MVH308 • 408 • 508 PLATE COMPACTORS

MAINTENANCE ○ DISASSEMBLY DIAGRAMS ○ TROUBLESHOOTING
Proposition 65 Warning:

Engine exhaust and some of its constituents, and some dust created by power sanding, sawing, grinding, drilling and other construction activities contains chemicals known to the State of California to cause cancer, birth defects and other reproductive harm.

Some examples of these chemicals are:

- Lead and lead-based paint.
- Crystalline silica from bricks.
- Cement and other masonry products.
- Arsenic and chromium from chemically treated lumber.

Your risk from these exposures varies, depending on how often you do this type of work. To reduce your exposure to these chemicals: ALWAYS work in a well ventilated area, and work with approved safety equipment, such as dust mask that are specially designed to filter out microscopic particles.
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</table>
1. INTRODUCTION

- For correct operation, maintenance and service of Reversible Compactor, please read the separate operation manual before your work for your safe work.

- For the handling of engine, please read the separate engine operation manual and maintenance/service manual.

- This service manual explains the maintenance standard and how to disassemble and assemble for Reversible Compactor. Please read this service manual for a better understanding of the maintenance standard, the structure and function of each part.

- For inquiries about repair parts, parts lists, service manuals, and repair of the machine, please contact Multiquip dealer in your area. In addition, parts lists are available on the MQ Service & Support Center website at: http://service.multiquip.com

2. WARNING SIGNS

The triangle shaped \(<\) marks used in this manual and on the decals stuck on the main body indicate common hazards. Be sure to read and observe the cautions described.

<table>
<thead>
<tr>
<th>Warning labels indicating hazards to humans and to equipment.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DANGER</strong> (&lt;)** Denotes an extreme hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, is likely to result in serious injury or death.</td>
</tr>
<tr>
<td><strong>WARNING</strong> (&lt;)** Denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in serious injury or death.</td>
</tr>
<tr>
<td><strong>CAUTION</strong> (&lt;)** Denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury to people and may damage or destroy the product.</td>
</tr>
<tr>
<td><strong>CAUTION (without at (&lt;&gt;)</strong> Failure to follow the instructions may result in damage to property.</td>
</tr>
</tbody>
</table>

3. CAUTIONS FOR MAINTENANCE TO SECURE SAFETY

3.1 Work Site

**DANGER**

- Do not work indoor or inside a tunnel where ventilation is poor. The emission from the engine contains toxic gas such as carbon monoxide, and it is very dangerous if this toxic gas and dust are inhaled. Also, to improve ventilation, please keep a proper distance between this machine and a building when operating the machine.

**CAUTION**

- Maintenance should be done in a place with a flat and hard surface to keep the machine stable. Also, do maintenance at sufficient work space.
- Before maintenance work, clean the floor. Oil on the floor, in particular, becomes the cause of falling accident.
- For maintenance work, have sufficient lighting in the work site. A portable lamp used to illuminate the work area has to be protected by wire. In case if the lamp is broken, fuel and oil might ignite.
- To prepare for an accident, please have emergency medical supplies and fire extinguisher ready at an easily accessible area.
To work safely, wear work clothes of appropriate size, and use suitable protective gear such as helmet and safety shoes. The work clothes that do not fit the body size might result in unpredicted injury because the clothes easily get caught by rotating part of the machine.

When adding fuel
- Always refuel in the well ventilated area.
- Always refuel after the engine stopped and cooled sufficiently.
- Select a flat surface location away from flammable material and Do not overfill the tank. If spilled fuel, wipe it off well.
- Never put fire near the refueling area. (Never refuel while smoking.)
- If fuel is filled to the top, it might overflow, and is dangerous.
- After refueling, securely tighten the tank cap.

Start your work after the machine temperature drops. Especially, the muffler gets very hot, and it will pose a danger of burn accident. Also, engine and engine oil as well as vibrator become hot. Be careful not to get a burn.

If maintenance work is started with the engine running, injury might occur because you might get caught by the rotating part such as pulley and V-belt. Always stop the engine before maintenance.

Before maintenance work, remove the starter key of the engine. Before starting maintenance, always remove the minus (-) terminal of the battery.

When lifting the machine body and the engine, always use a crane. When lifting the machine and the engine, follow the cautions listed below. If the machine or the engine is dropped, a serious accident might occur.

To operate a crane, a crane handling qualification is required. Have someone qualified to handle and operate a crane do this work.

Before lifting, check the parts (especially, hook and anti-vibration rubber) of this machine for damage and loosening/lack of bolts to secure safety.

Before lifting, stop the engine and shut the fuel cock. Use sufficiently strong wire rope.

For lifting, use only the lifting hook. Do not use other part for lifting.

Never allow anyone or any animal come under the lifted machine.

For safety, do not lift to the height more than necessary.

Use an appropriate tool. If the tool that is not suitable for the part is used, not only the damage on the part, but also unpredicted accident might occur.

Before starting maintenance, always remove the minus terminal of the battery. If short circuit occurs, ignition might occur.

The battery gas might become a cause of explosion. Do not put fire nearby.

Especially, during charging, flammable gas is released. Do not put fire nearby.

The battery fluid is very toxic. Be careful when handling. If the battery fluid gets on your skin, eye or on your clothes, wash it off with plenty of water, then see a doctor.
3.7 Use Of Genuine Parts And Appropriate Oil And V-belt

**CAUTION**
- Always use genuine parts.
  - If inappropriate parts are used, not only it will shorten the machine life, but it might lead to unpredicted accident.

3.8 Tightening Torque Of Bolts And Nuts

**WARNING**
- Tighten bolts and nuts with the tightening torque specified in this maintenance manual.
  - Over tightening torque and lack of tightening torque not only affect the machine life, but also might occur unexpected accident.

3.9 Disposal Of Waste Material

**CAUTION**
- Unnecessary engine oil, hydraulic oil and fuel should be kept in a container. Never dump it on the ground or pour into the sewage system such as side ditch.
- For disposal of unnecessary engine oil, hydraulic oil and fuel, follow the law and other regulations.
4. TOOLS

1. Wrench 10mm 12mm 13mm 14mm 17mm 19mm 22mm 24mm 27mm
   Offset wrench/Socket wrench/Adjustable wrench

2. Hexagonal wrench 3/16inch
   5mm 8mm 10mm 14mm

3. Plier

4. External snap ring plier/Internal snap ring plier (bent type can be also used)

5. Screwdriver, flat and cross

6. Metal and plastic hammers

7. Pulley puller

8. Screw lock agent
   (Locktite 242, 271 and 638)

9. Torch burner

10. Liquid gasket

11. Pressing machine

12. Special jig for hand pump disassembly and assembly

   9840-10060
   Spring compression tool

   9840-10040
   Disassembling tool

13. Special jig for vibrator disassembly and assembly

   9840-10070
   Bearing remover

   9849-10011
   Bearing insertion jig (driven shaft and drive one) set
5. INSPECTION PROCEDURE

5.1 Appearance Check

1. Assembly condition of each component (bolt loosening, defective parts, etc.)
2. Damage on machine body
3. Oil check (oil level, dirtiness)
   a. Engine oil (when shipped, SAE10W30) (For oil level, please see the table below.)
   b. Vibrator oil
   c. Hydraulic oil (forward/backward travel)
4. V-belt check (tension, scratch, crack, deterioration, etc.)
5. Anti-vibration rubber check (scratch, crack, setting, deterioration, etc.)

5.2 Operation Check

1. Engine
2. Engine speed check (Operating speed, idling speed)
   a. Forward/backward travel switch check
   b. Forward/backward travel speed check
3. Check for abnormal noise during operation

### Standard torque table

<table>
<thead>
<tr>
<th>Screw diameter</th>
<th>The caller screws materials</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Aluminum type</td>
<td>SS, FCD, Aluminum type + Helisert</td>
</tr>
<tr>
<td>M6</td>
<td>N·m</td>
<td>11.8 - 14.7</td>
</tr>
<tr>
<td></td>
<td>Kgf·cm</td>
<td>120 - 150</td>
</tr>
<tr>
<td></td>
<td>ft·lbf</td>
<td>8.7 - 10.8</td>
</tr>
<tr>
<td>M8</td>
<td>N·m</td>
<td>24.5 - 29.4</td>
</tr>
<tr>
<td></td>
<td>Kgf·cm</td>
<td>250 - 300</td>
</tr>
<tr>
<td></td>
<td>ft·lbf</td>
<td>18.1 - 21.7</td>
</tr>
<tr>
<td>M10</td>
<td>N·m</td>
<td>58.8 - 68.6</td>
</tr>
<tr>
<td></td>
<td>Kgf·cm</td>
<td>600 - 700</td>
</tr>
<tr>
<td></td>
<td>ft·lbf</td>
<td>43.4 - 50.6</td>
</tr>
<tr>
<td>M12</td>
<td>N·m</td>
<td>98.1 - 107.9</td>
</tr>
<tr>
<td></td>
<td>Kgf·cm</td>
<td>1000 - 1100</td>
</tr>
<tr>
<td></td>
<td>ft·lbf</td>
<td>72.3 - 79.6</td>
</tr>
<tr>
<td>M14</td>
<td>N·m</td>
<td>117.7 - 127.5</td>
</tr>
<tr>
<td></td>
<td>Kgf·cm</td>
<td>1200 - 1300</td>
</tr>
<tr>
<td></td>
<td>ft·lbf</td>
<td>86.8 - 94.4</td>
</tr>
</tbody>
</table>

### Engine oil level table

<table>
<thead>
<tr>
<th>Model</th>
<th>MVH-308DZ</th>
<th>MVH-408DZ</th>
<th>MVH-508DZ</th>
<th>MVH-308GH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine type</td>
<td>HATZ 1B30</td>
<td>HATZ 1B50</td>
<td>HATZ 1D81</td>
<td>HONDA GX270</td>
</tr>
<tr>
<td>Capacity of Lubricant for Engine</td>
<td>1,100cc</td>
<td>1,500cc</td>
<td>2,000cc</td>
<td>1,050cc</td>
</tr>
<tr>
<td>Model</td>
<td>MVH-408GH</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Engine type</td>
<td>HONDA GX390</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Capacity of Lubricant for Engine</td>
<td>1,100cc</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 6. SPECIFICATION

<table>
<thead>
<tr>
<th>MODEL</th>
<th>MVH–308DZ</th>
<th>MVH–408DZ</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main Dimensions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall Length</td>
<td>in.(mm) 60.63(1540)</td>
<td>62.01(1575)</td>
</tr>
<tr>
<td>Overall Height (Handle)</td>
<td>in.(mm) 47.64(1210)</td>
<td>47.64(1210)</td>
</tr>
<tr>
<td>Overall Width</td>
<td>in.(mm) 17.52(445)</td>
<td>19.68(500)</td>
</tr>
<tr>
<td><strong>Compacting Board</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Width (w/ extension plate option)</td>
<td>in.(mm) 23.62(600)</td>
<td>25.59(900)</td>
</tr>
<tr>
<td>Length</td>
<td>in.(mm) 33.86(860)</td>
<td>35.43(900)</td>
</tr>
<tr>
<td><strong>Operating Weight</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight (w/out extension plate option)</td>
<td>lbs.(kg) 760.59(345)</td>
<td>899.48(408)</td>
</tr>
<tr>
<td>Weight (w/ extension plate option)</td>
<td>lbs.(kg) 794(360)</td>
<td>933(423)</td>
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<tr>
<td><strong>Engine</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturer/Type</td>
<td>HATZ,1B30</td>
<td>HATZ,1B50</td>
</tr>
<tr>
<td>Type Of Engine</td>
<td>Air-cooled 4-cycle diesel engine</td>
<td>Air-cooled 4-cycle diesel engine</td>
</tr>
<tr>
<td>Maximum Power</td>
<td>kw/min(^1) 4.9/3300</td>
<td>6.7/3300 (PS/min(^1) 6.7/3300</td>
</tr>
<tr>
<td>Set Engine Revolution</td>
<td>r.p.m 3350</td>
<td>2350</td>
</tr>
<tr>
<td>Electric Start</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td><strong>Performance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vibrating Frequency</td>
<td>Hz/VPM 73/4400</td>
<td>73/4400</td>
</tr>
<tr>
<td>Centrifugal Force</td>
<td>lbs/kN 10.116/45</td>
<td>12.365/55</td>
</tr>
<tr>
<td>Max. Traveling Speed</td>
<td>ft/min(m/min) 79(24)</td>
<td>82(25)</td>
</tr>
<tr>
<td>Hand Arm Vibration (Ahv)</td>
<td>m/sec(^2) 6.1</td>
<td>4.7</td>
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</table>

<table>
<thead>
<tr>
<th>MODEL</th>
<th>MVH–508DZ</th>
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<tbody>
<tr>
<td><strong>Main Dimensions</strong></td>
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</tr>
<tr>
<td>Overall Length</td>
<td>in.(mm) 63(1600)</td>
</tr>
<tr>
<td>Overall Height (Handle)</td>
<td>in.(mm) 47.64(1210)</td>
</tr>
<tr>
<td>Overall Width</td>
<td>in.(mm) 19.68(500)</td>
</tr>
<tr>
<td><strong>Compacting Board</strong></td>
<td></td>
</tr>
<tr>
<td>Width (w/ extension plate option)</td>
<td>in.(mm) 25.59(650)</td>
</tr>
<tr>
<td>Length</td>
<td>in.(mm) 35.43(900)</td>
</tr>
<tr>
<td><strong>Operating Weight</strong></td>
<td></td>
</tr>
<tr>
<td>Weight (w/out extension plate option)</td>
<td>lbs.(kg) 1157.42(525)</td>
</tr>
<tr>
<td>Weight (w/ extension plate option)</td>
<td>lbs.(kg) 1182(536)</td>
</tr>
<tr>
<td><strong>Engine</strong></td>
<td></td>
</tr>
<tr>
<td>Manufacturer/Type</td>
<td>HATZ,1D81</td>
</tr>
<tr>
<td>Type Of Engine</td>
<td>Air-cooled 4-cycle diesel engine</td>
</tr>
<tr>
<td>Maximum Power</td>
<td>kw/min(^1) 8.9/2500</td>
</tr>
<tr>
<td>Set Engine Revolution</td>
<td>r.p.m 2350</td>
</tr>
<tr>
<td>Electric Start</td>
<td>□</td>
</tr>
<tr>
<td><strong>Performance</strong></td>
<td></td>
</tr>
<tr>
<td>Vibrating Frequency</td>
<td>Hz/VPM 69/4150</td>
</tr>
<tr>
<td>Centrifugal Force</td>
<td>lbs/kN 14.613(65)</td>
</tr>
<tr>
<td>Max. Traveling Speed</td>
<td>ft/min(m/min) 82(25)</td>
</tr>
<tr>
<td>Hand Arm Vibration (Ahv)</td>
<td>m/sec(^2) 5.5</td>
</tr>
<tr>
<td></td>
<td>MVH-308GH</td>
</tr>
<tr>
<td>----------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td><strong>Main Dimensions</strong></td>
<td></td>
</tr>
<tr>
<td>Overall Length</td>
<td>60.63(1540)</td>
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<td>Overall Height (Handle)</td>
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</tr>
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<td><strong>Compacting Board</strong></td>
<td></td>
</tr>
<tr>
<td>Width (w/ extension plate option)</td>
<td>23.62(600)</td>
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<tr>
<td>Length</td>
<td>33.86(860)</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td></td>
</tr>
<tr>
<td>Weight (w/ extension plate option)</td>
<td>683(310)</td>
</tr>
<tr>
<td>Weight (w/o extension plate option)</td>
<td>717(325)</td>
</tr>
<tr>
<td><strong>Engine</strong></td>
<td></td>
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<tr>
<td>Manufacturer/Type</td>
<td>HONDA, GX270</td>
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<tr>
<td>Type Of Engine</td>
<td>Air-cooled 4-cycle petrol engine</td>
</tr>
<tr>
<td>Maximum Power</td>
<td>6.3/3600</td>
</tr>
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<td></td>
<td>8.6/3600</td>
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<tr>
<td>Set Engine Revolution</td>
<td>3600 r.p.m</td>
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<td>Electric Start</td>
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<tr>
<td><strong>Performance</strong></td>
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<tr>
<td>Vibrating Frequency</td>
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<td>Centrifugal Force</td>
<td>10,116(45)</td>
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<td>Max. Traveling Speed</td>
<td>79(24)</td>
</tr>
<tr>
<td>Hand Arm Vibration (Ahv)</td>
<td>2.8</td>
</tr>
</tbody>
</table>
1. Disassembly and assembly of this machine, with inspection and change of vibrator oil included, should be done on a horizontal surface area. Before disassembly and assembly, understand well the normal assembly condition so that you will not make assembly error.

2. If oil seal, gasket, packing, O-ring or lock washer is disassembled, replace it with a new one each time.

3. The contact surface between vibrator case and vibrator top cover should be sealed with O-ring. (Clean the contact surface and be careful about O-ring position when assembling.)

4. When tightening bolts and nuts, tighten them according to the specified standard torque and applying the screw lock agent (Loctite, etc.). For bolts and nuts with no specification, refer to the “Tightening torque list”. (When applying screw lock agent, degrease and clean the screw part with the brake cleaner, etc.)

Note) The bolts used on this machine are all of the right hand thread.

5. When disassembling and assembling, work in the maintenance shop without dirt and dust.

**Tightening torque list** (unit: kgf·cm, 1kgf·cm=9.80665N·cm)

<table>
<thead>
<tr>
<th>Material</th>
<th>Thread diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6mm</td>
</tr>
<tr>
<td>4T(SS41)</td>
<td>70</td>
</tr>
<tr>
<td>6-8T(S45C)</td>
<td>100</td>
</tr>
<tr>
<td>11T(SCM3)</td>
<td>150</td>
</tr>
<tr>
<td>When the mating material is aluminum</td>
<td>100</td>
</tr>
</tbody>
</table>

To change the unit to kgf·cm, convert with 1 N·m = 10.197 kgf·cm.

6. When the bolts applied the screw lock agent (Loctite, etc.) are difficult to loosen, they loosen easily by heating them with a torch burner. Then, replace the heated bolt with a new one. It should be a specified high tension bolt (genuine parts).

7. Use correct tools correctly.

8. First of all, the machine with battery remove the minus terminal before starting disassembly. After assembly is done completely, install the minus terminal.
8. DISASSEMBLY AND ASSEMBLY

8.1 How To Remove The Battery

1. Unlatch the two stoppers at the top portion of the rear cover to open the rear cover (Fig.1)

2. Loosen the two bolts on each side for the bar connecting the battery to the sider rails (Fig.2)

3. Slide the bar up the notches for easy access to the battery and tighten the bolts.

4. Take off the nuts and remove the battery holder.

5. After tilting the battery backward, disconnect the battery terminal. Always disconnect the black terminal on the negative side first.

6. Pull up the handle on the top of the battery to remove the battery from the machine. (Fig. 3). Make sure that the battery terminals do not touch the frame.

8.2 Control Part

(1) Disassembly

Start your work after the temperature of hydraulic oil gets sufficiently lowered.

a. Remove 6 bolts (46), then remove the handle cover (43).

b. Remove a bolt (57), then remove the travel lever (55).

c. Remove 2 bolts (63) and 2 nuts (62), then remove the handle grip (59).

d. Remove the hydraulic hose (51) from hand pump (50), then remove the hand pump (50) from the handle (16). (Fig. 4)

(2) Assembly

8.3. MVH-308GH

Start reassembly after checking all parts individually and making sure they are clean.

8.4. MVH-308DZ

After the hydraulic hose is removed, tighten the caps on both ends to prevent entry of dust.
Assembly

Assemble with the reversed procedure of disassembly, but be careful about the following points.

- Fix the wire (coupler) inside rear cover (18) with cable tie certainly. (Fig. 6)
- When installing the handle assembly to the engine base, tighten 4 bolts (3) for the handle brackets of right (1) and left (2) temporarily. Then after adjusting the handle operation with double nuts (14, 15), tighten 4 bolts (3) completely. (Fig. 4)
- Apply the grease to the shaft and washer.

Disassembly

Remove 4 bolts (35), then remove the belt cover OUT (33). (Fig. 9)

Remove the V-belt (22).

Remove the wire terminal on engine side.

f. Remove the hose clamp (33), then remove the hydraulic hose (51) from the cylinder on vibrator side. (Fig. 5)

CAUTION

- Be very careful not to have your fingers get caught by the hinge part.
- When removing V-belt, after hanging the waste cloth on the V-belt, then remove the V-belt by rotating while pulling the waste cloth. Be very careful not to have your finger get caught.
- In case of the V-belt have damage, it might be broken by the pulling force. Your body might damage due to this broken, so be very careful about level of pulling force.

8.3 Main Body Part

(Separation Of Engine Base And Vibrating Plate Assembly)

(a) Disassembly

- a. Remove 4 bolts (35), then remove the belt cover OUT (33). (Fig. 9)
- b. Remove the V-belt (22).

CAUTION

- Be very careful not to have your finger get caught by the hinge part.

For Inspection and Charge of the hydraulic oil, See the “9-8. Inspection & Change of Hydraulic Oil”.

MVH-308

CAUTION

- Be very careful not to have your fingers get caught by the hand pump spring.
- Be very careful not to damage the wiring, when pulling out the hand pump.

Before removing the hydraulic hose, clean up dirt and soil on its connection part.

Waste cloth V-belt (22)

CAUTION

- Be very careful not to have your finger get caught by the hand pump.

WARNING

Before removing the hydraulic hose, clean up dirt and soil on its connection part.
(2) Assembly

Assemble with the reversed procedure of disassembly, but be careful about the following points.

a. Apply Loctite #243 to bolts and nuts for assembling anti-vibration rubber.
b. Apply Loctite #243 to the all bolts for assembling the BASE AND ENGINE.
c. When installing the clutch, put the shoe side of it to engine side.
d. Use HDPF type V-belt for Mikasa genuine parts.

8.4 Vibrator Partontrol

During disassembly and assembly, be careful not to damage each part.
Replace O-ring, oil seal, and packing with new one.

**CAUTION**

During disassembly and assembly of vibrator, be very careful not to have your fingers get caught by gear, eccentric rotator, and vibrator case.

(1) Disassembly (Fig.10)

a. Remove 5 bolts (52), then remove the belt cover, lower (51).
b. Remove a bolt (43), then remove the vibrator pulley (40).
c. Remove 18 bolts that are fixing vibrator top cover, then remove the vibrator top cover from vibrating plate.
d. Remove each 2 bolts (7 & 12), then remove 4 eccentric rotator (6). (Fig.11)

e. Disassembly of piston(Fig.12)
   ① Remove 4 bolts (34), then remove the cylinder (28).
      When removing the cylinder, use the screw hole for cylinder removal.
   ② By rotating the driven gear (15), the piston (22) AY come out of the vibrator case.
   ③ Remove the stop ring for internal, R-26 (24), from the inside of piston. (Use internal snap ring plier with bent nose.)
   ④ Pull out the piston.
   ⑤ Remove the stop ring for external, S-10 (21), then remove 2 bearings (20) and the stop ring for internal (24) that was already removed.

f. Disassembly of driven shaft (11) AY
   ① Remove the seal cap (17).
      The seal cap can remove easily by hitting its bottom side.
   ② By Inserting the bearing remover (9844-67730) from seal cap side, the driven shaft (11) AY come out to piston side, then remove the bearing outer for piston side. (Fig.13)
   ③ Remove the bearing outer for seal cap side with the bearing remover, then remove the driven shaft (11) AY from the inside of vibrator case. (Fig.14)
   ④ Remove the bearing inner from driven shaft (11) AY with pulley puller. (Fig. 15)
   ⑤ By pushing out the driven gear to opposite side of piston, Remove the bearing (16) of opposite side of piston.
      In case of it is difficult to push out driven gear, push out it with pressing machine do not hit it with a hammer. (Fig. 15)
   ⑥ Remove the knock pin (14), then remove the piston rod (13). (Fig. 16)
   ⑦ Remove the bearing (16) on piston side. (Fig. 16)
Disassembly of drive shaft (2) AY

1. Remove 4 bolts (34), then remove bearing cover (27). When removing the bearing cover, use screw hole for bearing cover removal.
2. By hitting the end of pulley side on the drive shaft (2) with plastic hammer, the drive shaft AY come out to bearing cover side, then remove the bearing outer for bearing cover side. (Fig.17)

Remove the oil seal (8), then remove the bearing outer of pulley side by inserting the bearing remover (9844-67730) from pulley side.
4. Remove the drive shaft (2) AY from the inside of vibrator case.
5. Remove the bearing inner from drive shaft (2) AY with pulley puller.
6. Remove the stop ring (5) for external, then remove the drive gear. (Fig. 18) In case of it is difficult to push out the drive gear, push out it with pressing machine do not hit it with a hammer.

Remove the key (3).

Assembly

Degrease and clean the contact surface between the vibrator case and vibrator top cover, and other parts.

Assembly of drive shaft

1. Assemble the key to drive shaft (2), then press fit drive gear (4). Fix both sides with stop ring (5) for external. (Fig.18)

Apply the grease to the drive gear (4) before press fitting.
The punch mark of drive gear (4) should put the pulley side. (Fig.19)
Be careful about the direction of the stop ring. (The edge side should put outside.)
Press fit the bearing inner to drive shaft (2).
The flange of bearing inner should put to the eccentric rotator side. (Fig.19)

After Assembling the bearing insert ring to the bearing inner on the pulley side of drive shaft (2), assemble the bearing outer there. Then insert this drive shaft into the vibrator case. (Fig.20)

Assemble the bearing insertion puller to threaded hole of bearing cover, then assemble the bearing insertion cup between the center bolt and the bearing housing. (Fig. 21)
5. Press fit the bearing outer of pulley side by tightening the center bolt of bearing insertion puller. (Fig. 22)

6. Remove the bearing insertion ring of ③ from the drive shaft (2).

7. Press fit the bearing outer of bearing cover side with the bearing insertion puller and bearing insertion cup. At this time, press fit the bearing outer 2 to 3 mm deep from the mounting surface for bearing cover. (Fig. 23, 24)

8. Assemble the O-ring (30) to the bearing cover (27), then assemble it to the vibrator case for the bearing cover side. After assembled the bearing cover, check the thrust gap of drive shaft. (Standard value: 0.5mm to 1.0mm).

9. Insert oil seal (8) into vibrator case of pulley side of drive shaft. (Fig.25)

**CAUTION**

- Assemble the bearing after applying grease.
- Assemble the O-ring after applying grease.
- When inserting oil seal, make sure that there is no bend on oil seal and no damage on the lip.
- Apply Loctite #243 to the bolts for assembling the bearing cover.
- Tightening torque 35 N·m

b. Assembly of driven shaft

1. Assemble an eccentric rotator (6) to the pulley side (inside: straight) on the driven shaft (11) by tightening a bolt (12). Then, press fit bearing (16) to driven shaft. (Fig.26, 27)
2. Insert the piston rod (13) from the piston side (inside: tapered) of driven shaft, then insert knock pin (14) into the hole of piston rod through the groove of driven shaft. (Fig. 28)

3. Put the eccentric rotator of driven shaft to the upper side, then push the piston rod into the driven shaft.

4. Put the punch mark of driven gear to the pulley side, then insert it to the driven shaft. At this time, set the driven gear by turning its punch mark to the right side when seeing from the pulley side. (Fig. 29)

5. By seeing from the pulley side, while rotating driven gear to the right, insert the knock pin into the spiral groove of driven gear.

6. Press fit the bearing (16), then fix the drive gear (15). (Fig. 31)

7. Press fit the bearing inner to the driven shaft (11).

8. Press fit the bearing outer of pulley side from the inside of vibrator case with the bearing insertion puller and bearing insertion holder. (Fig. 32)

In case of the driven gear is assembled correctly, when pulling out the piston rod, the punch mark of driven gear and the threaded holes for eccentric rotator of driven shaft should be set in the same straight line. (Fig. 30)
9. Insert from the piston side of driven shaft (11) AY into the vibrator case, then align the punch mark between the drive gear and driven gear. (Fig. 33)

![Fig. 33]

10. Press fit the bearing outer of piston side with the bearing insertion puller and bearing insertion cup. At this time, press fit the bearing outer 2 to 3 mm deep from the mounting surface for cylinder cover. See the “a. Assembly of drive shaft” on P14.

![Fig. 34]

CAUTION

- When press fitting the bearing outer of piston side, push the piston rod until the end of groove of driven shaft.

c. Assemble the eccentric rotators to the drive shaft and driven shaft. (Fig. 34)

![Fig. 35]

CAUTION

- Check the bolts size.
- Apply Loctite #263 to the each bolts (7 & 12).
- Do not turn the drive shaft and driven shaft, when tightening the bolts for eccentric rotator with torque wrench.
  
  Tightening torque 275 N·m

WARNING

- Be very careful not to have your fingers get caught by gear, eccentric rotator, and vibrator case.

d. Assembly of piston

1. First, insert the stop ring for internal (24) to piston rod. (Fig. 35)

![Fig. 36]

CAUTION

- Apply the grease to the bearing insertion part of piston rod.
- Use the genuine parts for bearing (20).

2. Insert 2 bearings (20) to piston rod, then fix them with stop ring for external (21). (Fig. 35)

CAUTION

- Make sure that there is no scratch and no damage on the piston.
- Make sure that there is no damage on the UHS packing.
- Be careful about the direction of the UHS packing.
Assemble the piston (22) to bearings (20), then fix it by assembling the stop ring for internal (24) that was already inserted.

**CAUTION**
- When assembling the piston, push it with your hand or hit it with a plastic hammer lightly.
- When assembling the stop ring for internal, use internal snap ring plier with bent nose. Make sure that it assembles into the groove certainly.
- After assembled the piston, make sure that it rotates smoothly.
- The edge side of the stop ring should put outside.

e. Assemble the O-ring (30) to the cylinder (28), then assemble it to the vibrating for the piston side. After assembled the cylinder, check the thrust gap of driven shaft.

(Standard value: 0.5 ~ 1.0mm)

**CAUTION**
- Apply Loctite #243 to the bolts (34) for assembling cylinder.
  
  *Tightening torque 35N·m*
- When inserting the piston to the cylinder, be careful not to damage UHS packing.
- Assemble the O-ring after applying grease.

f. Assemble the connector (29), air release bolt (31), and packing (32) to the cylinder.

**CAUTION**
Apply the seal tape around the connector (29).

g. Assemble the seal cap (17) to the vibrator case at the opposite side of the cylinder.

h. By the above steps, the assembly of the vibrator is completed. As a final step, turn the drive shaft with your hand to make sure that it rotates smoothly. If it does not rotate smoothly, adjust it by hitting the side of gear with a plastic hammer lightly.

**WARNING**
Be very careful not to have your fingers get caught between gear and eccentric rotator.

**CAUTION**
Never hit the gear teeth.

Add the new vibrator oil (10W-30 of SAE grade or higher) to vibrator case as specified level.
Degrease the contact surface between the vibrator case and vibrator top cover, then after assembling O-ring to the vibrator case, assemble them by tightening bolts.
(Fig. 37)

- Use the engine oil (SAE10W-30) as vibrator oil.
- The oil quantity is 600cc (0.6L) / Oil level height is 9mm.

Measure the vibrator oil quantity correctly. (If it is more than the specified value, it might cause over-load. If it is less than the specified value, noise and shortening of bearing life might occur.)

- Apply Loctite #243 to the bolts.
  
  *Tightening torque 35 N·m*
- Tighten the bolts in a crisscross pattern.
8.5 Hand pump & Accumulator CP

**CAUTION**
- During disassembly and assembly, be careful not to damage each part.
- Replace the O-ring, oil seal, and packing with a new one.
- Work in a clean workplace to prevent entry of dust and foreign material.

(1) Disassembly
a. Remove the breather plug, then remove the hydraulic oil from the inside of hand pump. (Fig. 38)

![Breather plug](image)

b. Fix the pump head with the vise. (Fig. 40)
Fix the handle insertion part of the pump head.

![Fig.40](image)

c. Compress the springs of accumulator by using the spring compression tool (81). (Fig. 39)

① Securely assemble the spring compression jig to accumulator case and its springs. (Fig. 41)

![Fig.41](image)

② Compress the spring by tightening the two bolts of spring compression tool evenly.
③ Compress the springs until there is no spring pressure to the spring holder. (Fig. 42)

![Spring holder](image)

d. Heat the spring holder with torch burner so that the spring holder can be removed easily. (Fig. 43)

![Fig.42](image)
e. Remove the spring holder with the spring holder disassembling tool. (Fig. 44)

f. Loosen the two bolts of spring compression tool evenly. After making sure there is no spring pressure, remove the spring compression tool.

g. Remove the springs.

h. Degrease and clean the shaft of accumulator, then remove the accumulator case. (Fig. 45)

i. Remove the dust seal and O-ring from the inside of accumulator case.

(2) Assembly

Assemble with the reversed procedure of disassembly, but be careful about the following points.

① Degrease and clean the each parts.
② Be careful not to damage each parts, during assembly.
③ Replace the O-ring and dust seal with a new one.
④ Apply the molybdenum grease to the O-ring, dust seal and sliding area.
⑤ Be careful to prevent entry of dust and foreign matter.

a. Assemble the dust seal and O-ring into the accumulator case.
Put the lip of dust seal to the outside. (Fig. 46)

b. Insert the accumulator case to the accumulator shaft.
To prevent damage of the dust seal and O-ring, apply the tape to the thread on the end of accumulator shaft for protection. (Fig. 47)

c. Degrease and clean the thread on the end of accumulator shaft, then apply 2 to 3 drops of Loctite #638. (Fig. 48)
d. Assemble the springs to the accumulator. Then, compress the springs with the spring compression tool until the thread on the end of accumulator shaft is out completely. (Fig. 49)

**CAUTION**

Be very careful not to have your fingers get caught between the springs and spring compression tool.

![Fig. 49](image)

The thread on the end of accumulator shaft

**e.** Assemble the spring holder with the spring holder disassembling tool. (Fig. 50)

*The spring holder tightening torque: 20N·m*

**CAUTION**

When assembling the spring holder, be very careful for the spring pressure.

![Fig. 50](image)

f. Remove the spring compression tool.

*By the above steps, the assembly of hand pump and accumulator is completed.*
To use the machine in good condition all the time, always do the inspection and maintenance according to the following inspection sheet.

Do inspection and maintenance work in a place with a flat and hard surface to keep the machine stable, after stopped the engine certainly.

### 9.1 Inspection and Maintenance Chart

To use the machine in good condition all the time, always do the inspection and maintenance according to the following inspection sheet.

<table>
<thead>
<tr>
<th>Check frequency</th>
<th>Check parts</th>
<th>Check items</th>
<th>Oils</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily (before starting)</td>
<td>Appearance</td>
<td>Flaw, deformation</td>
<td>Light oil, gasoline</td>
</tr>
<tr>
<td></td>
<td>Fuel tank</td>
<td>Leakage, oil level, dirt</td>
<td>Engine oil</td>
</tr>
<tr>
<td></td>
<td>Fuel system</td>
<td>Leakage, oil level, dirt</td>
<td>Engine oil</td>
</tr>
<tr>
<td></td>
<td>Engine oil</td>
<td>Leakage, oil level, dirt</td>
<td>Hydraulic oil</td>
</tr>
<tr>
<td></td>
<td>Shock absorber</td>
<td>Crack, damage, wear</td>
<td>Engine oil</td>
</tr>
<tr>
<td></td>
<td>Hand pump</td>
<td>Leakage</td>
<td>Hydraulic oil</td>
</tr>
<tr>
<td></td>
<td>Vibrator oil</td>
<td>Leakage</td>
<td>Engine oil</td>
</tr>
<tr>
<td></td>
<td>Hydraulic pipe system</td>
<td>Leakage, looseness, flaw, wear</td>
<td>Dust on sponge</td>
</tr>
<tr>
<td></td>
<td>Air cleaner</td>
<td>Breakage, flaw, loosened or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Guard frame</td>
<td>missing bolts and nuts</td>
<td>Missing, breakage</td>
</tr>
<tr>
<td></td>
<td>Back and forth motion lever, linking parts</td>
<td>flaw, looseness or missing bolts and nuts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Back and forth motion lever operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bolts and nuts</td>
<td>Looseness, missing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Duct hose</td>
<td>Crack, damage</td>
<td></td>
</tr>
<tr>
<td>Every 20 hours</td>
<td>Engine oil</td>
<td>Replace only after the first 20 hours</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Engine oil filter</td>
<td>Replace only after the first 20 hours</td>
<td></td>
</tr>
<tr>
<td>Every 100 hours</td>
<td>Engine oil filter</td>
<td>Change</td>
<td>Engine oil</td>
</tr>
<tr>
<td></td>
<td>Engine oil filter</td>
<td>Washing</td>
<td>Engine oil</td>
</tr>
<tr>
<td></td>
<td>Vibrator oil</td>
<td>Leakage, oil level, dirt</td>
<td>Engine oil</td>
</tr>
<tr>
<td></td>
<td>Hydraulic oil</td>
<td>Leakage, oil level, dirt</td>
<td>Engine oil</td>
</tr>
<tr>
<td></td>
<td>Battery terminal</td>
<td>Cleaning</td>
<td>Hydraulic oil</td>
</tr>
<tr>
<td>Every 200 hours</td>
<td>V-belt for vibrator</td>
<td>Flaw, tension</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clutch</td>
<td>Dirt, flaw, wear</td>
<td></td>
</tr>
<tr>
<td>Every 300 hours</td>
<td>Vibrator oil</td>
<td>Change</td>
<td>Engine oil</td>
</tr>
<tr>
<td></td>
<td>Hydraulic oil</td>
<td>Change</td>
<td>Hydraulic oil</td>
</tr>
<tr>
<td></td>
<td>Fuel filter</td>
<td>Change</td>
<td>Engine oil</td>
</tr>
<tr>
<td></td>
<td>Engine oil filter</td>
<td>Change</td>
<td>Hydraulic oil</td>
</tr>
<tr>
<td>Every 2 years</td>
<td>Fuel pipes</td>
<td>Change</td>
<td></td>
</tr>
<tr>
<td>Irregular</td>
<td>Air cleaner element</td>
<td>Change</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hydraulic hose</td>
<td>Change</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cyclone cleaner</td>
<td>Change</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Duct hose/(Cyclone cleaner)</td>
<td>Change</td>
<td></td>
</tr>
</tbody>
</table>

For details about the check and maintenance of the engine, please refer to the attached engine operation manual. Caution: The above table shows the check frequency for standard condition. The check frequency may vary depending on the condition in which the machine is used.

### 9.2 Oil Application Table

<table>
<thead>
<tr>
<th>Oil type</th>
<th>Quality</th>
<th>Temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-30</td>
<td>-25</td>
</tr>
<tr>
<td>Engine oil</td>
<td>For diesel CE/CF class</td>
<td>SAE 5W-20 / 5W-30</td>
</tr>
<tr>
<td></td>
<td>SAE 10W-40 or SAE 15W-40</td>
<td>SAE 10W-30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SAE 20W-40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SAE 15W-40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SAE 10W-40</td>
</tr>
<tr>
<td>Vibrator oil</td>
<td>Engine oil SAE 10W-30</td>
<td>SAE 10W-30</td>
</tr>
<tr>
<td>Hydraulic oil</td>
<td>Hydraulic oil ISO VG46</td>
<td>ISO VG32</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ISO VG45</td>
</tr>
</tbody>
</table>

**CAUTION** Fuel pipes should be changed every two years.

Check for fuel and oil leakage.
Check the hand pump and pipe hose for oil leakage.
Check whether the hose joint is loose or not with the wrench, because the fuel and oil leakage might be occurred due to the loose of hose joint.
9.3 Opening The Front Cover

**CAUTION**
- During disassembly a maintenance work in a place with a flat and hard surface to keep the machine stable.
- Start your work after the machine and engine cool down completely.
- Be careful to catch the finger when opening and closing the front cover.

1. Remove the bolts (M14x35) on the front cover. Loosen the bolts (M14x35) on the side of front cover. (Do not remove.) (Fig.51)

![Fig.51](image1)

![Fig.52](image2)

Gasoline Engine

2. Hold the side of front cover, and pull up to open position. (Fig.52)

3. Open the front cover slowly. (Fig.53)

![Fig.53](image3)

Diesel Engine

2. Hold the hook and the front side of front cover, and pull up to open position. (Fig.54)

![Fig.54](image4)

3. Open the front cover slowly. (Fig.55)

![Fig.55](image5)

**CAUTION**
When doing maintenance by opening the front cover, tighten the bolt on the front cover side temporarily for safety.

4. Return the front cover to original position temporarily for safety.

<table>
<thead>
<tr>
<th>Size</th>
<th>Tightening torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolt M14X45</td>
<td>176.6N·m (130.2ft·lbf)</td>
</tr>
</tbody>
</table>

**CAUTION**
- Do not start the engine when opening the front cover.
- Tighten the bolts firmly.

9.4 Changing The Engine Oil

Perform the first engine oil change after 20 hours of operation, then change at every 100 hours. (Fig.56)
The Engine Air Cleaner
When the air cleaner element becomes dirty, the engine does not start smoothly, and sufficient output cannot be obtained. Machine operation will be affected and the engine life will be shortened greatly. Do not forget to clean the element. *(For details, please see the separate engine operation manual.)*
If the element cannot be cleaned, replace it with a new one. *(Fig. 57)*

Cyclone Cleaner
Always clean Dust Pot. Clogged Dust Pot leads to reduce cyclone effect with easy wear of Cleaner Element.

9.5 Cleaning The Air Cleaner

9.6 Checking/Changing The V-belt And Clutch

Check of V-belt *(Fig. 60)*
At every 200 hours, remove the belt cover (top) to check the tension of the V-belt. The flexibility of the belt should be about 10 mm when pushed strongly with your finger at the mid-point between the axes. When the V-belt is loose, the engine power is not transmitted well, resulting in poor compacting force and shortening the life of the V-belt.

Changing the V-belt
*a. Removing the V-belt*
Remove the top and bottom belt covers. Put a wrench (19mm) on the tightening bolt of the vibrator pulley (lower side). Put a piece of cloth at the center of the left side of the V-belt, and pull the belt strongly towards you. While pulling, turn the wrench clockwise, then remove the V-belt.
*b. Installing the V-belt*
Set the V-belt on the lower side of the vibrator pulley. Push the V-belt to the left side of the upper clutch. Similar to removing the V-belt, turn the wrench clockwise to install.

CAUTION

Do not use organic solvent like paint thinner, which may cause damage or deformation of Dust Pot.

b. Clean Dust Pot inside with water and neutral detergent.

CAUTION

Be careful to avoid pinched fingers.

How to clean Dust Pot
a. Latch off to remove Dust Pot. *(Fig. 58)*

b. Latch up securely to return Dust Pot to Air Cleaner. *(Fig. 59)*

CAUTION

Be careful to avoid pinched fingers.
9.7 Checking/Changing The Vibrator Oil

- At every 100 hours of operation, set the machine on a level surface and remove the oil gauge of the vibrator. Check the oil level to see if it is within the allowable range. (Fig.61)
- Change the vibrator oil at every 300 hour operation. Drain the oil from the drain plug. For draining, put a beam under the compacting board at the other side of the drain plug to tilt the machine.

*Use engine oil SAE 10W-30 as lubrication oil. The quantity used is 600cc.*

9.8 Checking/Changing The Hydraulic Oil

- Check the hydraulic oil
  - Check the hydraulic oil at every 100 hours' operation. By making the handle bar vertical (done at the time of storage), remove the breather plug at the top of the hydraulic hand pump to see if the hydraulic oil is at the specified level (OIL LEVEL). (Fig.62)
• Changing the hydraulic oil

Remove the plug cap of the hand pump. Then remove the breather plug (with 24mm wrench) before removing the hydraulic hose connected to the cylinder on the vibrator side. Set the run lever to reverse, then drain the hydraulic oil from the pump. (Fig.62, 63)

1. After the oil is drained, attach the hydraulic hose again to the cylinder on the vibrator side. With the direction control lever at the forward-most position, fix to the hook with a rope to immobilize. (Fig.63, 64)

2. Pour hydraulic oil (550cc) from the hand pump breather plug attachment hole. (Fig.62)

3. Remove the air releasing plug of vibrator cylinder. Then oil will come out from the air releasing plug. After air bubbles stop coming out, attach the plug. Tighten securely. (Fig.61)

4. Remove the rope that is fixing the travel lever, then while stopping the travel lever for about 10 sec. at the forward position, move the travel lever to maximum position for forward and backward a few dozen times. At this time, the check valve opens at the maximum position for forward, and the air in hydraulic oil will be bleed from the oil tank at the top of hand pump. (Fig.64)

5. Remove the handle cover, and if the accumulator move about 2 to 3 cm when moved the travel lever to forward position as shown in Fig. 67, air bleeding is completed. If there is the lack of air bleeding, do the procedure “1” again. (Fig.64, 65)

6. Attach the hand pump breather plug, put on the plug cap. After making sure the hydraulic oil in the pump is at OIL LEVEL, attach the breather plug.

CAUTION

The level of the hydraulic oil in the hand pump should always be at OIL LEVEL. If the level is higher, the oil bursts out from the breather plug.

Hydraulic oil:
Shell Terrace Oil #32 or equivalent

9.9 Battery

• Checking the battery

The standard battery installed is a maintenance free battery. It is not necessary to supply battery fluid. In case of a sudden voltage drop, the battery cannot be charged quickly, so it has to be replaced with a new one.

• Check of battery capacity by battery checker

When the battery charging level gets low, the battery checker of the hour tachometer lights up in red. (Fig.66)
Inspection and cleaning of battery
- Check the battery for damage such as scratch and deterioration.
- Check the terminal for corrosion. If corroded, grind with wire brush or sanding paper, and apply grease at the terminal.
- Also clean outside of the battery.
- Do inspection and cleaning also at the battery storage area of main machine side. Check also the anti-vibration mat. If it is necessary to replace with a new one due to deterioration or breakage, replace it.
- After the battery inspection is completed, securely fix it with the battery holder.

When battery is dead
“Battery is dead” when the starter does not rotate. Also, even when the starter rotates, if the rotation is weak and the engine does not start, then the battery is dead.

Method taken for emergency
- Start the engine manually (use recoil starter or crank handle)
- If impossible to start the engine manually due to breakage or breakdown, jump-start the engine using another vehicle.

Starting method using booster cable (Jump-starting)(Fig. 67)
- Connect the booster cable by the following order.
  1. + (red) terminal of the battery of machine side
  2. + (red) terminal of the battery of another vehicle side
  3. - (black) terminal of the battery of another vehicle side
  4. Unpainted and protruded part of the crank case of the engine shown by “Fig. 67” (Connect the ground wire.)

WARNING
- For the above connection at 4, never connect the minus (black) terminal of battery directly. Spark occurs, and then explosion of the battery might occur due to ignite to the flammable gas from the battery by sparking.
- When connecting the booster cable, never contact the plus (+) terminal and the minus (-) terminal. Spark occurs, and then explosion of the battery might occur due to ignite to the flammable gas from the battery by sparking.
- Do not put fire near the battery. There is a danger of explosion.
- During charging the battery, do not go near the battery. Battery fluid that contains dilute sulfuric acid might be ejected. Eye and skin that contacted with such fluid might lead to serious injury. In case of contacting with battery fluid wash with plenty of water, then see a doctor.

Do not keep using the deteriorated battery. Do not operate with the battery removed. Engine regulator might be damaged.
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10. TROUBLESHOOTING

10.1 Gasoline Engine

(1) Starting problems

Fuel is supplied, but the igniter plug does not ignite.
- Electricity reaches the high voltage cable.
  - Bridging the igniter plug.
  - Carbon accumulated on the igniter plug.
  - Short circuit due to insulation problems of the igniter plug.
  - Inappropriate spark gap
- Electricity does not reach the high voltage cable.
  - Short circuit of the ON-OFF switch
  - Ignition coil problems
  - Dirt of the point or inappropriate gap.
  - Breakage of ignition coil or short circuit

Fuel supplied, and the igniter plug ignites.
- Compression is good.
  - The wrong fuel is used.
  - Mixing of water or foreign materials
  - The air cleaner not working
- Compression is not good.
  - Intake/exhaust valve is stuck or pushed up
  - Piston ring, cylinder wear
  - Cylinder head, igniter plug tightening problem
  - Head gasket, igniter plug gasket breakage

Fuel does not reach the carburetor.
- No fuel in the fuel tank.
- Fuel cock does not open properly.
- Clogging of fuel filter.
- Clogging of tank cap air hole
- Air trapped in the fuel pipe

(2) Operation problems

Lowered power.
- Compression is good and no firing problem.
  - Dirt of air cleaner.
  - Carbon accumulated in the cylinder.
  - Carburetor oil level inappropriate.
- Insufficient compression (see the item “compression is not good.”)
  - Water mixed in fuel
  - Dirt of the igniter plug.
  - Ignition coil problem
  - Occasional short circuit of the ignition coil

Engine overheating
- Carbon accumulated inside combustion chamber and exhaust hole.
- Spark plug thermal value inappropriate
- Dirt and breakage of the cooling fin.

Revolution fluctuation
- Governor adjustment inappropriate
- Governor spring problems
- Fuel does not flow properly.
- Air taken from intake pipe system

(3) Recoil starter problems

Recoil starter operation not good
- Clogging of foreign materials at the rotating part.
- Weakening of the spiral spring
10.2 Diesel Engine

(1) Starting problems

(A) In case of compression problems

- No compression at all
  - Intake/exhaust valve upthrust
  - Decompressor adjustment problems

- Almost no compression
  - Contact with seat not close enough.
  - Piston ring wear
  - Cylinder wear
  - Cylinder, cylinder head mating surface problems
  - Nozzle seat looseness

(B) In case of inappropriate fuel injection inside the combustion chamber

- Fuel flow low or no flow
  - Clogging of the tank cap air hole.
  - Clogging of the fuel filter
  - Fuel cock not open
  - Air inside the fuel pipe

- Fuel not injected inside the combustion chamber
  - Injection pump barrel, plunger stuck
  - Nozzle hole clogging
  - Nozzle needle stuck

- No fuel in the fuel tank
- Mixing of water or foreign materials

(C) Fuel and compression pressure appropriate, but the engine does not start.

- Does not reach the starting revolution.
  - Inappropriate starting operations
  - Engine oil viscosity high, engine oil is very dirty.
  - Air trapped inside the fuel pipe.

(2) Insufficient output and operation problems

- Insufficient compression
  See the comment for insufficient compression.

- Engine overheating with black smoke
  - Dirt and breakage of cooling fin
  - Mixing of water inside the fuel filter
  - Carbon accumulated in the combustion chamber or exhaust hole.
  - Smoke set inappropriate
  - Overload
  - Inappropriate injecting timing
  - Nozzle clogging

- Revolution fluctuation
  - Governor fork and sleeve mating surface problems
  - Governor spring problems
  - Fly plate and sliding part wear and operation problems
10.3 Main Body

**Engine revolution does not increase.**
- Valve open/close timing inappropriate
- Clogged exhaust hole, muffler
- Overload

**Firing problem with white smoke (when unloaded)**
- Piston, cylinder ring wear
- Nozzle hole clogging
- Piston ring stuck
- Wrong assembly (upside down) of piston ring
- Inappropriate injection timing
- Inappropriate valve open/close timing
- Looseness of injection pump joint

**Fuel consumption too high (black smoke)**
- Leakage from fuel passage
- Clogging of the air cleaner element
- Inappropriate fuel due to mixing of impurities
- Overload

**Extensive wear on sliding parts or stuck piston rings**
- Use of wrong oil
- Failure to change oil
- Breakage of the air cleaner element or failure to clean the air cleaner

**Stopped suddenly with abnormal noise**
- Searing or damage of the piston, rod, etc.

**Lubrication oil diluted and increased.**
- Wear on the injection pump barrel or plunger

**Engine does not stop even though the fuel supply is cut (or over-running)**
- Too much oil
- Wrong assembly of the governor system
- Detached injection pump rack

**Low travel speed and vibration weak**
- Insufficient engine output and inappropriate high speed set revolution
- Slipping of clutch
- Slipping of V-belt
- Too much vibrator oil
- Failure inside vibrator

**Move forward or backwards, but unable to switch between back and forth motion**
- Hand pump problems
- Inappropriately installed forward/backward motion lever
- Breakage of the oil hose
- Mixing of air in the hydraulic oil
- Clogging of foreign materials in the check valve inside the hand pump
- Breakage of the piston bearing in cylinder

**No forward, backward motion**
- V-belt coming off, slipping and breakage
- Slipping of the clutch
- Locking of the vibrator
- Breakage of the piston bearing in cylinder

**Movement of lever heavy**
- Piston inside the hand pump not moving smoothly
- Vibrator cylinder piston does not move smoothly
11. WIRING DIAGRAM

**MVH-308DZ**

- Dynamo
- Regulator
- Starter DC12V 1.0kW
- Oil pressure switch
- No.3: Relay drive
- Battery 55B24L
- Starter switch

**MVH-408DZ**

- Dynamo
- Regulator
- Starter DC12V 1.0kW
- Oil pressure switch
- No.3: Relay drive
- Battery 75D23L
- Starter switch

**MVH-508DZ**

- Dynamo
- Regulator
- Starter DC12V 1.0kW
- Oil pressure switch
- No.3: Relay drive
- Battery 75D23L
- Starter switch