376OMA5900

OPERATION & MAINTENANCE MANUAL

BL200-1

WHEEL LOADER

WITH H-SERIES CEV STAGE IV ENGINE AND AVTEC TRASMISSION

(ELECTRIC GEAR SHIFT)

BEML LIMITED
INDIA

FORWARD

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 5 completely reinforced to 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 Technical Precautions with * marks in this manual. The safety information contained in this manual 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 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 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 turning should be avoided.
- At the first 250 hrs of operation, the machine should be maintained in the following manner in addition to usual 250 hrs service :

1. Check fuel filter cartridge and transmission oil filter element for any contamination. For replacement procedure and details, see maintenance table in the maintenance section.

NOTE: WHEN REPLACING OIL FILTERS ELEMENTS, CHECK THEIR INTERIORS FOR DIRT AND DUST. IF HEAVILY COLLECTED, CHECK FOR POSSIBLE CAUSE BEFORE

CONTENTS

OPERATION

MAINTENANCE

SAFETY HINTS

GENERAL:

- Wear well-fitted helmet, safety shoes and working clothes. If the nature of work hazardous wear protective goggles or mask, thick gloves, ear plugs or other protection.
- Take care of your health. Do not operate when tired or after drinking.
- When there is a leader, fix standard signals and always follow these signals when operating.
- Learn the prohibitions, cautions and rules about work procedures in the work site.
- Read the Operation & Maintenance manual carefully. Learn how to use the control devices, gauges and warning devices. Be sure you understand the meaning of the caution plates.
- Confirm that oil gauges and warning devices are functioning correctly, and that the gauge readings are within the prescribed range.
- Learn about the safety devices on your own machine and about how to use them.

DURING MAINTENANCE:

- When getting on or off the machine use the steps, hand grips and ladders. Never jump on or off the machine. If the above items are provided or damaged use suitable stand.
- If necessary, remove the cables from battery terminals. When charging the battery, make sure the area is well ventilated.
- Exhaust gas is dangerous. When working inside, be particularly careful to have good ventilation.

- When opening inspection covers, stop engine. If the hood or other covers are fitted with a lock, always apply the locks securely when opening or closing the hood or cover.
- Always stop the engine before adjusting belt tension or before checking or servicing the water pump.
- Be particularly careful when removing the radiator cap or the hydraulic oil tank filler cap. If this is done immediately after using the machine, there is a danger that boiling oil may spurt out. Always release the pressure in the circuit before checking or servicing the oil, water or air circuits.
- When the engine stops, the water and oil in the circuit is hot, so be careful not to get burned. Wait for the water and oil to cool before starting any work on the machine.
- Never allow unauthorized person to operate the machine.
- In case of an accident or fire or any other such unexpected mishap, deal quickly by using the nearest apparatus.
- Learn before hand over the locations of the first aid boxes and fire extinguishers and how to use them. It is also important to know the emergency system.
- Fuel or oil is dangerous substances. Do not smoke near these types of flammable substances. Never handle fuel, oil, grease or oily cloth in the places where there is any fire.

CHECKING JOBSITE CONDITIONS:

- Examine the lay of the land and the kind of soil at the work site to determine the dangerous points and the best methods of operation. Proceed with the work only after making safety arrangements about the dangerous points.

- Do not work when visibility is reduced by smoke, fog or dust. If the jobsite is dark, install lighting arrangement.
- Keep work site flat by sprinkle water over the surface which improves the work efficiency.
- Check the load limits of the bridges before crossing.
- When the machine is to be operated in water, check the water depth, ground conditions and water velocity. Do not take the machine in water exceeding the allowable depth.
- The overall height of the machine is limited by tunnels, over head electrical wires. So check for above conditions on the jobsite before operating the machine.

CHECK BEFORE STARTING:

- Carry out checks before staring the machine. If any problem is found, do not start the engine, inform the foreman immediately.
- Before starting the machine, be sure to check the bar and pins for setting in storage position. The machine cannot be steered with frames locked.
- Always stop the engine while filling the fuel. After filling the fuel tighten the fuel cap properly.
- Avoid any kind of dry leaves or papers inside engine room as it may cause to fire.
- Keep the tools in proper place. Do not leave any tool open on the floor.
- Wipe off any grease or oil on the handrail, foot step, cabin floor and control levers. Failure to do this may lead to slip.

PRECAUTIONS WHEN GETTING ON THE MACHINE:

- If the machine is fitted with a cab, make sure the windows are clean and check the visibility. Always lock the door before starting.

- When getting on or off the machine, use the handrail and steps provided. Do not jump up onto or down from the machine.
- If seat belt is provided, always use it. If the belt is damaged or worn, replace it with new one.

PRECAUTIONS WHEN STARTING THE MACHINE:

- Before starting the engine, confirm that all control levers are in neutral position.
- Exhaust gas is dangerous. When working inside, be particularly careful to have ventilation.
- To ensure the safety of workers near 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.

CHECK AFTER STARTING THE ENGINE:

- Before starting of the work, test drives the machine in a safe place and check that the transmission, brakes, accelerator and steering are in good condition. At the same time check that there is any abnormal noise or vibration malfunctioning of the gauges and other safety devices.

DURING OPERATION:

- Always sit in the operator's seat when operating machine.
- Do not allow unauthorized person to on to the machine.
- Always beware of the operating capacity of the machine. Using the machine to do work beyond the capacity will not only damage the machine, but may even cause unexpected accidents.
- The machine condition can be judged from many factors like changes in gauges readings, sound; vibrations exhaust gas color and control levers response. In such case park the machine in a safe place and take appropriate action immediately.

ATTENTION TO THE SURROUNDINGS:

- Always sound horn to ensure the safety of the people near the machine before cranking the engine.
- During the operation do not discard your attention on other matters.
- When loading the trucks or hoppers, be careful not to hit the truck or hopper with the bucket. Do not bring the bucket over people's heads or over the cab of the truck.
- In dangerous places or in places where visibility is poor, stop the vehicle and get down from the vehicle to check that it is safe to run the machine.
- On haul roads or in narrow places, give way to loaded machines.
- When traveling, keep the work attachment close to the ground to maintain stability of the machine.
- Avoid obstacles on while traveling on rough roads.
- Always travel at a slow speed and do not suddenly change the direction.
- Do not use bucket as brake except in emergency conditions.
- If engine stops suddenly, do not steer the machine. Apply brakes immediately to stop the machine.
- When traveling with load on hills always travel up in forward direction, down in reverse direction.
- Always operate the machine at moderate speed. Never do speeding, sudden starting, sudden braking, sudden turning, snaking, Coasting.
- Do not make quick turns or quick braking when bucket is in lifted condition.
- Do not load the bucket by thrusting into a pile of soil or gravel at high speed because it is dangerous.
- Be careful while traveling on wet surface, pilled soil.
- While traveling down never put vehicle in neutral.

- Whe machine stops on a slope, apply the brake slowly, lower the work attachment to ground, and then apply parking brake. After that put control levers in neutral condition and start the engine.
- At night time operate with adequate lightning.
- Before starting towing operation make sure that no one is near the machine. After taking up the slack in the wire rope start towing carefully. Do not tow any machine whose brakes and steering have broken down.

PARKING THE MACHINE:

- Park the machine in safe place outside the working site where there is a flat surface and it is free from rock falls, landslides and floods.
- If the machine has to be parked on a slope, park the vehicle facing directly upwards or downwards the slope. Place chocks under the tires.
- When leaving the machine always lower the work attachment completely to the ground and put all control levers in neutral. Next apply the parking brake, lock the control levers. Then put blocks under the tires.
- After stopping the engine always remove the starting key.

GENERAL LOCATIONS AND SPECIFICATIONS

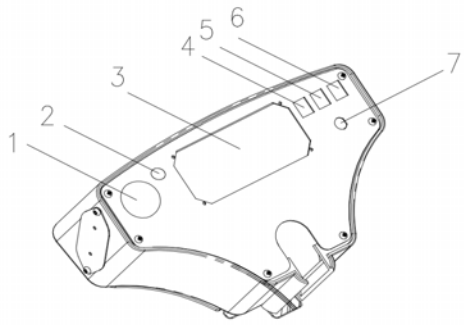
1. Bucket
2. Bell crank
3. Lift arm
4. Dump cylinder
5. Lift cylinder
6. Head lamp
7. Front wheel
8. Rear wheel
9. Safety bar

PERFORMANCE:

1. Bucket capacity (Heaped) : 1.7 Cu.M
2. Travel speeds
   Forward : Max. 35 kmph
   Reverse : Max. 22 kmph
3. Operating weight : 10500±500 kg
4. **Engine Model** : H6C413323
   Make : M/s. ASHOK LEYLAND
5. Gross horsepower : 98 kW @ 2300 rpm
6. **Transmission** : Power shift, 2 forward, 1 reverse

NOTE : SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT PRIOR NOTICE.

INSTRUMENTAL PANEL



1. AIR PRESSURE GAUGE :

This gauge indicates the air pressure in the air tank used by the brake system. Relief pressure: 7 bar.

2 PRE HEATING INDICATOR :

This lamp glows as soon as the ignition switch put into in pre heat position.

3 MURPHY PV450 LCD PANEL

Murphy PV 450 LCD panel displays the following parameters

a) HOURMETER
b) ENGINE OIL PRESSURE
c) RPM
d) TRANS.OIL PRESSURE
e) TRANS.OIL TEMPERATURE
f) COOLANT TEMPERATURE
g) HIGH BEAM INDICATOR
h) FUEL LEVEL

4 HEAD LAMP SWITCH :

This switch is used to switch ON & OFF the head lamp.

5 WORK LAMP :

This switch is used to switch ON & OFF the front and rear work lamps.

6 HAZARD SWITCH

This switch is used when there is any abnormal condition takes place. When this switch is switched on all lights will glow indicating the danger.

7 . STARTING SWITCH:

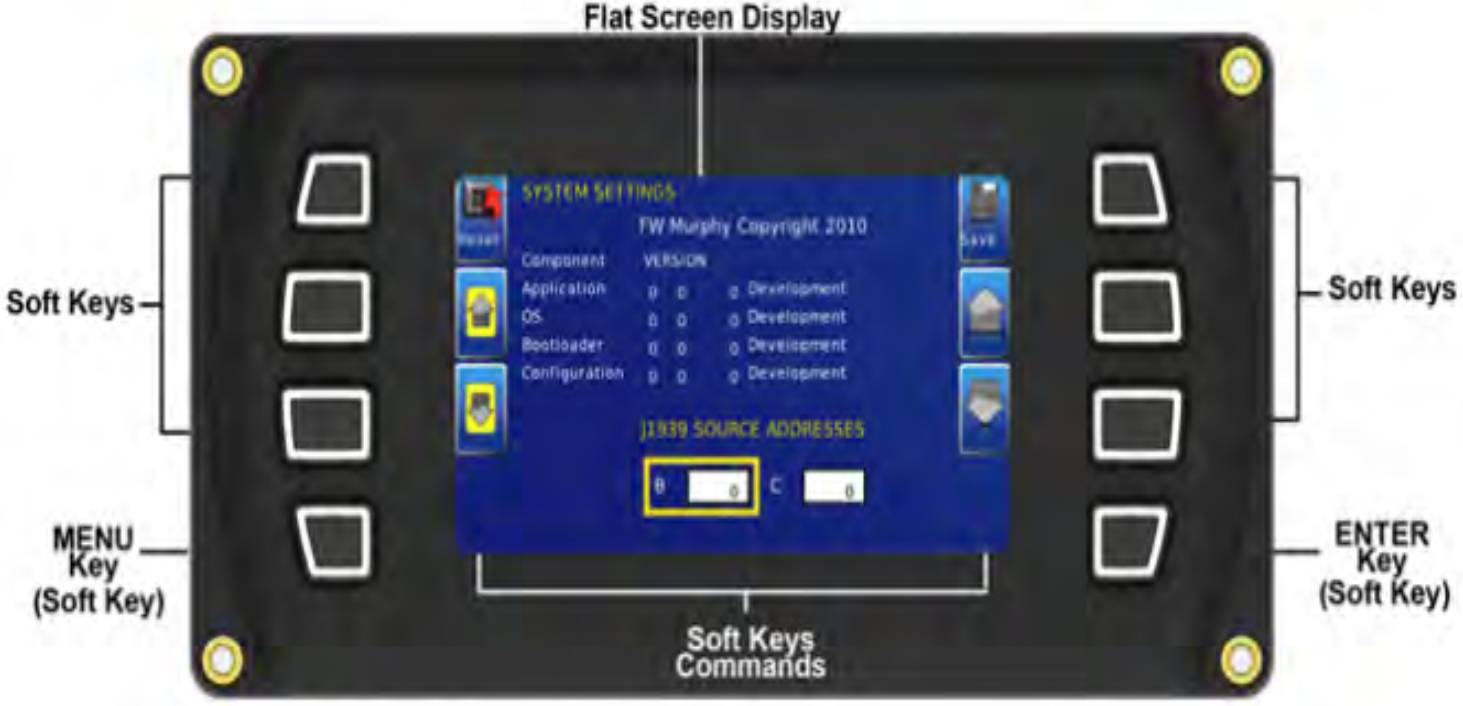
This switch is used to start or stop the engine. To ON the engine insert the key in the prescribed slot and turn to on position as indicated. To stop the engine turn the key to stop position as indicated.

Never place the starting switch key in off position while engine is in running condition. This will damage the alternator.

PV450- LCD Display Panel:

A 4.3” color transmissive TFT LCD display is used toindicate gauges, warnings along with fault messages of all the equipment parameters.

Display controls:



1.Flat screen Display 2.Soft Keys

3.MENU Key 4.ENTER Key

5.Soft Keys Commands

1.Flat Screen Display
A colour screen displays gauges, soft key commands, and fault messages, as well as menu options for setup and configuration.

2.Soft Keys
The soft keys correspond to the soft key commands and allow selections to be made accordingly.

3.MENU Key
The bottom left key is a soft key reserved in most cases for the Menu. In rare cases, it could be used for other options. Pressing the **MENU** key at any time displays the list of menu options. If not labelled, it is the **MENU** key.

4.ENTER Key
The bottom right key is a soft key reserved in most cases for the Enter. In rare cases, it could be used for other options. Pressing the ENTER key will select the option displayed much like the ENTER key on a keyboard. If not labelled, it is the **ENTER** key.

5.Soft Key Commands
Columns of vertical commands may be located to the left and/or right of the display. They will change according to the options available for the screen being displayed.

Power Up sequence:

The Power View display is installed with power connected to the ignition. When the ignition is turned on, the

Following sequence occurs:
(a) Display powers up indicating “Booting…””
(b) BL200-1 image with BEML logo appears for about 2-3 sec.

Display Day/Night Screen Selection

Provision has been given to view gauges in either day or night mode for proper visibility depending on Day or Night. To go to this mode following steps to be followed:

Press ENTER key twice

Press the switch on panel corresponding to the image of Day/Night as  to toggle between Day and Night modes.

Operators need to operate only NAVIGATION keys to view equipment parameters on Display Screens.

Display Screen-1 /Home Screen:

The Display (Page-1) shows the following Parameters:

a) Engine RPM

Normal speed of the engine is 650 to 2400 RPM. If the RPM gauge reads beyond 2400 then ERROR code will pop up. This data is received from Engine controller.

b) Engine Oil Pressure Gauge

This gauge shows the value of engine oil pressure. Data are received from Engine controller

Range	Color	Condition
0 to 1 bar	Red	Abnormal
1 to10 bar	Green	Normal

c) Engine Coolant Temperature Gauge

This gauge shows the temperature of engine radiator water. When temp crosses more than 95°C, engine will be shut down automatically by engine controller. This data are received from Engine controller

Range	Color	Condition
40 to 95 ° C	Green	Normal
95 to120 ° C	Red	Abnormal

Display Screen-2:

a) Transmission Oil Pressure Gauge

This gauge shows transmission oil pressure. Data are received from Transmission controller

Range	Color	Condition
0 to 16 Bar	Red	Abnormal
16 to 25 Bar	Green	Normal
25 to 40 Bar	Red	Abnormal

b) Torque Converter Oil Temperature Gauge (COT)

This gauge shows Torque Converter oil temperature. This data are received from Transmission controller

Range	Color	Condition
40~105 ºC	Green	Normal
105~140 ºC	Red	Abnormal

c) Engine oil Temperature Gauge (EOT)

It represents engine oil temperature. This data are received from Engine controller

Range	Color	Condition
40 – 105 º C	Green	Normal
105 -140 º C	Red	Abnormal

Display screen-3/Trouble schooting screen:

More insight on this screen is covered under Troubleshooting Guide lines section below.

<u>Fault Warning Indicators:</u>

1) High Engine Oil Temperature Warning

This icon appears red, when engine oil temperature reaches 106°C or more.

2) Low Engine Oil Pressure Warning

This warning symbol appears red when the engine oil pressure goes below 0.8 bars.

3) High Coolant Temperature Warning

This warning indicator appears, when the coolant water temperature reaches 95°C or more.

4) Transmission Oil Pressure low indicator

This warning indicator appears, when the transmission oil pressure goes below 12 bars

5). Torque converter temperature oil high indicator

This warning indicator appears, when the torque converter oil temperature reaches 125^0C or more.

6). Low Coolant Level Indicator

This icon appears, when the coolant water level in the upper radiator tank drops below the specified level.

7). Battery Charge Indicator

This warning indicator appears when Engine is OFF and it disappear when the engine is started and alternator starts charging the battery.

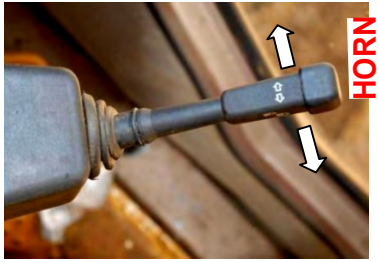
8). Low Fuel Level Warning

This warning indicator appears when the fuel level becomes low.

9). Seat Belt Warning

This error comes up whenever seat belt is not buckled during engine running condition. This feature does not work when engine is in OFF condition. Error condition will be sensed continuously for 10 seconds and if seat belt is still not buckled, this error pops up on display screen with buzzer sounding.

TURN SIGNAL SWITCH:



When the equipment has to take a left or right turn, operator has to push the switch to ‘R’ or ‘L’ respectively. Soon after the operation is over, the switch has to be brought back to its original position.

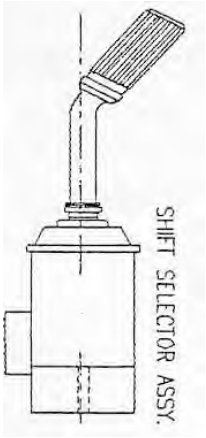
HORN SWITCH:

When the horn button shown in figure above is pressed towards inside, the horn sounds.

CIRCUIT BREAKER:

The circuit breaker protects the electric devices and wiring from burning out.

CONTROL LEVERS:



The control levers are used to change the speed and direction of the machine. The machine has two control levers namely.

SPEED CONTROL LEVER:

This lever is used to increase or decrease the speed of the machine.

DIRECTION CONTROL LEVER:

This lever is used make the machine to travel in forward or in reverse direction.

NOTE:

AT INITIAL STAGE THE SPEED CONTROL LEVER WILL BE IN 1ST GEAR AND DIRECTION CONTROL LEVER IN NEUTRAL POSITION. AFTER THE OPERATION IS COMPLETED, THE ENGINE HAS TO BE SWITCHED OFF AND THESE LEVERS HAS TO BE BROUGHT TO THE INITIAL POSITION AS STATED ABOVE.

BRAKE PEDAL:

The brake pedal which is located at the left side of the operator foot is used to apply brakes.

Do not use the brake pedal repeatedly unless necessary.

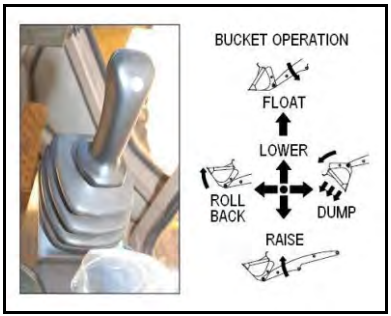
Do not use the brake pedal as foot rest. Use them only for braking.

THROTTLE PEDAL:

The Throttle pedal which is located at the right side of operator foot is used to throttle the engine which increases or decreases the speed of the machine

When the machine has to bring to the rest slowly remove the feet from throttle pedal and start applying the brake.

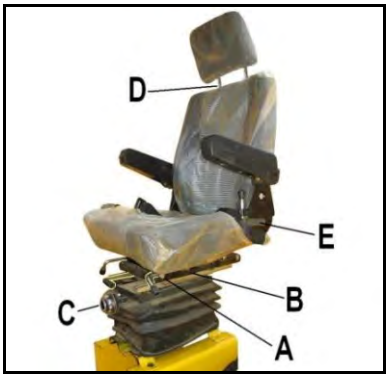
JOY STICK:



The joystick which is located at the right side of the operator near to his right hand is used to control the movement of the work attachment (Bucket).

The movement of joystick required to operate the work attachment is shown in above figure.

OPERATOR SEAT:



The seat adjustment as to be checked at the beginning of each shift and when operators change.

A. This lever is used for independent height & angle adjustment. Lift the lever for the adjustment.

B. This lever is used for forward & backward movement of the seat. Lift the lever for the adjustment

C. This knob is used to adjust the cushioning effect according to the weight of the operator. Rotate the knob to adjust the cushioning effect. The bearable weights were marked on the knob.

D. This push button is used to adjust the head rest. Press the button for adjusting.

E. This lever is used to reclining the seat. Lift the lever for the adjustment.

SEAT BELT:

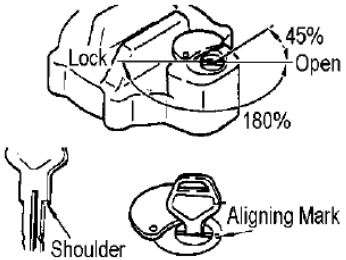
Fasten the belt and remove it in the following manner:

1. Adjust the seat so that the brake pedal can be depressed all the way with the operator's back against the backrest.
2. Sit in the seat wrap the belt on your stomach such that the buckle comes in front. Hold the buckle and insert the lock into it. Check the belt has locked by pulling it.
3. For removing the belt, press the button on the buckle and remove the lock from it.
4. To shorten the belt, pull the free end of the belt on either the buckle body or lock side
5. To lengthen, pull the belt while holding it at a right angle to buckle or insert.
6. When operating a machine with ROPS, be sure to have a seat belt.
7. Check all bolts and nuts used to mount the seat. Retighten any loosen bolts to 2~3 kgm torque.
8. If the seat belt is scratched or frayed or if any of the fittings are broken or deformed from long service, replace the seat belt immediately.

LOCKING CAP:

- A locking cap is available as an optional radiator cap, fuel tank cap or hydraulic tank cap. Open and close locking caps as follows :
- To open the cap, insert the key rotate as shown in figure. Do not turn with key half inserted as it may break.

INSTRUMENTAL PANEL



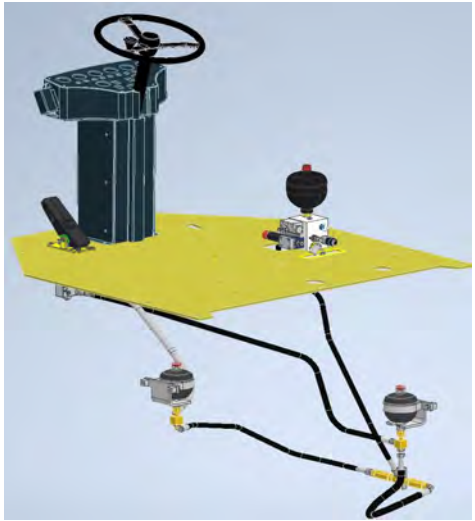
- Turn the key counter clockwise and bring the rotor groove in line with the alignment mark on the cap. Turn the cap slowly until a “clicking” sound is made. This releases the lock and allows the cap to be opened.
- To lock the cap, turn the cap into place and turn the key to the clockwise and remove it.

Hydraulic Brake system

The machine uses only hydraulic pressure for braking system in the equipment.

The hydraulic line from the pilot accumulator is connected to brake pedal, and when brake pedal is depresses the pressurised oil will go to the axles and pushes the brake shoe to the dry disc to applies the brakes.

Between the hydraulic brake pedal and pilot manifold block, individual accumulators provided for each brake line i.e. for each front and rear line for emergency braking purpose.



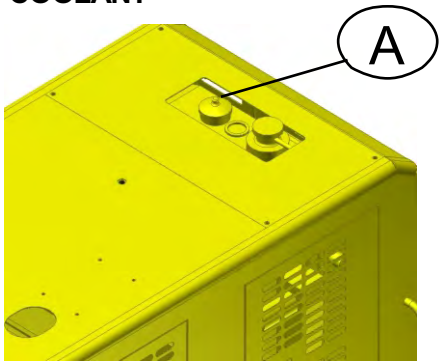
CHECK BEFORE STARTING

Pre operation checks to be done. Never neglect them.

WALK –AROUND CHECK

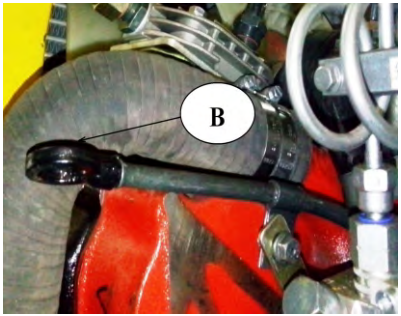
- Che ck bucket for wear
- Check around the transmission case joints for oil leak.
- Check around the brake line for oil leak.
- Check tightness of battery mounting bolt.
- Check tightness of battery terminal.
- Check for radiator water and Coolant leak
- Check tires for damage and wear.
- Check around the axle for oil leaks.
- Check hydraulic tank for oil leaks.
- Check for oil leak at high pressure hose, high pressure joints and hydraulic cylinder seal.
- Check that parking brake is working properly.
- Check that brakes are working properly.
- Check lamps, horns, gauges and other electrical items works properly.
- Check for steering.
- Check rear view mirror is in right direction.
- Check for exhaust gas color and sound normal.

CHECK AND REFILL COOLANT



- Remove the cap ‘A on the radiator and check that coolant is up to mark. If not add coolant.
- If volume of the coolant is more than usual, check for possible leakage.
- Do not open the cap when the coolant inside the radiator is hot as coolant may sprout out.

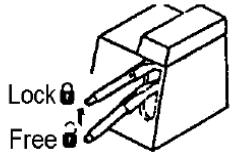
CHECK OIL LEVEL AND REFILL IN ENGINE OIL PAN



- Open the guard at rear side of the machine. Remove the dipstick ‘B’ from the engine to see oil level.
- Two notches were provided on the dip stick, the oil level should be in between these notches. If necessary add oil.
- The type of oil depends upon the ambient temperature. Select the oil as per table “FUEL, COOLANT AND LUBRICATION”.
- Stop the engine when checking the oil level.

OPERATING YOUR MACHINE

BEFORE STARTING THE ENGINE



Before starting the machine, always check that levers are in initial position (which was explained under section control levers).

1. Carry out initial inspection as stated in section checking before starting.
2. With your back resting against the back rest of the operator seat, adjust the seat position so that brake pedal can be easily depressed.
3. Lower the parking brake lever to release parking brake as shown in figure below.
4. Check whether the work attachment is locked by safety lock (if provided).
5. Check that area is safe before starting the engine.
6. Depress the throttle pedal lightly
7. Turn the key of starting switch to “ON” position to start the engine. If engine does not start repeat the procedure after 2 minutes.

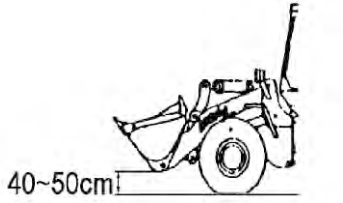
CHECKS AFTER STARTING

1. After starting, make the following checks.
2. Depress throttle pedal lightly and run engine with no load at midrange speed for about 5 minutes.
3. Confirm that the engine oil pressure caution lamp goes off when the engine is running at low idle.
4. After warm-up run is completed, check gauges and caution lamps for proper operation.

5. Continue to run the engine at light load until the green ranges of the engine water temperature gauge and torque converter oil gauge are indicated.
6. Check if the exhaust color is normal or whether there is any abnormal noise or vibration.
7. Avoid abruptly accelerating the engine until the completion of warm-up.

TO MOVE THE MACHINE OFF

- Check that the caution lamps are not highlighted.
- Free the safety lock for work equipment control lever; bring the work equipment in the traveling posture as shown in above figure.



- Depress brake pedal and release the parking brake using parking brake lever.
- Release the brake pedal then depress throttle pedal to move the machine off.
- Move the control lever (directional control lever) to the forward position to make the machine to move.
- For different speeds and load conditions use the control lever appropriately.
- When shifting the speed control lever, use the brake pedal before shifting.
- Before shifting the directional control lever make sure that speed control lever is in 1st gear position.
- When traveling, use the steering wheel to turn the machine.
- When the steering wheel is rotated the front frame is turned to desire position with the help of steering cylinders and back wheels follows the front wheels.
- Turn the steering wheel slowly. Do not turn the steering wheel beyond the limit.

⚠ CAUTION:

- Never change between FORWARD and REVERSE at high speed.
- It is dangerous to turn the machine suddenly at high speed, or to turn on steep hills.
- If the engine stops when the machine is traveling, the steering cannot be used. This particularly dangerous on hills, so never stop the engine when the machine is traveling.

TO STOP THE ENGINE:

- Release the throttle pedal and depress brake pedal to stop the machine.
- Bring the Direction control lever to neutral position.
- Slowly lower the work attachment to the ground level by operating the joystick.
- Pull the parking brake lever up to apply parking brake as shown below.

- Stop the machine in a safe place where the ground is firm. If machine has to be stopped at a slope, put blocks under the tires. In addition to this dig the bucket into the ground to increase safety.
- Run the machine low idle for 5 minutes to allow it to cool down.
- Turn the key to off position. And remove the key from it.

- If the engine is abruptly stopped before it cools down, the life of the engine reduces. So do not stop engine abruptly other than in case of emergency.
- In case of engine over heat, do not stop the engine abruptly, but run it at medium speed for some time to allow it to cool down gradually and then stop it.

MAXIMUM DEPTH OF WATER:

When working in water or on swampy ground, do not let the water come above the bottom of the axle housing.

After finishing the operation, wash and check the lubricating points.

Axle housing

PRECAUTIONS WHEN DRIVING UP OR DOWN SLOPES:

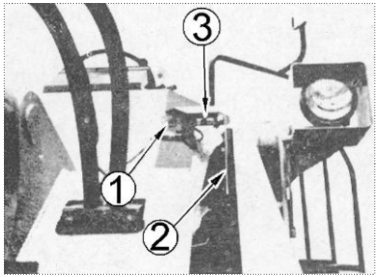
- Lower the centre of gravity by lowering the work attachment when turning on the slopes as machine may tipple when work attachment is not lowered.
- When driving down slope, put the speed control lever to 1st gear and gradually apply brake.
- If engine stops on a slope, depress the brake pedal fully. Next, lower the work attachment to the ground and apply the parking brake. Put the directional control lever in neutral and start engine again.

ADJUSTMENT OF WORK EQUIPMENT

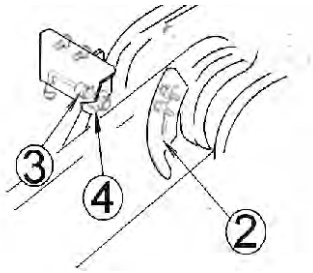
ADJUSTMENT BOOM KICKOUT (If equipped)

The boom kick out makes it possible to set the bucket so that it automatically stops at the desire lifting height (lift arm higher than horizontal) and the bucket positioned makes if possible to set the bucket so that it automatically stops at the desired digging angle. The setting can be adjusted to match the working conditions.

1. Raise the bucket to the desired height, set the lift arm control joystick at HOLD by proximity sensors.
   Then stop the engine and adjust as follows;
2. Loosen two bolts (1) and adjust plate (2) so that the bottom edge is in line with the center of the sensing surface of contact switch (3). Then tighten the loosen bolts to hold the plate in position.



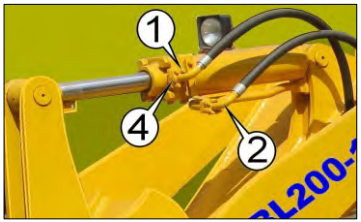
3. Loosen two nuts (4) to give a clearance of 5 to 8 mm between plate (2) and the sensing surface of contact switch (3). Then tighten the nuts to hold in position.
4. Tightening torque: 1.5~2.0 kgm



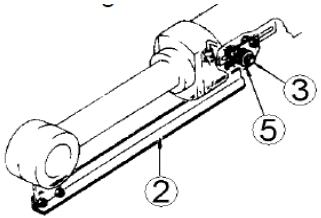
5. After adjusting, start the engine and operate the lift arm joy stick. Check that the joystick operation is automatically cutoff to HOLD When the bucket reaches the desired height.

ADJUSTING BUCKET POSITIONER (If equipped)

1. Lower the bucket to the ground and adjust the bucket to the desired digging angle. Set the bucket control joystick at HOLD, stop the engine and adjust as follows.



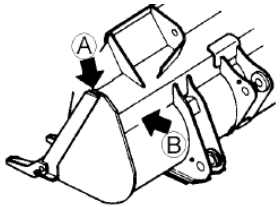
2. Loosen two bolts (1) and adjust mounting bracket (4) of the contact switch so that the rear tip of angle (2) is in line with the center of the sensing surface of contact switch (3). Then tighten the bolts to HOLD the bracket in position.
3. Loosen two nuts (5) and give clearance of 5 to 8 mm between angle (2) and the sensing surface of contact switch (3). Then tighten the nuts to HOLD in position.
4. Tightening torque:
   1.5~2.0kgm



5. After adjusting, start the engine and raise the lift arm. Operate the bucket control joystick to the DUMP position, then operate it to the TILT position and check that the bucket control joystick is automatically cutoff to HOLD. When the bucket reaches the desired angle.

BUCKET LEVEL INDICATOR (If equipped)

(A) and (B) at the top rear of the bucket are the level indicators so the bucket angle can be checked during operations.



A. Parallel with cutting edge.

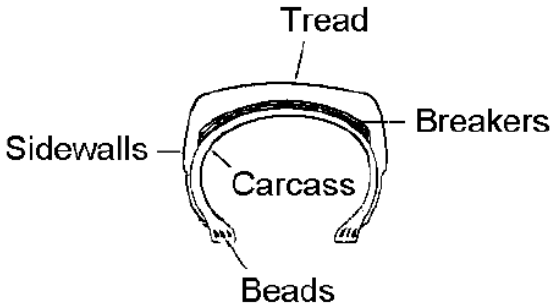
B. 90^0 to cutting edge.

HANDLING THE TIRES

PRECAUTIONS WHEN HANDLING TIRES:

If the following defects are found in the tire, replace the tire with new one:-

- Bead wire is broken or bent, or the tire is greatly deformed
- Wear is excessive and the carcass ply (excluding breaker) is exposed for more than ¼ of the circumference.
- Damage to the carcass exceeds 1/3 of the tire width.
- Tire layers are separated.
- Radial cracks reach the carcass.
- Deformation or damage which makes the tire unsuitable for use.



PRECAUTIONS WHEN DRIVING MACHINE:

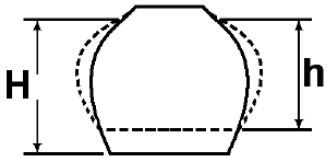
When machines runs at high speed for long it gets over heated. Avoid running the machine at high speeds for long duration. If unavoidable please take following precautions listed below.

- Follow the regulation related to this machine, and drive carefully.
- Carry out checks before starting the machines.
- The most suitable tire pressure, travel speed, or tire type differ according to the condition of the travel surface. Contact your nearest BEML or dealer for information.
- Generally the tire pressure should be 70 +/- 5 psi
- After traveling for 1 hour, stop for 30 minutes. Check the tires and other parts for damage.
- When traveling at high speed, travel with empty bucket only.
- Never put calcium chloride or dry ballast in the tires when traveling.
- Check the tire pressure when the tire is in cool condition before starting the machine. If the inflation pressure is too low, it causes overload on tires; if the inflation pressure is too high, the tire may be cut or may burst under shock. Therefore adjust the inflation pressure to the values in the following table.

TECHNICAL NOTES:

- Stock pile operations mean the loading of sand and other loose materials.
- Deflection ratio =

(H-h) /H)*100.
(H-h) /H)*100.



- As a guide of visual checks, the deflection ratio should be as follows.
- Normal loading and carrying operations: 15 - 25% .
- Digging operations (rear wheels off ground): 25 – 35%.
- When checking the tire pressure, check also for small cracks and damage, and for wire or small pieces of metal which may cause punctures. Check also for abnormal wear.
- Operating costs can be reduced and tire life increased by keeping the operating area in good condition and free from fallen rocks.

TOWING

- This machine must not be towed except in emergencies. When towing the machine, take the following precautions.
- If there is a failure in the brake line, the brakes cannot be used, so tow with extreme care.
- Always keep the engine running when towing the machine, so that the steering and braking can be used.
- When engine cannot be used disconnect the front and rear drive shafts, steering cylinder and steering linkage before moving the vehicle.
- The machine should be towed only to the nearest place for inspection and maintenance, Do not tow the machine for long distances.

TRANSPORTATION

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

- Properly apply the brakes on the trailer and insert blocks beneath the tires to ensure that it does not move. Then fix the gangplank in line with the centers of the trailer and the machine.

- Make sure that the gangplank has sufficient width, length and thickness to enable the machine to be safely loaded and unloaded.

- Determine the direction of the gangplank, then slowly load or unload the machine.

- Do not, on any account change the direction of the gangplank. To change the direction of the machine, first take it down from the gangplank.

- Correctly load the machine onto the specified part of the trailer.

- Lower the bucket and close the pilot manifold block lever to lock the joystick operations

- When transporting the machine place blocks underneath the front and rear wheels to prevent the machine from moving about. Also, hold it down with chains or wire ropes.

- Determine the route for transporting the machine by taking into account the width, height and weight of the machine.

- When loading the machine, park the trailer on a flat firm roadbed. Keep a fairly long distance between the road shoulder and the machine.

HANDLING OF BATTERY

PRECAUTIONS FOR CHARGING BATTERY

- Before charging, disconnect the cable from the negative (-) terminal of the battery. Otherwise, an usually high voltage will damage the alternator.
- While charging the battery, remove all battery plugs for satisfactory ventilation.
- To avoid gas explosions, do not bring fire or sparks near the battery.
- If the leakage temperature exceeds 45^{o}C, stop charging for a while.
- Turn off the charger as soon as the battery is charged. Overcharging may cause battery to get overheat, decreasing the quantity of electrolyte, damaging the electrolyte plate.
- If the electrolyte gets on your skin or clothes, immediately wash with plenty of clean water.
- Do not mix up cables by wrong corrections as it will damage the alternator.
- When inspecting or servicing a battery, be sure to stop the engine and turn the starting switch key to OFF position.
- When performing any service to battery besides checking the electrolyte level or measuring the specific gravity, disconnect cables from the battery.

REMOVAL AND INSTALLATION OF BATTERY

- When removing battery, first disconnect the cable with the black tube from the ground (normally, from the negative (-) terminal). If a tool touches a cable connecting the positive terminal and the chassis there is a danger of sparks being emitted.
- When installing the battery, the ground cable should be connected to the ground terminal as the first step.
- The batteries are connected to both sides of the machine. The grounding cable is connected to left side of battery.

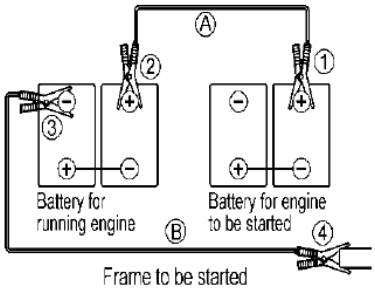
STARTING THE ENGINE WITH BOOSTER CABLE:

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

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

Connect the booster cables in the following manner:

- Connect one clip of booster cable A to the positive (+) terminal of the engine to be started.
- Connect the other clip to the positive (+) terminal to the engine which is running.
- Connect one clip of booster cable B to the negative (-) terminal of the engine which is running.
- Connect the other clip to the frame to be started.
- Make sure the clips are firmly connected to battery terminals. Then, start the engine.
- When connecting the cables, never connect the positive (+) and negative terminal (-).
- Make sure that the booster cable connections are correct. Connect the booster cable to the frame as far as possible from the battery.
- Start the engine, if the engine does not start at first, try again after 2 minutes or so.
- After the engine has started, the booster cables should be disconnected in the reverse order in which they are connected.



COLD WEATHER OPERATION

PREPERATION FOR LOW TEMPERATURE

- Change lubrication oil by that with prescribed viscosity.
- Fuel of low pour point shall be used. ASTM D975 No.1 diesel fuel should be used at atmospheric temperature lower than -10°C.
- Add antifreeze in the cooling water. When the atmospheric temperature drops lower 0°C while the machine is stopped, prevent freezing by adding antifreeze to the cooling water.

CAUTIONS FOR USING ANTIFREEZE

- Permanent type antifreeze shall be used.
- Soft water preferably distilled water should be used as mixing water.
- Cooling systems must be thoroughly flushed before filling with antifreeze mixture.
- When the climate becomes warmer so that antifreeze is not needed, replace by clean water after perfectly cleaning the cooling system.
- **Take care for the fire as antifreeze is inflammable**

BATTERY

- As ambient temperature drops, battery capacity will drop, and electrolyte may sometimes freeze if battery charge is low. Maintain battery at a charge level of appx. 100% and insulate it against cold temperature so that machine can be readily started in the next morning.
- Measure specific gravity of fluid and obtain rate of charge from the following conversion table.
- When electrolyte level 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.

Temp of fluid / Rate of charge	20^0 C	0^0 C	-10^0 C	-20^0 C
100%	1.28	1.29	1.31	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 temperature rises, change lubricating oil in each unit to that of recommended viscosity.
- Completely drain antifreeze from cooling system and fill with soft water after thorough flushing.
- If the electrolyte gets on your skin or clothes, immediately wash with plenty of clean water.
- To avoid gas explosions, do not bring fire or sparks near the battery.

CAUTIONS AFTER COMPLETION OF WORK

- Mud and water on the machine body should be completely removed. Park the machine on concrete or hand ground. If this is impossible, park the machine on wooden boards. This will prevent the accessories from freezing to the ground thereby preventing machine movement the next morning. Particular attention should be given to water drops collected on the surface of the hydraulic cylinder piston rods. Such droplets must be fully wiped off because if water is frozen to the rod when the cylinder is utilized, the cylinder oil seals may be damaged.
- Drain water collected in fuel system so that such water may be frozen at night.
- As battery capacity drops at low ambient temperature, cover the battery or remove it from the machine to be kept warm at night.
- Never use starting aid fluids as they may cause explosions.

- The standard specification machine is designed to work in ambient temperature-20°C to 40°C.
- When the machine has to work at the temperature below -20°C, contact BEML office for details.

PERIODIC MAINTAINENCE

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

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

PRECAUTIONS FOR MAINTAINENCE

GENERAL

- Wear well fitting helmet, safety shoes, goggles and working clothes while working on the machine for maintenance.
- When working with others choose a group leader and work according to his instructions. Do not perform any maintenance beyond the agreed work.
- Hang a caution sign in the operator's compartment which will prevent anyone from starting or moving the machine by mistake.
- Smoke only in designated places. Never smoke while working.
- Always keep workshop in good condition. Make sure that there is no mud or oil on the floor.
- Keep oily clothes and other combustible things in a safe place away from fire. In addition, learn the location and method of operation of fire extinguishers. Always stop the engine before cleaning the machine or adding fuel.
- Flame should never be used instead of lamps. Never use a nakes flame to check leaks or level of oil, fuel, antifreeze or electrolyte.
- Always use non-flammable cleaning agents when cleaning parts.

BEFORE MAINTENANCE:

- Before starting work, stop the machine on a firm, level surface, and use blocks to keep the machine from moving during operations.
- Lower the bucket to the ground. If this is impossible, use the safety pin and blocks to hold the work equipment securely in position. In addition, apply the locks to all control levers.

- Always lock the front and rear frames before inspecting and servicing the machine.
- Remove all oil and mud from the machine. In particular, be sure that the steps, hand grips, and the floor of the operator's compartment are clean.
- Always use the standard ROPS equipment. Do not modify the ROPS equipment.

DURING MAINTENANCE

- When getting on or off the machine, use the steps, hand grips and ladders. Never jump on or off the machine. If the steps, hand grips, or ladder cannot be used, use a stand to give firm footing.
- If necessary, remove the cables from the battery terminals. When charging the battery, make sure the area is well ventilated.
- Exhaust gas is dangerous. When working inside, be particularly careful to have good ventilation.
- When opening inspection covers. stop the engine. If the hood or other covers are fitted with a lock, always apply the locks securely when opening or closing the hood or cover.
- Always stop the engine before adjusting belt tension or before checking o servicing the water pump.
- Be particularly careful when removing the radiator cap or the hydraulic oil tank filler cap. If this is done immediately after using the machine, there is a danger that boiling coolant or oil may spurt out. Always release the pressure in the circuit before checking or servicing the oil, coolant or air circuits,
- When the engine stops, the coolant and oil in the circuit is hot, so be careful not to get burned, Wait for the coolant and oil to cool before starting any work on the machine,

MISCELLANEOUS

- Thoroughly wash the machine particularly the oiling and greasing parts and the vicinity, thereof, in order to prevent the ingress of dust.
- Use genuine BEML replacement parts specified in the parts list.
- Use BEML specified oils and grease. Use oil and grease having the recommended viscosity for the particular ambient temperature.
- Use clean oil and grease and keep them in clean containers to avoid the ingress of dust.
- Inspect or replace oil in a dust free location to prevent the ingress of dirt.
- Drain off used oil after heating it to a suitable temperature (about 20 to 40°C).
- After replacing oil, filter element or strainer, bleed the air from the circuit.
- When the strainer is located in the oil filler, the strainer must not be removed while adding oil.
- When adding oil or checking the oil level, check that the oil is at the correct level.
- After greasing up, always wipe off the old grease that was forced out,
- When changing the oil or filter, check the drained oil and filter for any signs of excessive metal particles or other foreign materials.
- When removing parts containing 0-rings, gaskets or seals, clean the mounting surface and replace with new sealing parts.
- When washing the machine, ensure that water does not get onto the alternator.
- Special measuring apparatus is needed for testing hydraulic pressure.
- Thoroughly wash the machine. In particular, be careful to clean the filler caps, grease fittings and the area around the dipsticks. Be careful not to let any dirt or dust into the system.

- When checking an open cover there is a risk of dropping things in. Before removing the covers to inspect cover, empty everything from your pockets. Be particularly careful to remove wrenches and nuts.
- When working on the sea shore, carefully clean aH electrical equipment to ensure that is does riot corrode,
- Before working in muddy water, rain or snow, check that the various plugs, valves, are properly screwed up. Upon completion of work, wash the machine, then check the various parts of the machine for cracking, scratching, loose or missing nuts and bolts Also, oil and grease the various parts of the machine.
- When working on rocky ground, be careful of damage to the undercarriage, loose nuts and bolts, cracks, wear and other damage.

When working in a dusty location, be careful of the following:

- Inspect the dust indicator to see whether the air cleaner is blocked up. Clean the air cleaner as soon as it becomes blocked up. Clean the air cleaner as soon as it becomes dirty.
- Clean the radiator core so that it does not become blocked up.
- Clean or replace the fuel filter as soon as it becomes dirty.
- Clean the electrical equipment, particularly the starting motor and alternator to prevent accumulation of dust.
- When installing car radio and a walkie-talkie or citizen band, contact your BEML office
- When washing the machine, take care not to splash water over the electrical equipment. If it is soaked with water, it may not operate normally.

- After disconnecting the connector, cover it with a vinyl bag to prevent oil or dust from sticking to its contact section.

When welding, be careful of the following:

- Turn OFF the power (starting switch).
- Do not continuously apply more than 200 V.
- Install the ground cable at least 1 m from the range to be welded.
- Take care not to install the seals between the grounded point and the range to be welded.
- Use ordinary automobile washer fluid. Be careful not to let dirt or dust get in.

Greasing the rod end

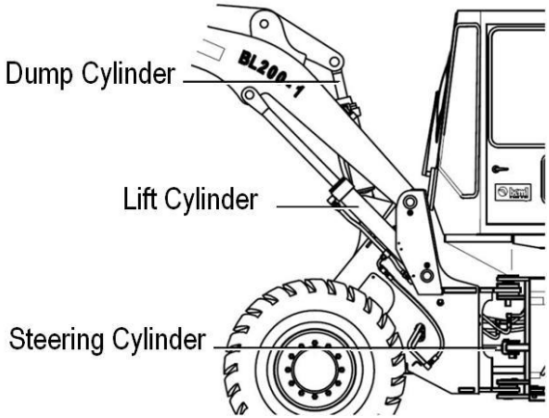
- Because the rod end is the oil less type, no greasing is required, although a grease nipple is fitted to the rod end on the lever linkage.
- The rod end should be greased only when it becomes stiff after using it for a long span of time.

BLEEDING AIR FROM HYDRAULIC CIRCUIT

After replacing oil, filter element of strainer, bleed the air from the circuit.

To breed the air from the hydraulic cylinders or hydraulic piping, run the engine at low idling and do as follows:

- Operate each hydraulic cylinders 4 to 5 times, stopping 100 mm from stroke end.
- Next, operate each cylinder 3 to 4 times to the stroke end.
- If the engine is run at high speed at first, or if the cylinder is moved to the end of its stroke, the air in the cylinder may damage the piston packing etc.



MAINTENANCE TABLE

No	Item	Service	Page
CHECK BEFORE STARTING			
a	Walk-around check	Check	
b	Coolant	Check & supply	
c	Fuel tank	Check & supply	
d	Engine oil pan	Check & supply	
e	Dust indicator	Check	
f	Water separator	Check	
g	Battery electrolyte	Check level	
h	Parking brake	Check function	
i	Foot brake	Check function	
j	Horn	Check function	
k	Lmaps	Check function	
l	Rear view mirror (Optional)	Check	
m	Exhaust gas & colour	Check	
n	Instruments	Check function	20
o	Steering wheel	Check play	20
p	Back-up buzzer (If equipped)	Check function	

No	Item	Service	Page
EVERY 50 HOURS ERVICE			
a	Fuel Tank	Drain water and sediment	
b	Tyres	Check air pressure and damages	
EVERY 100 HOURS SERVICE			
a	Hydraulic tank	Check & supply	
INITIAL 250 HOURS SERVICE			
a	Transmission oil Filter	Replace element	
b	Hydraulic tank Suction strainer	Check and Clean	

MAINTENANCE TABLE

No	Item	Service	Page
EVERY 250 HOURS SERVICE			
a	Lubricating		
-1	Bucket pin	Lubricate 2 point	
-2	Bucket link pin	Lubricate 2 point	
-3	Tilt lever pin	Lubricate1points	
-4	Dump cylinder pin	Lubricate 2 points	
-5	Lift cylinder pin	Lubricate 4 points	
-6	Lift arm pivot pin	Lubricate 2 points	
-7	Steering cylinder pin	Lubricate 4 points	
-8	Rear axle pivot pin	Lubricate 2 points	
b	Fan belt	Check tension	
c	Wheel hub bolts	Check and tighten	
EVERY 500 HOURS SERVICE			
a	Lubricating		
1	Drive shafts	Lubricate 6 points	
b	Fuel filter	Replace element	
c	Engine oil pan and filter	Change oil and replace element	
d	Transmission oil filter	Replace element	

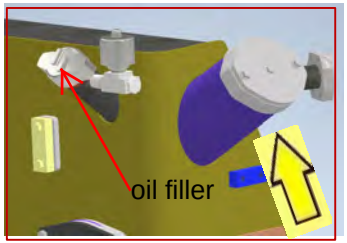
No	Item	Service	Page
EVERY 1000 HOURS SERVICE			
a	Lubricating		
-1	Center hinge pin	Lubricate 2 points	
-2	Front drive shaft	Lubricate 2 points	
-3	Drive shaft center support	Lubricate 1 points	
-4	Center drive shaft	Lubricate 2 points	
-5	Rear drive shaft	Lubricate 2 points	
b	Transmission case and strainer	Change oil and clean strainer	
c	Transmission case breather	Clean	
EVERY 2000 HOURS SERVICE			
a	Axle (Front & Rear)	Change oil	
b	Hydraulic tank and filter	Change oil and replace element	
c	Engine breather	Clean element	
d	Hydraulic tank breather	Replace element	
e	Alternator and starting motor	Check	
f	Pipe joints	Check	
g	Oil temperature	Check	
h	Leakage oil	Check	

No	Item	Service	Page
EVERY 4000 HOURS SERVICE			
a	Water pump	Check	
b	Vibration damper	Check	

No	Item	Service	Page
WHEN REQUIRED			
a	Air cleaner element	Check, clean replace when required	
b	Electrical intake air heater	Check	
c	Coolant	Change and Supply .To be changed after 5000 Hrs recommended Coolant LEYPOWER COOLANT 5000	
d	Transmission oil	Check and supply	
e	Axle oil	Check and supply	
f	Axle case breather	Clean	
g	Lubricating		
-1	Accelerator pedal linkage	Lubricate 1 point	
h	Radiator fins	Clean	
i	Water separator	Drain water	
j	Bucket teeth	Replace	

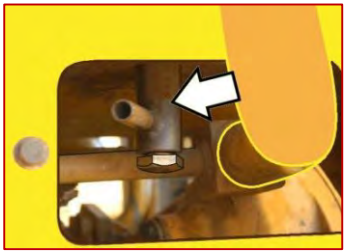
OIL FILLER AND LEVEL GAUGES POSITIONS

1. Hydraulic tank oil filter



2. Hydraulic tank oil level and temperature guage

3. Hydraulic tank drain plug



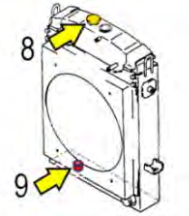
4. Transmission oil level plug

5. Transmission oil filler

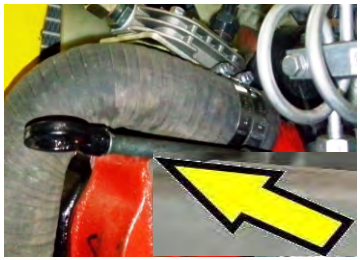
6. Front & Rear axle drain plug

7. Front & Rear axle level plug and oil filter

8. Coolant inlet
9. Coolant drain valve



10. Engine oil pan level gauge



11. Engine oil

12. Engine oil pan drain valve

14. Fuel tank drain valve

15. Fuel tank oil filler

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

EVERY 100 HOURS SERVICE

- Lower the bucket horizontally to the ground and stop the engine. Wait for 5 minutes, then check sight gauge (2) the oil should be visible in sight gauge (2).
- Add hydraulic oil from oil filler (1), if necessary.
- The type of Lubricant used depends on the ambient temperature. Select according to the table
- “FUEL COOLANT AND LUBRICANTS”
- When removing the cap, turn it slowly to relieve inner pressure.

INITIAL 250 HOURS SERVICE

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

- **FUEL FILTER**
- **TRANSMISSION OIL FILTER**
- **ENGINE OIL PAN AND FILTER**
- **ENGINE VALVE CLEARANCE**

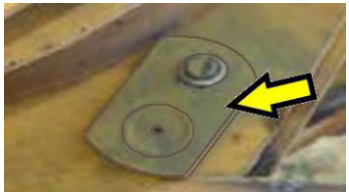
For details of the method of replacing or maintaining, see the section on EVERY 500 HOURS AND 2000 HOURS SERVICE.

EVERY 250 HOURS SERVICE

A. LUBRICATING

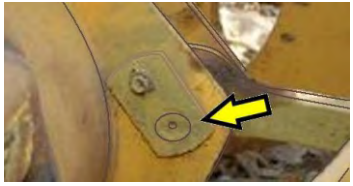
Apply grease to the grease fittings shown by arrows below.

1. Bucket Pin (2 points)



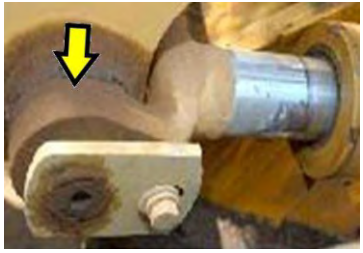
2. Bucket Link Pin (2 points)

3. Tilt Lever Pin (1 point)



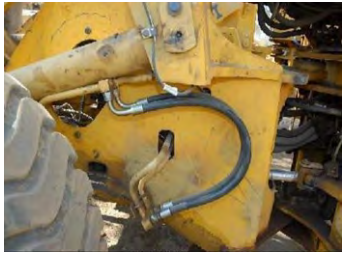
4. Dump Cylinder Pin (2 points)

5. Lift cylinder Pin (4 points)
6. Lift Arm Pivot Pin (2 points)



7. Steering Cylinder Pin (4 points)

8. Rear Axle Pivot Pin (2 points)



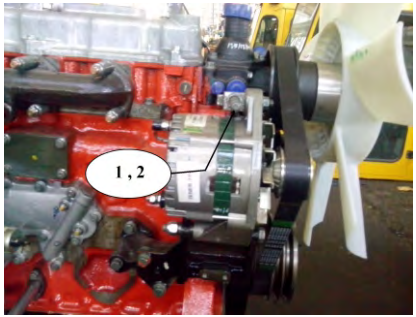
B. FAN BELT

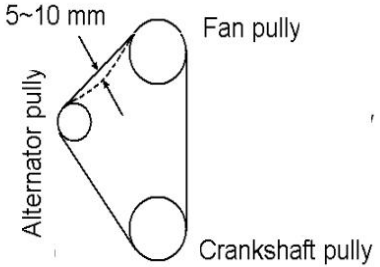
1. The belt tension should normally deflect by about 5 to 10 mm when pressed with the finger at a point midway between the alternator pulley and the fan pulley (approx, 6 kg).
2. To adjust the belt tension, loosen bolt (1) and nut (2) and shift alternator (3) slightly.
3. After adjustment, tighten bolt (1) and nut (2) securely.

★When adjusting the V-belt, do not attempt to push alternator (3) directly with a bar or the like, but use a wood pad to prevent damage to the core.

★Check each pulley for damage, and V-grooves and V-belt for wear. Particularly, check whether V-belt is in contact with bottom of V-groove through wear.

★Replace belt if it has stretched, leaving no allowance for adjustment, or if there is a cut or crack on belt.

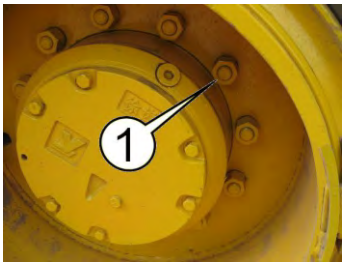




C. WHEEL HUB BOLTS

If wheel hub bolts (1) are loose, tire wear will be increased and accidents may be caused. If any hub bolts are loose, tighten them to the specified tightening torque.

★ Tightening torque:
40+5Kgm.



★ If any wheel bolt is broken, replace all bolts for that wheel.

★ Always rotate in the direction of tightening when checking for loose bolts.

Note: Care should be taken to avoid any effort to interchanging of nuts since the nuts are not interchangeable due to LH and RH threads.

EVERY 500 HOURS SERVICE

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

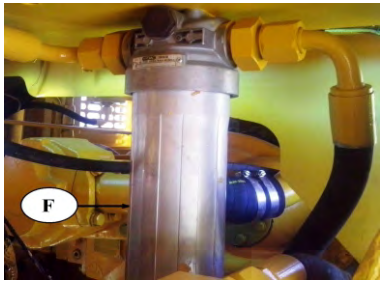
A. LUBRICATING

Apply grease to the grease to the propeller shaft spline.

B. FUEL FILTER

Fuel filter to be Replaced
(Contact Nearest Ashok Leyland dealer)

C. TRANSMISSION OIL FILTER



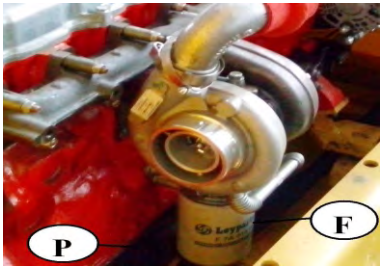
- Remove drain plug at the bottom of the filter case, and drain the oil. After draining the oil tighten the plug.
- Hold case and loosen center bolt then remove case
- Remove the element, and clean the inside of the case. Assemble a new element, and then install the case.
- Be careful not to apply excessive torque to center bolt Tightening torque: 7.8 ± 1.2 kgm.
- Run the engine for a short time at idling speed, and then stop the engine. Check that the oil is at the specified level ,

- **Use a genuine BEML element**

- Replace the filter gasket and O-rings with new parts. Coat the gasket and O-rings with clean engine oil before installing.

D. ENGINE OIL PAN AND FILTER

Oil to be changed .
Lub Oil filter to be replaced.
(Contact Nearest Ashok Leyland dealer)
Engine oil pan (P) and Oil filter (F).



EVERY 1000 HOURS SERVICE

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

A. LUBRICATING

Apply grease at the following fittings

1. Center hinge pin (2 points):

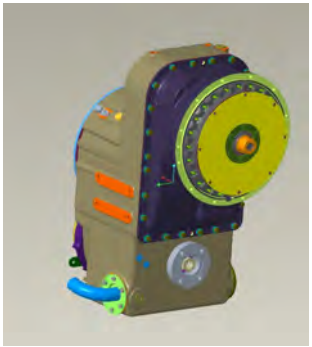
2. Front drive shaft (1 points):

3. Drive shaft center support (1 point):

4. Center drive shaft (2 points):

5. Rear drive shaft (1 point):

B. TRANSMISSION



- Loosen drain plug, pull out the plug slowly to prevent the oil sprouting out.
- After draining off the oil, tighten up drain plug.
- Pour in the specified amount of engine oil through oil filler (F).
- After refilling, check the oil level and ensure that it is correct.
- The type of lubricant used depends on the ambient temperature. Select according to the table
- "FUEL COOLANT AND LUBRICANTS".
- Check for oil leak at transmission case and filter.

C. TRANSMISSION CASE BREATHER

- Remove all mud and dirt from around the breather, then remove the breather. Put in cleaning fluid and clean the breather.

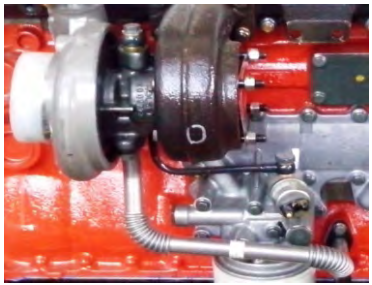
EVERY 2000 HOURS SERVICE

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

A. AXLE

- Remove drain plugs to drain the oil.
- After draining the oil, clean drain plugs, then install them.
- Add oil to the specified level through the oil filler ports of the axle housing.
- Check the oil level and ensure that is correct.
- Use the same procedure to change the oil for the front and rear axles.
- Refill capacity: 15.5 L (each)
- The type of lubricant used depends on the ambient temperature. Select according to the table “FUEL, COOLANT & LUBRICANTS”.

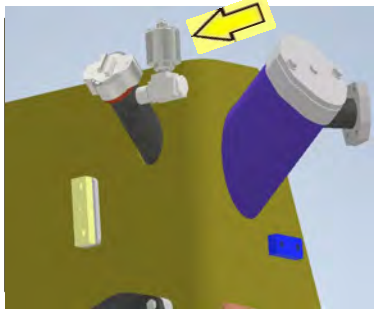
B. ENGINE BREATHER



C. HYDRAULIC TANK BREATHER

- Remove cap of oil filler.
- When removing the cap, turn it slowly to relieve inner pressure.
- Remove snap ring on breather (1), then remove breather cap.
- Replace filter element with a new part, then install cap and snap ring.
- It is possible to replace the element with the breather installed in the tank... However, if the breather is removed, do not wrap the taper thread of the breather.

with seal tape when assembling again, and be careful not to tighten too much.



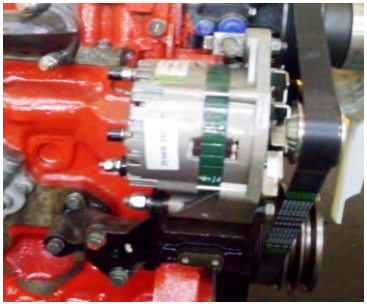
D. ALTERNATOR AND STARTING MOTOR

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

EVERY 4000 HOURS SERVICE

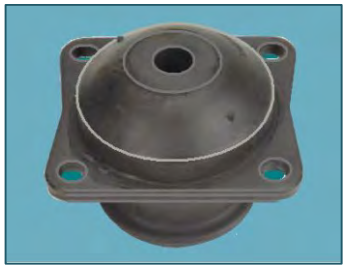
A. WATER PUMP

- Inspect the water pump for play in the pulley, grease leakage and water leakage.
- If any fault is detected ask nearest BEML Office to disassemble and repair or replace.



D. VIBRATION DAMPER

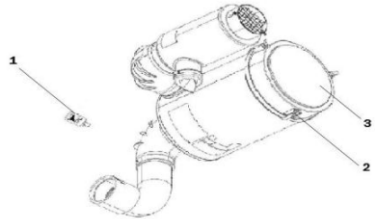
- Check that there are no cracks in the damper rubber. If there is any abnormality, contact your nearest BEML office for repairs.
- Maintenance for every 50, 100, 250, 500, 1000 & 2000 hours should be carried' out at time same time.



WHEN REQUIRED

A. CHECK, CLEAN AND REPLACE AIR CLEANER ELEMENT

Cleaning and replacing outer element



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

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

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

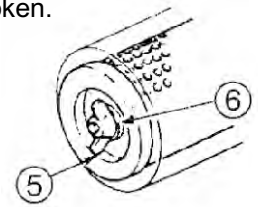
★ Replace the inner element at the same time.

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

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

★ Check inner element mounting nuts for looseness and, if necessary, retighten.

★ Replace seal washer (6) or wing nut (5) it they are broken.



REPLACING THE INNER ELEMENT

1. First - remove the cover and the outer element, and then remove the inner element.
2. Place the' cover over the air intake part to prevent dust entering.

   Clean the air cleaner body interior then removes the cover from air intake port.
3. Fit a new inner element and tighten it with nuts.
4. Install the outer element and the cover. Push the dust indicator reset button.

   NOTE: Do not attempt to reins stall a cleaned Inner element.

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

CLEANING OUTER ELEMENT

With compressed air

Direct dry compressed air (less than 7 kg/cm2) to element from inside along its folds, then direct it from outside along its folds and again from inside, and check element.

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

The following methods require spare parts.

With water

Dash city water (less than 3 kg/cm2) one element from inside along folds, then from outside and again from inside. Dry and check it.

With cleaning agent

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

★ Drying can be speeded up by blowing dried compressed air less than 7 kg/cm2) from the inside to the outside of the element.

Never attempt to heat the element.

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

★If small holes or thinner parts are found on element when it is checked with an electric bulb after cleaning and drying, replace the element.

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

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

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

B. CHANGE COOLANT

Use LEYPOWER COOLANT 5000
Pre mixed coolant .
No need to add water.
The recommended coolant change interval is 5000 Hrs. or 18 months whicever is earlier.

CHANGING COOLANT

Do not loosen Drain plug While Engine is still hot.
Stop the engine .Loosen the radiator drain plug, to drain Coolant. Drain the complete system and tighten drain plug.
Slowly feed coolant into the radiator through the filler untill the radiator is full.
Pour it slowly to prevent mixing of air with Coolant.

C. CHECK AND REFILL TRANSMISSION OIL

1. Start the engine and remove the cap of oil filler.
2. Use dipstick to check the oil level.
3. If the oil level is low replenish with new oil

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

★After the engine is operated for 3 to 5 minutes, check the oil level of the transmission in neutral position at the engine idling.

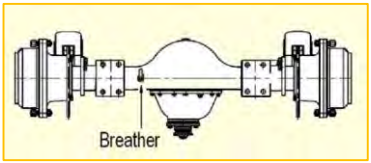
- **When checking the oil level, apply the parking brake, and lock the front and rear frames with the safety bar and pin.**

D. CHECK AND REFILL AXLE OIL

Remove oil level plug, and check that the oil level reaches the bottom of the plug hole. If necessary, add oil through the hole of plug

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

E. CLEAN AXLE CASE BREATHER



Remove all mud and dirt from around the breather with brush.

★Clean the breathers of the front and rear axles in the same way.

F. LUBRICATING

Apply grease to the grease fittings listed below.

1. Transmission control linkages
2. Throttle pedal linkages.

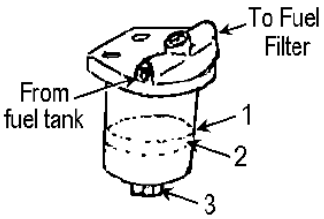
G. CLEAN RADIATOR FINS

1. Loosen bolt and remove radiator guard.
2. Clean the radiator fins and oil cooler fins clogged with mud, dust and leaves with compressed air. Steam or water may be used instead of compressed air.

★The rubber hose should be checked at the same time. If the hose is found to have cracks or to be hardened by ageing, such hose should be

replaced by new one. Further, loosened hose clamp should also be checked.

H. WATER SEPERATOR (if equipped)



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

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

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

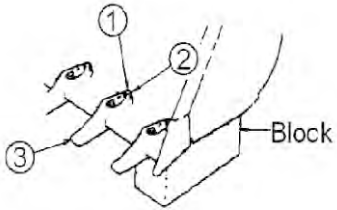
I. REPLACING BUCKET TEETH

If the bucket equipped with bolt- on-tooth.

When the bucket teeth are worn, replace them as follows.

1. Raise the bucket to a convenient height, and put blocks under the bucket to prevent it from coming down.

   ★Raise the bucket so that the bottom is horizontal.



2. Remove the bolts and nuts (1) and (2), then remove bucket teeth (3)
3. Install the new teeth on the bucket. When installing the teeth, insert the shim so that there is no clearance between teeth and the top surface of the bucket.

4. To prevent any clearance between the tooth and the edge of the bucket, tighten the nut partially, and then hit the tip of the tooth with a hammer.

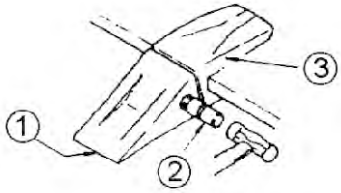
   ★ Tightening torque of mounting bolt: 115 ± 5 kgm

   ★ After operating the machine for a few hours, tighten the mounting bolts again.

If the bucket equipped with tip tooth.

Replace the teeth before they wear down as far as the adaptor.

1. Extract pin (2) fitted to the bucket and then remove tooth (1).

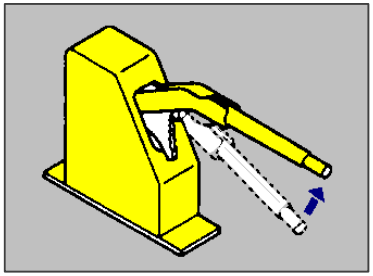


   ★ When extracting pin (2), strike the part (either the left or right part) with a sharp object. This will enable the pin to be extracted from the opposite side.

2. Insert the new tooth (1) into the adaptor (3), and insert pin (2) partway as shown in the diagram. Then drive it home by means of a hammer.

ADJUSTING PARKING BRAKE

Inspection



If 12 or more ratchets are counted before the parking brake comes into effect, perform the following adjustment.

PARKING BRAKE ADJUSTMENT

The internal, expanding shoe-type parking brake is mounted on the rear of the transmission housing at the output. Adjust the parking brake as follows:

- Using two 0.010 inch (0.25 mm) feeler gauges, simultaneously insert each one between the adjusting ends of each shoe and the drum. Adjust the brake shoes by inserting a screwdriver or brake adjusting tool into a hole at the end of the brake shoes. The star wheel should be rotated until the two feeler gauges are held snugly between the adjusting ends of the shoes and the brake drum.
- When properly adjusted, brake linkage should be able to be freely connected to or disconnected from the apply lever on the brake without actually moving the brake. Fully release the hand lever before starting the adjustment. Remove all slack from the linkage but be sure the linkage can be freely removed when the adjustment has been completed.

TROUBLE SHOOTING GUIDE

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

ELECTRICAL SYSTEM

The voltmeter is not stable while the engine is running at a constant speed.

Lamp does not glow brightly even when engine runs at high speed.

Lamp flickers while engine runs.

- Check for loose terminals and open circuit wiring.
- Adjust belt tension.

Voltmeter does work even when engine speed rises

- Replace the voltmeter.
- Replace the alternator.
- Check and repair wiring.

Starting motor turns the engine sluggishly.

- Charge the battery.
- Replace the starting motor.

The starting motor disengages before the engine starts up.

- Check and repair the wiring.
- Charge the battery.

Starting motor does not turn when starting switch is turned on.

- Inspect and repair the wiring.
- Charge the battery.
- Replace the starting switch.
- Replace the battery relay switch.
- Put directional lever in neutral position.

The heater signal does not glow red.

- Check and repair wiring.
- Replace the heater relay.
- Replace the monitor.

The heater signal glow white.

- Check preheating time.
- Replace electrical intake air heater.

The engine oil pressure caution lamp does not light up when engine is stationary (when the starting switch is in ON position.)

- Replace the lamp.
- Replace the caution lamp switch.

ENGINE

Engine oil pressure caution lamp does not go off immediately after starting engine.

- Add the oil to the specified level.
- Replace the oil element.
- Check oil leakage from the pipe or the joint.
- Replace the lamp.

Steam is emitted from the top part of the radiator (the pressure valve).

The engine cooling water temperature gauge Indicates red range.

- Supply the cooling water and check leakage.
- Adjust fan belt tension.
- Wash out inside of cooling system.
- Clean or repair the radiator fin.
- Replace the thermostat.
- Tighten the radiator cap firmly or replace the gasket of it.
- Replace the gauge.

The engine cooling water temperature gauge indicates white range.

- Replace thermostat.
- Replace the gauge.

The engine does not start when the starting motor is turned on.

- Add fuel.
- Repair where air is leaking into fuel system.
- Replace the injection pump or the nozzle.
- Check the valve clearance.
- Check engine compression pressure.
- Refer to the section of electrical system.

Exhaust gas is white or blue.

- Adjust to specified oil quantity.
- Replace with specified fuel.

Exhaust gas occasionally turns black.

- Clean or replace the air cleaner element.
- Replace the nozzle.
- Check engine compression pressure.

Combustion noise occasionally changes to breathing sound.

- Replace the nozzle.

Unusual combustion noise or mechanical noise.

- Replace with specified fuel.
- Check over-heating.
- Replace the muffler,
- Adjust valve clearance.

CHASSIS

Transmission

Engine is running but machine will not move.

- Release parking brake.
- Put directional lever in position properly.
- Add oil to transmission case to the specified level.

Even at full throttle, machine moves slowly and lacks power,

- Add oil to transmission case to the specified level.
- Disassemble transmission strainer and clean.

Oil overheats

- Add oil to transmission case to the specified level or drain oil.
- Use a suitable gear speed.
- Reduce time using torque converter at stall speed.
- Check engine.

Abnormal noise is produced.

- Add oil to transmission case to the specified level,

AXLE

Abnormal noise is produced.

- Add oil to axle case to the specified level.

Disc brake

Brake does not work when pedal is depressed.

- Replace disc.
- Bleed air from brake system.

Brake drags or stays applied.

- Adjust brake pedal play.
- Clean air vent of master cylinder.

Brake slips.

- Replace disc.

Parking brake

Brake does not work properly.

- Adjust linkage.
- Check linkage, replace parts.

Hydraulic system

Bucket lacks lifting power.
Bucket lifting speed is low,

- Add oil.
- Replace filter in hydraulic tank.

Many bubbles form in oil

- Replace with specified oil.
- Add oil.
- Bleed air from oil line.

Oil pressure is too low.

- Add oil and bleed air.

Cylinder vibrates when operating.

- Add oil.

STORAGE

BEFORE STORAGE

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

- After every part is washed and dried, the machine shall be housed in a dry building. Never leave it outdoors.
- In case it is indispensable to leave it outdoors, lay wood plates on the ground, and park the machine on the wood plates and cover it with canvas etc.
- Completely fill fuel tank, lubricate and change oil before storage.
- Apply a thin coat of grease to metal surface (hydraulic piston rods and splined shaft).
- As to batteries, remove the terminals and cover them or re- move them from the machine & store separately.
- When the ambient temperature is anticipated to drop below 0°C, always add antifreeze in the cooling water.
- Set each control levers to neutral hold position, lock them apply the parking brake.

DURING STORAGE

- Operate the engine and move the machine for a short distance once a month so that new oil film will be coated over movable parts and component surfaces.
- Before operating the work equipment, wipe off the grease on the hydraulic piston rod.
- If it is unavoidable to carry out rust-preventive operation while the machine is Indoors, open up doors and windows to improve ventilation and prevent the gas poisoning.

AFTER STORAGE

After storage (when it is kept without cover or the rust-preventive operation for a month).

You shall apply the following treatment before operation. .

- Wipe off the grease on the hydraulic cylinder rod.
- When using the machine without carrying out the monthly rust prevention operation, please contact your BEML office.
- After the engine is started, operate it until it is warmed up completely.
- You should request nearest - BEML office for following service.
- Remove the cylinder head, valves and rocker arms. And inspect the valve operation.

Fuel suplhur content	***Change interval of oil in engine oil pan***
0.5 to 1.0%	½ of regular interval
Above 1.0%	¼ of regular interval

NOTE:

(1) When fuel sulphur content is less than 0.5%, change oil in the oil pan every periodic maintenance hours described in this manual.

Change oil according to the following table if fuel sulphur content is above 0.5%.

ASTM **:** American Society of Testing material
SAE **:** Society of Automotive Engineers

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

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

SERVICE METER

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

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

How the meter progresses

- The service meter progresses by 1 when the engine is operated for one hour, regardless of the engine speed.
- Consequently, if the engine is running, the service meter will advance even if the machine does not move.
- While engine is running, green pilot lamp on the service meter flashes to show the service meter advances.

FUEL, COOLANT AND LUBRICANTS

RESERVOIR	KIND OF FLUID	BEML STDANDARD	AMBIENT TEMPERATURE -22 -4 14 32 50 68 86 104 122 (deg. F) -30 -20 -10 0 10 20 30 40 50 (deg. C)		CAPACITY (ltrs)	
					SPECIFIED	REFILL
ENGINE OIL	ENGINE OIL	———	SEE NOTE 2	API CK4 10W30	18	16
TRANSMISSION CASE	TM . OIL	C6002-12	C4 SAE30		30	25
HYD. SYSTEM	HYD. OIL	C6002-02	SAE 10W / EH-10CD		110	81
AXLE (FRONT AND REAR)	GEAR OIL	C6002-46		80W90 LS API-GL5	18	--
GREASE	LITHIUM BASE EP-2	C5003-04		NLGI-2	--	--
FUEL TANK	DIESEL	C6002-01	SEE NOTE 1	ASTM D975 NO.2	170	--
COOLING SYSTEM	PRE MIXED	———	SEE NOTE 3	LEY POWER COOLANT 5000	9+8 (INCL RADIATOR)	--
UDS TANK	PRE MIXED	———		ADBLUE	24	6% OF FUEL REFILLED

DETAILS ON COOLANT, OIL AND DIESEL FOR COLD START :

NOTE:

1. DIESEL : WINTER DIESEL (ATF + 0.4% No-NoX)
2. ENGINE OIL : GULF 10W30/ 5W30(SEMI / FULLY SYNTHETIC), ADDITIVE : NOT APPLICABLE
3. ENGINE COOLANT : GULF EURO COOL JIS K 2234 (CLASS 2) CONCENTRATION 50:50.

Key activities to be done during cold Starting:

1. F uel hand priming to be done (till the fuel line is filled) before start of engine with the help of priming pump mounted on fuel injection pump.
2. Energize the flange heater for 45 sec (pre-heat) and crank the engine either till firing or till the maximum Time limit per crank (45sec) whichever is earlier with flange heater energized continuously. Post heating of 30 -45 sec is required for smoke clean-up.
3. Accelerator throttle pedal to be pressed by 80% approx.

Engine derating guidelines upto 4500m Altitude:

FIP needs fuel recalibration to limit the Turbine speeds and high smoke levels.
General Guidelines on fuel pump calibration is given below:

1. No Derating on fuel setting up to 1500m altitude.
2. 5~6% reduction in fuel quantity for every 1000m after 1500m.