or safety relay	* Consult BEML Limited.
Starting motor will rotate as the starting switch is turned to START inadvertently with the engine running.	* Defective safety relay or starter	* Consult BEML limited.
Starting motor will not crank the engine instantly	* Faulty wiring * Battery not fully charged * Defective starting motor	* Check and repair * Re-charge * Consult BEML Limited for service
Staeting motor disengages before cranking the engine.	* Faulty wiring. * Battery not fully charged. * Defective solenoid switch.	* Check and repair. * Re-charge. * Consult BEML Limited for service.
Starting motor fails to disengage property after cranking the engine.	* Defective solenoid switch.	* Consult BEML Limited for service.

CHASSIS

Main clutch slips.	* Clutch out of adjustment. * Worn clutch lining. * Insufficient clutch pressure.	* Adjust. * Consult BEML Limited for service.
Main clutch rattles as the gears are meshed in.	* Too high a viscosity of oil. * Adjusting ring out of adjustment. * Malfunctioning of inertia brake. * Distorted plate or disc.	* Use oil of correct grade. * Adjust. * Adjust. * Consult BEML Limited for service.
Main clutch lever drags.	* Burnt ring bushings. * Malfunctioning booster due to: ** Insufficient oil in main clutch case. ** Oil leaks due to defective piping. ** Defective gear pump.	* Replenish oil. * Replenish oil. * Consult BEML Limited for service.
Gears will not mesh in.	* Inertia brake out or adjustment.	* Adjust.
Transmission issues abnormal noise. (rattles).	* Insufficient oil In transmission case. * Damaged gear bearing. worn gear or shaft spline:	* Add up to oil level. * Consult BEML Limited for service.
Machine will stop or engine RPM varies as either steering clutch lever is pulled.	* Starting clutch not disengaged properly due to damaged or distorted lining. * Slippery steering clutch on the other side.	* Consult BEML Limited for service. * Follow the instruction under "slippery steering clutch" above.
Machine moves forward as either steering clutch lever is pulled and brake. pedal depressed.	* Steering clutch not disengaged properly. * Malfunctioning of clutch brake.	* See the instruction above. * Adjust.
Steering clutch lever drags.	* Defective steering booster.	* Consult BEML Limited for service.
Machine will not stop as the brake pedals are depressed.	* Defective brake. * Excessively worn brake lining.	* Adjust * Consult BEML Limited for service.
Oil leaks at drive sprocket.	* Worn or damaged seal ring.	* Consult BEML Limited for service.
Track runs out of place.	* Loose track tension. * Damaged track roller flange.	* Adjust track tension. * Consult BEML Limited for service.
Sprocket will be worn excessively.	* Loose track tension.	* Adjust.
Oil leaks from idlers, carrier rollers and track rollers.	* Worn or damaged seal rings.	* Consult BEML Limited for service.

Proper track tension adjustment will not be effected.		* Rusty idler adjusting rod.	* Consult BEML Limited for service.
Hydraulic type dozer equipment.	Blade will rise slowly or not rise at all.	* Insufficient oil in hydraulic tank. * Defective or damaged safety valve gear pump or piston gasket. * Worn or damaged control valve.	* Add oil. * Consult BEML Limited for service.
	Blade lowers quickly by its own weight.	* Defective control valve. * Damaged cylinder. * Worn or damaged piston gasket.	* Consult BEML Limited for service.
	Oil leaks at piston rod.	* Worn or damaged piston gasket.	* Consult BEML Limited for service.

ELECTRICAL SYSTEM

DESCRIPTION

The electrical system consists of all alternator internally rectified, used in conjunction with a voltage regulator, starting motor and 12V batteries with front and rear lights.

GENERAL INSTRUCTIONS:

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

1. Inspect the wiring for condition. The wiring should show no indication of chating, sharp bends, kinks, or other damage.
2. Before replacing any electrical component or repairing the cables, be sure to pull out the starting switch key to ensure safety. Disconnect "Earth Cable". A wrench or any tool should not be put on the battery.
3. Cables, when disconnected at terminals, should be identified with marks for their locations, so that they may be put back to their original positions and in the same condition as before.

ALTERNATOR

The alternator is a charging generator different in function and construction from the D.C generator which uses the rotary armature coil placed inside the field coil and commutator and bush assembly for taking out D.C Electromotive force.

In the alternator the rotary field coil is placed inside the fixed armature. A.C e.m.f. developed in the armature coil is rectified by the diode rectifier into D.C voltage, so that D.C voltage is supplied to the charging circuit.

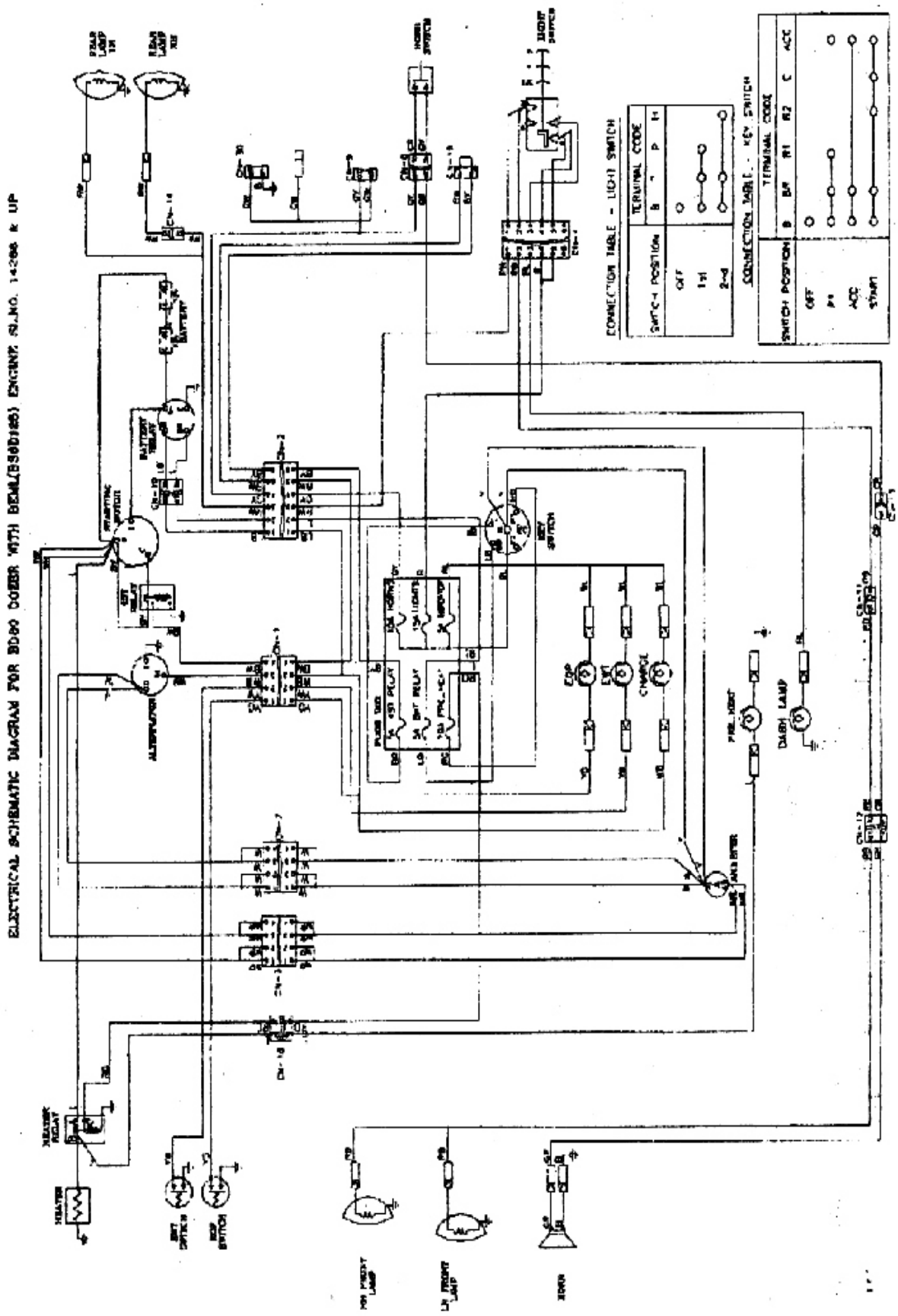
The alternators with a built in regulator have lately become usable in addition to the conventional alternator which use the separate regulator.

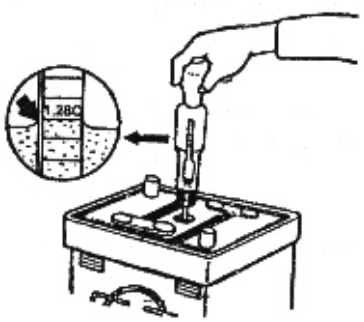
FEATURES OF BUILT-IN REGULATOR ALTERNATOR:

1. High charging performance at Low engine speeds.
2. Light in weight.
3. No wiring is required between the regulator and alternator.
4. No jamming is caused.

PRECAUTION

1. Never test alternator/regulator with the engine running.
2. It is always preferable to test the units off the vehicle.
3. As a rule always disconnect the negative terminal of the battery before commencing any work.
4. Keep the regulator housing clean to ensure that cooling air can freely pass over it.


ELECTRICAL SCHEMATIC DIAGRAM FOR BD80 DOZER WITH BEML/BS6D185 ENGINE S/NO. 14266 & UP
CONNECTION TABLE - LIGHT SWITCH
TERMINAL CODE
SWITCH POSITION
OFF
1-H
2-H
CONNECTION TABLE - KEY SWITCH
TERMINAL CODE
SWITCH POSITION
OFF
ACC
START



The S.G chart above serves as a general reference in determining the state of charge. However, the recommendations of Battery Manufacturers should be followed. UNDER NO CIRCUMSTANCES, SHOULD THE BATTERY BE USED BELOW 70% CHARGED CONDITION.

Atmospheric Temperature

Charge Rate	0°F (-32°C)	32°F (0°C)	80°F (27°C)
100%	1.260	1.260	1.280
75%	1.230	1.230	1.250
50%	1.200	1.200	1.200
25%	1.170	1.170	1.190
Discharge	1.110	1.110	1.130

Battery term inals 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 connection should be kept free of water and dirt. Before placing the batteries in storage, raise the level of electrolyte a little above the normal level and charge it fully. Select a dry and cool place to keep the batteries in.

CAUTION:

A ll service work off alternator, starting motor, and regulator should be performed by an a competent person.

PRECAUTIONS TO BE OBSERVED

1). Battery positive to be earthed. Positive and negative MUST NEVER be interrchanged. Otherwise the rectifier diodes in the alternator will be damaged.

2). The Alternator and regulator MUST be earthed individually. This is very essential in the case of the Regulator, where omission of earthing cable will result in failure of the Regulator.

3). DO NOT run the Alternator without connecting the battery. In case there is a necessary for the Alternator, Engine to run

without a battery, it should be ensured that the Alternator connection wires are completely removed, otherwise, there is a likelihood of the Alternator rectifiers getting damaged.

4). DO NOT flash the wires into the Alternator to check whether it is functioning or not. This will result in punctured diodes.

5. The alternator should always be used with the fan fitted in position.

6. The alternator is designed for clockwise rotation, looking from the front, i.e., the pulley side. The alternator SHOULD NOT be run in the reverse rotation.

STARTING CIRCUIT

When the key is turned to START position (R2 terminals), current from the battery energizes the solenoid switch, which causes the armature to rotate slowly and simultaneously moves the armature with pinion towards fly-wheel to engage with the ring gear. Then the second stage contacts are closed and the motor starts cranking the engine. The pinion will disengage, when the starting key is released after starting the engine. The starting switch should not be used for more than 15 second at a time.

STARTING MOTOR :

The starter is an engine accessory for torquing the crankshaft and accelerates it from stand- still to a certain speed level at which the engine can fire to start running by itself It also consists of a solenoid switch, clutch and pinion.

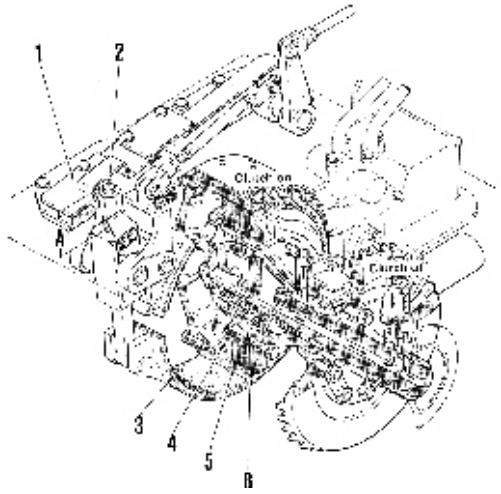
The following points should be observed while using the starter.

1. Turn the key to START and hold it firmly and release it immediately when the engine fires.

2. Do not crank the engine more than 30 seconds at a time. Wait for some time before making second attempt.

3. Do not try to put the key to START when the engine is running.

MAIN CLUTCH



1. Adjusting ring
2. Lock plate
3. Lock plate
4. Brake lever
5. Set bolt
6. Adjusting screw
7. Clutch shaft
8. Disc
9. Pressure plate
10. Flywheel cover
11. Release yoke
12. Brake lining
13. Brake drum

The main clutch is a multi disc over centre wet type and is secured to the engine flywheel and housed in the main clutch casing bolted to the fly wheel casing. The oil in the main clutch case is delivered under pressure by the gear pump to the clutch linings to prevent them from overheating at the time of clutch operation, and to the hydraulic booster for smooth operation of the clutch lever, and to the various parts which require lubrication in the system.

An hydraulic booster is provided on the clutch to minimize the effort required at the clutch control lever. The booster is mounted on the upper part of the clutch casing.

It is also fitted with an inertia brake, which stops the main clutch shaft on disengagement of the clutch.

NOTE:

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

Insufficient oil in the case, or use of an oil of poor quality will result in rapid wear of the lining, gear grating and other similar troubles in the system.

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

CLUTCH ADJUSTMENT

Correct adjustment of the clutch may be judged by the following manner:

Let the engine run at full speed. Place the gearshift lever into 5th speed position, and depress full the brake pedals. Then, pull the main clutch lever all the way to engage the clutch, and the engine will be forced to stop. In this case, the clutch adjustment is correct if the engine is stopped within two seconds.

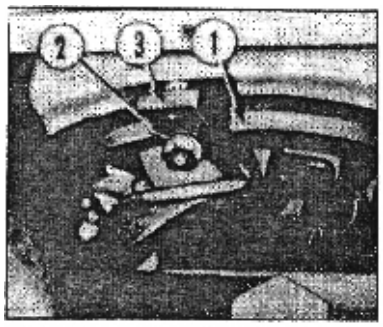
When the slippery main clutch is noticed adjustment should be made as follows:

Remove the inspection cover. Turn the flywheel until the lock nut (2) comes up. Loosen the lock nuts (2 places, at 180°C apart) securing the lock plate (3) in place.

Using a wrench on the weight ring, turn the adjusting ring (1) in either direction until correct adjustment is obtained.

Check the clutch lever operating force and adjust if necessary. The operating force should be 40 to 50 kgs. as measured at the lever tip.

After adjustment, tighten nuts and install the inspection cover in place to housing.



INERTIA BRAKE

Where the clutch shaft is still rotating due to inertia even with the clutch disengaged, the gear shifting is difficult. In this case, push the lever all the way forward to apply the braking force to the clutch shaft.

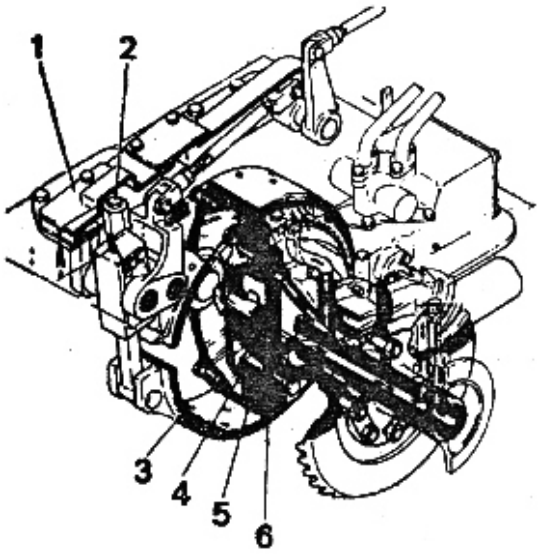
When the main clutch lever is pushed all the way forward the clutch shaft should stop rotating within three seconds. This adjustments should be effected after the engine reaches the operating temperature. To adjust, proceed as follows:

Push the main clutch lever forward to de-clutch. Loosen the lock nut and turn in the adjusting screw (6) until the lining (12) comes into contact with the brake drum (13). From the position, back the screw away 1.2 rotation and lock nut securely.

NOTE:

If the brake lining is worn down beyond its limit of 2.3 mm replace with a new one.

STEERING SYSTEM



1. Cover
2. Adjusting screw
3. Brake lining
4. Pressure plate
5. Brake drum
6. Lining

The steering system consists of two steering clutch assemblies, one at each end of cross shaft. They are identical in all respects. Each clutch assembly is a combination of drum type brake and multi disc wet type clutch.

Steering of the machine is accomplished by pulling back the steering lever on the side to which turn is desired. To make a sharp turn, it is necessary to apply the brake pedal on the same side by pressing it down all the way the steering lever pulled fully.

The steering clutch case is filled with engine oil to the proper level, since the clutch is of wet type design.

A steering control valve incorporated in the steering system is used for the smooth operation of the steering clutch levers.

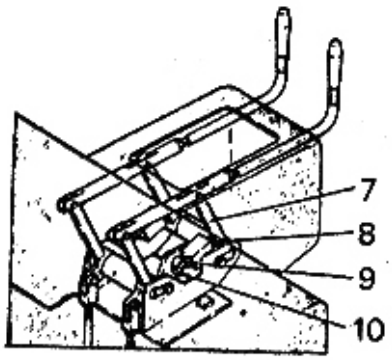
Once adjusted at the factory during assembly, It requires no adjustment thereafter.

1. Use BEML Steering clutch oil. Take care, when filling the case, not to allow entry of foreign particles into the case.

2. Service the oil filter and strainers periodically.

STEERING CLUTCH

The steering clutches are actuated (disengaged) hydraulically and require no adjustment.



STEERING LEVER ADJUSTMENT

Steering clutch lever stroke should be anywhere between 125 mm and 130 mm at the top of the steering clutch lever. When it becomes necessary to adjust stroke of the levers, proceed as fo llows;

Pull one of the levers slowly toward the operator's seat until resistance is felt at the lever grip. Holding it there, loosen the lock Nut (9), turn in the adjusting bolt (10) until the stopper (8) touches the lever (7) and, from that position, turn in the bolt (10) another one complete rotation. Then, tighten the lock nut.

Even after the adjustment, if pulling either lever will not make the tractor to turn or cause it to stop, lining wear or damage has occurred. Consult BEML Limited for repair.

STEERING CLUTCH BRAKE

The steering brake is of externally contracting band type. If the brake lining is worn excessively, the pedal stroke will increase. In this case, adjustment should be made to maintain clearance between the drum and the band. The standard stroke of a steering brake pedal ranges from 90 to 130 mm at the top of the brake pedal.

ADJUSTMENT

Open the cover located on the rear side of the machine. Remove the cover (I) and screw in the adjusting bolt (2) until the lining touches the drum. (Their contact is ascertained by depressing down the pedal). Then, turn out the bolt about 1.5 to 2 rotations to obtain the correct clearance between the brake lining and the drum.

After adjustment, the height "A" shown in the figure shall be between 89 to 68 mm. If it reduces to less than 68mm, consult BEML Limited for service.

UNDERCARRIAGE

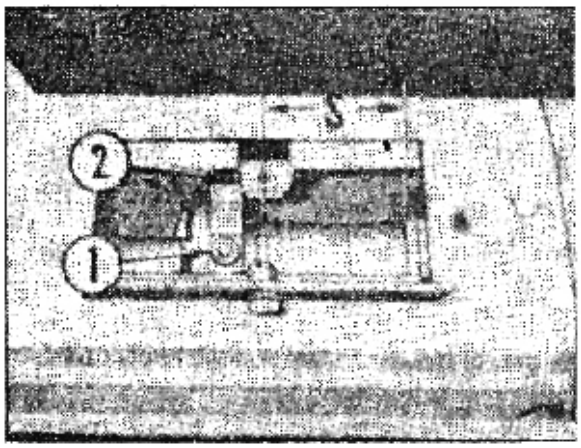
DESCRIPTION

Each main frame of under carriage consists of a track chain, sprocket wheel, idler, carrier and track roller mounted on track frame. The track chain which is an endless one linked with grousered track plates also called shoes.

The track frame with its track roller riding on the chain is kept in its proper al ignmcnt by guide. The carrier rollers support the upper span of the track and idler wheel keeps the chain in proper tension and by its recoil spring absorbs shock due to obstacles encountered during operation.

Track tension is adjusted properly by moving the front idlers in the fore-and aft-direction as necessary. The track chains must always be in properly tensioned. Too tight a track chain may cause undue wear of track links, pins, and bushings. Too loose a track chain would cause the track chain to run outside of alignment when a turn is made, and also, result in an increased rolling resistance. If the two track chains are unequally tensioned, the machine will tend to pull to the side of loose track chain.

ADJUSTING TRACK TENSION



To increase the track tension, remove the cover located beneath the front carrier roller and charge with grease through the grease fitting (I) into the grease cylinder with a grease gun. To reduce the track tension, loosen the plug (2) by one revolution, and grease will come out of the port.

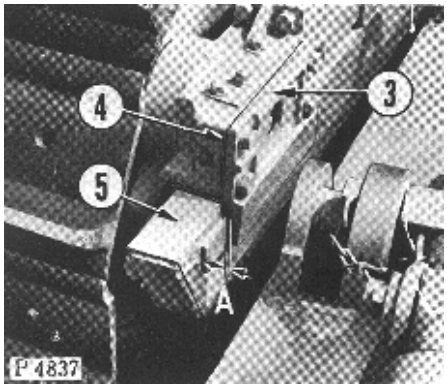
In the course of operation over long period, the track pins and bushings gradually wear off, causing the tracks to be stretched out. When the distance "S" as shown, is measured larger than 215 mm consult BEML Limited for service.

CAUTION:

NEVER TURN THE PLUG (2) OUT MORE THAN ONE REVOLUTION.

When grease is not sufficiently be drained out in reducing the track tension, move the machine a little back and forth with engine running to allow grease to come out steadily.

FRONT IDLER ADJUSTMENT



The front idler is used to support guide the track chain and to maintain the proper track tension. It is carried by a yoke designed to allow the idler assembly to traverse back and forth on the track roller frame. The guide pawl (3) prevents the idler from slipping out of the track frame. As wear occurs on the guide pawl, the idler comes out of alignment or track chain tends to run side ways. Check the guide pawl now and, then for wear and if necessary, adjust as follows:

Place the tractor on a level surface. Check the clearance (A) between the track frame (5) and guide pawl (3) inner and outer points, both sides) to see if it is 1 mm at each point. If any point should be in excess of 4 mm, remove shims (4) until correct adjustment is made. Under no circumstances, should the clearance be less than 0.6 mm. each shim is 1 mm in thickness.

SHOE BOLTS

These heat treated shoe bolts are of extra ordinary strength to withstand shocks and strain they receive during the machine operation. Check these bolts now and then for tightness and if, found loose, tighten securely.

FLOATING SEALS

The sliding contact of the roller, idler and sprockets bores and their shaft is lubricated with engine oil hermetically contained by the floating seals. Therefore, these parts need not be re-lubricated until overhaul for reconditioning.

However visual inspection of these parts for oil tightness of floating seals, is included as part of the daily care and should be strictly carried out. If any of these parts are found with oil leaks, consult BEML Limited for service.

HYDRAULIC SYSTEM

1. Hydraulic Filter
2. Control valve
3. Hydraulic oil tank
4. Gear Pump
5. Hydraulic oil cylinder

A) Blade lower
B) Blade raise

DESCRIPTION

The hydraulic system is the means of making hydraulic power available for hydraulic cylinder for operation of the blade, ripper, etc., The major components of hydraulic system are hydraulic oil tank located in the right side of the operator's seat and containing the control valve assembly; the gear pump mounted on the fly wheel housing and driven by the power take-off; the hydraulic cylinders to which "C" frame and blade are attached, filters; oil piping control levers, etc.,

Hydraulic oil in the oil tank is drawn by the gear pump and supplied to the control valve within the oil tank. A relief valve is provided in this circuit for limiting the line pressure to the specified level.

OPERATION:

The blade is placed in the RAISE, LOWER, HOLD and FLOAT positions by the movement of the control valve located in the hydraulic tank.

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 piston wi ll extend to allow the blade to be lowered.

In the HOLD position, blade will be held in its appl ied position.

If the control valve is moved to the FLOAT position, the blade will be moved freely by external force.

Too lowa 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. The recommended Max. pressure is 140 kg/cm^2.

NOTE:

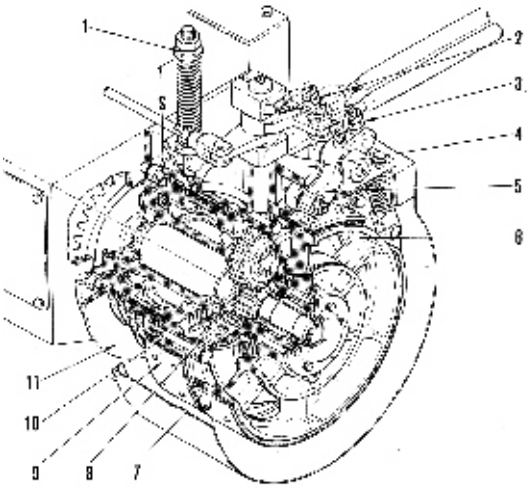
I). ALL SERVICE WORKS ON THE HYDRAULIC SYSTEM SHOULD BE PERFORMED BY THE BEML Limited.

2). Use a proper grade of oil.

3). 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 the tank.

4). When the 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,. Besides, bleed air out of the hydraulic filter element (refer to the "1000 HOUR SERVICE OPERATIONS" for air bleeding the oil filter.

REAR MOUNTED POWER CONTROL UNIT



1. Adjusting nut
2. Brake adjusting nut
3. Clutch adjusting nut
4. Roller cam
5. Swivel arm
6. Clutch drum
7. Clutch band
8. Planetary gear
9. Brake band
10. Brake drum
11. Cable drum

The power control unit is primarily to control cables for the operation of the blade.

Engine power is transmitted from the engine crankshaft to the drive shaft of the power control unit through universal joint, and is further transmitted to the drum shaft through the reduction gearing. Thus, deceleration is accomplished through the planetary gear system, which rotates the cable drum.

If the R.P.C.U. control lever is pulled to "RAISE" position, the clutch drum is pressed by the clutch band, while the brake drum is released from the brake band. Thus the brake drum will continue to rotate, and the cable will be reeled on the drum, causing the blade to rise.

If the blade control lever is pushed to "LOWER" position, the clutch band is released from the clutch drum, where the brake is OFF. Thus, the cable will be payed out from the drum under the weight of the blade.

If the lever is in "HOLD" position, the clutch band will be released from the clutch drum, while the brake drum will be pressed by the band. Thus, the brake drum remains stationary.

If the lever is pushed to "FLOAT" position, both the brake and clutch drums are released from the band. Thus, the clutch drum rotates freely by external force, making the blade move freely.

CLUTCH ADJUSTMENT

Effective lever stroke (excl. lever play) is approx. 150 to 170 mm as measured at the lever grip, when the length of the control lever is 1 m. As wear increases on the clutch lining, the clutch will not function properly. To adjust, loosen the locknut and turn in or out the adjusting nut (3) until correct lever stroke is obtained. Tighten the locknut securely.

BRAKE ADJUSTMENT

Normally, the brake drum is brought to a halt by the brake spring pressure. The standard lever play is 45 to 85 mm as measured at the lever grip, when the length of the lever is 1 m. Too much a play will elongate the spring reducing braking effect.

To adjust, loosen the lock nut and turn in or out the adjusting nut (2) until the correct lever stroke is obtained. Then, adjust the installed length "S" of the spring to 178 mm.

CAUTION

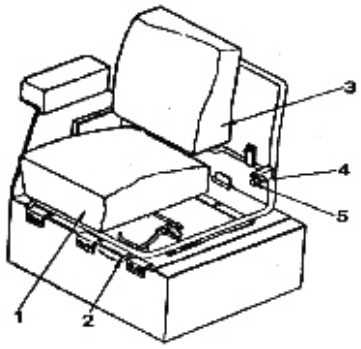
When it becomes necessary to adjust the P.C.U., be sure to rest the blade on the ground and shut down the engine. Particularly in a sandy place, the blade on the ground may sink into the ground, should the cable be slackened.

BLADE CONTROL LEVER ADJUSTMENT

The lever boss and the lever shaft: are fitted by the serrations. To adjust the length of the lever, loosen the setting bolt at the mid-part of the lever and extend or retract the lever as required.

To adjust the angle of the lever, loosen the bolt at the lever boss and change the setting position of the serration as required.

OPERATOR'S SEAT



The operator's seat is designed for improved comfort of the operator and may be adjusted as follows:

HORIZONTAL ADJUSTMENT

Moving the lever (2) in the indicated direction releases the pawl, making the seat (1) move horizontally in fore-aft direction. After positioning the seat as desired, release the lever to secure the seat in that position.

BACK - REST ADJUSTMENT

Push the handle (4) toward the operator's seat to disengage the lock (5), and pull the back-rest (3) by holding its bottom part to the desired position. Engage the lock (5) with one of the two grooves.

The seat can be turned over by simply pulling the back-rest forward.

FUEL AND LUBRICANTS

CAPACITIES :

Fuel	Fuel Tank	420 lit
Engine Oil	Engine oil pan	32 lit
	Main clutch case	25 lit
	Steering clutch case	75 lit
	(incl. transmission case)	
	Final drive case (each)	36 lit
	Recoil spring case (each)	10 lit
Engine Oil (SAE 10W only)	Hydraulic system (H)	105 lit.
Cooling Water	Cooling System	65 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

10° C (14° F)

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

ASTM 975 No. 1D- When the atmospheric temperatures are consistently below _10° C (14° 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 on next page 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.

MAINE 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°DF (-20°C and 10°C)

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

For the extreme climatic conditions below 0°F (-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		Servo Gear Super 90	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 T20	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