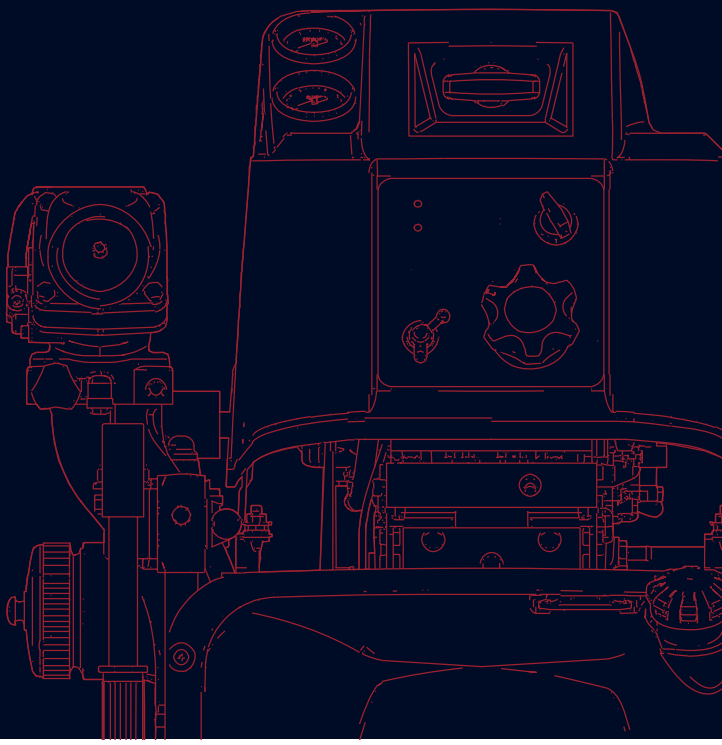
OWNER'S MANUAL

TOHATSU

VF53BS

PORTABLE
FIRE PUMP

No.003-12099-0



BACKS YOU UP™

APPLICATIONS OF THIS FIRE PUMP

USAGE

TOHATSU portable fire pump "VF53BS" is manufactured for use in firefighting operations.

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

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

Using the portable 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, service or maintain the portable fire pump must read and understand the following items:

- Owner's manual
- Safety-related instructions on the pump and the other parts such as a battery.
- The other owner's manuals, such as a battery charger.

The portable fire 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 the fire pump.

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

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

⚠CAUTION

- **Keep the manual in a safe place for further reference.**
- **Operators of the portable fire pump must always refer to all the relevant manuals in order to avoid errors, personal injuries and equipment damages when operating the portable fire pump, and to maintain faultless operation.**
- **Place owner's manual so that operators can refer to it where they operate the fire pump.**

INTRODUCTION

Thank you for purchasing the TOHATSU portable fire pump.

This portable fire pump has passed a range of quality assurance standards.

Owner's manual

The portable fire pump complies with relevant laws and regulations.

The manual includes descriptions for operation and maintenance. Before using the portable fire pump, be sure to read and understand the manual thoroughly.

Engine operation

The manual also includes descriptions for operation and maintenance of the engine.

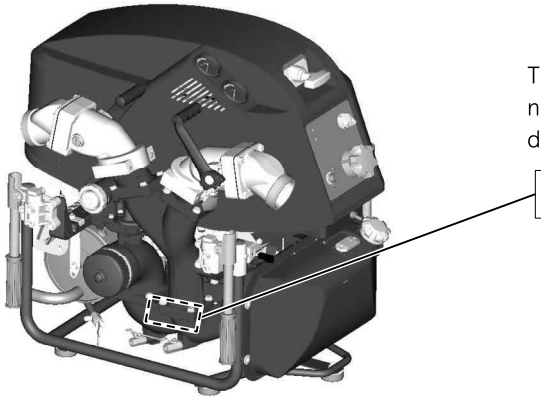
NOTE

- The manual is an important item that goes with the portable fire pump.
- The manual should accompany the portable fire pump if sold to another person.

Before using the portable fire pump, write down the serial number in the following boxes. It will be useful in the case of asking about servicing, repairs and genuine parts.

<u>Serial Number</u>

(Identification Number)



The pump serial (identification) number is marked on the adapter discharge valve.

GENERAL SAFETY INFORMATION

Overview

Before operating the TOHATSU portable fire pump thoroughly read the manual to understand the 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.**

- The instruction provides special information to facilitate the use or maintenance of the portable fire pump or to clarify important points.
- For attaching position of the warning label, refer to the contents “3. LABELS”.
- **Warning labels should be read clearly at any time.**

  If the display of the warning label may become difficult to read, it must be replaced immediately.

Safety-related instructions and warning signs

Read and follow the safety-related instructions described in the 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 a hand or finger between top of the retractable handle and bracket.**
- **When transporting the portable fire pump, assign one person per handle.**
- **Also, transporting 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

Purchasing a new portable fire pump, it is placed in a packing box and protected.

Storage of pump after transportation

Keep the pump away from high humidity, and place it on level ground.

Disposal of packing box

Dispose the packing box by following the environmental laws.

Emissions

Noise emission

⚠CAUTION

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

Exhaust gas

Fatal hazard from carbon monoxide (CO) poisoning

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.

Safety devices

Before operating the 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.

After protection devices (such as muffler guard) have been disassembled during servicing or maintenance work, install them back as soon as possible to their original positions, and make 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 devices 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.

Protective clothing and Protective equipment

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

- Fire protective closing
- Fireproof helmet
- Fireproof protective gloves
- Fireproof protective boots

Service and Maintenance

Servicing and maintenance of the portable fire pump must be carried out by only the persons who have professional knowledge, who are familiar with the device, and who understand laws and regulations regarding safety and accident prevention.

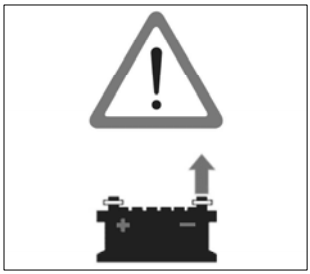
Before starting maintenance work, turn the main switch off to stop the engine.

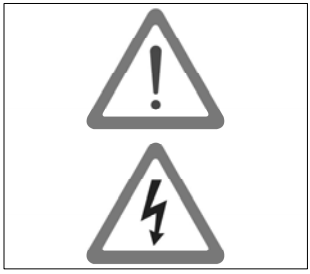
Disconnect the negative terminal of the battery.

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.

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 connecting the cable to the battery, be sure to connect the positive (+) cable first. After that, connect the negative (-) cable next.

Do not place any metal on the top of or around the battery. Doing so many causes 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 the 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 portable fire pump on a regular basis.

Battery

Follow any safety-related instructions shown on the battery.

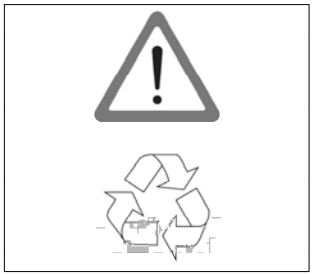
The battery can generate flammable hydrogen gas that may **cause an explosion**.

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 the disused batteries according to relevant laws and regulations.

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 refilling fuel. Do not smoke while refilling 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 it according to relevant laws and regulations.

⚠WARNING

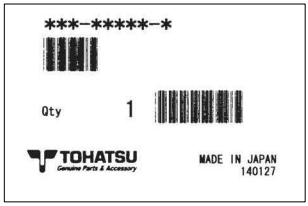
- **Crude oil, gasoline, diesel fuel and other petroleum products can expose you to chemicals including toluene and benzene, which are known to the State of California to cause cancer and birth defects or other reproductive harm. These exposures can occur in and around oil fields, refineries, chemical 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.

Genuine parts

When replacing parts for servicing and maintenance of portable fire pumps, be sure to use only Tohatsu genuine parts.

If genuine Tohatsu parts and accessories are not used, it may adversely affect the functioning and safety of the portable 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.



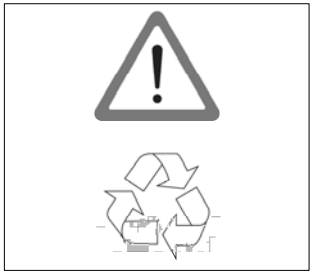
Environmental protection measures

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

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

Store the 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.

CONTENTS

1. SPECIFICATIONS

Model	VF53BS
Description	Portable fire pump
Max. operating pressure	1.4 MPa (203 psi)
Temperature range	-20 °C to +40 °C ambient temperature
Engine	
Manufacturer	TOHATSU CORPORATION
Model	3WF61B
Type	4-stroke, 3-cylinder, water cooled gasoline engine
Bore × Stroke	61 mm × 57 mm
Number of Cylinder	3
Piston displacement	500 cm^3
Rated power	22 kW (30 PS)
Fuel type	Unleaded gasoline (RON 91)
Fuel tank capacity	10 L (2.6 gal(US))
Fuel consumption	9.5 L/h (2.5 gal(US)/h)
Engine oil	API: SH, SJ, SL SAE: 10W-30/40
Engine oil quantity	1.6 L/0.42 gal(US) (When replacing oil filter:1.7 L/0.45 gal(US))
Cooling system	Water cooling
Ignition	Flywheel magneto (DIGITAL C.D.I.system)
Spark plug	NGK DCPR6E
Starting system	Electric starter and Manual starter (Recoil)
Lubrication	Wet sump
Fuel system	Electronic fuel injection
Battery	12 V-16 Ah/5HR, 12V-18 Ah/10HR
Floodlight *1	12V-27W LED

*1 Option (Floodlight)

1. SPECIFICATIONS

Model	VF53BS
Primer	
Type	Rotary-vane vacuum pump (Oil less type)
Max. suction height	Approx. 9 m (29.5 ft.)
Pump	
Type	Single suction, single stage, high pressure turbine pump
Number of delivery outlets*1	2
Discharge port coupling	JIS fire thread (B-9912) 2-1/2" (65 mm) male BSP thread G 2-1/2" (65 mm) male
Suction port coupling	JIS fire thread (B-9912) 3" (75 mm) male BSP thread G 4" (100 mm) male
Pump performance (Suction height: 1 m)	340 gal(US)/min at 75 psi
	1.2 m^3/min at 0.6 MPa
	290 gal(US)/min at 100 psi
	0.95 m^3/min at 0.8 MPa
Dimensions and weight	
Overall Length x Width x Height	670×780×740 mm (26.4×30.7×29.1 in.)
Mass	89 kg /196 lbs(dry) 99kg /218 lbs(ready for operation)

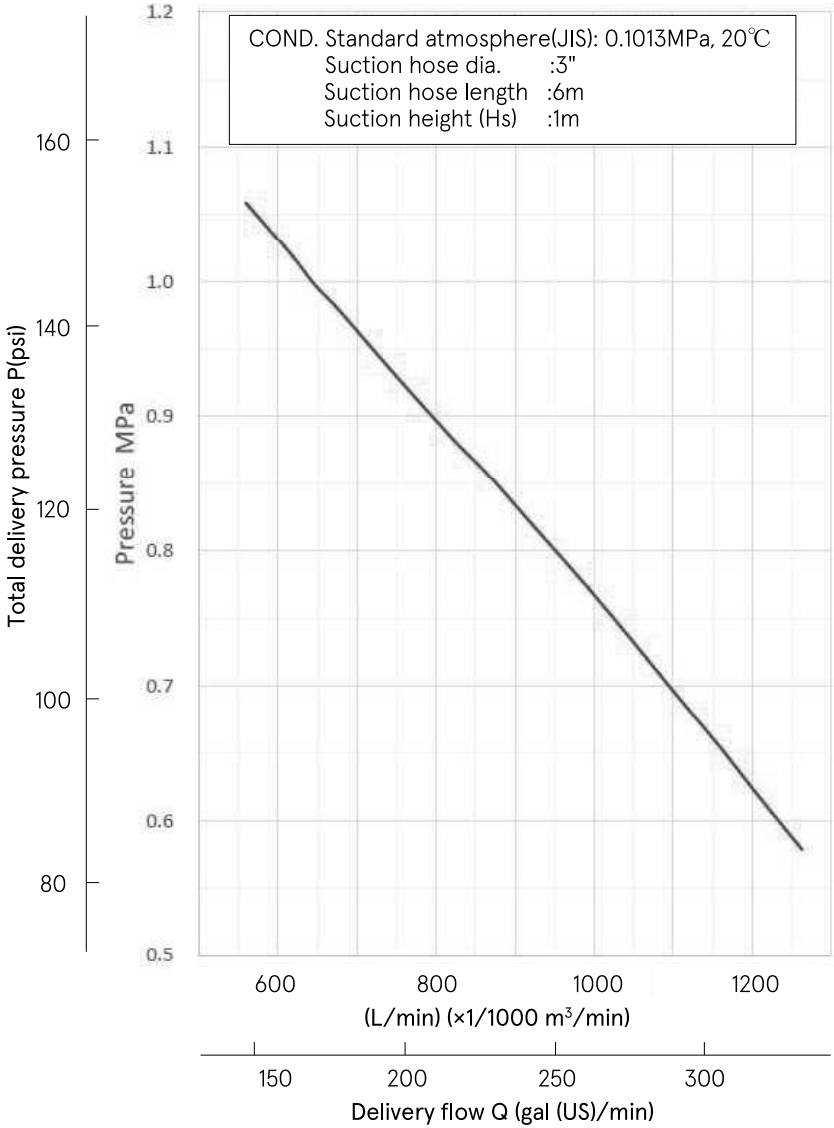
*1 Twin outlet standard

Materials

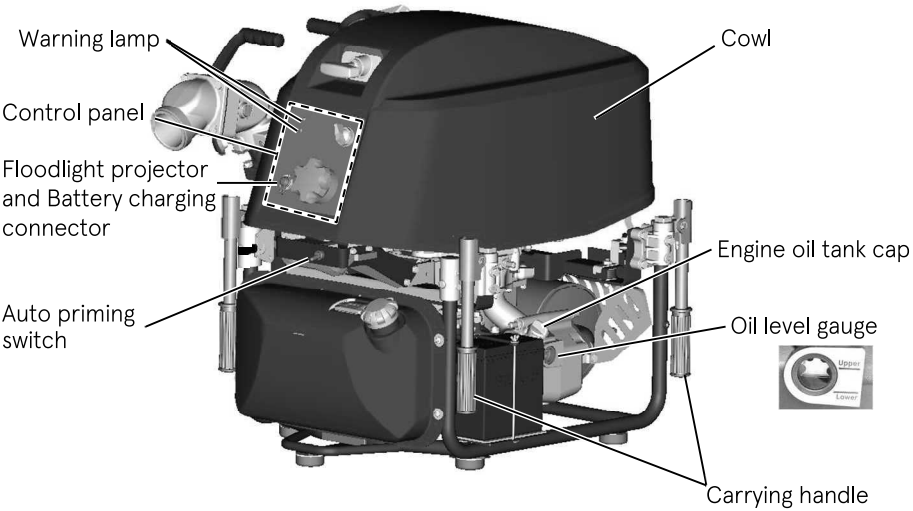
Engine	
Crankcase, Cylinder, Cylinder head	Aluminum alloy
Crankshaft	Chromium-molybdenum steel
Connecting rod	Aluminum alloy
Piston	Aluminum alloy
Pump shaft	Chromium-molybdenum steel with metal plating
Muffler	Stainless / Steel
Pump	
Pump casing, Pump cover	Aluminum alloy
Impeller	Aluminum alloy
Shaft seal	
Type	Mechanical seal

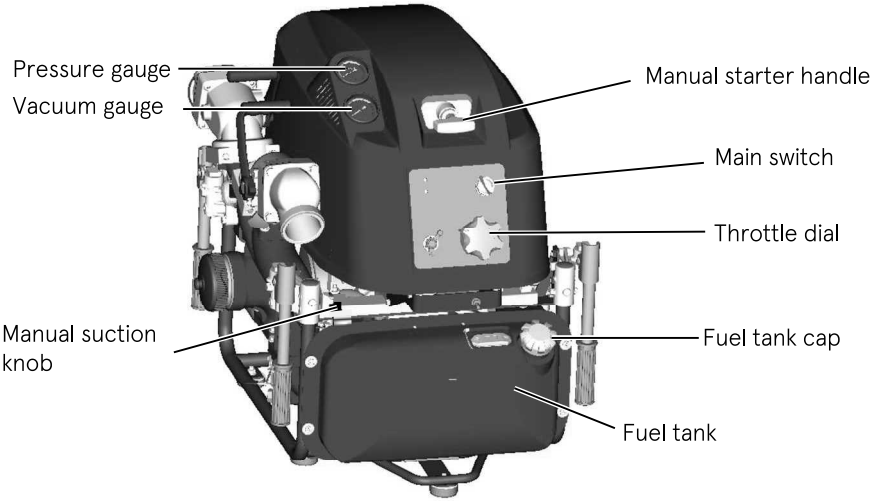
1. SPECIFICATIONS

Performance Curve



2. OPERATION DEVICE





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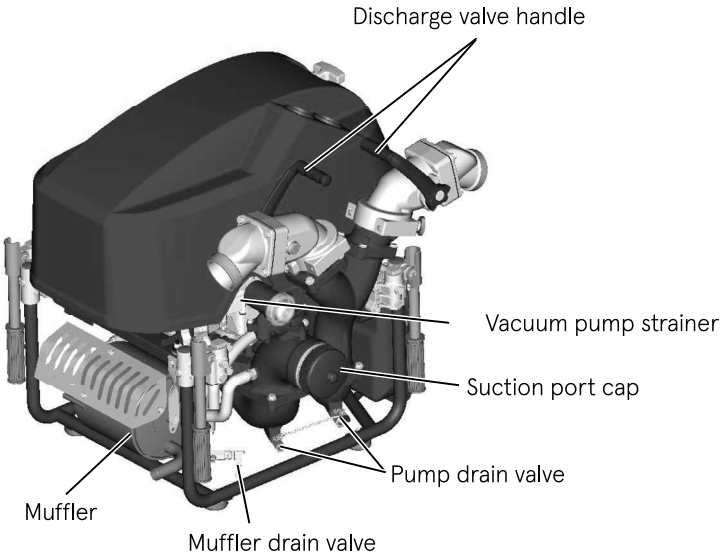
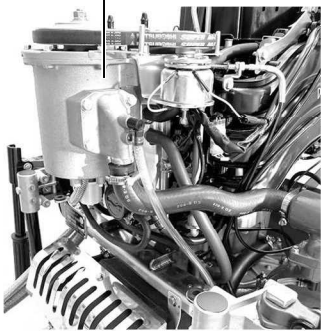
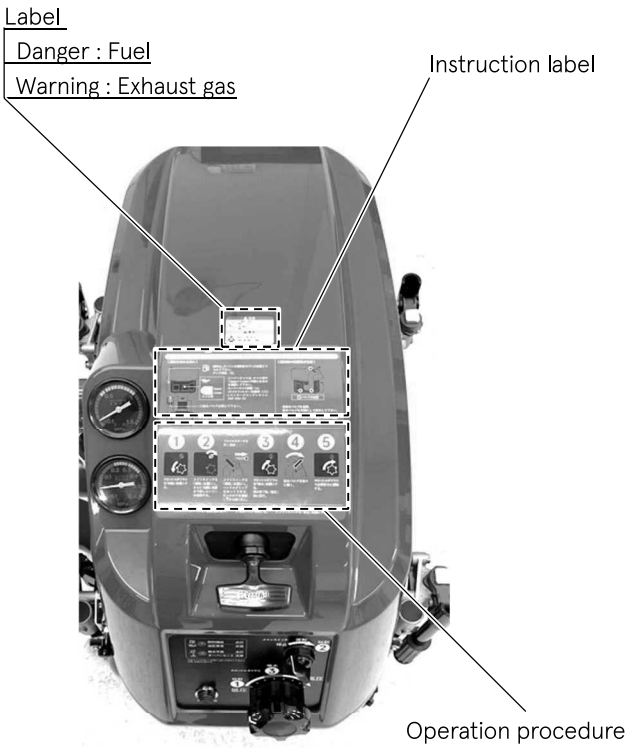


Plug cap

Vacuum pump



3. LABEL


Label
Danger : Fuel
Warning : Exhaust gas
Instruction label
Operation procedure

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.**

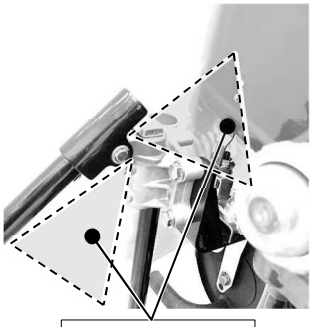
NOTE

- 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 on 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. (More operation of vacuum pump for 3 to 5 seconds from beginning of water discharge.)
- Be sure to install strainer and basket at the end of suction hose. If the pump may suck sand or mud from the water source bottom, place sheet below the basket.
- Strainer and basket of suction hose should be placed more than 30 cm below water surface to prevent suck of air.
- Discharge hose should be arranged not to be bent.

4. OPERATING PRECAUTIONS

⚠CAUTION

- **When installing the portable pump in a vehicle, place the vehicle on level ground, 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 using 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 on each to avoid falling down the pump.**



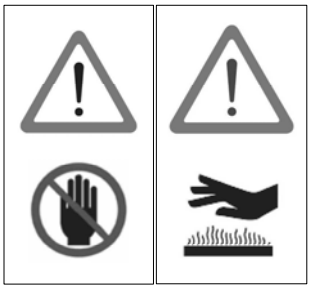
Do not put your hands or fingers

NOTE

- When placing the portable fire pump on the ground, place it slowly and horizontally.

⚠CAUTION

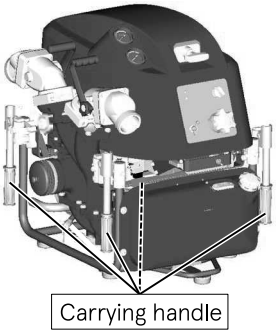
- **Do not touch the exhaust pipe and the muffler while the engine is running, or for more than 10 minutes after the engine has been stopped. These parts are very hot and will cause severe burns.**



5. DESCRIPTION OF DEVICES

Carrying handle

The fire pump is equipped with four carrying handles. The handles can be manually folded, and turned 90 degrees to open it.

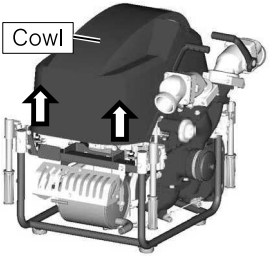


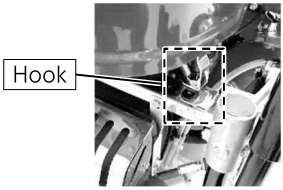
⚠CAUTION

- **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 injury, two people or more should carry and install the pump.**

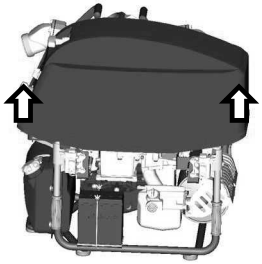
Opening cowl

1. First lift the hooks on the back, then lift the hooks on the front while avoiding interference with the starter handle and the water discharge valve(s).





2. Remove the cowl by lifting the front and rear of the cowl.



5. DESCRIPTION OF DEVICES

Assembling cowl

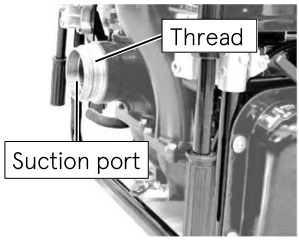
Assembling order is in reverse order of the removing.

NOTE

- Pay attention to have the starter handle for manual starting go through the window at the front-upper side.

Suction port

The diameter of the thread for the fire pump is JIS fire thread (B-9912) 3" (75 mm) or BSP thread G 4" (100 mm).



⚠WARNING

- **Putting a finger or a hand into the suction port while the pump is running without installing the strainer, it may be seriously damaged by the rotating inducer.**

⚠CAUTION

- **A strainer must be installed at the suction port.**
- **Do not run the pump if the strainer is not installed. If the pump is running without the strainer, gravel may enter the pump and causes significantly reduced water discharge capacity.**

5. DESCRIPTION OF DEVICES

Discharge port

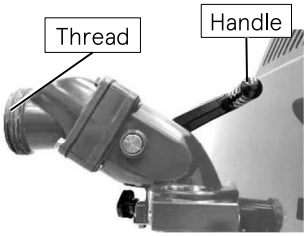
The diameter of the thread for fire pump,

JIS fire thread (B-9912) 2-1/2" (65 mm)

BSP thread G 2-1/2" (65 mm)

Discharge valve

Use discharge valve handle for opening and closing the discharge valves.

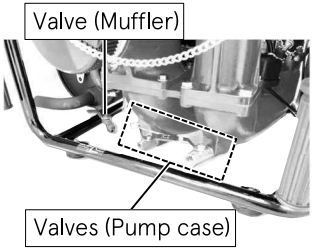


Drain valve

Use the drain valves to drain water from the pump.

Drain valves:

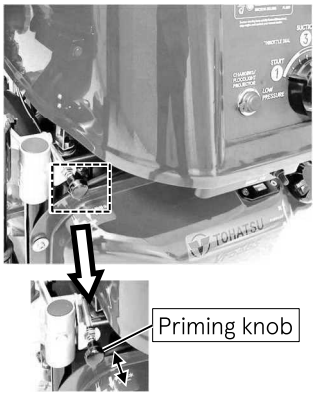
- Pump case
- Muffler



5. DESCRIPTION OF DEVICES

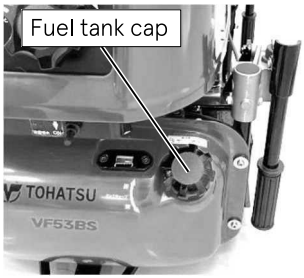
Priming knob

- Use for priming water by manual operation.
- After starting the engine, pull the priming knob to suction water.
- After priming water has been completed, return the priming knob to its original position.



Fuel tank

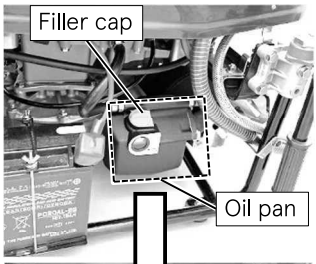
- Refill appropriate amount of gasoline to the fuel tank.
- Close the fuel tank cap all the time except refuel.



Engine oil

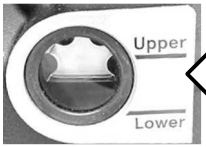
Before using the pump, fill it with the designated amount (approximately 1.6 L/ 0.42 gal(US)) of 4-stroke engine oil.

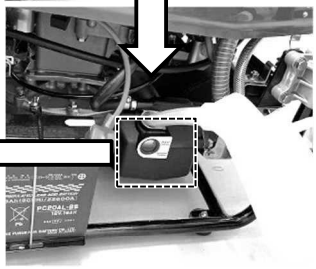
Fill the engine oil until “Upper” level.



NOTE

- Fill the 4-stroke engine oil.



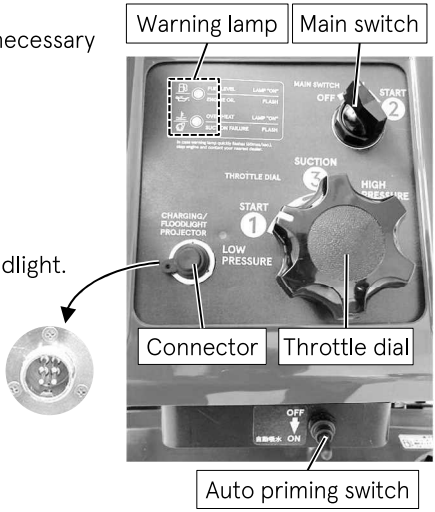


5. DESCRIPTION OF DEVICES

Control panel

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

- Main switch
- Throttle dial
- All warning lamps
- Auto priming switch
- Connector for charging battery and floodlight.



Warning lamp & buzzer

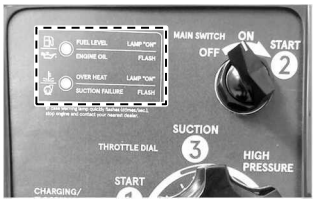
Turning the main switch to the ON position, the lamp and buzzer check mode starts.
The warning lamps turn on and the warning buzzer sounds for a moment while the check mode operates.
If the lamp and buzzer check mode would show failure, refer to "Chapter 16 TROUBLESHOOTING" to eliminate the cause.

⚠CAUTION

- **Remove the cause of failure following "Chapter 16 TROUBLESHOOTING".**

The monitor indicates the following information.

- Fuel level warning
- Engine oil pressure warning
- Suction failure warning
- Overheat warning



Fuel and Engine oil warning

If the fuel level in the fuel tank is below approximately 1/3, the warning lamp turns on and the warning buzzer sounds continuously when the main switch is at ON position.

If the oil pressure drops, the warning lamp blinks slowly, and the warning buzzer sounds continuously when the main switch is at ON position.

If the oil pressure switch is defective or the circuit is disconnected, the warning lamp blinks slowly when the main switch is at ON position.

⚠CAUTION

- **If the lamp blinks or turns on, take countermeasures following "Chapter 16 TROUBLESHOOTING".**

NOTE

- The lamps turn on and warning buzzer sounds instantaneously when the main switch is turned on, which is normal operation. The lamps turning on instantaneously show the system check operation has done.

Engine overheating and Suction failure

If the engine stops due to insufficient cooling water, the warning lamp turns on and the warning buzzer sounds continuously.

If the engine stops due to unable suction water complete within 30 seconds in the auto priming mode, the warning lamp blinks slowly and the warning buzzer sounds continuously.

If the TPS, MAT, MAP or ETS is defective, or the circuit is disconnected, the warning lamp blinks fast and the buzzer sounds intermittently when the main switch is turned on.

⚠CAUTION

- **The engine may be damaged.**
- **Do not restart the engine soon after it has stopped running.**
- **Take countermeasures first following "Chapter 16 TROUBLESHOOTING".**

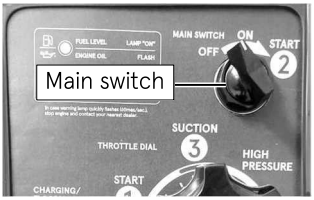
NOTE

- The engine stops automatically when the overheating is detected.

Main switch

Main switch position and function

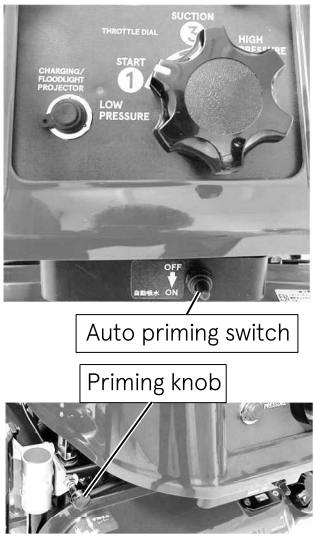
Description	Function
OFF	To stop the engine
ON	Engine running position
Start	To start the engine



Auto priming

Auto priming switch

In the case of turning on the auto priming switch, running the engine and turning the throttle dial to water suction position, the pump starts to suck water.



Auto priming switch

Priming knob

CAUTION

- **Do not manual operation of pulling priming knob when the automatic priming water switch is ON.**

Pressure gauge for discharge

The pressure gauge for discharge indicates the actual operating water pressure.

Pressure gauge for discharge

Pressure gauge for suction

Pressure gauge for suction

The pressure gauge for suction indicates the suction side water pressure and the input pressure supplied from an external water source.

Manual starter

If the battery is not sufficiently charged to start the engine, use the manual starter to start the engine.

Manual starter handle

CAUTION

- **Do not pull the manual starter handle when the pump is running. Personal injuries may occur, and the manual starter may be damaged.**

NOTE

- Engage the manual starter ratchet by pulling the starter rope slowly. And then pull the starter handle quickly with great force from the position in which feeling harder resistance.

Cooling water recirculation system

This system is to recirculate the cooling water without draining outside.

Accordingly, the engine does not have a cooling water drain hose.

Overheat prevention device

This device monitors the engine temperature with an engine temperature sensor. When the engine temperature rises over the setting temperature (approximately 90°C) or higher, warning buzzer alarms and automatically the engine stops to prevent overheating.

- Status of the lamp after the overheat prevention device is activated.
  ① If the engine is restarted while the main switch is being at ON position, the alarm lamp will turn on (an alarm buzzer will also sound).
  ② If the engine is restarted after the main switch turned off once, the alarm lamp will go off (reset). The alarm buzzer will not sound, either.

- Precautions for restarting after the overheat prevention device is activated
  ① Resolve the cause of the abnormally high engine temperature, and then restart the engine. If the cause of the abnormally high engine temperature has not been resolved, the engine will stop again within approximately 30 seconds.
  (The time in seconds until engine stop varies depending on the temperature of the engine wall.)
  ② The starter motor will operate even if the engine wall temperature exceeds about 120 ° C, but the engine prevention function is activated, and the pump cannot be restarted.

NOTE

- Do not repeatedly restart the engine without resolving the cause of the abnormally high engine wall temperature.

5. DESCRIPTION OF DEVICES

Electric Safety Governor (ESG)

The electric governor controls the maximum engine speed by cutting off ignition so that the engine speed does not exceed 6200 r/min.

Battery save control

If the engine being power on but it is not started within 30 minutes, the power automatically turns off.

Initial charge of battery

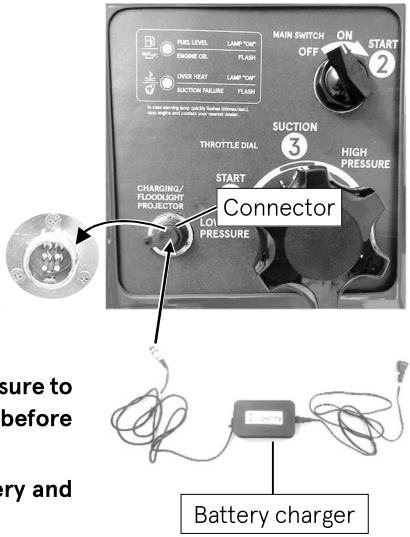
The battery can be used immediately after filling cells with electrolyte.
Be sure not to open the battery after filling it with electrolyte. (Sealed type /Maintenance free battery)
Refer to the instruction of the battery.

Battery charger connector

Used to charge the pump battery.

<Specifications of accessory connector>

- Voltage: DC12V
- Max. allowable current: 7.5A



⚠CAUTION

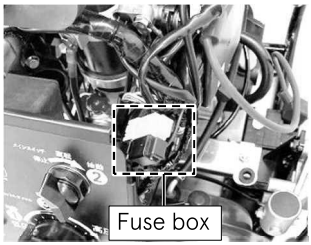
- **Before charging the battery, turn off the main switch.**
- **When starting operation, be sure to remove the battery charger before turning on the main switch.**
- **The connector is for a battery and a floodlight.**
- **Do not connect a cigarette lighter to the connector, because it is not a heat-resistant object.**

Fuse box

Security fuses are installed for electrical circuit in the fuse boxes.

There are two fuse boxes:

- Black color fuse box: 15A fuse.
- Yellow color fuse box: 7.5A fuse.



Manual starter

If the engine does not start with a starter motor, use a manual starter.

⚠CAUTION

- **Do not pull the manual starter handle when the pump is running. Personal injuries may occur, and the manual starter may be damaged.**

NOTE

- To start the engine with manual starter, engage the manual starter ratchet by pulling the starter rope slowly. And then pull the starter handle quickly with great force from the position in which feeling harder resistance.

5. DESCRIPTION OF DEVICES

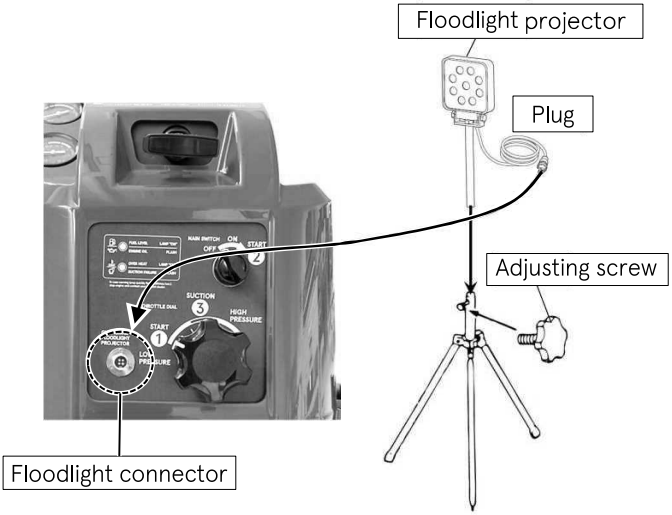
Floodlight (Option)

Use the floodlight projector to light up the location where the fire pump works.

Loosen the adjusting screw and pull up the floodlight projector to adjust its height. After the adjustment is completed, tighten the adjusting screw.

⚠CAUTION

- **Secure enough lighting for the location where the fire pump works, otherwise an accident may occur.**

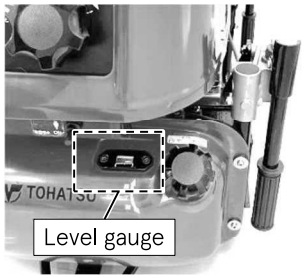


6. PREPARATION FOR OPERATION

Fuel

Fill the tank with gasoline until the maximum level of the (red) gauge indication.

Fuel tank capacity: 10 L (2.6 gal(US))



⚠ DANGER

- **Vaporized fuel may cause ignition or an explosion.**
- **Keep the flame away from the fuel.**
- **Stop the engine before refueling.**
- **Do not spill fuel.**
- **Do not overfill the tank with fuel.**

NOTE

- **Do not inhale the fumes! Gasoline fumes are very toxic!**
- **After stopping the engine, do not touch it while it is hot.**
- **Refuel after the engine has cooled down.**
- **Close the fuel tank cap tightly.**
- **Remove the fuel tank cap only when refueling the fuel tank or when inspecting the inside of the fuel tank.**
- **Clean out all spilled fuel properly (checking for gasoline vapor) before starting engine.**
- **If fuel is spilled, wipe it off with a cloth and dispose of it according to the law.**

NOTE

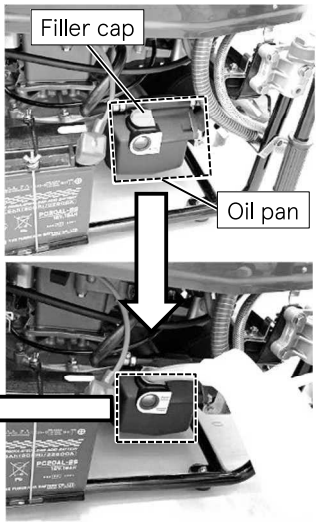
- Using low quality fuel will shorten the life of the engine and cause engine problems such as difficulty in starting.
- Fuels containing alcohol, methanol (methyl), or ethanol (ethyl) may cause the following.
  - Deterioration of rubber and plastic parts.
  - Starting, idling, or other engine performance problems.
- Do not use fuel containing more than 10% ethanol. Do not use fuel containing 5% or more methanol.
- Damages resulting from the use of fuel that contain alcohol are not covered under the limited warranty.
- Always fill the fuel tank with gasoline to be ready.

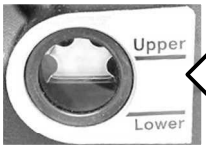
Engine oil

Before using the pump, fill it with the designated amount.

Fill the engine oil until upper level.

1. Check the engine oil level before starting the engine.
2. To check the engine oil level correctly, leave the engine stopped for at least 24 hours. Then, check the oil level.
3. Refill the oil pan with the appropriate amount of oil.
4. Always close the oil tank filler cap except for refueling.





⚠CAUTION

- **Fill with 4-stroke engine oil. (Upper level, approximately 1.6 L / 0.42 gal(US))**

NOTE

- Check the engine oil level before starting the engine. To check the engine oil level correctly, leave the engine stopped for at least 24 hours. Then check the oil level.
- If the oil becomes cloudy white or dirty, please contact your local sales representative.

4-stroke engine oil

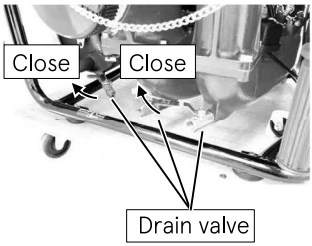
Use the engine oil shown below (classification),

API: SH, SJ, SL

SAE: 10W-30/40

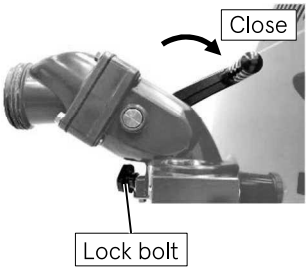
Drain valves

Make sure to close all the drain valves.



Discharge valve

Close the discharge valves.

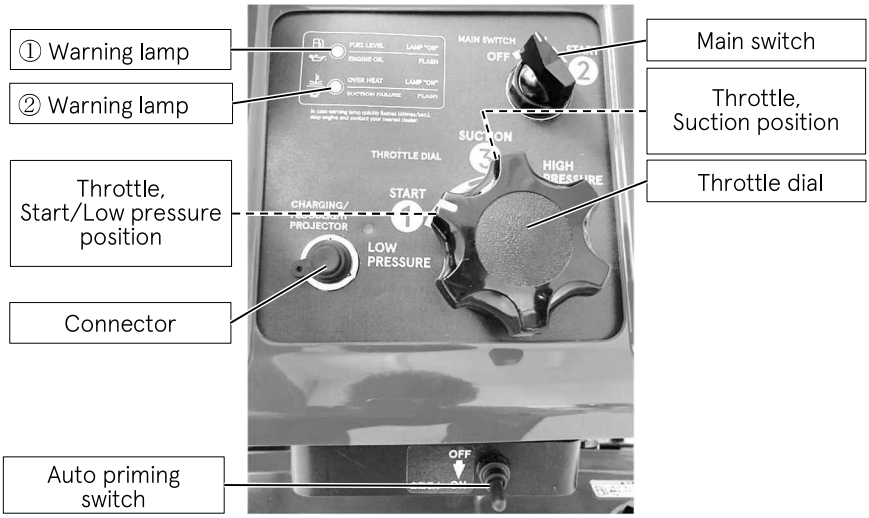


NOTE

- For the ball cock discharge valve, the direction of the valve can be locked by tightening the locking (positioning) bolt
- Do not change the direction of the discharge valve if the lock bolt is tightened.

7. USE OF CONTROL PANEL

Control Panel



Warning lamp

①	Warning lamp	Turn on: Fuel shortage. Slow blinking: Engine oil pressure reduced. Oil pressure switch is defective or the circuit break.
②	Warning lamp	Turn on: Engine stop due to overheating. Slow blinking: Water cannot be sucked up within 30 seconds. Fast blinking: Failure of TPS, MAT, MAP, ETS or circuit break.

7. USE OF CONTROL PANEL

When the warning lamps are all off, there is no problem with each function.

* Countermeasures (Warning lamp turns on)

It is necessary to take a countermeasure if the lamp turns on when turning on the main switch. Then take a countermeasure referring to “Chapter 16 TROUBLESHOOTING”.

Warning system

Warning indicator			High-speed ESG	Low-speed ESG	Engine Speed	Abnormal Phenomenon	Remedy
Warning lamp ①	Warning lamp ②	Buzzer					
Fuel Supply. Abnormal oil pressure.	Overheat. Suction Disabled.						
Instantaneous light	Instantaneous light	Instantaneous light				It is normal because these are system check operation when starting the system. *1	
Turn on		Continuous sound				Fuel level in tank is below approximately 1/3.	A
Slow blinking		Continuous sound		ON		Engine oil pressure drops. *2	B
	Turn on	Continuous sound			Stop	Engine stops due to insufficient cooling water. *3	C
	Slow blinking	Continuous sound			Stop	Engine will stop if water suction cannot be completed within 30 seconds after automatic water suction started.	D
			ON			Exceeded allowable engine speed. *4	E
	Fast blinking	Intermittent sound				TPS, MAT, MAP or ETS is defective or circuit break. *5	F
Slow blinking						Oil pressure switch is defective or the circuit break. *6	F

*1 When the main switch is turned on.

*2 The engine speed is controlled to be 2800 r/min or less.

*3 • When the engine wall temperature sensor reaches approximately 90°C or higher, the overheat prevention device is actuated and stops the engine.

• Even if the engine wall temperature sensor exceeds approximately 120°C, the cell motor can be run. But the engine prevention function is actuated, and the pump cannot be restarted.

*4 The engine speed is controlled to be 6200 r/min or less.

*5

TPS (Throttle position sensor)
MAT (Manifold air temperature sensor)
MAP (Manifold air pressure sensor)
ETS (Engine wall temperature sensor)

*6 When the main switch is set to the ON position and before the engine starts running.

Remedy

A. Refueling.

B. Check the amount of engine oil. If it is below the specified level, replenish the oil. If the specified oil level is met, consult your distributor.

NOTE

• Check the engine oil level before engine start. To confirm the engine oil level correctly, keep the engine stopped for more than 24 hours. After that, check the oil level.

C. Correct the cause of cooling water insufficiency, and then restart the engine.

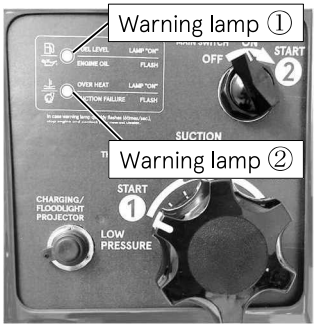
D. Correct the cause of abnormality by referring to “Chapter 16 TROUBLESHOOTING”, and then restart the engine.

E. Turn the throttle dial to the low-pressure side. There may not be enough water left in the water suction line.

F. Except in an emergency, stop the engine and consult your local sales representative.

Warning lamp and sensor

Turning on the main switch, warning lamps turn on and the buzzer sounds for a moment, which shows the alarm checking is done.



⚠CAUTION

- **After the engine has stopped due to overheating, restarting the engine immediately, the engine may burn out. Before restarting the engine, eliminate the cause.**

  (Refer to "Chapter 16 TROUBLESHOOTING")

- **After that, check that the warning lamps are turned off.**

Overheat warning lamp (Warning lamp ②)

This device monitors the engine wall temperature with an engine wall temperature sensor.

When the engine wall temperature reaches the setting temperature of approximately 80°C, the buzzer sounds and the warning lamp ② turns on.

When the engine wall temperature reaches the setting temperature of approximately 90°C or higher, it sounds buzzer warning, the warning lamp ② turns on and the engine will automatically stop.

Status of the warning after the overheat prevention device activated

1. When the engine is restarted with the main switch turning on, the warning lamp will turn on. The warning buzzer will also sound.
2. If the engine is restarted after turning off the main switch once, the warning will be reset and the warning buzzer will not sound.

Precautions for restarting after the overheat prevention device actuated

1. Resolve the cause of the abnormally high engine wall temperature, and then restart the engine. If the cause of the abnormally high engine wall temperature has not been resolved, the engine will stop again within approximately 30 seconds. (The time it takes for the engine to stop depends on the temperature of the engine wall.)
2. After solving the problem of overheating, the engine can be temporarily started even if the engine wall temperature is above 90℃. This allows the engine to be effectively cooled by pumping lower temperature water.
3. The starter motor can be run even if the engine wall temperature exceeds about 120°C, but the engine prevention function works and the pump cannot be restarted.

After eliminating the cause of overheating and solving the problem, restart the engine, pump up water and discharge water, then the engine wall temperature goes down, and then the warning lamp turns off and the warning buzzer stops.

⚠CAUTION

- **Do not restart the engine repeatedly without solving the cause of the abnormally high cooling water temperature.**

Closed Circulating Water Cooling System

In this system, engine cooling water is taken from the pumping up water, and pressurized by the pump. Some of the water passes through the engine and the muffler, and returns to the water intake of the pump.

Warning device check

NOTE

- When the main switch is turned on, the warning lamps and buzzer operate for about one second. After one second, the warning lamps are turned off in the condition of power on, it shows there is no problem with each function.
- If the warning lamp turns on or blinks, the function does not work properly.

8. STARTING THE ENGINE

Pump installation

⚠WARNING

- **Set the pump on level ground at least three meters away from inflammable materials including dead leaves and wood. Because the temperature around the engine becomes high with the muffler and exhaust gas.**
- **Exhaust gas, which contains carbon monoxide, is deadly poisonous gas with no color and no smell.**
- **Do not operate the engine in a closed space or an insufficient ventilation place such as indoor, in the vehicle, warehouse, tunnel, well, in the hold of a ship.**
- **Do not start the engine with the discharge valve open.**
- **Do not pump up and discharge liquids other than water. (e.g., flammable liquids or chemicals)**
- **The pump is only designed as a water pump.**
- **Do not discharge water to water-prohibiting substance.**
- **Do not run the pump without suction port strainer.**
- **Do not put your hand or fingers into the suction port. Putting your hand or fingers in could cause serious injury with the rotating part.**

⚠CAUTION

- **If gravel enters the pump, it can damage the pump and significantly reduce its performance.**

1. Place the pump near the water source on level ground.
2. Connect suction hose and delivery hose to the pump securely. Put one end of suction hose into the water source. The suction hose must have a strainer and a basket at the tip of the hose.
3. Recommended diameter of the nozzles* for the pump.

   Single outlet use: in between 21.5 ~ 36(mm)

   Twin outlet use: in between 15.2 ~ 25(mm)

   *3 (m) of suction head.

8. STARTING THE ENGINE

Starting engine

⚠CAUTION

- **Wear a proper hearing protection during operation.**

- **While the engine is running, never touch the high voltage ignition wire attached to spark plug. The wire has a very high voltage and can cause injury and physical harm.**

- **Do not operate the pump on dry grass. The exhaust system will be very hot and could cause the dry grass burnt and fire. Clear the area if necessary.**

✓ Make sure that all the discharge valve(s) is closed.

✓ Make sure to turn on the auto priming switch.

In the case of the auto priming switch is on, the engine will stop if water is not supplied within 30 seconds.

Operate it according to the operating procedure number indicated on the pump.

8. STARTING THE ENGINE

1. Turn the throttle dial to the start position.

2. Turn on the main switch and turn it further to the start position to start the engine.

NOTE

- Extended operation of the starter motor will run the battery drain. Limit the operating time of starter motor maximum 3 seconds at one time. If the engine does not start, wait for 5 seconds before operating the starter motor again.
- Do not operate the starter motor after the engine started.
- If the starter motor does not work, check that the battery terminals are tightly connected and the battery is fully charged.

Starting engine using a manual starter

If the electric starter does not work, use a manual starter.

⚠WARNING

- **Do not try to start manually when motor is running.**

NOTE

- Even an insufficient charge battery, install the battery to start the engine and operate the pump.

1. Turn the throttle dial to the start (low-pressure) position, and turn the main switch to the ON position. Start the engine by pulling the starter handle.

NOTE

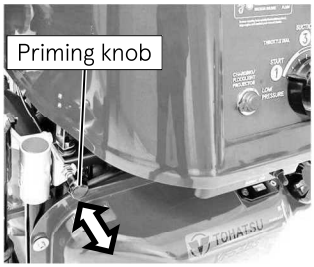
- Engage the manual starter ratchet by pulling the starter rope slowly. And then pull the starter handle quickly with great force from the position in which feeling harder resistance.

2. Once the engine starts, turn the throttle dial to the suction position.

*Operate the pump as the same way with battery started case.

In the case of the auto priming switch turns on, the vacuum pump will run automatically. In the case of the auto priming switch turns off, pull the priming handle to suck up water.

3. Pull the priming knob, and operate the vacuum pump. Confirming the completion of suction water, then return the knob and the throttle dial to the low-pressure position.



NOTE

- The operation time of the vacuum pump should be within 30 seconds.
- If suction cannot be done within 30 seconds, there is the other problem.

Dry operation

Since the cooling system of the portable pump uses water from outside as cooling water, limit the duration of dry operation* so that it is within the following time periods.

*Dry operation: Running engine without water.

Doing dry operation longer than the specified time period may cause damage to the engine or pump.

- Throttle dial at low-pressure (idle) position: Within 2 minutes
- Throttle dial at suction position: Within 30 seconds

Closed discharge valves operation after priming water

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

NOTE

- **Continued operation of the discharge valve closed after water suction will cause the pump to overheat.**

9. PRIME AND DISCHARGE

⚠WARNING

- **While the engine is running with the cowl removed, do not touch the rotating parts such as the pulleys and belts. It may cause personal injury.**

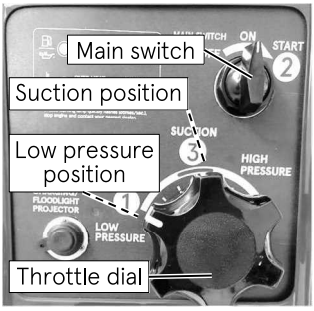
NOTE

If, when operating the vacuum pump for 30 seconds, the pump does not suck up water or if the water can not to be pumped up continuously by the pump during the water discharge operation, check the following:

- Is the tip of the suction hose completely below the water surface?
- Is the suction hose damaged?
- Does the vacuum performance of the priming pump reduce significantly?
- Does the pump case leak vacuum?
- Does the vacuum leak occur when the pump is connected with the suction hose which is capped at the tip of the hose?

Refer to “Chapter 16 TROUBLESHOOTING”.

1. Once the engine starts, turn the throttle dial to the suction position.
2. The vacuum pump operates automatically until the suction finished (Maximum operating time is for 30 seconds). When the water suction completed, the vacuum pump automatically stops.
3. When the vacuum pump stops, return the throttle dial to the low-pressure side.



NOTE

In the auto priming mode,

- If water cannot be supplied within 30 seconds, the engine will stop automatically.
- If the engine speed is lower than 1300 r/min and the vacuum pump is not operated, the engine will stop automatically in about 30 seconds.

4. Make sure that the water pumped up is drained from the priming outlet of the vacuum pump, and make sure the pressure gauge is showing positive side.

NOTE

- The vacuum pump automatically operates for 30 seconds.
- If the water suction cannot be completed within the time that the vacuum pump operates, there are some other problems. Check the cause.

Refer to "Chapter 16 TROUBLESHOOTING"

Start to discharge water after informing the people who are on the hose side.

5. Open the discharge valve handle slowly to start discharging water.

⚠CAUTION

- **Before opening the water discharge port or valve of the pump, confirm the operators holding the nozzle or the branch pipe, that have already checked the nozzle opened and ready to discharge water.**

- **During operation, check the suction and discharge hoses. It 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 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.

6. Checking the pressure and gradually turn the throttle dial to adjust the pressure.

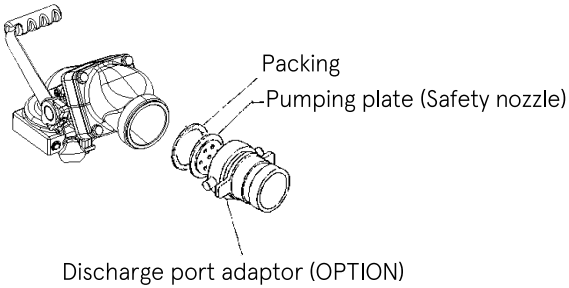
⚠CAUTION

- **In the case of using a branch pipe, the person holding the branch pipe must be informed of changes in water discharge pressure caused from engine speed changes and/or discharge water valve opening setting changes.**
- **Do not direct the nozzle toward people under any circumstances.**
- **Do not look into the nozzle opening at any time.**
- **Do not put fingers or a hand into the discharge nozzle.**

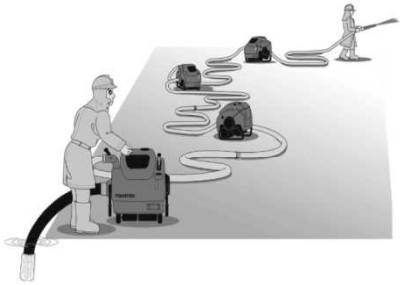
Relay pumping water operation

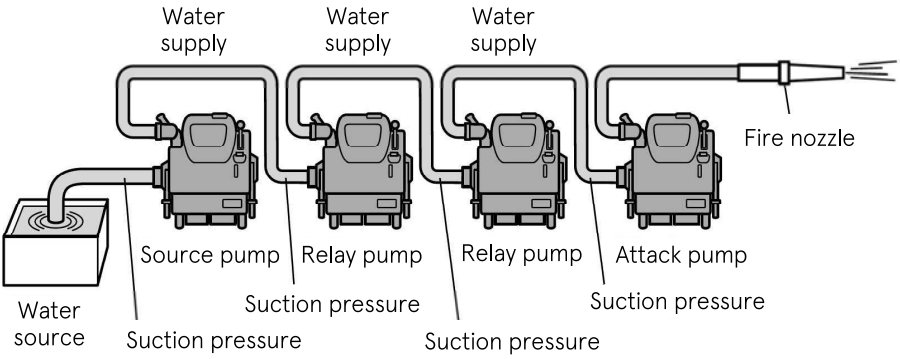
⚠CAUTION

- **In the case of relay pumping operation training on level ground, If the extension hose (inner diameter ϕ65) is less than 200 m, use the pumping plate (safety nozzle) attached.**



Description of relay pumping operation





Performing relayed water supply (When having water from fire hydrant)

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

Pump pressure = needed pressure + height loss + friction loss

2. Fire hydrants may contain foreign materials such as dirt, gravel, or iron rust. 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 relief valve between the delivery hose and the suction port. And use a delivery hose (for high pressure) to connect the suction port instead of a suction hose in principle. Because the water pressure of the fire hydrant could be too high.
4. Set the discharge valve handle of the pump to the fully open position.
5. Gradually open the fire hydrant on-off valve.

   However, check the water pressure from the fire hydrant with suction pressure gauge of the pump, and adjust the opening of fire hydrant, if necessary.

⚠CAUTION

- **If the water pressure from a fire hydrant is higher than 0.6MPa (87psi), do not continue to open the fire hydrant on-off valve.**
- **If the water pressure from a fire hydrant is higher than the required discharge pressure, it is not necessary to run the pump.**
- **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 (15psi) or below. If it does, stop increasing the pressure and keep (operate) the throttle dial not to make the suction water side pressure below 0.1MPa (15psi).
7. At the end of discharging water, turn the throttle dial to the low-pressure position first, then stop the engine, and close the fire hydrant on-off valve.

⚠CAUTION

- **Make sure not to close the discharge valve(s) and nozzle(s) before all pumps stop and the fire hydrant on-off valve is closed. 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.**

8. Open all the drain valves to drain the remaining water as maintenance after the operation.

9. PRIME AND DISCHARGE

Preparation for operation

⚠WARNING

- **Do not close the discharge valve of source pump, relay pumps and fire nozzle(s). If the discharge valves or nozzle is (are) closed during relay water supply, 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 all opened, including the fire nozzles.
4. Decide the discharge pressure of each pump in consideration of the needed pressure for the next pump (or fire nozzle), height loss and hose pressure loss (friction loss).

Pump pressure = needed pressure + height loss + friction loss

Start the source pump

⚠WARNING

- **Once the water supply has started, keep supplying it until finished. If reducing or stopping to supply water, overheating or cavitation may occur in the relay pumps.**

< Auto priming>

1. Make sure that the discharge valves and the fire nozzle(s) are all opened.
2. Turn on the auto priming switch. (In the case of choosing the manual mode, sucking up water (priming) must be done by manual.)
3. Start the source pump. (Refer to "Chapter 8. STARTING THE ENGINE")
4. Start the engine and turn the throttle dial to the suction position.

* The pump will start to suck up water if the priming water mode switch is chosen auto mode. If the priming water mode switch is chosen manual mode, suck up water using a priming handle.

9. PRIME AND DISCHARGE

Starting relay pump

1. Make sure that the discharge valve is opened, and wait for water supply.

   Turn off the auto priming switch.

   At first, the hose swells due to air pressure. Check that the water was supplied from the source pump, step on the hose to judge whether the swelling of the hose is due to water or air if possible.

2. When the water pressure of the relay pump raised to more than 0.1MPa (15psi) due to the water sent from the source (previous) pump. (If it becomes clear that water was supplied to the pump.)
   - Check the pressure with the pressure gauge. Start the engine when discharge pressure is lower than the decided pressure. If the pressure is higher than decided pressure, no need to start the engine.
   - Adjust the discharge pressure with throttle dial. Always check the discharge pressure and suction pressure with the pressure gauges. If the suction pressure goes down below 0.1MPa (15psi), order the operator of the pre-stage pump to increase the discharge water pressure, and adjust the relay pump pressure with the throttle dial. If the suction pressure rises, adjust the pressure with the throttle dial again.

Starting of attack pump operation

It is the same as for the relay pump operation.

Finishing of relay pump operation

1. Keep all the discharge valves and the nozzle(s) opened.
   Do not close the valves or the nozzle(s) first.
2. Stop the operation one by one from the pump closest to the nozzle.
   * Stop the relay pump which is closest to the nozzle first. After that, stop the second closest relay pump to the nozzle. Then stop the third relay pump, in order. Finally, stop the source pump.
   * The signal to stop should be given by the nozzle operator first.
3. Drain all the water from the pumps.

⚠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.

9. PRIME AND DISCHARGE

< In the case of using water from a fire hydrant >

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

Pump pressure = needed pressure + height loss + friction loss

2. A fire hydrant may contain foreign materials such as dirt, gravel, or iron rust. 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 relief valve between the delivery hose and the suction port. And use a delivery hose (for high pressure) to connect the suction port instead of a suction hose in principle. Because the water pressure of the fire hydrant could be very high.
4. Open the discharge valve all the way.
5. Gradually open the fire hydrant on-off valve. However, check the water pressure from fire hydrant with suction side pressure gauge of the pump, and adjust the valve opening of fire hydrant, if necessary.

⚠CAUTION

- **If the water pressure from the fire hydrant is higher than 0.6MPa (87psi), do not open the fire hydrant on-off valve more.**
- **If the water pressure from the fire hydrant is higher than the required discharge pressure, it is not necessary to start the engine.**
- **Too high pressure could damage the hose, pump, and water line.**
- **If the water pressure from the fire hydrant has not reached the required pressure, then start the engine.**

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

   Stop increasing discharge pressure if the suction pressure gauge shows 0.1MPa (15 psi) or below. Keep (Operate) the throttle dial not to make the suction water side pressure below 0.1MPa (15psi).
7. To finish the discharging water, turn the throttle dial to the low pressure firstly, then stop the engine, and close the fire hydrant on-off valve.

⚠CAUTION

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

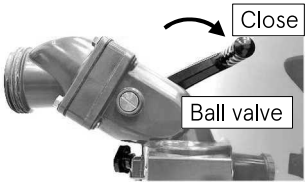
8. Open all the drain valves to drain the remaining water from the engine and pump for pump maintenance.

10. STOPPING THE ENGINE

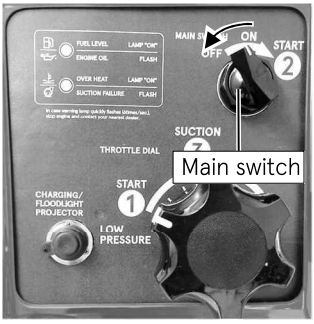
Stopping the engine

1. Return the throttle dial to the low-pressure position.

2. Close the discharge valve handle(s).



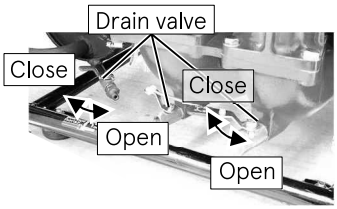
3. Turn off the main switch.



11. MAINTENANCE AFTER OPERATION

Drain water

1. Open the drain valves to drain all the water from the pump. Do not leave water in the pump.
2. Close the drain valves for the next operation.

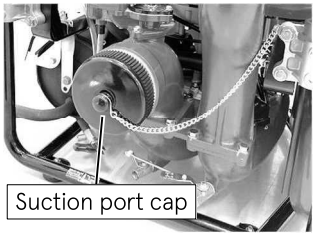


Dry operation for vacuum pump

(Check suction performance)

After the drainage of all the water from the pump,

1. Open the drain valves of muffler and pump. Start the engine and run the vacuum pump for 10 seconds to drain out all the water.
2. Attach the suction port cap.
3. Close all the drain valves.

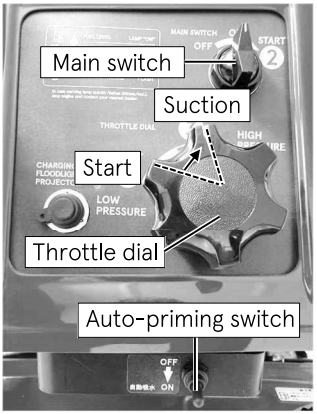


NOTE

- Prepare a suction port cap that is suitable for the suction coupling.

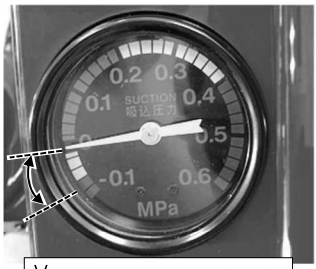
4. Confirm the throttle dial is at the start position, and turn on the Auto-priming switch.
5. Start the engine turning the main switch.
6. Turn the throttle dial to the suction position, then the suction operation will start automatically
7. The engine runs for about 30 seconds and then the engine will stop automatically because of suction water failure.

* This is for vaporizing the water in the vacuum pump and in the water pump, and then drain out the vapor.



8. Check the vacuum pressure of suction is at around -0.08MPa (-12psi).

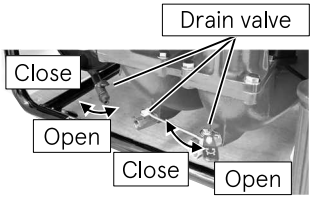
9. In order to check if there is no vacuum leak, leave it for 30 seconds and confirm that the pointer of the pressure gauge for suction keeps the same indicated pressure.



Vacuum pressure gauge

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

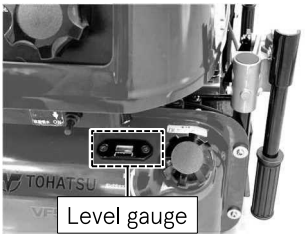
11. Close the drain valves again.



NOTE

- Before storing the fire pump, flush with fresh water to purge any debris from the pump. (Especially after using salt water, muddy water, contaminated water, etc.)
- Worn rubber seals (Rubber gaskets, O-rings, seals for the discharge and suction hose fitting wear) will cause water leaks, poor vacuum. Frequent inspection of these items is mandatory.

Fuel and Oil



1. Fuel

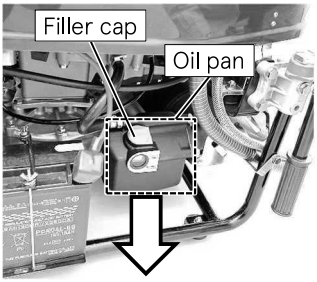
   Fill fuel until the maximum level of the fuel tank.

   The maximum level can be confirmed by the fuel level gauge indicator (Red).

   * Fuel tank capacity: 10L (2.6 gal(US))

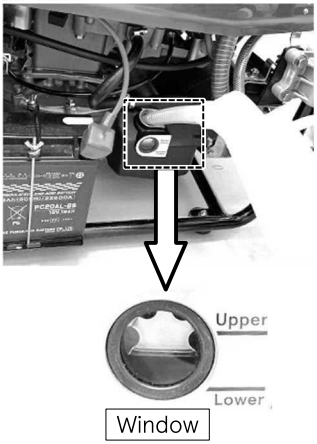
⚠CAUTION

- **Wipe off fuel using a cloth or the other materials if there is fuel out of the fuel tank.**



2. Engine oil

   Fill the engine with 4-stroke engine oil.
   Classification:
   API: SH, SJ, SL
   SAE: 10W-30/40
   Amount of replacement oil
   (Upper limit of engine oil level)
   Oil filter reused : 1.6 L (0.42 gal(US))
   Oil filter replaced: 1.7 L (0.45 gal(US))



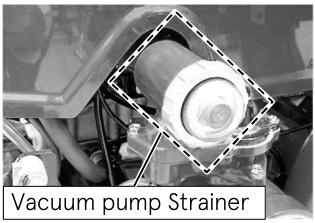
NOTE

- A new pump is not filled with engine oil.
- Before using the pump, fill it with the designated amount of engine oil.
- Be sure to use oil having viscosity suitable for the external air temperature of the area where the pump is used.

Check the amount and cleanliness of the engine oil through the window installed on the oil pan. To confirm the engine oil level correctly, keep the engine stopped for more than 24 hours, then check the oil level.

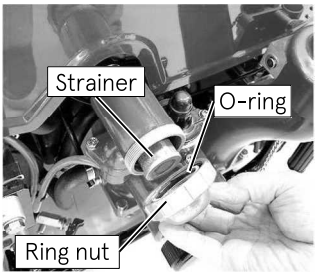
Cleaning the strainer for priming water

Remove the strainer and clean it with fresh water. If the strainer is dirty with dust, etc., vacuum performance efficiency will be reduced.



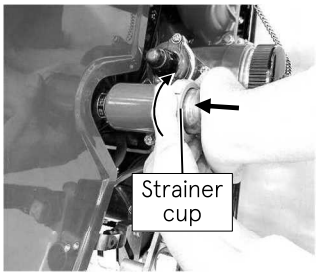
⚠CAUTION

- **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 the strainer, tighten the ring nut while holding and pushing the strainer cup.



Maintenance after pumping seawater or foul water

In case of pumping seawater or foul water, the pump should be flushed out with fresh water immediately to prevent excessive corrosion. And operate the vacuum pump to flushed out with fresh water for 5 seconds at low engine speed in order to clean the vacuum pump.

11. MAINTENANCE AFTER OPERATION

Charging battery

<Battery>

⚠WARNING

- **Read the safety instructions and/or warnings carefully before using or charging the battery.**
- **Hydrogen gas from the battery is explosive.**
- **Keep the battery away from flames and sparks.**
- **Charge the battery in well ventilated area. Do not charge battery in unventilated area.**

⚠CAUTION

- **Connecting battery cables, connect positive (+) lead first.**
- **Disconnecting battery cables, disconnect negative (-) lead first.**

NOTE

- Keep surface of the battery clean.

<Battery charger>

⚠WARNING

- **The battery capacity must be 12V-16Ah/5HR (12V-18Ah/10HR).**
- **Do not connect a cigarette lighter to the battery charger connector. Doing so may melt or burn out the connector due to overheating.**
- **Hydrogen gas inside the battery may explode if something sparks.**
- **Keep the battery away from flames and sparks.**
- **Charge battery in well ventilated area.**

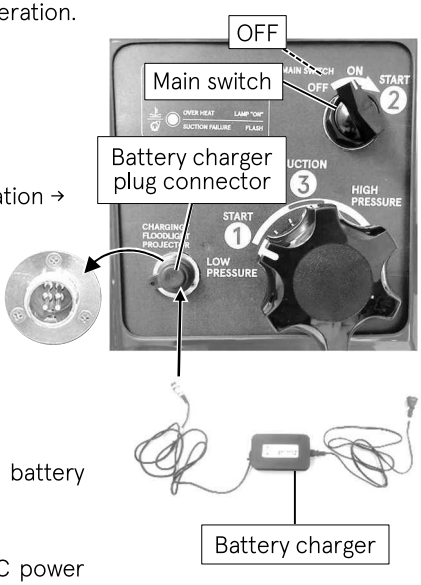
⚠CAUTION

- **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.**

11. MAINTENANCE AFTER OPERATION

1. Be sure to charge the battery after each operation.

Battery charger plug connector location →



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 into the pump battery charger plug connector first.

5. Plug the power plug of the charger into AC power source next.

6. Confirm the battery charging status.

   * Refer to the instruction manual of the battery charger.

7. Disconnect the battery charger plug from the connector when using or moving the pump.

NOTE

- If the main switch is on, the battery cannot be charged.
- Pull out the battery charger plug from the connector when using or moving the pump.
- Plug the charging plug into the pump battery charger plug connector first, then plug the power plug of the charger to AC power source next.

12. MAINTENANCE IN COLD CONDITION

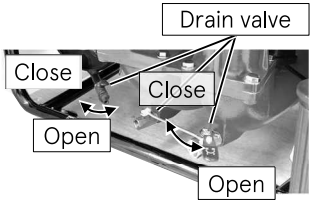
Infuse anti-freezing fluid

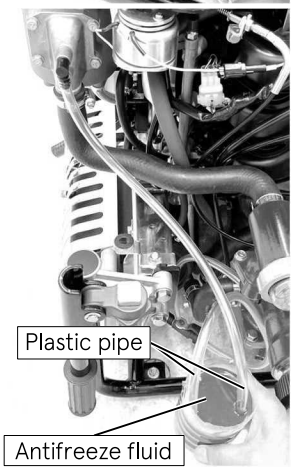
⚠CAUTION

- **If the temperature around the pump could be subzero, the inside of the pump can be frozen. In this case, the water pump or vacuum pump may not be worked. 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 after each use.**
- **After draining the water, put antifreeze fluid into the pump and vacuum pump.**

Pump unit

1. When storing the pump, drain all the water from the pump. Open the pump drain valves and muffler drain valve to drain all water from the pump.
2. Close the pump drain valves and muffler drain valve. Attach the suction port cap and close.
3. Start the engine and turn on the auto priming switch. Turn the throttle to the suction position to run the vacuum pump for about 5 seconds to take the water off on the rotating part.
4. Stop the engine. Open all drain valves and the suction cap to drain the remaining water.
5. After draining completely, close the pump drain valves and attach the suction port cap and close. (Open the muffler drain valve.)
6. Connect the plastic(vinyl) pipe (accessory) to the muffler drain valve.
7. Put the two vinyl pipes (air assist pipe) coming out of the vacuum pump and plastic pipe connected to the muffler drain valve into the container containing the antifreeze (Undiluted solution 500 mL/0.13 gal(US)).

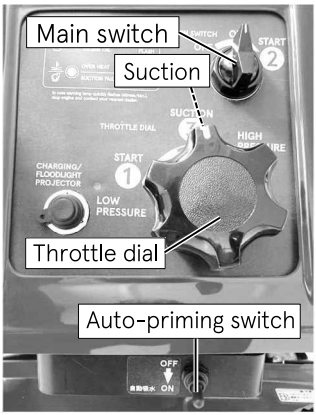




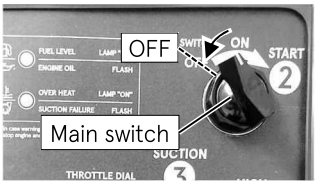
8. Turn on the Auto-priming switch and restart the engine.

9. Turn the throttle to the suction position and run the engine until the engine automatically stops (about 30 seconds) due to water suction failure.

NOTE Do not stop the engine even if the antifreeze runs out. Be sure to run the engine until it stops automatically.



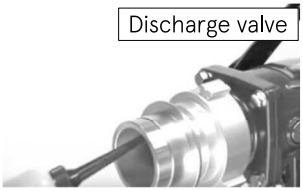
10. Turn off the main switch (turn off the power) and close the muffler drain valve. Turn the throttle dial to the start position.



11. Pour antifreeze into the seal area of the discharge valve.

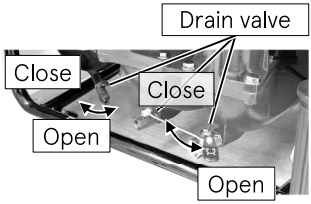
NOTE

- To use a long nozzle container is helpful when pouring antifreeze fluid.



12. Open the pump drain valves to collect the antifreeze.

13. Close the valves and remove the plastic pipes.



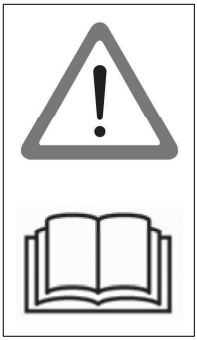
13. USE OF ACCESSORY

Battery

Battery performance deteriorates in a low-temperature condition.
Further, battery could be easier to freeze if the specific gravity is low.

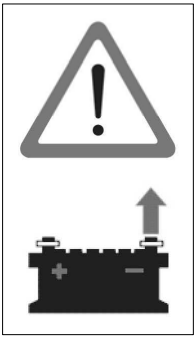
⚠WARNING

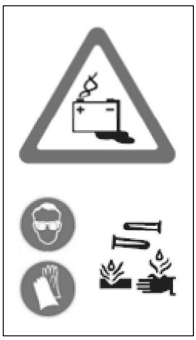
- **Hydrogen gas from a battery is explosive. Keep a battery away from flame and sparks.**
- **Hydrogen gas emitted from a battery will also cause severe burns to skin and damage.**
- **Charge a battery in well ventilated area. Do not charge a battery in an unventilated area.**



⚠CAUTION

- **Read the instructions attached to the battery carefully before use.**
- **When charging the battery, be sure to use an automatic battery charger.**
- **Use the 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 the 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 very corrosive acid that can cause severe skin burns and damage to clothing.**





Battery charger

⚠CAUTION

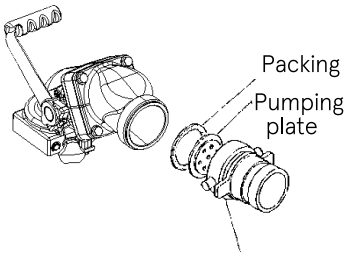
- **Read the instruction manual of the battery charger. The instruction manual is packed with the charger.**
- **Set the battery charger on a suitable noninflammable stand, not directly onto the ground.**

13. USE OF ACCESSORY

Pumping plate

⚠CAUTION

- **In the case of using a fire pump without a nozzle as a water supply pump, such as pumping water from a basement, put the pumping plate (which has holes) in between the discharge port adapter and the packing in order to prevent the overheating of the engine and the pump cavitation which may cause damages to the pump.**



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 the pump can be used without the discharge nozzle.

14. PERIODICAL INSPECTION

Be sure to inspect the fire pump according to the following inspection list.

Inspection Item	Operating Time or Period	Description of Inspection	Action	Remarks
Fuel	After each use	Fuel inside of tank	Replenish	
Engine oil	Before each use Before starting the engine	Check for designated amount	Replenish	
	100 hours or 1 year	-	Replace*	
Oil filter	200 hours or 3 years	-	Replace	○
Valve clearance	100 hours or 1 year	Inspect	Adjust	○
Timing belt	100 hours or 1 year	Crack, wear	Replace	○
Air filter	200 hours or 3 years	-	Replace *	
Fuel filter	50 hours or 6 months	Inspect	Clean the filter.	
Fuel hose	50 hours or 6 months	Damage, leak from joint area	Replace *	
Spark plug	100 hours or 1 year	Fouling, wear, gap (0.8 – 0.9 mm)	Clean, correct or replace.	
Battery	Every month	Voltage	Replace parts if necessary.	○
Starter rope	Every month	Wear, damage	Replace	
Vacuum pump strainer	After each use	Clogging or broken mesh	Clean.	
Vacuum pump driving Belt (V-belt)	100 hours or 1 year	Crack, wear	Replace *	○
Cooling water passage	100 hours or 1 year	Water temperature, clogging water	Replace parts if necessary.	○
Pump and related components	50 to 100 hours or 1 year	Performance check	Replace parts if necessary.	○
Discharge valve and related components	After every 50 to 100 hours or 1 year	Vacuum leak, handle open/close smoothness	Replace parts if necessary. Replenish designated oil.	○
Compression pressure	200 hours or 1 year	Compression pressure (1.13MPa)	Replace parts if necessary.	○
All components	300 hours or 3 years	Overhaul	Replace parts if necessary.	○

Note: 1) Regarding the inspections and actions for the items indicated by the "○" symbol in the remarks column, as well as the changes of parts indicated by the symbol "*" in the action column, please make a request to the local sales representative.

2) Inspection interval which has been reached earlier in the operating time and the periodic inspection period should be the inspection timing.

14. PERIODICAL INSPECTION

The following table shows the parts that are recommended to be changed periodically.

Parts Name	Recommended Replacement Frequency	Problem Occurred
Spark plug	1 year	Unable to start due to wear of electrode
Fuel hose	2 years	Fuel leak due to deterioration
Battery	2 years	Life expiration
Oil hose	3 years	Oil leak due to deterioration
Oil filter	3 years	Overheating of engine
Air filter	3 years	Engine revolution failure
Vacuum pump driving belt	3 years	Slip due to wear
Timing belt	3 years	Valve timing deviation
Other rubbers	2 years	Functional deterioration
Starter rope	3 years	Breakage due to wear
Fuel filter	3 years	Unable to start due to clogging with dust or mixing of water
Discharge reverse flow check valve (rubber)	3 years	Functional deterioration due to wear
Mechanical seal	3 years	Unable to suck water due to wear
Vane for oil less vacuum pump	3 years	Unable to suck water due to wear
Fuel tank	10 years	Functional deterioration due to corrosion

Parts to be simultaneously changed during disassembly:

- Gasket
- O-ring

and the other parts which have damages should be changed.

15. SERVICE AND MAINTENANCE

General

Servicing and maintenance of the fire pump must only be carried out by personnel who have professional related knowledge and who are familiar with the fire pump and regulations regarding safety and accident prevention.

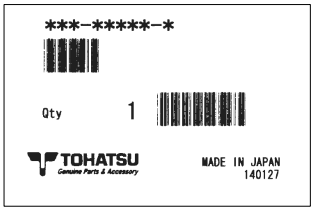
Before starting maintenance work:

- Stop the engine.
- Place the pump on level ground.
- Disconnect the negative terminal of the battery.

Safety devices

⚠CAUTION

- **If the safety or protective devices have been disassembled in the servicing and maintenance work process, immediately install them back to the original position after the maintenance. Make sure that they work normally without problems.**



Genuine parts

When replacing parts as a part of servicing and maintenance of the 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 reason, use only Tohatsu genuine parts.

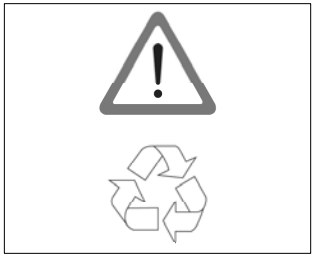
Tohatsu bears no responsibility for any personal injuries or equipment damages that may result from use of parts or accessories obtained from outside sources.

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

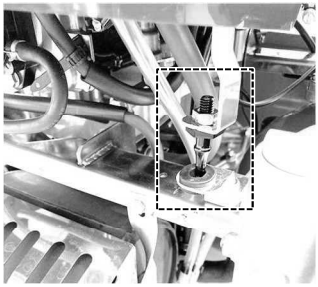
When discarding parts, go waste in accordance with environmental laws in the region procedure.



Cowl removal and installation

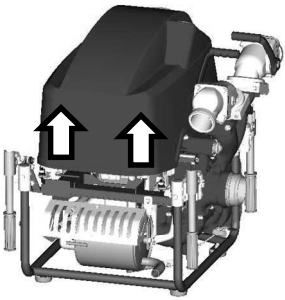
Cowl removal

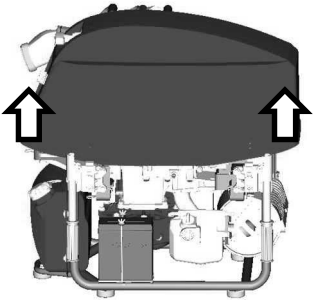
Pull up the two cowl hooks on the back first, then pull up the two cowl hooks on the front and slowly lift the entire cowl.



⚠ **CAUTION**

- **Remove the cowl carefully without coming in contact with the discharge valves.**

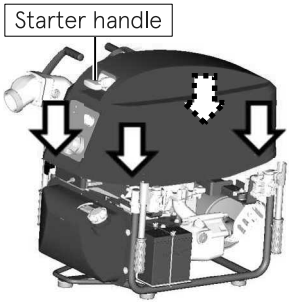




Cowl installation

Assemble in reverse order of removal.

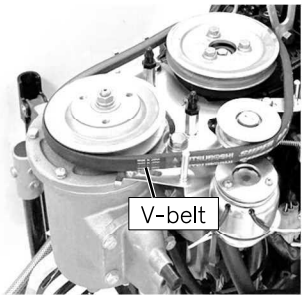
Pass the manual starter handle through the front of the cowl, place the cowl on the pump, and secure the cowl with the four hooks.



Vacuum pump driving belt (V-belt)

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

V-belt size: LA-26



Vacuum pump strainer

Maintenance

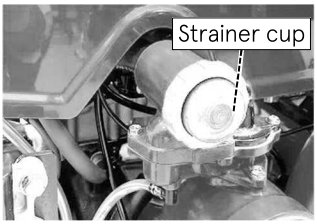
NOTE

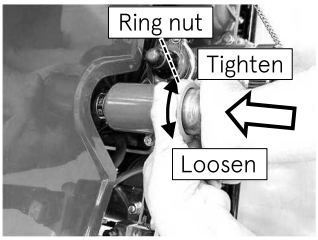
- Incorrect installation of the strainer may cause a vacuum leak. Be sure to install the strainer correctly.

Refer to “Chapter 11 MAINTENANCE AFTER OPERATION”

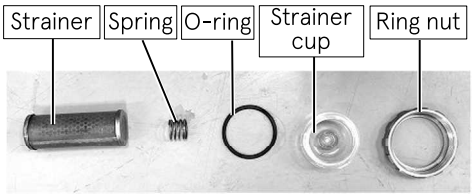
Wash the strainer with fresh water after use.

1. Remove the vacuum pump strainer.
   Turn the ring nut while pushing and holding the strainer cup.





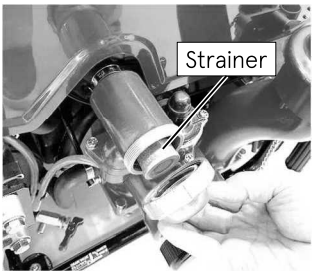
2. Wash the strainer and the strainer cup.



3. After the washing, reassemble the strainer.

NOTE

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

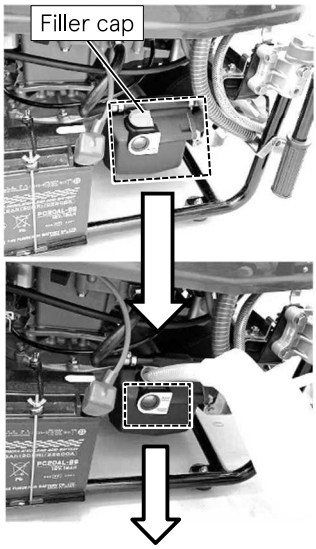


Engine oil

Check the oil level

Check the oil level **before starting the engine.**
The correct engine oil level cannot be confirmed during the engine driving and just after driving. Need time (24 hours) to check the level correctly.

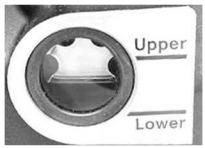
* The engine oil stays in some parts inside the engine.



⚠CAUTION

- **Make sure the filler cap is tightly closed except putting the engine oil each time.**
- **Check the oil level before each operation.**

1. Place the pump on level ground (horizontal).
2. Check the oil level.
3. Put the oil until about upper level if the oil level is not enough.



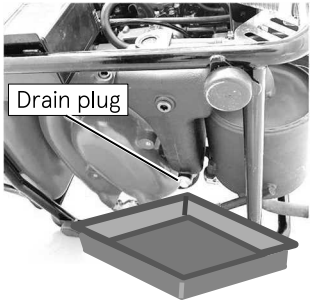
NOTE

- 4-stroke engine oil:
  API: SH, SJ, SL
  SAE: 10W-30/40

Engine Oil Change

It is recommended that oil changes be done by the dealer.

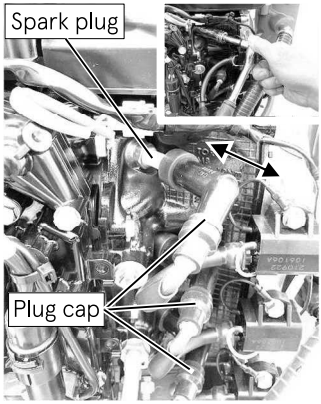
1. Stop the engine and remove the oil filler cap after the engine has cooled sufficiently.
2. Raise the two carrying handles on the water suction side and tilt the pump.
3. Place the oil drain pan under the oil drain plug.
4. Remove the oil drain plug and drain the oil.
5. Tighten the oil drain plug.
   *Apply oil to the drain plug seal.
6. Return the pump to horizontal position.
7. Fill new engine oil from the inlet to the upper limit of the oil level.
8. Tighten the oil filler cap.



⚠CAUTION

- Just after the engine is stopped, the temperature of the engine body and engine oil is high, which may cause burns. Change the engine oil after the engine has cooled down sufficiently. If the drained oil is milky white, there is a possibility of moisture mixing with (condensation, etc.) inside the engine.

Spark plug



Check the spark plugs.

1. Remove the plug cap, and remove the spark plug.

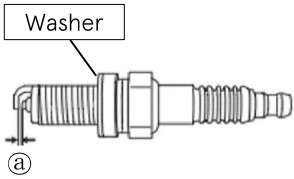
2. Clean the electrode of the spark plug using a wire brush or spark plug cleaner.

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.

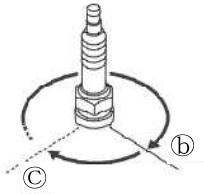
   If necessary, adjust the gap to specification.

   - Spark plug gap ⓐ : 0.8–0.9 mm
   - Usage limit : 1.2 mm
   - Spark plug : NGK DCPR6E



5. Assemble the spark plug as far as ⓑ by hand. Tighten the plug further to the specified torque using a plug wrench. (Ⓒ)

   - Tightening torque: 18 N·m (13 lb·ft) [1.8 kgf·m]



Battery

General safety information

Follow the safety instructions on the battery.

When charging a battery, highly explosive oxyhydrogen gas mixture is produced.

Do not charge a battery in a poorly ventilated place.

Do not smoke near the battery.

DANGER

Injury caused with caustic substances of battery.

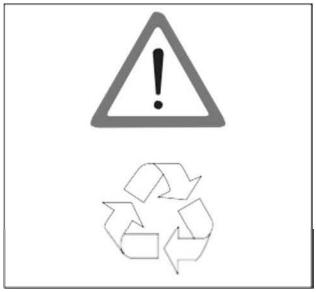
- **Always wear protective clothing.**
- **Always wear protective gloves.**
- **Always wear protective glasses.**
- **Do not tip the battery, acid would come out through the air vents.**

Disposal

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

After each operation of the battery, check the voltage. Replace the battery if necessary.

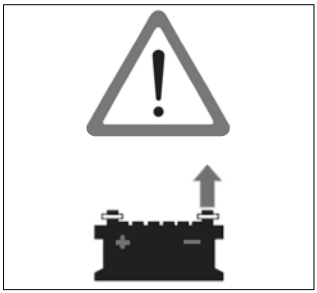
When disconnect a battery, disconnect the negative (-) terminal of the battery cable first, then disconnect the positive terminal.



CAUTION

- **There is a risk of injury.**
- **When handling the battery, be sure to wear safety glasses and protective gloves.**

Electric equipment



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

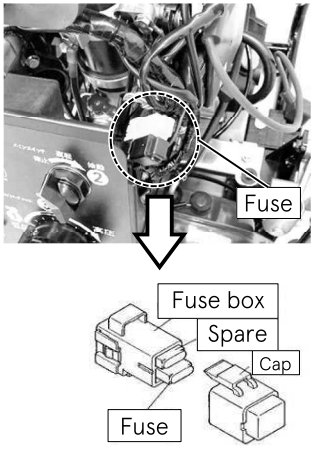
Be sure to disconnect battery cables before handling electrical equipment.

When disconnecting the battery cables, first disconnect the negative (-) terminal and then the positive (+) terminal.

When connecting the battery cables, connect the positive (+) terminal first. Next, connect the minus (-) terminal.

Use a fuse with the same rated current (ampere) as the installed fuse. Using a fuse with too high resistance will not protect the electrical equipment and may damage it.

Fuse



Security fuses are installed in electrical circuits used.

Before replacing the fuse, isolate the cause of the short circuit, and take an appropriate action.

After the appropriate action has been taken, replace the fuse with a new one.

Always have spare fuses available in case of emergency.

Suction performance and Vacuum leak check

⚠CAUTION

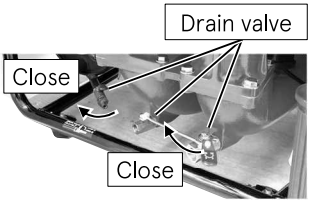
- **Limit the continuous operation time of the vacuum pump to 30 seconds or less.**
- **Running the engine at vacuum pump operating speed continuously with no water for more than 30 seconds, may cause the engine overheating. If the engine overheats, wait until it cools down, or run the pump with pumping up water and discharging water to cool down the engine earlier.**
  - ➢ **The water discharge operation allows the cooling water goes into the engine cooling line and circulates in the engine, and then the engine will be cooled down.**

1. Cap the suction port with a suitable suction cap.

NOTE

- Prepare a suction port cap that is suitable for the suction coupling.

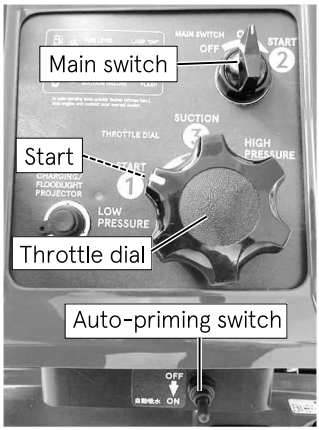
2. Confirm the drain valves are all closed.



3. Run the engine
   - Turn on the Auto-priming switch.
   - Turn the throttle dial to the start position.
   - Start the engine turning the main switch.

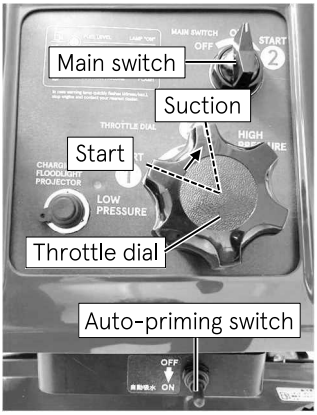
NOTE

- Extended operation of the starter motor will run the battery drain. Operate the starter motor for a maximum of 3 seconds at a time. If the engine does not start, wait for 5 seconds before operating the starter motor again.



4. Turn the throttle dial to suction position, then the pump will start to suck up water automatically.

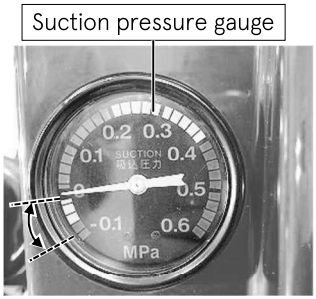
   If suction water is not confirmed by the sensor in 30 seconds, the engine will stop automatically. Refer to "Chapter 16 TROBLESHOOTING".
   Then take the appropriate action and check the vacuum leak again.



5. Check if the pressure gauge for suction indicates approximately -0.08MPa (-12psi).

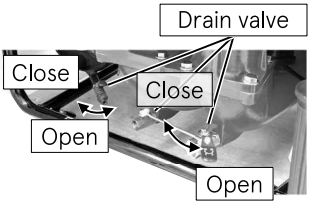
6. Stop the engine and keep it for about 30 second. Check if the suction pressure is kept the same pressure.

   If the vacuum leak is found, referring to Chapter 16 Troubleshooting to eliminate the cause and fix it. Check the vacuum leak will not happen again.



7. Open the drain valves slowly to expose it to the atmosphere, and check that the pointer of the suction pressure gauge returns to "0".

8. Close the drain valves again.

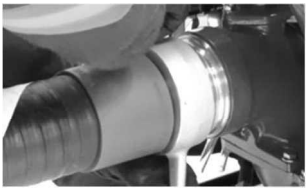


NOTE

- Before storing the fire pump, flush with fresh water to remove debris from the pump inside. (Especially after using 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.

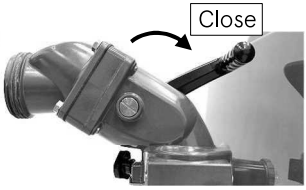
Water leak check

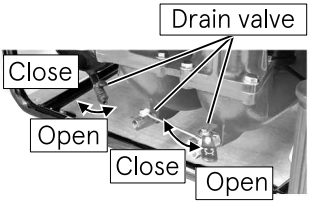
1. Attach a suction hose to the suction port.



2. Place the end of the hose into the water more than 30cm deep from the water surface.

3. Close the discharge valve(s) and drain valves.



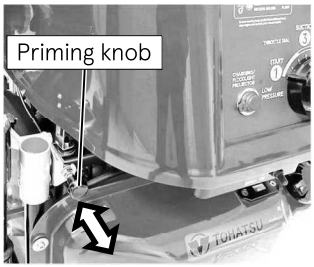


4. Start the engine and suck up water.
   * In the case of manual operation, pull the priming knob.

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

   If a water leak is found, referring to Chapter 16 Troubleshooting to eliminate the cause and fix it. Check the vacuum leak will not happen again.

(Manual operation)



16. TROUBLESHOOTING

Typical causes of engine troubles are listed in the following tables.

	Cause \ Trouble	Battery charging failure	Starter motor does not work	Engine start failure	Engine stumble or stall	Rough idling	Idling is too high	Poor acceleration	Engine over- revolution	Engine overheating	Engine seizing	Vacuum pressure defective	Air leaking	Water suction failure	Insufficient water discharge: Caused by suction	Insufficient water discharge: Caused by pump unit	Insufficient water discharge: Caused by playpipe	Insufficient water discharge: Caused by engine unit	Floodlight, Gauge lamp, Hour meter, Warning lamp do not work	Warning lamp flashing	Action
Fuel and lubrication	Fuel shortage			●	●			●										●			Refuel.
	Deterioration of fuel			●	●	●		●		●								●			Replace with new fuel.
	Fuel tank air vent clogging			●	●	●		●		●								●			Clean the clogging.
	Fuel filter clogging			●	●	●		●		●								●			Clean the clogging.
	Fuel pump failure			●	●	●		●		●								●			Replace.
	Injector failure			●	●	●		●		●								●			Replace.
	Fuel hose kink or snap			●	●	●		●		●								●			Fix routing of the pipe.
	Throttle dial at other than “start” position			●																	Turn dial to “start” position.
	Oil filter clogging					●		●			●							●			Replace oil filter. (Do not fill it up with the different brand of oil.)

16. TROUBLESHOOTING

	Cause \ Trouble	Battery charging failure	Starter motor does not work	Engine start failure	Engine stumble or stall	Rough idling	Idling is too high	Poor acceleration	Engine over- revolution	Engine overheating	Engine seizing	Vacuum pressure defective	Air leaking	Water suction failure	Insufficient water discharge: Caused by suction	Insufficient water discharge: Caused by pump unit	Insufficient water discharge: Caused by playpipe	Insufficient water discharge: Caused by engine unit	Floodlight, Gauge lamp, Hour meter, Warning lamp do not work	Warning lamp flashing	Action
Electrical	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.
	ECU and/or Sensors failure			●	●	●	●	●	●	●								●		●	Check wire connection. Plug in surely. If necessary, replace.
	Battery loose connection, terminal corrosion or expired	●	●																●		Clean terminal and/ or tighten a terminal screw. If necessary, replace.
	Battery charger defective	●																			Check 7.5A fuse and/ or Battery charger. Replace if necessary.

16. TROUBLESHOOTING

Trouble / Cause		Battery charging failure	Starter motor does not work	Engine start failure	Engine stumble or stall	Rough idling	Idling is too high	Poor acceleration	Engine over- revolution	Engine overheating	Engine seizing	Vacuum pressure defective	Air leaking	Water suction failure	Insufficient water discharge: Caused by suction	Insufficient water discharge: Caused by pump unit	Insufficient water discharge: Caused by playpipe	Insufficient water discharge: Caused by engine unit	Floodlight, Gauge lamp, Hour meter, Warning lamp do not work	Warning lamp flashing	Action
Electrical	15A fuse blown		●																●		Replace with spare fuse. When the blowout of the fuse happens repeatedly, check a cause. **15A**: Battery cable reverse connection, Operation panel components. Starter solenoid VP solenoid **7.5A**: Charging connector. Floodlight connector.
	7.5A fuse blown	●																			
	Starter motor defective		●																		Check terminals, cords and screws. Replace parts if necessary.
	Control panel defective	●	●																●		Check input of starter solenoid. (Equal to control panel output.) Replace parts if necessary.

16. TROUBLESHOOTING

Trouble / Cause		Battery charging failure	Starter motor does not work	Engine start failure	Engine stumble or stall	Rough idling	Idling is too high	Poor acceleration	Engine over- revolution	Engine overheating	Engine seizing	Vacuum pressure defective	Air leaking	Water suction failure	Insufficient water discharge: Caused by suction	Insufficient water discharge: Caused by pump unit	Insufficient water discharge: Caused by playpipe	Insufficient water discharge: Caused by engine unit	Floodlight, Gauge lamp, Hour meter, Warning lamp do not work	Warning lamp flashing	Action
Compression	Piston, piston ring or cylinder worn excessively.			●	●	●		●			●							●			Correct or replace.
	Carbon deposition in the combustion chamber					●				●	●							●			Clean out.
Suction	Suction height too high or length too long													●							Place the pump nearer and/or lower position.
	Suction hose end is not in water											●	●	●	●						Put the end of suction hose below 30cm from the surface of water.
	Suction hose coupling loose or gasket defective											●	●	●	●						Clean out a gasket and tighten securely. Replace a gasket if necessary.
	Suction hose strainer clogged with dead leaf or waste etc.													●	●						Clean out.
	Suction hose cracking or Lining peeling off											●	●	●	●						Repair or replace.

16. TROUBLESHOOTING

Trouble / Cause		Battery charging failure	Starter motor does not work	Engine start failure	Engine stumble or stall	Rough idling	Idling is too high	Poor acceleration	Engine over- revolution	Engine overheating	Engine seizing	Vacuum pressure defective	Air leaking	Water suction failure	Insufficient water discharge: Caused by suction	Insufficient water discharge: Caused by pump unit	Insufficient water discharge: Caused by playpipe	Insufficient water discharge: Caused by engine unit	Floodlight, Gauge lamp, Hour meter, Warning lamp do not work	Warning lamp flashing	Action
Primer	Vacuum pipe loose or cracking											●		●							Tighten securely a clump of vacuum pipe or replace.
	Strainer cap loose or O-ring failure											●		●							Tighten securely or replace.
	V-belt damaged or worn.											●		●							Replace.
	Vacuum pump rotor shaft seizing											●									Repair or replace.
	Vane, Side plate worn or damaged											●		●							Replace.
Water stop valve	Water stop valve contamination											●	●	●							Clean out.
	Water stop valve diaphragm failure											●	●	●							Replace.

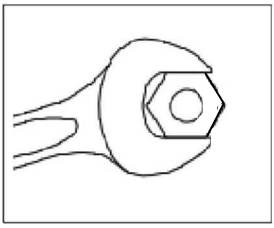
16. TROUBLESHOOTING

	Trouble / Cause	Battery charging failure	Starter motor does not work	Engine start failure	Engine stumble or stall	Rough idling	Idling is too high	Poor acceleration	Engine over- revolution	Engine overheating	Engine seizing	Vacuum pressure defective	Air leaking	Water suction failure	Insufficient water discharge: Caused by pump unit	Insufficient water discharge: Caused by playpipe	Insufficient water discharge: Caused by engine unit	Floodlight, Gauge lamp, Hour meter, Warning lamp do not work	Warning lamp flashing	Action
Pump	Drain valves are not closed											●	●	●						Close securely.
	Suction port strainer clogged with dead leaf or waste etc.													●	●					Clean out.
	Discharge valve imperfect open								●						●					Open securely.
	Gauge pipe connector loose or gasket defective											●	●		●					Tighten securely. Replace a gasket if necessary.
	Pump cover bolts loose											●	●	●		●				Tighten securely.
	Pump cover O-ring degradation											●	●							Clean out or replace.
	Impeller or Guide vane caught a stone or damaged								●							●				Clean or replace.
	Mechanical seal damaged											●	●							Replace.
Nozzles	Discharge nozzle too large									●	●						●			Change a nozzle for suitable size or incorporate safety nozzle.
	Spray nozzle clogged																●			Clean out.

17. APPENDIX

Tightening torque specifications

		M3	M4	M5	M6	M8	M10
Standard Bolt	N·m	0.8	1.8	3.5	6	15	30
	kgf·m	0.08	0.18	0.35	0.6	1.5	3.0
Heat Treated Bolt	N·m	-	-	-	10	26	54
	kgf·m				1.0	2.6	5.4

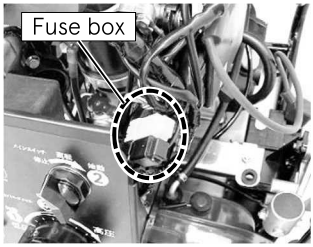


18. TOOL AND STANDARD ACCESSORY

Standard accessory

Description	Remarks	Quantity
Tool kit		1
• Tool kit bag		1
• Plug wrench		1
• Handle of plug wrench		1
Spark plug	NGK DCPR6E	1
Pumping plate		2
Fuse *1	15A	1
	7.5A	1
Vinyl pipe		1
Auto battery charger		1

*1 Spare fuses are attached in the fuse box.



OWNER'S MANUAL

VF53BS

PORTABLE
FIRE PUMP

No.003-12099-0

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