APPLICATIONS OF THIS FIRE PUMP

USAGE
TOHATSU portable fire pumps “VC52AS, VC72AS, VC82ASE, VC85BS” are manufactured for use in firefighting operations.

These portable fire pumps are intended only for firefighting activities in collaboration with general public fire extinguishing equipment.

Using it for other applications is regarded as being used for improper purposes.

The manufacturer of this fire pump bears no responsibility for any damages that may result from modification of the fire pump without prior permission from the manufacturer, improper use of the fire pump, or use of the fire pump for applications other than those stated above.

Note that use this fire pump for applications other than those stated above can result in personal injury or damage to the equipment.

Using this fire pump within the range of intended uses implies that the user should follow the instructions provided by the manufacturer relevant to operation, servicing and maintenance.
Intended people
All persons who operate, services or maintains this fire pump must read and understand the following items:
- Owner’s manual
- Safety-related instructions on the pump and the other parts such as the battery.
- The other owner’s manuals, such as battery charger.

The portable pump should be operated by only persons who received training as operators of fire engines along with each country’s (region’s) regulations. The range of personal responsibility and supervision must be strictly defined by the user.

If a person does not have adequate professional knowledge which is required for his/her assignment, he/she must undergo relevant training or receive appropriate instructions from an individual who is actually knowledgeable in operation of this fire pump.

A person who does not have enough knowledge is not permitted to operate this fire pump.

When using this fire pump, conditions under which an explosion may occur are not considered.

Keep this manual in a safe place for further reference. Operators of this fire pump must always refer to all the relevant manuals in order to avoid errors, personal injuries and equipment damage when operating the portable fire pump, and to maintain faultless operation. Arrange owner’s manual so that operators can refer to them where they operate the fire pump.
Thank you for purchasing the TOHATSU Fire Pump.
This fire pump has passed a range of quality assurance standards.

Owner’s manual
This portable fire pump complies with relevant laws and regulations.
This manual includes a description for operation and maintenance. Before using this fire pump, be sure to read and understand this manual thoroughly.

Engine operation
This manual also includes a description for operation and maintenance of the engine.

NOTE
This manual is an important item that goes with your portable fire pump.
This manual should accompany this fire pump if sold to another person.
Before using this fire pump, write down the serial number in the following boxes. This will be useful when you inquire about servicing, repairs and genuine parts.

TOHATSU CORPORATION
Address : 3-5-4 Azusawa, Itabashi-ku, Tokyo, JAPAN
FAX : +81-3-3966-2951
Phone : +81-3-3966-3137

Serial Number
(Identification Number)

The pump serial number is marked on the pump casing.
GENERAL SAFETY INFORMATION

Overview
Before operating the TOHATSU fire pump thoroughly read this manual. Understanding proper operating procedures including “DANGER”, “WARNING”, “CAUTION” and “NOTE”. These notices are designed to bring attention to very important information necessary to ensure safe, trouble free operation.

Warning sign
Meaning
This sign is used for safety-related instructions in this manual.
Be sure to follow all safety-related instructions, otherwise personal injury may occur.

Signal words

*DANGER* Failure to observe will result in severe personal injury or death, and possibly property damage.

*WARNING* Failure to observe could result in severe personal injury or death.

*CAUTION* Failure to observe could result in personal injury or property damage.

- This instruction provides special information to facilitate the use or maintenance of the pump or to clarify important points.
- For attaching position of the warning label, refer to the contents “LABELS”.
- **Warning labels should be read clearly at any time.**
  - If the display of the warning label becomes difficult to be read, it was almost come off, you must replace paste immediately.

Safety-related instructions and warning signs
Read and follow the safety-related instructions described in this manual and all warning signs on the portable fire pump thoroughly.
Always keep the warning signs in a legible condition. If any warning sign becomes illegible or detached, replace it immediately.
Transporting the portable fire pump

**CAUTION** Retractable handle is folding type. Do not put hand or finger between top of retractable handle and bracket. When transporting the portable fire pump, assign one person per handle. Also, when you transport the portable fire pump, it should be transported holding the handle firmly. There is a risk of injury to the leg by fall.

Durability of protection
When you purchase a new pump, it is placed in packing box and protected.

Storage of pump after transportation
Keep the pump away from high humidity, and place it on a horizontal plane.

Disposal of packing box
Dispose the packing box by following the environmental laws.

**CAUTION** Wear proper hearing protection during operation.

Exhaust gas
Exhaust gas emitted from the engine contains carbon monoxide (CO) etc. that may seriously affect human health. Do not operate the engine in a room, car, warehouse, tunnel or other closed locations that have poor ventilation. Mortal danger due to carbon monoxide (CO) poisoning.
Handling of fuel
Exercise care when handling fuel. Failure to do so may cause fire.
Do not bring any flames near fuel.
Stop the engine before refueling fuel.
Do not smoke while refueling fuel.
Do not refill fuel in an enclosed room to avoid an explosion by fuel fumes.
If fuel spills, wipe it with a cloth or other material, and dispose of it according to relevant laws and regulations.

Crude oil, gasoline, diesel fuel and other petroleum products can expose you to chemicals including toluene and benzene, which are known to the State of California to cause cancer and birth defects or other reproductive harm. These exposures can occur in and around oil fields, refineries, chemical plants, transport and storage operations such as pipelines, marine terminals, tank trucks and other facilities and equipment. For more information go to: www.P65Warnings.ca.gov/petroleum.

Safety devices
Before operating this portable fire pump, be sure to check that all the safety devices have been installed in the appropriate positions. Before removing the safety devices, turn the main switch off.

Protective clothing
Protective equipment
During fire extinguishing training or normal fire fighting services, wear normal protective clothing and equipment to protect your body.

- Fire protective closing
- Fireproof helmet
- Fireproof protective gloves
- Fireproof protective boots
Service
Maintenance
Servicing and maintenance of this fire pump must be carried out by only persons who have professional knowledge, who are familiar with the device and who understand laws and regulations regarding safety and accident prevention.

Before starting maintenance work, turn the main switch off to stop the engine.

Disconnect the negative terminal of the battery.

Before starting maintenance work, securely place the portable fire pump on the ground.

Do not touch the exhaust pipe, the muffler and the other engine parts until these parts will be cold enough. These parts could be very hot and will cause severe burns.

Safety devices
After protection devices (such as muffler guard) have been disassembled as part of servicing and maintenance work, immediately install them back to their original locations, making sure that they are in safe secure condition.

Check the portable fire pump visually and functionally on a regular basis.

If you find any faulty device or equipment, remove it immediately, and repair or replace it, if necessary. Failure to do so may cause an accident. After it has been repaired or replaced, make sure that it functions correctly.
Electrical equipment
Only expert electricians or trained staff members should handle electrical equipment.

When removing the battery cable from the electrical equipment, always disconnect the negative (−) cable first.

When installing the battery cable, be sure to connect the positive (+) cable first before connecting the negative (−).

Do not place any metal on the top of or around the battery. Doing so may cause a short circuit.

Use a fuse with the same specifications as the original one when replacing it. Using a fuse that has a greater capacity than the rated value may damage the equipment.

While engine is running, do not touch the high voltage ignition wire attached to spark plug. This wire carries very high voltage which will cause injury and bodily harm.

Check the electrical equipment of the fire pump on a regular basis.
Battery
Follow any safety-related instructions shown on the battery.

The battery can generate flammable hydrogen gas that may cause an explosion.

Do not charge the battery in closed location.
Do not smoke around the battery.

The battery electrolyte is caustic and may cause personal injuries.

- Always wear protective clothing.
- Always wear protective gloves.
- Always wear protective glasses.
- Do not tilt the battery.
  Doing so may cause the battery electrolyte to leak out from the vent hole.

Disposal
Dispose of disused batteries according to relevant laws and regulations.
Genuine parts
When replacing parts for servicing and maintenance of the portable fire pump, only use Tohatsu genuine parts.

If genuine Tohatsu parts and accessories are not used it may adversely affect the functioning and safety of the fire pump. Use genuine Tohatsu parts only.

Tohatsu bears no responsibility for any personal injuries or equipment damage that may result from use of parts or accessories obtained from outside sources.

Environmental protection measures
Dispose of oil, fuel, batteries, etc. according to relevant environmental laws.

Do not dump waste into the ground, water, or sewerage.

Store fuel only in the specified container.

When disposing of parts, follow the correct disposal procedure.

Water-prohibiting substance
Do not discharge water to water-prohibited substance.

Use of water
Do not pump combustible liquids, chemical or caustic liquids.
Customer Service
If any problems occur during servicing and maintenance work of the portable fire pump, contact our Customer Service.

Address : 3-5-4 Azusawa, Itabashi-ku, Tokyo, Japan
Fax : +81-3-3966-2951
Phone : Service +81-3-3966-3380
Email : tohatsu-pservice@tohatsu.co.jp

Overseas section fire protection sales department
+81-3-3966-3137
bousaiex@tohatsu.co.jp
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## 1 SPECIFICATIONS

<table>
<thead>
<tr>
<th>Model</th>
<th>VC52AS</th>
<th>VC72S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Portable fire pump</td>
<td></td>
</tr>
<tr>
<td>Engine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturer</td>
<td>TOHATSU CORPORATION</td>
<td></td>
</tr>
<tr>
<td>Model</td>
<td>2WT76AM</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>2-stroke, water-cooled spark ignition engine</td>
<td></td>
</tr>
<tr>
<td>Bore × Stroke</td>
<td>76 mm × 68 mm (2.99 in × 2.68 in)</td>
<td></td>
</tr>
<tr>
<td>Number of Cylinder</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Piston displacement</td>
<td>617 ml</td>
<td></td>
</tr>
<tr>
<td>Authorized output</td>
<td>30kW (40.8PS)</td>
<td></td>
</tr>
<tr>
<td>Fuel type</td>
<td>Unleaded petrol RON91</td>
<td></td>
</tr>
<tr>
<td>Fuel tank capacity</td>
<td>18 L (4.75gal)</td>
<td></td>
</tr>
<tr>
<td>Fuel consumption</td>
<td>9 L/h (2.37gal/h)</td>
<td>12 L/h (3.17gal/h)</td>
</tr>
<tr>
<td>Engine oil tank capacity</td>
<td>1.6 L (0.42gal)</td>
<td></td>
</tr>
<tr>
<td>Ignition</td>
<td>C.D.I.</td>
<td></td>
</tr>
<tr>
<td>Spark plug</td>
<td>NGK BPR7HS-10</td>
<td></td>
</tr>
<tr>
<td>Starting system</td>
<td>Electric starter and Manual starter</td>
<td></td>
</tr>
<tr>
<td>Lubrication</td>
<td>Auto mixing</td>
<td></td>
</tr>
<tr>
<td>Fuel system</td>
<td>Carburetor</td>
<td></td>
</tr>
<tr>
<td>Battery</td>
<td>12V-16 Ah/5 h</td>
<td></td>
</tr>
<tr>
<td>Flooding bulb *</td>
<td>12V-35W</td>
<td></td>
</tr>
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# SPECIFICATIONS

<table>
<thead>
<tr>
<th>Model</th>
<th>VC52AS</th>
<th>VC72S</th>
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<tbody>
<tr>
<td><strong>Primer</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>Rotary-vane vacuum pump (Oil less type)</td>
<td></td>
</tr>
<tr>
<td><strong>Max. suction height</strong></td>
<td>Approx. 9 m (29.5 ft)</td>
<td></td>
</tr>
<tr>
<td><strong>Pump</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>Single suction, single stage, centrifugal pump</td>
<td></td>
</tr>
<tr>
<td><strong>Number of delivery outlet</strong></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Discharge port coupling</strong></td>
<td>BSP thread 2-1/2” (male) JIS fire thread (B-9912) 2-1/2” (male)</td>
<td></td>
</tr>
<tr>
<td><strong>Suction port coupling</strong></td>
<td>BSP thread 4”(male), 4-1/2” (male) JIS fire thread (B-9912), 3” (male), 3-1/2” (male)</td>
<td></td>
</tr>
<tr>
<td><strong>Pump performance (Suction height: 3 m / 9.8 ft)</strong></td>
<td>1.45 m³/min at 0.5 MPa 380 USG/min at 75 psi 1.43 m³/min at 0.7 MPa 375 USG/min at 100 psi 1.15 m³/min at 0.7 MPa 300 USG/min at 100 psi 1.02 m³/min at 1.0 MPa 265 USG/min at 150 psi</td>
<td></td>
</tr>
<tr>
<td><strong>Dimensions and weight</strong></td>
<td>Length × Width × Height 700 × 620 × 730 mm (27.6 × 24.4 × 28.7 in)</td>
<td></td>
</tr>
<tr>
<td><strong>Mass (Dry)</strong></td>
<td>85 kg (187.4 lbs)</td>
<td></td>
</tr>
<tr>
<td><strong>Materials</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Engine</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crankcase, Cylinder, Cylinder head</td>
<td>Aluminum alloy</td>
<td></td>
</tr>
<tr>
<td>Crankshaft</td>
<td>Chromium-molybdenum steel</td>
<td></td>
</tr>
<tr>
<td>Connecting rod</td>
<td>Chromium-molybdenum steel</td>
<td></td>
</tr>
<tr>
<td>Piston</td>
<td>Aluminum alloy</td>
<td></td>
</tr>
<tr>
<td>Pump shaft</td>
<td>Chromium-molybdenum steel</td>
<td></td>
</tr>
<tr>
<td>Muffler</td>
<td>Steel</td>
<td></td>
</tr>
<tr>
<td><strong>Pump</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pump casing,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pump cover</td>
<td>Aluminum alloy</td>
<td></td>
</tr>
<tr>
<td>Impeller</td>
<td>Aluminum alloy</td>
<td></td>
</tr>
<tr>
<td><strong>Shaft seal</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>Mechanical seal</td>
<td></td>
</tr>
</tbody>
</table>
## SPECIFICATIONS

<table>
<thead>
<tr>
<th>Description</th>
<th>Portable fire pump</th>
</tr>
</thead>
</table>

### Engine

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>TOHATSU CORPORATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>2WT78GA</td>
</tr>
<tr>
<td>Type</td>
<td>2-stroke, water-cooled spark ignition engine</td>
</tr>
<tr>
<td>Bore × Stroke</td>
<td>78 mm × 78 mm (3.07 in × 3.07 in)</td>
</tr>
<tr>
<td>Number of Cylinder</td>
<td>2</td>
</tr>
<tr>
<td>Piston displacement</td>
<td>746 ml</td>
</tr>
<tr>
<td>Authorized output</td>
<td>40.5kW (55PS)</td>
</tr>
<tr>
<td>Fuel type</td>
<td>Unleaded petrol RON91</td>
</tr>
<tr>
<td>Fuel tank capacity</td>
<td>18 L (4.75gal)</td>
</tr>
<tr>
<td>Fuel consumption</td>
<td>20 L/h (5.28gal/h)</td>
</tr>
<tr>
<td>Engine oil tank capacity</td>
<td>1.6 L (0.42gal)</td>
</tr>
<tr>
<td>Ignition</td>
<td>C.D.I.</td>
</tr>
<tr>
<td>Spark plug</td>
<td>NGK BPR7HS-10</td>
</tr>
<tr>
<td>Starting system</td>
<td>Electric starter and Manual starter</td>
</tr>
<tr>
<td>Lubrication</td>
<td>Auto mixing</td>
</tr>
<tr>
<td>Fuel system</td>
<td>Carburetor</td>
</tr>
<tr>
<td>Battery</td>
<td>12V-16 Ah/5 h</td>
</tr>
<tr>
<td>Flooding bulb *</td>
<td>12V-35W</td>
</tr>
</tbody>
</table>

* Option
**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Model</th>
<th>VC82ASE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primer</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>Rotary-vane vacuum pump (Oil less type)</td>
</tr>
<tr>
<td><strong>Max. suction height</strong></td>
<td>Approx. 9 m (29.5 ft)</td>
</tr>
<tr>
<td><strong>Pump</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>Single suction, single stage, centrifugal pump</td>
</tr>
<tr>
<td><strong>Number of delivery outlet</strong></td>
<td>2</td>
</tr>
</tbody>
</table>
| **Discharge port coupling** | BSP thread 2-1/2” (male)  
JIS fire thread (B-9912) 2-1/2” (male) (Twin outlet) |
| **Suction port coupling** | BSP thread 4”(male), 4-1/2”(male)  
JIS fire thread (B-9912) 3-1/2” (male) |
| **Pump performance** |  
(Suction height: 3 m / 9.8 ft)  
1.79 m³/min at 0.7 MPa, 470 USG/min at 100 psi  
1.40 m³/min at 1.0 MPa, 370 USG/min at 150 psi |
| **Dimensions and weight** |               |
| **Length x Width x Height** | 742 x 682 x 760 mm (29.2 x 26.9 x 29.9 in) |
| **Mass (Dry)** | 94 kg (207.2 lbs) |
| **Materials** |               |
| **Engine**   |               |
| Crankcase, Cylinder, Cylinder head | Aluminum alloy |
| Crankshaft   | Chromium-molybdenum steel |
| Connecting rod | Chromium-molybdenum steel |
| Piston       | Aluminum alloy |
| Pump shaft   | Chromium-molybdenum steel |
| Muffler      | Steel |
| **Pump**     |               |
| Pump casing  | Aluminum alloy |
| Pump cover   | Aluminum alloy |
| Impeller     | Aluminum alloy |
| **Shaft seal** |               |
| **Type**     | Mechanical seal |
# SPECIFICATIONS

<table>
<thead>
<tr>
<th>Model</th>
<th>VC85BS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Portable fire pump</td>
</tr>
<tr>
<td>Engine</td>
<td></td>
</tr>
<tr>
<td>Manufacturer</td>
<td>TOHATSU CORPORATION</td>
</tr>
<tr>
<td>Model</td>
<td>2WT78GA</td>
</tr>
<tr>
<td>Type</td>
<td>2-stroke, water-cooled spark ignition engine</td>
</tr>
<tr>
<td>Bore ×Stroke</td>
<td>78 mm × 78 mm (3.07 in × 3.07 in)</td>
</tr>
<tr>
<td>Number of Cylinder</td>
<td>2</td>
</tr>
<tr>
<td>Piston displacement</td>
<td>746 ml</td>
</tr>
<tr>
<td>Authorized output</td>
<td>40.5kW (55PS)</td>
</tr>
<tr>
<td>Fuel type</td>
<td>Unleaded petrol RON91</td>
</tr>
<tr>
<td>Fuel tank capacity</td>
<td>18 L (4.75gal)</td>
</tr>
<tr>
<td>Fuel consumption</td>
<td>20 L/h (5.28gal/h)</td>
</tr>
<tr>
<td>Engine oil tank capacity</td>
<td>1.6 L (0.42gal)</td>
</tr>
<tr>
<td>Ignition</td>
<td>C.D.I.</td>
</tr>
<tr>
<td>Spark plug</td>
<td>NGK BPR7HS-10</td>
</tr>
<tr>
<td>Starting system</td>
<td>Electric starter and Manual starter</td>
</tr>
<tr>
<td>Lubrication</td>
<td>Auto mixing</td>
</tr>
<tr>
<td>Fuel system</td>
<td>Carburetor</td>
</tr>
<tr>
<td>Battery</td>
<td>12V-16 Ah/5 h</td>
</tr>
<tr>
<td>Flooding bulb *</td>
<td>12V-35W</td>
</tr>
</tbody>
</table>
### SPECIFICATIONS

<table>
<thead>
<tr>
<th>Model</th>
<th>VC85BS</th>
</tr>
</thead>
</table>

#### Primer
- **Type**: Rotary-vane vacuum pump (Oil less type)
- **Max. suction height**: Approx. 9 m (29.5 ft)

#### Pump
- **Type**: Single suction, single stage, centrifugal pump
- **Number of delivery outlet**: 2
- **Discharge port coupling**: BSP thread 2-1/2” (male)  
  JIS fire thread (B-9912) 2-1/2” (male)  
  (Twin outlet)
- **Suction port coupling**: BSP thread 4”(male), 4-1/2”(male)  
  JIS fire thread (B-9912) 3-1/2” (male)
- **Pump performance**  
  (Suction height: 3 m / 9.8 ft)  
  1.79 m³/min at 0.7 MPa, 470 USG/min at 100 psi  
  1.40 m³/min at 1.0 MPa, 370 USG/min at 150 psi

#### Dimensions and weight
- **Length × Width × Height**: 742×682×760 mm (29.2 × 26.9 × 29.9 in)
- **Mass (Dry)**: 95 kg (207.2 lbs)

#### Materials

<table>
<thead>
<tr>
<th>Engine</th>
<th>Crankcase, Cylinder, Cylinder head</th>
<th>Aluminum alloy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Crankshaft</td>
<td>Chromium-molybdenum steel</td>
</tr>
<tr>
<td></td>
<td>Connecting rod</td>
<td>Chromium-molybdenum steel</td>
</tr>
<tr>
<td></td>
<td>Piston</td>
<td>Aluminum alloy</td>
</tr>
<tr>
<td></td>
<td>Pump shaft</td>
<td>Chromium-molybdenum steel</td>
</tr>
<tr>
<td></td>
<td>Muffler</td>
<td>Steel</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pump</th>
<th>Pump casing, Pump cover</th>
<th>Aluminum alloy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Impeller</td>
<td>Aluminum alloy</td>
</tr>
<tr>
<td></td>
<td>Shaft seal</td>
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</tr>
<tr>
<td></td>
<td>Type</td>
<td>Mechanical seal</td>
</tr>
</tbody>
</table>
Performance Curve

VC52AS
Performance Curve

VC72AS
Performance Curve

VC82ASE
Performance Curve

VC85BS
VC52AS, VC72AS

Discharge valve handle
Discharge valve
Discharge port
Suction port
Suction hose coupling (cap)
Pump casing drain cock
Fuel tank cap
Engine oil tank cap
Engine oil tank
Front cowl
Battery
Knob (wing screw)

Priming lever
Primer strainer
Spark plug (#1)
Spark plug (#2)
Fuel cock
Carrying handles
Manual starter handle
Fuel drain pot
Muffler
Rear cowl
Priming outlet
Exhaust pipe
VC82ASE

- Discharge valve handle
- Fuel tank cap
- Discharge valve
- Engine oil tank cap
- Discharge port
- Engine oil tank
- Suction port
- Front cowl
- Suction hose coupling cap
- Primer strainer
- Pump casing drain cock
- Discharge valve handle
- Front cowl
- Battery
- Knob (wing screw)
- Priming lever
- Primer strainer
- Fuel cock
- Rear cowl
- Manual starter handle
- Priming outlet
- Fuel drain pot
- Carrying handles
- Muffler
- Exhaust pipe
2 OPERATING DEVICE

VC85BS
2 OPERATING DEVICE

Control panel: VC52AS, VC72AS, VC82ASE,

- Pressure gauge for suction
- Over-heat switch
- Operation panel
- Monitor lamps
- Hour meter
- Main switch
- Pressure gauge for discharge
- Floodlight projector and battery charging socket
- Throttle dial

Operation panel warning lamps

- Fuel
- Engine oil
- Overheat
Operation panel

- Pressure gauge for suction
- Monitor lamps
- Main switch
- Automatic suction switch
- Floodlight projector and battery charging socket
- Throttle dial

Operation panel warning lamps

- Engine oil
- Suction failure
- Fuel
- Overheat
WARNING & CAUTION

※For VC52AS and VC72AS

**WARNING**
- Do not touch any electrical parts while the engine is running.
- Do not touch rotating parts while the engine is running. Severe personal injury will occur.

**CAUTION**
- Risk of burns
  - Do not touch a muffler and an exhaust pipe.
- Open fuel drain valve

(Pulley for Vacuum pump)
On the fuel tank - Inside of the cowl

(On the fuel tank)
4 OPERATING PRECAUTIONS

Installing pump

**CAUTION**

The fire pump must be installed on level ground. Otherwise, an accident may occur.

If the fire pump should be installed on uneven ground, it must be secured.

**NOTE**

Place the pump as near as possible to water source, and water suction height as low as possible.

When putting the portable fire pump down to the ground, put it gently and horizontally.

In case of the inclined location or uneven ground, make sure that water suction hose is lower than suction port of the pump.

In case of the suction hose is put undulated, air can be left easily in the hose, and possibly cause suction inability when the water discharge valve is opened.

In case of the suction inability due to air remaining in the suction hose, set the water discharge valve half-opened, and operate vacuum pump until water is discharged continuously. (for 3 to 5 seconds from beginning of water discharge).

Be sure to install strainer and basket on the end of suction hose. If the pump may suck sand or mud of the bottom of water source, place sheet below the basket.

Strainer and basket of suction hose should be placed more than 300 mm (11.8 in) below water surface to prevent suck of air.

Discharge hose should be arranged not to be bent.
When installing the portable pump in the vehicle, place the vehicle on a level place, and install the pump.

When installing the portable pump in the vehicle, make sure to apply the brakes of the vehicle in order to stop the wheels. A serious accident may occur if the vehicle moves.

Do not put your hands or fingers in the retractable part when you operate the handle.

When transporting the portable fire pump, assign one person per handle. Also, when you transport the portable fire pump, it should be transported holding the handle firmly.

When lowering the portable fire pump to the ground, lower it gently and horizontally.

Do not touch the exhaust pipe and the muffler while the engine is running, or for more than 10 minutes after the engine has been stopped. These parts are very hot and will cause severe burns.
Carrying handle
The fire pump is equipped with four carrying handles. The handles can be manually folded, and opened by rotating them by 90 degrees.

**CAUTION**
Personal injuries may occur when opening or closing the handle. Do not put your hands or fingers into the retractable part when operating the handle. To prevent injuries, two persons should work together when carrying and placing the pump.

Opening the cowl

Front cowl
When you remove the front cowl, turn the 2 wing screws at the front cowl and release the lock on each screws. Release the 2 hooks up at the back side of the pump. Lift the front cowl toward upper side.

**NOTE**
When removing the cowl, do not use excessive force with care to avoid damaging the hook, cowl or other parts.
Rear cowl
VC52AS, VC72AS:
- When you remove the rear cowl, detach the two plug caps from the spark plugs.
- Pull open the cowl at around the support pin.
- Remove the plug caps through the holes in the cowl.
- Lift the rear cowl toward upper side.

VC82ASE, VC85BS:
- Pull open the cowl at around the support pin.
- Lift the rear cowl toward upper side.

NOTE: Remove the front cowl first, and the real cowl second.

Assembling the cowl
Assembling order is in reverse order of the opening. The hooks (at 2 locations on the cowl) must be aligned to sockets of the grommet before insert firmly.

NOTE: Assemble the rear cowl first, and the front cowl second.
Suction port
The diameter of the thread for the fire pump is
BSP thread 4” (male), 4-1/2” (male)
JIS fire thread (B-9912), 3” (male), 3-1/2” (male)

![Suction port]

WARNING When the pump is running, do not put your finger into the suction port, you may be seriously injured by the rotating inducer.

CAUTION If the pump runs without a strainer, gravel may enter the pump, resulting in significantly reduced water discharge capacity.
Discharge port
The diameter of the thread for the fire pump is
- BSP thread 2-1/2” (male)
- JIS fire thread (B-9912) 2-1/2” (male)

Discharge valve
Use the discharge valve handle for opening and closing the discharge valve.
Drain valve
Use the drain valves to drain water.
Drain valves;
- at the pump case
- at the muffler
- at the ball cock discharge valves (Only for ball cock discharge valve type)

NOTE. Close all the valves when operating the fire pump. If the valve is opened, water cannot be suctioned.

Priming lever
Use for suctioning water.
After starting the engine, pull down the priming lever to suction water.
After priming has been completed, return the priming lever to its original position.

Fuel tank
Refill appropriate amount of gasoline to the fuel tank. Close the fuel tank cap all the time except refuel.
5 DESCRIPTION OF DEVICES

Engine oil tank
Refill appropriate amount of oil to the oil tank. Close the Oil tank cap all the time except filling. The oil tank has an oil level sensor. The warning buzzer sounds, if the engine oil is not enough filled.

⚠️ CAUTION ⚠️ If you run the pump despite of the warning buzzer sounds, the engine could have damages and/or be stuck.

NOTE Fill the 2-stroke engine oil until the oil level warning buzzer does not sound.

Fuel valve
Full open or close completely.

Control panel
The control panel is equipped with all the necessary operating and control instruments as follows.

Operation panel
The operation panel is equipped with
・Main switch
・All warning lamps, and
For VC52AS, VC72AS ,VC82ASE,
・Hour meter
・Over-heat switch
For VC85BS
・Automatic suction switch
5 DESCRIPTION OF DEVICES

Main switch (Stop switch)
Turn the Main switch to run or to stop the pump.

<table>
<thead>
<tr>
<th>Description</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>To stop the pump</td>
</tr>
<tr>
<td>ON</td>
<td>Running position</td>
</tr>
<tr>
<td>START</td>
<td>To start the pump running</td>
</tr>
</tbody>
</table>

Warning lamp and Warning buzzer
Turning the start switch “ON” position, If there is no problem in the engine to start, the warning lamps and buzzer are off. If there some problems in the pump, the monitor lamps light on when you turn the start switch on. The warning lamps and the buzzer indicate the following information:

- Warning lamp: Fuel, Engine oil, Overheat, Suction failure(Only for VC85BS)
- Warning buzzer alarms: Engine oil

⚠️ CAUTION ⚠️ If they do not, remove the cause by following the content "16 trouble shooting" section.

- Low fuel level warning
  If the fuel level goes down below approximately 1/3 of the fuel tank, monitor lamp lights up.

- Low engine oil warning
  If the engine oil level goes down below approximately 1/3 of the engine oil tank, warning lamp lights up and the warning buzzer sounds.

⚠️ CAUTION ⚠️ Refill the engine oil immediately. Even if the warning lamp lights up and the buzzer sounds, the engine will not stop soon. However, refill the engine oil immediately to avoid the engine stuck risk.
DESCRIPTION OF DEVICES

- Overheat warning
  If the engine overheat caused by lack of cooling water, etc. then the overheat lamp lights.

  **CAUTION** The engine may be damaged. Do not restart the engine soon after it has stopped running

  **NOTE:** In the case of the overheat sensor switch is set in “ON” position, the engine stops automatically when an overheated is detected.

  Overheat switch (For VC52AS, VC72AS, VC82ASE)
  The overheat sensor switch should be always set in “ON” position to avoid a malfunction or destruction of the engine by overheat.

  **CAUTION** Restarting without treating cause of overheat may cause engine condition worse or damaged.
  Restart engine after remedy cause especially in suction line, cooling line, fuel line and engine itself. Be sure that warning lamp and buzzer have gone out.

  In the case of the switch “ON”, the engine will stop, the lamp will light and buzzer sounds when the overheat sensor works.
  In the case of the switch “OFF”, the engine will not stop, the lamp will light and buzzer will also sound when the overheat sensor works.
  The engine can be started if the switch is set in “OFF” position.

  Automatic suction switch (For VC85BS)
  Turning on the Automatic suction switch, the pump primes water automatically after engine started.

  **CAUTION** Do not manual operation of pulling the priming lever when the Automatic suction switch is “ON”
**Description of Devices**

**Hour meter** (For VC52AS, VC72AS, VC82ASE)
The hour meter indicates the accumulated operation time of the fire pump.

**NOTE.**
Use it to check the running time and maintenance.
The meter continues counting as long as main switch is “ON”

**Throttle dial**
Use the Throttle dial to control discharge pressure.

**Pressure gauge for suction**
The pressure gauge for suction indicates the actual operating pressure.

**Pressure gauge for discharge**
The pressure gauge for discharge indicates the actual operating pressure.

**Battery charger socket**
Connect the battery charger plug to the socket when you charge the battery of the pump.

<Specifications of accessory socket>
- Voltage: DC12V
- Max. allowable current: 5A

**CAUTION**
- Before charging a battery, turn the main switch OFF.
- When starting operation, be sure to remove the battery charger before turning the main switch ON.
- The socket is for a battery and a floodlight.
- Do not connect a cigarette lighter to the socket, because it is not a heat-resistant object.
Fuse box.
Security fuses are installed for electrical circuit in the fuse boxes.
There are two fuse boxes:
- Black color fuse box is for 15A fuse.
- Yellow color fuse box is for 5A fuse.

Manual starter
If the engine will not start with the starter motor, use the manual starter.

⚠️ CAUTION Do not pull the manual starter handle when the pump is running. Personal injuries may occur. Otherwise, the manual starter may be damaged.

NOTE When you start the engine using the manual starter, pull the starter handle in a breath when you feel the handle heavier.
Governor case
Checked the governor oil level with the governor oil level gauge (dipstick).

Oil level gauge
The governor oil gauge shows upper and lower level on the gauge.

If oil is needed, add 2-cycle engine oil from the oil gauge port up to the full line mark.
Use the engine oil recommended by the engine manufacture.

Be sure to stop the engine before checking the oil level. If you pull the dipstick when the pump is running, the oil may blow out.

Mechanical governor
A built-in mechanical governor controls the throttle valve so that the maximum engine speed does not exceed the revolution shown below.

- VC52AS: 5650 r/min
- VC72AS: 5720 r/min
- VC82ASE: 5500 r/min
- VC85BS: 5500 r/min
Floodlight (Search light)  *Option
Use the floodlight projector to illuminate the location where this fire pump is operated. Connect the floodlight plug to the pump side outlet socket. Fix the projector to the tripod with tightening the adjust screw.

Secure adequate lighting for the location where this fire pump is operated, otherwise an accident may occur.
Initial charge of battery
The battery can be used immediately after filling cells with electrolyte.
Do not open the battery after filling it with electrolyte. Because this is maintenance free of electrode. (Sealed type battery)
Refer to the INSTRUCTIONS on the battery.

Fuel
Fill the tank with gasoline until the maximum level by the gauge indication (in red).
* Gasoline: 87 octane minimum at pump posted rating …91 based on the research octane rating method.
* Fuel tank capacity : 18 L (4.75 gal)

Vaporized fuel may cause ignition or an explosion.
* Do not bring any flames near fuel.
* Errant sparks, smoking and other source of fire, heat, sparks and static electricity can cause explosion.
* Stop the engine before refueling or draining fuel from carburetor.
* Do not spill fuel or overfill fuel into the tank.
CAUTION

- Do not breathe in vapor!
- Petrol fumes are very toxic.
- After stopping the engine, do not touch it while it is hot.
- Refill fuel after the engine has cooled down.
- Fuel tank cap should be always tightly closed. Fuel tank cap should be removed only to fill tank with fuel.
- Properly clean up all fuel spills (checking for gasoline vapor) before starting engine.
- If petrol or fuel spills, wipe it off using a cloth or materials, and dispose of them according to the relevant laws and regulations.

NOTE

Use of low-quality fuel results in a short engine life as well as starting difficulty and other engine problems. Fuel containing alcohol, methanol (methyl), or ethanol (ethyl), may cause:
- Deterioration of rubber parts and plastic parts.
- Starting, idling and other engine performance problems.

Do not use fuel that contains more than 10% ethanol or more than 5% methanol. Damages resulting from the use of fuel contain alcohol are not covered under the limited warranty.

Keep fuel tank full with gasoline at all times to ensure readiness.

Governor oil

Before using fire pump, check governor oil level. Pull out governor oil gauge (dipstick), check the oil level, the oil level should be between upper and lower line on the dipstick. If the oil level is under the lower line, add 2-stroke engine oil from the oil gauge port up to the full line mark.
Engine oil
Refill the 2-stroke engine oil to the oil tank.
* Fill the oil tank with the engine oil until “F” level.

⚠️ CAUTION
If the engine oil is not enough filled.
The warning buzzer sounds, (switch “ON”)
We recommend that you use engine oil of ISO FB grade or higher.
If different grades of engine oil are mixed, it may gelate, which could cause oil filter clogged.
Always wipe off spilled engine oil.

NOTE
If the engine oil is not enough (less than approx. 1/3 of the oil tank), the monitor lamp for oil level lights on, and also the warning buzzer sounds.

2-stroke engine oil
We recommend that you use engine oil of ISO FB grade or higher.

Oil level sensor
The lamp on the operation panel will light when the level of engine oil goes down to approximately to 1/3 of the oil tank. And also the buzzer will sound.
Drain valves
Make sure the all drain valves are closed.

Discharge valve
Make sure the discharge valve is closed. In the case of ball cock discharge valve type, also close the drain cock.

Screw down discharge valve _____________

Ball cock discharge valve _______________

Closed Circulating Water Cooling System
In this system, engine cooling water is taken from the suction water, and pressurized by the pump. The water goes through the engine and the muffler, and returns to the water intake of the pump.
Overheat protection sensor
When you turn on the overheat sensor switch, this device shuts down the engine automatically when the engine has excessively overheated caused by lack of cooling water. Usually turn on the overheat sensor switch.

Overheat warning lamp
If the temperature of the cooling water reaches approximately 75°C or more, the engine will be stopped automatically to prevent overheating.

Warning lamp and sensor
When you turn the main switch to the “ON” position, in the case of no problem in these checking points, the lamps keep turning off, and buzzer does not sound.

⚠️ CAUTION ⚠️
After the engine has stopped due to overheating, if you restart the engine immediately, engine may be burnt. Before restarting the engine, eliminate the cause (refer to the content “16 TROUBLESHOOTING”). Also, check that the warning lamps are turned off.

NOTE
Alert action check
When the main switch is turned ON, the warning lamps and buzzer will be activated for approximately one second. After one second, the warning lamps are all turned off in the condition of power ON, it shows there is no trouble on each function. If the warning lamps turn on or blinking, the function in particular does not work properly.

Battery installation
The battery mounted on the engine can be used immediately after filling cells with electrolyte (1.28 specific gravity at 20°C=68°F). Refer to the INSTRUCTIONS on the battery.
When the warning lamps are off, there is no trouble on each function.

* Countermeasures  (Warning lamps turn ON)
It is necessary to take a countermeasure if the lamp lights up when turning the main switch to the “ON” position. Then take a countermeasure referring to the content “TROUBLESHOOTING”.

## Warning system

<table>
<thead>
<tr>
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<th>Warning indicators</th>
<th>Description of faults or notice</th>
<th>Remedy</th>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(for VC85BS)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Suction failure</td>
<td>ON</td>
<td>Stop</td>
<td>C</td>
</tr>
<tr>
<td>Fuel Level</td>
<td>ON</td>
<td>Fuel level below approx. 1/3</td>
<td>A</td>
</tr>
<tr>
<td>Oil level</td>
<td>ON</td>
<td>Oil level below approx. 1/3</td>
<td>B</td>
</tr>
<tr>
<td>Overheat</td>
<td>ON</td>
<td>Stop</td>
<td>C</td>
</tr>
</tbody>
</table>

*1 When turning ON the main switch.
Remedy
A: Supply fuel.
B: Supply 2 stroke engine oil.
C: Read the TROUBLE SHOOTING and remedy it.

In the case of overheat
- Check the cause and remedy it.
- Turn off the overheat sensor switch and start the engine. After confirming the lamp is off, return the switch to the "ON" position.

1. For model VC85BS: After overheat detected, operator can start engine up to the 3rd trial. At the 4th trial or more, engine does not start, though electric starter works. As long as overheat cause is not remedied, lamp and buzzer keeps blinking, beeping, though main switch is reset. Unless the engine temperature goes down in 30 seconds after restarting, engine may be shut down, if you remedy the cause.

Even if you turn the main switch to "OFF" position and turn it back to "ON" position again, lamp-blinking and buzzer-beeping remain active, because the engine is still under overheat condition.

2. The system does not detect the overheat caused by some reasons such as shortage of engine oil or abnormal gas-mixture caused by malfunction of the carburetor.

In the case of suction failure (for model VC85BS)
- Restart the engine after the remedy.

If the pump cannot properly complete priming water within 15 seconds, the engine will stop under the automatic suction mode.
Before removing the electrical equipment, turn the main switch off and remove the battery. When removing the battery cable from the battery terminal, always disconnect the negative(-) cable first. When connecting battery cable, connect the positive(+) lead first. If you connect the negative(-) lead first, hydrogen gas generated by the battery may cause an explosion. Do not place any metal on the top or around the battery. Doing so may cause a short circuit.

If the warning lamp does not light when the lamp have to light (i.e. the fuel level is below one third of the tank), the bulb could be burned out. Then replace the lamp bulb or consult with your dealer. When carrying out a periodical inspection and pre-operation checks, check the monitor lamps and also each individual component. The system does not detect such overheat as caused by shortage of engine oil or abnormal thin gas-mixture occurred due to carburetor’s malfunction.
Hour meter (For VC52AS, VC72AS, VC82ASE)
(1) The hour meter starts counting when the main switch is turned “ON” position.
(2) The hour meter only works during the main switch is “ON” position.
(3) There is no reset capability.
(4) The hour meter covers a time 0.1 hour to 9,999 hour, and it rolls over to 0 when it reaches maximum range.

NOTE: In case of engine stop due to overheat or fuel shortage, the meter continues counting as long as main switch is “ON” position.
Installation pump

**WARNING**

Since the temperature around the engine become high because of the muffler and exhaust gas, install the pump on level ground at least three meters away from inflammable materials including dry grass and wood.

Exhaust gas, which contains carbon monoxide, is a deadly poisonous gas with no color and smell.

Do not operate engine in a closed space or in insufficient ventilation place, such as indoor, in the vehicle, warehouse, tunnel, well, in the hold of a ship.

Do not start engine with discharge valve open.

Do not pump and discharge liquids other than water (e.g. flammable liquids or chemicals).

This pump is only designed to pump water.

Do not discharge water to water-prohibiting substance.

Do not insert your hand into the suction port to avoid serious injury by the rotating inducer.


**CAUTION**

Do not run the pump without suction side strainer. If gravels go into the pump, then the pump could have been damaged and the performance would be significantly reduced.

1. Place the pump near water source on the flat area.
2. Connect suction hose and delivery hose to the pump securely. Put end of suction hose in water source. The suction hose must have a strainer and a basket.
3. Recommended diameter of the nozzles* for the pump.
   - Single outlet use: in between 21.5 ~ 36.0 mm (0.8 ~ 1.4 in)
   - Twin outlet use: in between 15.2 ~ 25.0 mm (0.6 ~ 1.0 in)

*at 3 (m) of suction head.
Starting engine

⚠️ CAUTION Wear proper hearing protection during operation.

While engine is running, do not touch the high voltage Ignition wire attached to spark plug. This wire carries very high voltage which will cause injury and bodily harm.

Do not operate pump on dry grass. The exhaust system gets very hot and will ignite dry grass. Clear the area if necessary.

1. Turn the fuel valve to open position, this will allow fuel to flow to the carburetor.
2. Turn the throttle dial to the “START SUCTION” position.

3. Turn the main switch to the “START” position. Release the main switch immediately after the engine starts.

NOTE: 1. Extended operation of the starter motor will run the battery drain. Operate the starter motor for maximum 3 seconds. If the engine does not start, wait for 5 seconds before operating the starter motor again.

2. Do not operate the starter motor after engine started.

3. If the starter motor does not work, check that the battery terminals are tightly connected and the battery is fully charged.

* If electric starter does not work to start, use the recoil starter.(Manual operation)
Starting engine by the manual operation
(Using a recoil starter)

If electric starter does not work, use the manual starter.
When you use the manual starter, operate the engine as shown below.

1. Turn the fuel valve to open position, this will allow fuel to flow to the carburetor.

2. Turn the throttle dial to the “START SUCTION” position.

3. Turn the main switch to the “ON” position.

4. Engage the starter ratchet by pulling the Starter handle slowly towards you. When you feel the ratchet engage, pull the handle sharply (holding the fire pump in place with your foot).

5. After engine starts, return the starter handle to the original position slowly. Do not let the starter handle go off, this can cause damage to the recoil of the starter.

**WARNING**
Do not run the engine with recoil starter cover opened. Doing so will result in serious injury.

**CAUTION**
Do not pull the manual starter handle when the pump is running. Otherwise, the manual starter may be damaged.
When you start the engine using the manual starter, engage the starter ratchet by pulling the starter rope slowly toward you. Pull the starter rope fast at once (in a breath)

*Holding the fire pump in place with your foot.

**NOTE**

Dry operation
This portable pump has an outside water cooling system, limit the duration of dry operation so that it is within the following time periods.

Performing dry operation longer than the specified time period may cause damage to the engine or pump.
- Idle position: within 2 minutes
- Throttle dial at “START” position: Within 30 seconds

Closed discharge valve operation after priming water
When the pump is operated with the discharge valve closed, the cooling water temperature becomes high.

**WARNING**
Do not run the engine with opened recoil starter to avoid serious injury.

**CAUTION**
If you continue the closed discharge valve operation after priming water, the pump will be overheated.
While the engine is running, do not touch the rotating parts of the pulley or belt. This can cause personal injuries.

If the pump cannot suck water during the operation of the vacuum pump for 30 seconds, or cannot keep the water in the water path of the pump during the water discharge operation, check the following:

- Is the tip of the suction pump hose completely under the water surface?
- Is air sucked through the joint of the suction hose?
- Is the suction hose damaged?
- Does the vacuum performance of the priming pump reduced significantly?
- Does the pump case leak vacuum?
- Does a vacuum leak occur when the pump is connected with the suction hose which the opening side is capped?

Refer to the contents "TROUBLESHOOTING".

1. After starting the engine, pull down the priming lever up to put tension on the “V” belt leading vacuum pump operation for suction.

2. Check that the pumped water is discharged continuously from the priming outlet of the vacuum pump. Be sure the pressure gauge shows positive side.

3. Return the priming lever to the original position.
Limit the vacuum pump operating time within 30 seconds. If the pump cannot suction water within 30 seconds, it may have another problem. Refer to the contents “16 TROUBLESHOOTING” to rectify the problem.

When priming water from a water source that is considerably lower than the pump, suction may fail to bring water up to pump.

Do not operate the engine more than 2 minutes without pumping water.

If the elevation of suction hose does not follow a downward slope from the pump to the water source, an air trap occurs and there could have insufficient discharge volume. In such case, immediately re-prime the pump.

When the air pocket stays trapped inside of suction hose, open the discharge valve, and operate vacuum pump 3-5 seconds intervals until there have smooth discharge water stream.

4. Open the discharge valve.

**Ball cock discharge valve**

Turn the discharge port lever towards the discharge port adapter (hose) at slow speed.

The discharge port can be turned approximately 90 degrees.

**Screw down discharge valve**

Turn the discharge valve handle to the left (counter clockwise).
PRIME AND DISCHARGE

**CAUTION**
Before opening water discharge port or valve of the pump, be sure to warn the person holding the nozzle or the branch pipe to check the nozzle is opened and ready to discharge water.

During operation, check the suction and discharge hoses. They must be free of kinks, pinches, etc., possibly caused from emergency vehicles rolling over hose.

**NOTE**
To avoid the air left in the hose, the pump should be located above the suction hose. If some air left in the hose, the pump may not be able to discharge the water by the accumulated air in the hose when you open the discharge valve. In this case, open the discharge valve and operate the vacuum pump for 3 to 5 seconds until the water is continuously discharged.

5. Adjust the water pressure (volume) using the throttle dial.

**CAUTION**
In the case of using a branch pipe, the person holding the branch pipe must be notified of changes in water discharge pressure caused from engine speed changes or discharge valve setting changes discharged water should not be directed toward people under any circumstances.
Do not look into the nozzle opening at any time.
Do not put fingers or hands into the discharge nozzle.
Performing relayed water supply (When using water from fire hydrant)

1. Determine the pump pressure in consideration of the water discharge pressure (nozzle pressure), hose pressure loss, and height loss.

\[
\text{Pump pressure} = \text{needed pressure} + \text{height loss} + \text{friction loss}
\]

2. Foreign materials such as dirt, gravel, iron rust, etc. may have intruded into a fire hydrant. Before connecting a hose, open a fire hydrant to discharge water in order to remove foreign materials.

3. When using water from a fire hydrant, set a mediation metal between the delivery hose and the suction port.

4. Set the discharge valve handle of the pump to the full open position.

5. Gradually open the fire hydrant on-off valve. However, check the water pressure from fire hydrant with suction pressure gauge on the pump and adjust the opening of fire hydrant, if necessary.

\[\text{If the water pressure from fire hydrant is higher than 6 bar, do not continue to open the fire hydrant on-off valve.}\]
\[\text{* If the water pressure from fire hydrant is higher than the required discharge pressure, it is not necessary to start the pump.}\]
\[\text{If the water pressure from fire hydrant has not reached the required pressure, start the engine.}\]

6. If the water pressure from fire hydrant is insufficient, start the engine and adjust the pressure to the required level by operating the throttle dial.

Stop increasing discharge pressure if the suction pressure gauge shows 0.1MPa (15 psi) or below. If it does, stop increasing the pressure and keep the throttle dial as it is.

7. To end discharge water, turn the throttle dial to the low pressure firstly, then stop the engine, and close the fire hydrant on-off valve.
9 PRIME AND DISCHARGE

Be sure not to close the discharge valves of all the pumps and the nozzle until all the pumps stopped and the fire hydrant on-off valve is closed.

8. Set the discharge valve to the half-open position, and open all the drain valves to drain the remaining water as maintenance after operation.
Relay pumping operations

⚠️ CAUTION ⚠️ In the case of relay pumping operations training in a flat place, if the number of extending hose is less than ten, use the safety nozzle attached.

Description of relay pumping operation
Preparation for operation

**WARNING** Do not close the discharge valve of source pump, relay pumps and fire nozzle. If the discharge valves or nozzle are(is) closed, there will be a risk of damage to the pumps and hoses with excessive pressure or water hammer.

1. Decide how many relay pumps are needed in consideration of distance and height between the water sauce and the fire ground.
2. Place the pumps according to the decision, and connect the hoses.
3. Make sure that the discharge valves are open, including the fire nozzle.
4. Decide the discharge pressure of each pump in consideration of needed pressure for next pump (or fire nozzle) and the height loss and friction loss.

\[
\text{Pump pressure} = \text{needed pressure} + \text{height loss} + \text{friction loss}
\]

Start the source pump

**WARNING** Once the water supply has started, keep supplying it until finished. If reduce or stop supplying water, overheat or cavitation may occur in the relay pumps.

1. Start the source pump according to the content “ENGINE START”.
2. Start supplying water according to the content “PRIME AND DISCHARGE”.
9  PRIME AND DISCHARGE

Start the Relay pump
1. Make sure that the discharge valve is opened and wait for supplied water.
2. Check that the water was supplied from the source pump. At first, the hose swells due to air pressure. Step on a hose to judge whether the swelling of the hose is due to water or air.
3. If it becomes clear that water was supplied to the pump, read a pressure gauge. Start the engine if the pressure is lower than the required pressure. If the pressure is high enough, no need to start the engine.
4. Adjust the discharge pressure with throttle dial. The suction pressure decreases with opening up the throttle. Always confirm the pressure with the suction pressure gauge.
5. If the suction pressure drops below 0.1 MPa (15 psi), order the operator of the pre-stage pump to increase the water pressure, and adjust the relay pump pressure by the throttle.
6. If suction pressure rises, adjust the throttle again.

Start the Attack pump
It is the same as the relay pump case.

Finish the relay pumping operations.
1. Do not close the fire nozzle.
2. Stop the attack pump running first.
3. Stop the relay pump running from the pump near the nozzle.
4. Finally, stop the source pump.

⚠️ CAUTION ⚠️
Do not touch the exhaust pipe and the muffler while the engine is running, and also do not touch it for 10 minutes more after the engine has been stopped. These parts are very hot and will cause severe burns.
1. Return the throttle dial to “LOW” position.

2. Close the discharge valve.
   - Screw down discharge valve ______________
     - Turn the discharge valve handle to the left (Clockwise).
   - Ball cock discharge valve ______________
     - Turn the discharge valve handle to close
     - The discharge port can be turned approximately 90 degrees.

3. Stop the engine
   - Turn the main switch to “OFF” position.

4. Close the fuel cock.

5. Open all the drain valves to drain water. Refer to the contents’ 11 MAINTENANCE AFTER OPERATION".
Drain Water
1. Open the drain valves and drain all the water from the pump.
   Do not leave water in the pump.
2. Close the drain valves for the next operation.

Check Suction Performance.
After the drainage of all the water from the pump,
1. Install the suction port cap.
2. Confirm the drain valves are all closed.

NOTE: Prepare a suction cap that is suitable for the suction coupling.

3. Turn the throttle dial at the "START" position, start the engine, and pull down the priming lever to produce a vacuum (within 30 seconds).
4. After a vacuum is produced, return the priming lever to the original position immediately, and stop the engine.

5. Check the vacuum pressure of the pressure gauge for suction is below -0.08MPa(-12 psi).

6. In order to check if there is no vacuum leak, leave it for 30 seconds and confirm that the pointer of the pressure gauge for suction keep the same pressure indicated.

7. Open the drain valve slowly to expose it to the atmosphere, and check that the pointer of the pressure gauge for suction returns to “0”.

8. Close the drain valve again.

**NOTE**

Before storing the fire pump, flush with fresh water to purge any debris from the pump. (Salt water, muddy water, contaminated water, etc.)

Rubber gaskets, O rings, seals for the discharge and suction hose fitting wear: Worn rubber seals will cause water leaks, poor vacuum, etc. Frequent inspection of these items is mandatory.
Fuel／Oil

1. Fuel
   - Fill fuel until the maximum level of the fuel tank. The maximum level can be confirmed by the Indicator (Red).
   * Fuel tank capacity: 18L (4.75 gal)
   - Draining fuel from the carburetor.
   Before storing the pump long-term, drain the fuel from the carburetor.
     a. After stopping the engine, close the fuel valve.
     b. Pull the knob of the drain valve. (Fuel will flow out)
     c. After all the fuel has drained, release the knob. (The drain valve will return to the closed position)
     d. Fuel from the drain pot could be returned to the fuel tank.

**CAUTION**
Wipe off fuel using a cloth or the other materials if there is fuel out of the fuel tank.
Drained fuel collects into the drain pot. This must be emptied into the fuel tank.

**NOTE**
Make sure the fuel is kept full in the fuel tank.
2. Engine oil
   Fill the oil tank with 2-stroke engine oil up to the “F” level.
   Engine oil tank capacity : 1.6L (0.42 gal)

   **NOTE.** Use 2-stroke engine oil of ISO FB grade or higher.

3. Governor oil
   Check the oil level using the dipstick.

   **NOTE.** Use 2-stroke engine oil of ISO FB Grade or higher.
Cleaning strainer for prime
Remove the strainer cap and clean the strainer with fresh water. If the strainer is dirty with dust, etc., vacuum performance efficiency will be reduced.

⚠️ CAUTION ⚠️
When installing the strainer, exercise care so that the O-ring does not get caught in, and tighten the ring nut securely. If the ring nut is not tightened completely, the vacuum leak may occur.

NOTE:
When assembling or disassembling the strainer assembly, tighten or loosen the ring nut while holding and pushing the strainer cap.
When installing a strainer, pay attention to the protrusion of the O-ring and install it correctly. Otherwise, a vacuum leak may occur.
When installing a strainer, tighten the ring nut while pressing the cup with your palm.
11 MAINTENANCE AFTER OPERATION

Charging battery

<Battery>

⚠️ WARNING ⚠️
You must read the safety instructions carefully and/or warnings before using or charging the batteries. Hydrogen gases from the battery are explosive. Keep battery away from flame and sparks. Charge the battery in well ventilated area. Do not charge battery in unventilated area.

⚠️ CAUTION ⚠️
When you connect battery cables, connect positive(+) lead first. When you disconnect battery cables, disconnect negative(-) lead first.

NOTE
Keep surfaces of the battery clean.

<Battery charger>

⚠️ WARNING ⚠️
The battery capacity must be 12V-16 Ah/5h. Do not connect a cigarette lighter to the battery charger socket. Doing so many melt or burn out the socket due to overheating. Hydrogen gas inside the battery may explode if something sparks. Keep the battery away from flame and sparks. Charge battery in well ventilated area.

⚠️ CAUTION ⚠️
Use an automatic battery charger. Use a battery charger that has an overcharge prevention function. Read the instruction manual of the battery charger before charging a battery. Automatic charger should be kept in a dry and well-ventilated place.
1. Be sure to charge the battery after each operation.
   Battery charger plug socket Location

   <Specification of accessory socket>
   ・ Voltage : DC12V
   ・ Max. allowable current : 5A

2. Turn off the main switch.
3. Confirm that there is no dirt, no slack, no backlash of the terminal.
4. Plug the charging plug to the battery charger plug socket.
5. Insert the input plug to the alternative current source.
6. Confirm the battery charging status referring the battery instruction manual.
7. Disconnect the battery charger plug from the socket when you use or move the pump.

   NOTE:  If the main switch is on, the battery cannot be charged.
          Pull out the battery charger plug from the socket when you use or move the pump.
Infuse anti-freezing fluid

**CAUTION** If the temperature around the pump could be subzero, the inside of the pump can be frozen up. In this case, the pump or the vacuum pump may not be operated. And also the pump unit including engine and muffler, may be damaged or broken. In order to prevent internal corrosion and freeze damage by the water in the pump, drain all the water from the pump unit. After draining the water, put antifreeze fluid into the pump and vacuum pump.

<For pump unit>

1. Open the drain valves.
   Drain all the water from the pump.
   In the case of the ball cock discharge valve, the valve has a drain valve at the bottom. Drain water also from here.

2. Close the all drain valves

3. Set a suction cap that is suitable for the suction coupling.
4. Attach the plastic tube to the pump drain valve and open the valve at the pump case.

5. Insert the plastic tube in the container filled with antifreeze fluid (180ml/0.04gal-200 ml/0.05gal).

6. Turn the throttle dial at “SUCTION・START” position. Turn the main switch at “ON” position.

7. Turn the main switch to start. Release the main switch immediately after the engine starts.

8. After starting the engine, suck antifreeze fluid by operating the priming lever.

**NOTE.** Even if antifreeze fluid disappears, continue pulling the priming lever for approximately 30 seconds. By this operation, antifreeze fluid goes every part in the pump water line.

Return the priming lever to the original position.
9. Return the throttle dial to “LOW” position.

10. Turn the main switch off.

11. Close the fuel cock.

<For discharge valve>

Fill antifreeze fluid into the seal area of the discharge valve.

*To use a long nozzle containing is helpful when you pour antifreeze fluid.

Screw down discharge valve __________

Ball cock discharge valve __________
<For primer>

1. Remove the strainer and strainer cup.
2. Inject antifreeze (undiluted 50 ml / 0.01gal) into the strainer guide.
3. After injection, assemble the strainer.

**NOTE**

When assembling or disassembling the strainer assembly, tighten or loosen the ring nut while holding and pushing the strainer cap.

When installing a strainer, pay attention to the protrusion of the O-ring and install it correctly. Otherwise, a vacuum leak may occur.

When installing a strainer, tighten the ring nut while pressing the cup with your palm.
Battery

Battery performance deteriorates if the temperature falls. Further, battery may freeze if the specific gravity is low.

Battery specification

Capacity: 16 Ah

- Hydrogen gases from the battery are explosive. Keep battery away from flame and sparks.
- Hydrogen gases emitted from the battery will also cause severe burns to skin and damage to clothing.
- Charge battery in well ventilated area. Do not charge battery in unventilated area.
- Read the instructions attached to the battery carefully before use.
- When charging batteries, be sure to use an automatic battery charger.
- Use an automatic battery charger that matches the battery specifications. Use of a mismatched automatic battery charger may cause the battery to explode.
- Keep the battery surface clean.
- Battery life is normally 2~3 years even if a battery is used properly. Replace with new battery every 2~3 years checking the deterioration of the charging performance.
- When connecting battery cables, positive(+) lead shall be connected first.
  (When disconnecting battery, remove the negative(-) lead first.)
- Battery electrolyte is a very caustic acid, which will cause severe burns to your skin and damage to clothing.
Battery charger

Read the instruction manual of the battery charger. The instruction manual is packed with the charger.

⚠️ CAUTION ⚠️ Set the battery charger on a suitable non-inflammable stand or fix on wall, not directly onto the ground.
Pumping plate

**CAUTION** When you use the fire pump without a nozzle as a water lifting pump, such as pumping water out of a cellar, put the pumping plate* with holes in between the discharge port adapter screw and the bracket packing in order to prevent the overheating of the engine and the pump cavitation which may cause damages to the pump.

* Pumping plate is the standard accessory: Part No. 151-39045-0

When you use the pump without a nozzle, put the pumping plate between the discharge port adaptor and the packing as shown in the figures above.

**NOTE.** Put the pumping plate as the figure shown above, so that pressure for cooling water in the pump is maintained at certain level. Then you can use the pump without a discharge nozzle.
PERIODICAL INSPECTION

Pay your serious attention to keep the pump in a good condition.

1. To store a fire pump properly:
   • Place it in a level place.
   • Keep it in a dry area. High humidity may cause corrosion in some parts of the pump.
2. Keep the fire pump free of dust.
3. When you store the pump, keep the fuel in the fuel tank full.
4. Fill the governor case with 2-stroke oil to proper level.
5. Run and operate the pump at least once a month.
6. Check the battery condition once a month. Add distilled water if the battery liquid level is lower than the specific level. And charge the battery.
   If the battery is maintenance free battery, do not add any water. Just charge the battery.
7. Before storing the pump for more than one month, drain the fuel from the carburetor completely.
8. Replace the spark plug* when it is dirty or worn.
   * No.: NGK BPR7HS-10 ... Gap 0.9~1.0 mm (0.04 in)
9. Replace the V-belt of the vacuum pump if the V-belt is cracked or worn.
10. Close the suction port with the cap to avoid a foreign material entering to the pump.

Inspection intervals should be determined according to the number of hours or number of month, whichever comes first.
Perform periodical inspections and maintenance according to the following procedures.

<table>
<thead>
<tr>
<th>Description</th>
<th>Inspection intervals</th>
<th>Inspection items</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>After each operation</td>
<td>0.5 years or 50hr</td>
<td>1 year or 100hr</td>
</tr>
<tr>
<td>Fuel System</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel</td>
<td>●</td>
<td>●</td>
<td>Clean*1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>●</td>
<td>Level</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Refuel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>●</td>
<td>Preservation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>period 6 month or more</td>
</tr>
<tr>
<td></td>
<td></td>
<td>●</td>
<td>Degradation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(ie. Stink or color) Replace*1</td>
</tr>
<tr>
<td>Strainer</td>
<td>●</td>
<td>●</td>
<td>Impurities (If water and/or waste has accumulated) Clean*1</td>
</tr>
<tr>
<td>Fuel hose</td>
<td>●</td>
<td>●</td>
<td>Curling, crack, leakage, connection Replace*1</td>
</tr>
<tr>
<td>Ignition</td>
<td>Spark plug</td>
<td>●</td>
<td>Fouling, wear, gap Clean or Replace</td>
</tr>
<tr>
<td>Engine</td>
<td>Cranking</td>
<td>●</td>
<td>Is not locked Poor compression pressure Replace parts if necessary*1</td>
</tr>
<tr>
<td>Engine oil</td>
<td>●</td>
<td>●</td>
<td>Oil level        Refill the same oil</td>
</tr>
<tr>
<td>Governor oil</td>
<td>●</td>
<td>●</td>
<td>Oil level with oil dipstick Refill</td>
</tr>
<tr>
<td>Starting system</td>
<td>Starter rope</td>
<td>●</td>
<td>Wear, damage     Replace*1</td>
</tr>
</tbody>
</table>

*1:means that an item should be replaced if necessary.
## PERIODICAL INSPECTION

<table>
<thead>
<tr>
<th>Description</th>
<th>Inspection intervals</th>
<th>Inspection items</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>After each operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.5 years or 50hr</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 year or 100hr</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 years or 300hr</td>
<td></td>
<td></td>
</tr>
<tr>
<td>starting system</td>
<td></td>
<td>Voltage measure</td>
<td>Charge</td>
</tr>
<tr>
<td>Battery (Sealed type)</td>
<td>●</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Period of use</td>
<td>Replace *1 *2</td>
</tr>
<tr>
<td>priming system</td>
<td></td>
<td>Wear, crack, belt, tension</td>
<td>Replace*1</td>
</tr>
<tr>
<td>V-Belt</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>strainer</td>
<td>●</td>
<td>Clogging or broken mesh</td>
<td>Clean or replace</td>
</tr>
<tr>
<td>primer</td>
<td>●</td>
<td>Is not locked</td>
<td>Replace parts if necessary *1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check performance</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-0.08MPa / -12 psi)</td>
<td></td>
</tr>
<tr>
<td>pump unit (discharge operation)</td>
<td></td>
<td>Air check</td>
<td>Check pump unit if necessary *1</td>
</tr>
<tr>
<td>discharge valve</td>
<td>●</td>
<td></td>
<td></td>
</tr>
<tr>
<td>discharge valve</td>
<td></td>
<td>Check performance</td>
<td>Replace parts if necessary *1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.0MPa / 145 psi)</td>
<td></td>
</tr>
<tr>
<td>discharge valve</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>all parts</td>
<td></td>
<td>Vacuum leakage</td>
<td>Replace parts if necessary*1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1 Ask our customer service staff to replace the parts.

*2 **WARNING** Batteries that have been used for more than three years may explode if charged.
General
Servicing and maintenance of this fire pump must only be carried out by personnel who have professional related knowledge and who are familiar with this fire pump and regulations regarding safety and accident prevention.

Before starting maintenance work:
・ Stop the engine.
・ Disconnect the negative terminal of the battery.
・ Place the pump on a level location.

Safety devices
After safety or protective devices have been disassembled as part of servicing and maintenance work, immediately install them back to their original locations, making sure that they run normally without problems.

Genuine parts
When replacing parts as part of servicing and maintenance of this fire pump, use only Tohatsu genuine parts. If genuine Tohatsu parts and accessories are not used it may adversely affect the function and safety of the fire pump.
Therefore, for safety reasons, use only Tohatsu genuine parts. Tohatsu bears no responsibility for any personal injuries or equipment damage that may result from use of parts or accessories obtained from outside sources.

Environmental protection measures
Dispose of oil, fuel, batteries, etc. according to relevant environmental laws in the region.
Do not dump to nature or sewerage.

Waste
When discarding parts, go waste in accordance with environmental laws in the region procedure.
Cowl removal and installation

Cowl removal

Front
- Unlock the knobs (wing screws) at two locations. Turn the knobs to left one quarter turn.

- Remove the cowl slowly, with care given to the area which would be contacted with the vacuum pump tension handle.

Rear
- Remove the cowl pins from the hooks.

- Detach the spark plug cap at two locations. (For VC52AS, VC72AS)

- Pull and turn the cowl at around the supporting pins.
· Pass the spark plug caps through the holes for the leads.
· Remove the cowl from the pins.
  (For VC52AS, VC72AS)

· Remove the cowl

**NOTE.** Remove the front cowl first, and the rear cowl second.

Cowl installation
Assemble order is in reverse order of the opening.

Rear
· Put the cowl as shown in the picture.

· Pass the spark plugs through the holes for the leads.
  (For VC52AS, VC72AS)
Set the cowl with two hooks shown in the picture.

The hooks are located in 2 places. The hooks must be aligned to the socket of the grommet before insert firmly.

Front
Set the cowl from upper side as shown in the picture

The hooks are located in 2 places. The hooks must be aligned to the sockets of the grommet before insert

Lock the knobs(wing screws) at two locations. Turn the knobs to right one quarter turn.

NOTE: Assemble the rear cowl first, and the front cowl second.
Vacuum pump strainer

Maintenance

**NOTE** Incorrect installation of the strainer may cause a vacuum leak. Be sure to install the strainer correctly.

Refer to the content “MAINTENANCE AFTER OPERATION”

Wash the strainer with fresh water after each use.
* On the occasion of washing the strainer, turn the ring nut. While holding the strainer cup. Remove strainer cup and the strainer.
* Wash the strainer and the strainer cup.
* After washing, assemble the strainer cup and strainer, tighten with the ring nut.

Engine Oil

Check the oil level.

**CAUTION** Confirm the filler cap closed tightly each time, whenever you check the oil level.

Check the oil level after each operation.
* Place the pump in a horizontal location.
* Check the oil level.
* Refill the oil until the “F” level.

**NOTE** 2-stroke engine oil. We recommend that you use engine oil of ISO FB grade or higher.
Governor oil
Check the governor oil level
- Check the governor oil level every three months or every 50 hours operating time.
- Place the pump in a horizontal location.
- Pull out the oil dipstick, wipe it with a cloth.
- Insert the oil dipstick completely.
- Pull out the oil dipstick again, and check the oil level.

If the oil level is under the lower line, add 2-stroke engine oil from the oil gauge port up to the full line mark.

Refer to “PREPARATION FOR OPERATION”

Vacuum pump V belt
Check the V belt.
- Check the V belt every year or every 100 hours operating time.

V belt size:
- VC82ASE : A-29
- VC85BS : M-32
- VC52AS,VC72AS : A-29
Spark plug
1. Remove the plug cap, and remove the spark plug.

2. Use a wire brush or spark plug cleaner, clean the electrode of the spark plug.

3. Check the spark plug for excessive carbon deposits, electrode erosion and check the washer for damage.

4. Measure the spark plug gap. If the gap is out of specification, replace the spark plug with the specified spark plug.
   If necessary, adjust the gap to specification.
   • Spark plug gap : 0.9-1.0 mm (0.04 in)
   • Usage limit : 1.2 mm (0.05 in)
   • Spark plug : NGK BPR7HS-10

5. After assembling the spark plug, as far as by hand ⊙, using a plug wrench further tightening, tighten to the specified torque ⊙.
   • Tightening torque : 27 Nm
Battery
General safety information

Follow the safety instructions on the battery.
When charging batteries, a highly explosive oxyhydrogen gas mixture is produced.
Do not charge a battery in a poorly ventilated place.
Do not smoke near the battery.

⚠️ DANGER ⚠️ Danger of injury due to caustic substances of battery.
• Always wear protective clothing.
• Always wear protective gloves.
• Always wear protective glasses.
• Do not tip the battery, acid would come out through the air vents.

Disposal
Disused batteries should be disposed of according to local laws or regulations.

After each operation of the battery, check the voltage.
Replace the battery if necessary.
• Disconnect the negative terminal of the battery cable, then disconnect the positive terminal.

⚠️ CAUTION ⚠️ There is a risk of injury.
When handing the battery, be sure to wear safety glasses and protective gloves.
Electric equipment

Only expert electricians or trained staff members should handle electrical equipment.

Be sure to disconnect battery cables before handling electrical equipment. Disconnect the negative terminal first, then disconnect the positive terminal.

When connecting battery cables, connect the positive terminal first, then connect the negative terminal.

Use the fuse with the same current rating (ampere) as that of the installed fuse. Using a fuse that has excessive high resistance may result in electrical equipment failures.

Fuse
Security fuses are installed in electrical circuits used in electrical equipment.

Before replacing the fuse, isolate the cause of the short circuit, and take the appropriate action. After the appropriate action has been taken, replace the fuse with a new one. Prepare the spare fuse at all times for emergency.
Suction performance check

⚠️ **CAUTION**  
Limit continuous operating time of the vacuum pump to 30 seconds or less.  
Operating the pump for 30 seconds or more continuously may cause the engine to overheat. If the engine overheats, wait until it cools down.

1. Cap the suction port, and then start the engine.

2. Pull down the priming lever to run the vacuum pump, and check that the pressure gauge for suction reads approximately -0.08MPa (-12 psi). Return the priming lever to the original position.

Vacuum leak check

After completing the vacuum performance check, monitor the pressure gauge for suction for approximately 30 seconds to check for vacuum leaks. If a vacuum leak is found, isolate the cause by referring to the content “16 TROUBLESHOOTING”. Then take the appropriate action and check the vacuum leak again.
Water leak check
1. Connect one end of the suction hose to the suction port.

Place the other end of the hose into the water more than 300mm (11.8 in) from the surface, and then close the discharge valve handle.

2. Start the engine, and pull down the priming lever to run the vacuum pump.

3. Operate the throttle dial to raise the pump pressure almost to 1MPa (145psi), and then check for water leaks from each part of the pump and the cooling water piping.

If a vacuum leak is found, isolate the cause by referring to the content “16 TROUBLESHOOTING”. Then, take the appropriate action and check the water leak again.
Typical causes of engine troubles are listed in the following table.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Battery Charging failure</th>
<th>Starter motor does not work</th>
<th>Engine start failure</th>
<th>Engine stumble or stall</th>
<th>Rough idling</th>
<th>Idling is too high</th>
<th>Poor acceleration</th>
<th>Engine over-rev.</th>
<th>Engine overheating</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low fuel</td>
<td>● ● ● ● ●</td>
<td>● ● ● ● ●</td>
<td>● ● ● ● ●</td>
<td>Refuel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deterioration of fuel</td>
<td>● ● ● ● ●</td>
<td>● ● ● ● ●</td>
<td>● ● ● ● ●</td>
<td>Replace with new fuel.</td>
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<td>Fuel filter clogging</td>
<td>● ● ● ● ●</td>
<td>● ● ● ● ●</td>
<td>● ● ● ● ●</td>
<td>Clean the clogging</td>
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<tr>
<td>Fuel pipe kink or snap</td>
<td>● ● ● ● ●</td>
<td>● ● ● ● ●</td>
<td>● ● ● ● ●</td>
<td>Fix routing of pipe</td>
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<td>Carburetor</td>
<td>● ● ● ● ●</td>
<td>● ● ● ● ●</td>
<td>● ● ● ● ●</td>
<td>Clean or replace with new Carburetor.</td>
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<td>Throttle dial at other than “Start” position</td>
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<td>Set dial to “Start” position</td>
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<td>Breather hole clogging</td>
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<td>Clean the clogging</td>
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<tr>
<td>Oil filter clogging</td>
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<td>●</td>
<td>●</td>
<td>Replace oil filter. (Do not fill it up with the different brand of oil)</td>
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## TROUBLESHOOTING

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<thead>
<tr>
<th>Trouble</th>
<th>Vacuum pressure defective</th>
<th>Air leaking</th>
<th>Water suction failure</th>
<th>Insufficient water discharge</th>
<th>Floodlight, Gauge lamp, Warning lamp do not work</th>
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<tr>
<td>Fuel and Lubrication</td>
<td>Low fuel</td>
<td>●</td>
<td>Refuel.</td>
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<td>Deterioration of fuel</td>
<td>●</td>
<td>Replace with new fuel.</td>
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<td>Fuel filter clogging</td>
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<td>Clean the clogging.</td>
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<td>Fuel pipe kink or snap</td>
<td>●</td>
<td>Fix routing of pipe.</td>
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<td>Carburetor</td>
<td>●</td>
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<td></td>
<td>Engine over-rev.</td>
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<td></td>
<td>Engine overheat</td>
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<tr>
<td></td>
<td>Engine seizing</td>
<td></td>
</tr>
<tr>
<td>Electrical</td>
<td>Spark plug cap comes off</td>
<td>Plug in surely.</td>
</tr>
<tr>
<td>Electrical</td>
<td>Use of unspecified spark plug</td>
<td>Replace with specified spark plug.</td>
</tr>
<tr>
<td>Electrical</td>
<td>Spark plug fouling (No spark or weak spark)</td>
<td>Clean or replace with specified spark plug.</td>
</tr>
<tr>
<td>Electrical</td>
<td>Battery loose connection, terminal corrosion or expired</td>
<td>Clean terminal and/or tighten a terminal screw. Replace if necessary</td>
</tr>
<tr>
<td>Electrical</td>
<td>Battery charger defective</td>
<td>Check 5A fuse and/or Battery charger. Replace if necessary</td>
</tr>
<tr>
<td>Trouble</td>
<td>Vacuum pressure defective</td>
<td>Air-leaking</td>
</tr>
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<tr>
<td>Cause</td>
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<td>Battery charger defective</td>
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| Action                      |                           |             |                       |                              |                                               |

<p>| Spark plug cap comes off    | Plug in surely.           |             |                       |                              |                                               |
| Use of unspecified spark plug | Replace with specified spark plug. |             |                       |                              |                                               |
| Spark plug fouling (No spark or weak spark) | Clean or replace with specified spark plug. |             |                       |                              |                                               |
| Battery loose connection, terminal corrosion or expired | Clean terminal and/or tighten a terminal screw. Replace if necessary |             |                       |                              |                                               |
| Battery charger defective   | Check 5A fuse and/or Battery charger. Replace if necessary |             |                       |                              |                                               |</p>
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<tr>
<th>Trouble</th>
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<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery charging failure</td>
<td>Electrical 5A fuse blown</td>
<td>Replace with spare fuse. When the blowout of the fuse happens repeatedly, check a cause. 15A: Battery cable reverse connection, operation panel components and search light connector. 5A: Charging connector.</td>
</tr>
<tr>
<td>Starter motor does not work</td>
<td>Starter motor defective</td>
<td>Check terminals, cords and screws. Replace parts if necessary.</td>
</tr>
<tr>
<td>Engine start failure</td>
<td>Operation panel defective</td>
<td>Check input of starter solenoid. (Equal to operation panel output.) Replace parts if necessary.</td>
</tr>
<tr>
<td>Engine stumble or stall</td>
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<tr>
<td>Rough idling</td>
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<tr>
<td></td>
<td>Water suction failure</td>
<td></td>
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<tr>
<td></td>
<td>Insufficient water discharge</td>
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<tr>
<td></td>
<td>Caused by Pump unit</td>
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<tr>
<td></td>
<td>Caused by Playpipe</td>
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<tr>
<td></td>
<td>Caused by Engine unit</td>
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</tr>
</tbody>
</table>

**5A fuse blown**

**Electrical**

- **Starter motor defective**
  - Check terminals, cords and screws.
  - Replace parts if necessary.

- **Operation panel defective**
  - Check input of starter solenoid.
  - (Equal to operation panel output.)
  - Replace parts if necessary.
<table>
<thead>
<tr>
<th>Cause</th>
<th>Trouble</th>
<th>Battery Charging failure</th>
<th>Starter motor does not work</th>
<th>Engine start failure</th>
<th>Engine stumble or stall</th>
<th>Rough idling</th>
<th>Idling is too high</th>
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<th>Engine overheat</th>
<th>Engine seizing</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Piston, piston ring or cylinder excessively worn</td>
<td>● ● ● ● ●</td>
<td>Correct or replace.</td>
<td></td>
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<tr>
<td></td>
<td>Carbon deposition in the combustion chamber</td>
<td>●</td>
<td>Clean out.</td>
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<tr>
<td></td>
<td>Suction height too high or length too long</td>
<td></td>
<td>Make it pump location to nearer and/or lower position.</td>
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<tr>
<td></td>
<td>Suction hose end is not in water</td>
<td></td>
<td>Put the end of suction hose below 300mm (11.8 in) of the surface of the water.</td>
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<tr>
<td></td>
<td>Suction hose coupling loose or gasket defective</td>
<td></td>
<td>Clean out a gasket and tighten securely. Replace a gasket if necessary.</td>
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<tr>
<td></td>
<td>Suction hose strainer clogged with dead leaf or waste etc.</td>
<td></td>
<td>Clean out.</td>
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<tr>
<td></td>
<td>Suction hose cracking or Lining peeling off</td>
<td></td>
<td>Repair or replace.</td>
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## Troubleshooting

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<th>Trouble</th>
<th>Vacuum pressure defective</th>
<th>Air leaking</th>
<th>Water suction failure</th>
<th>Insufficient water discharge</th>
<th>Insufficient water caused by suction</th>
<th>Insufficient water caused by pump unit</th>
<th>Insufficient water caused by play pipe</th>
<th>Insufficient water caused by engine unit</th>
<th>Floodlight, gauge lamp, warning lamp do not work</th>
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<tbody>
<tr>
<td>Compression</td>
<td>Piston, piston ring or cylinder excessively worn</td>
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<td>Tighten securely a clump of vacuum pipe or replace.</td>
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<td>Water stop contamination</td>
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<td>Starter motor does not work</td>
<td>Suction port strainer clogged with dead leaf or waste etc.</td>
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<td>Engine stumble or stall</td>
<td>Discharge valve imperfect open</td>
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<td>Idling is too high</td>
<td>Pump cover bolts loose</td>
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<td>Engine over-rev.</td>
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<td>Engine overheat</td>
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<td>Water discharge</td>
<td>Insufficient water</td>
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<td>Tighten securely. Replace a gasket if necessary.</td>
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<td>Pump cover bolts loose</td>
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<td>Cause</td>
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<td>Starter motor does not work</td>
<td>Engine start failure</td>
<td>Engine stumble or stall</td>
<td>Rough idling</td>
<td>Idling is too high</td>
<td>Poor acceleration</td>
<td>Engine over-rev.</td>
<td>Engine overheat</td>
<td>Engine seizing</td>
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## TROUBLESHOOTING

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<th>Trouble</th>
<th>Vacuum pressure defective</th>
<th>Air leaking</th>
<th>Water suction failure</th>
<th>Insufficient water discharge</th>
<th>Caused by suction</th>
<th>Caused by Pump unit</th>
<th>Caused by Playpipe</th>
<th>Caused by Engine unit</th>
<th>Floodlight, Gauge lamp, Warning lamp do not work</th>
<th>Action</th>
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<td>Change the nozzle for suitable size or incorporate safety nozzle.</td>
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<td>Readjust it securely.</td>
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Tightening torque specifications.

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## TOOLS AND STANDARD ACCESSORIES

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WIRING DIAGRAM: VC82ASE

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Wiring diagram details...
WIRING DIAGRAM : VC52AS, VC72AS
TOHATSU CORPORATION

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FAX: +81-3-3966-2951
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