SHIBAURA

OWNER'S MANUAL

SHIBAURA FIREFIGHTING PUMP

FK500-A

Please read this operation manual carefully in order to operate the Shibaura Firefighting Pump in safe and in correct manner. If the pump is operated incorrectly, any accident may result. If this manual is missing or damaged, give an order for new one to us or our agent promptly.

IHI Shibaura Machinery Corporation

IHI GROUP

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● For safe operation

The operation manual is a part of machine.
Keep this manual carefully with the firefighting pump.

- In this manual, ⚠ mark indicates particularly important instructions for safe operation. You should pay attention specifically to those marked descriptions and observe such instructions.

⚠ **Danger**	**If the machine is operated incorrectly, there is high possibility of death or serious injury.**
⚠ **Warning**	**If the machine is operated incorrectly, death or serious injury may result**
⚠ **Caution**	**If the machine is operated incorrectly, minor injury or damage of assets may result**

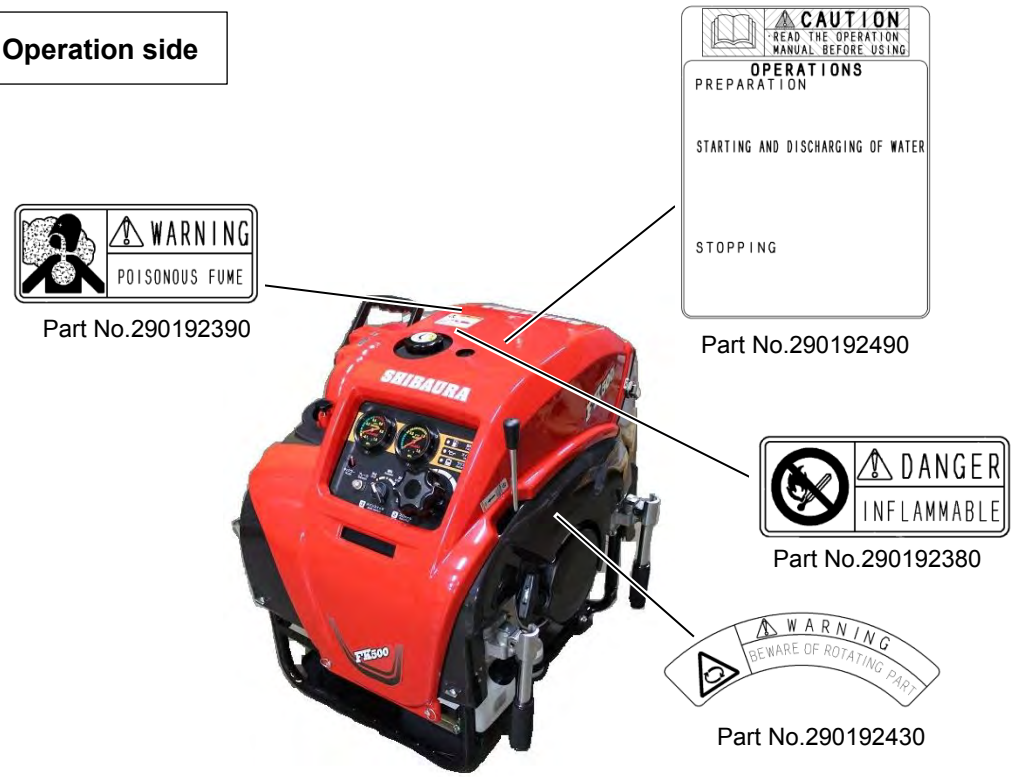
- Quality or performance of the machine may be improved or its components may be modified for the purpose of safety. For this reason, contents of the text in this manual or photographs or illustrations may be different from actual ones.

1. Matters to be attended to for safety

1. Warning label locations

Warning labels are attached to the positions of the firefighting pump as shown below. If the labels are peeled off or damaged, please order new ones telling the part No. as shown for each label.

Operation side



Part No.290192390

Part No.290192490

Part No.290192380

Part No.290192430

Non-operation side

Part No.290192410

Part No.290192510
(The cover inside)

Part No.290192400

1. Matters to be attended to for safety

2. Caution marks

(1) General instructions

Warning
The firefighting pump should be only by such a man among fire officers, firemen, volunteer disaster prevention expedition team members, self-defense firefighting team members or maintenance/inspection service men that has been specifically trained for safe operation.
〈If you do not observe the instruction〉
Serious accident including death may result due to incorrect operation.

Caution
Be sure to carry out periodical inspections.
〈If you do not observe the instruction〉
Accident due to damage of the machine or components may result or firefighting activities may be interfered.

Warning
Headbands, towel around neck, necktie, or towel carrying at the waist are prohibited. Wear a helmet, shoes with creepers, and clothes without looseness.
〈If you do not observe the instruction〉
You may be caught by the machine, or slip and fall and injured.

Warning
Do not operate the firefighting pump if you cannot concentrate your attention on operation as you are drunken, fatigued, sick or under influence of drug.
〈If you do not observe the instruction〉
Serious accident may result.

Caution
Do not use the firefighting pump for activities other than firefighting such as civil engineering work, irrigation, water sprinkling, etc.
〈If you do not observe the instruction〉
You may flip some objects to injure people or damage assets around you.

Danger
Do not suck in or discharge substances other than water such as combustibles, chemical of other liquid.
〈If you do not observe the instruction〉
Explosion, fire, burning or poisoning may result.

Caution
When throwing away the battery, oil or grease, entrust a professional industrial waste disposal dealer with their disposal.
〈If you do not observe the instruction〉
Fire may break out, you may get burnt, or environment may polluted.

1. Matters to be attended to for safety

⚠ **Warning**
Use only genuine parts and designated attachments. Do not remodel them.
〈If you do not observe the instruction〉
Accident, injury, or machine failure may result.

(2) Cautions before starting operation

⚠ **Warning**
Install the pump more than 3 m apart from combustibles.
〈If you do not observe the instruction〉
Fire may break out because of high temperature exhaust gas.

⚠ **Warning**
Remove dried grass and other objects which may catch fire easily before installing the pump.
〈If you do not observe the instruction〉
Fire may be caused by the heated muffler.

⚠ **Danger**
Do not bring a fire close to the pump when replenishing the fuel.
〈If you do not observe the instruction〉
The fuel may catch fire and explode.

⚠ **Danger**
When supplying the fuel, do not allow the fuel to exceed the mark “F” on the fuel gauge.
If the fuel spills, wipe it away immediately with cloth. Do not bring that cloth close to fire.
〈If you do not observe the instruction〉
The spilled fuel and the cloth may catch fire and explode.

⚠ **Caution**
After supplying fuel, close the fuel tank cap securely.
〈If you do not observe the instruction〉
The fuel may catch fire and explode.

⚠ **Warning**
Do not install the pump indoors or in the tunnel or the like ventilated badly.
〈If you do not observe the instruction〉
You may get poisoned by exhaust gas.

⚠ **Caution**
When holding the carrying handle, do not touch the folded portion.
〈If you do not observe the instruction〉
Your fingers may be caught and injured.

⚠ **Caution**
Carry or unload the firefighting pump by 4 people.
〈If you do not observe the instruction〉
You may drop the pump on your foot and injured, or get a crick in the back.

1. Matters to be attended to for safety

Caution
Connect the fire hose securely and make sure that it does not fall out.
〈If you do not observe the instruction〉
If the hose falls out while water is being discharged, it may injure people around it.

Caution
Avoid bending, twisting or sharp turn of the hose when installing.
〈If you do not observe the instruction〉
The hose may leap up and injure people around it.

(3) Caution during operation

Warning
Be sure to install the front and rear covers when operating the firefighting pump.
〈If you do not observe the instruction〉
You may be injured or burnt.

Caution
After operating the tickler or draining the fuel from the carburetor, wipe away the spilt fuel immediately.
〈If you do not observe the instruction〉
The spilt fuel may catch the fire.

Caution
When starting the engine using a rope, be careful to prevent your clothes or groves from being entangled.
〈If you do not observe the instruction〉
You may be injured.

Caution
When starting the engine using a rope, do not allow people to be within 2 m around the pump.
〈If you do not observe the instruction〉
They may be beaten by your elbow or the rope and injured.

Warning
Be sure to close the recoil starter securely during operation.
〈If you do not observe the instruction〉
You may be caught by the pulley or belt and get wound.

Danger
Before replenishing the fuel during operation, wait until the engine has cooled down enough.
〈If you do not observe the instruction〉
The fuel may catch fire and explode.

1. Matters to be attended to for safety

⚠ **Caution**
Open or close the water discharge valve always after returning the engine to a low speed.
Hold the nozzle at the end positively and wear the back band before discharging the water.
〈If you do not observe the instruction〉
You may lose control of the nozzle at the end and be injured when water discharging is started.

⚠ **Caution**
Do not direct the nozzle to other people or do not peep into it.
〈If you do not observe the instruction〉
You may be sent flying by high pressure and injured.

⚠ **Caution**
Do not touch the ignition plug or high-tension cord during operation.
〈If you do not observe the instruction〉
You may receive an electric shock.

⚠ **Caution**
Never touch the muffler and exhaust pipe during and after operation since they become very hot.
〈If you do not observe the instruction〉
You may get burnt.

⚠ **Caution**
During operation, do not approach the drain pipe of the cylinder head.
〈If you do not observe the instruction〉
Hot water may spout and you may get burnt.

⚠ **Caution**
Do not open the radiator cap while it is too hot to touch with empty hands.
〈If you do not observe the instruction〉
Hot water may spout and you may get burnt.

(4) Caution for inspections and services

⚠ **Warning**
When the battery cap is removed, do not bring a fire close to it.
〈If you do not observe the instruction〉
The electrolyte in the battery may catch fire and explode.

⚠ **Caution**
Before starting inspections or services, stop the engine and wait until it has cooled down sufficiently.
〈If you do not observe the instruction〉
You may get hurt or burnt and fire may break out.

1. Matters to be attended to for safety

⚠ **Caution**
When disconnecting the battery cord, remove the (-) cord first and when connecting, connect the (+) cord first.
〈If you do not observe the instruction〉
Short circuit may occur and cause a fire or burn you.

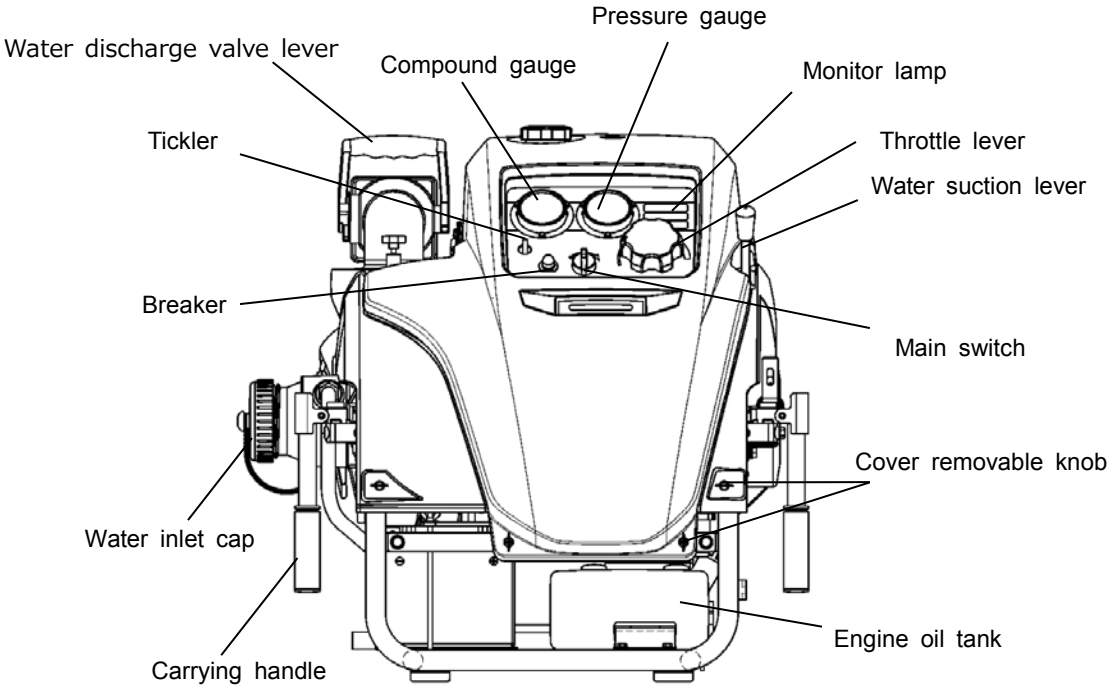
⚠ **Warning**
Remove the packing materials from the charger when charging with it.
〈If you do not observe the instruction〉
Fire may result.

⚠ **Caution**
Install the charger at a dry and well-ventilated place where it does not get wet.
〈If you do not observe the instruction〉
Electric shock or fire may result.

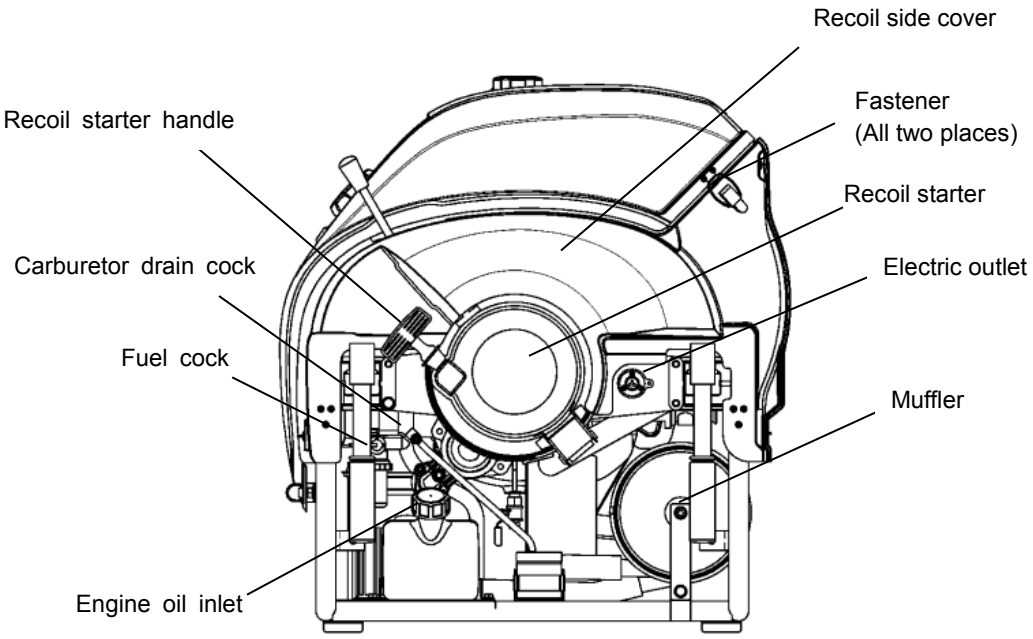
⚠ **Caution**
Only use a designated charger.
〈If you do not observe the instruction〉
Fire may break out due to overheat or damage of the wiring by a fire.

2. Name of components

Operating side

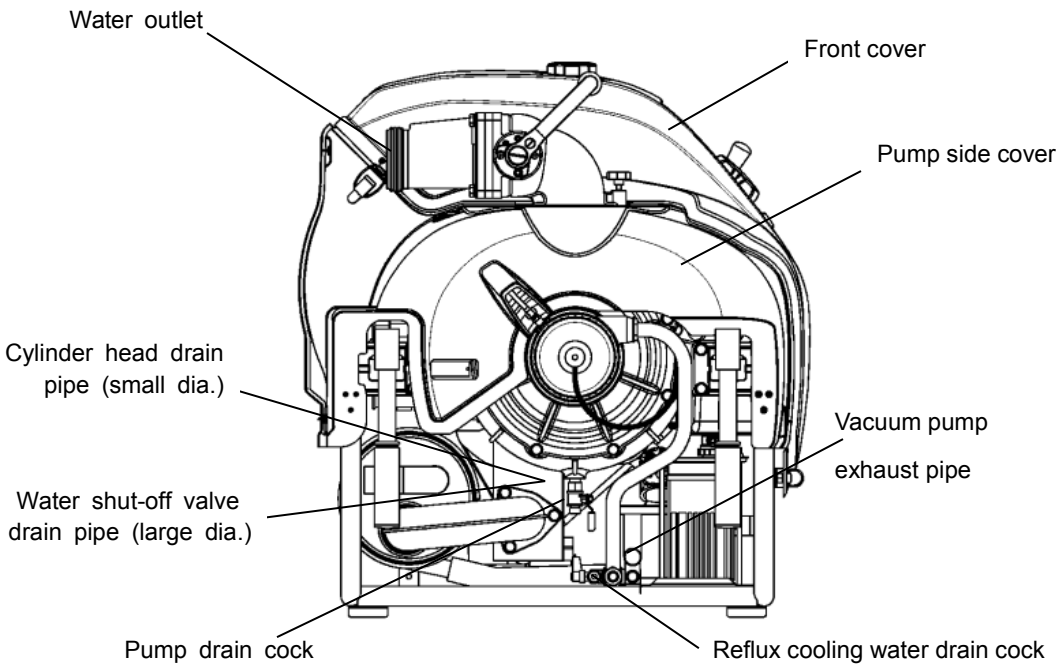


Recoil starter side

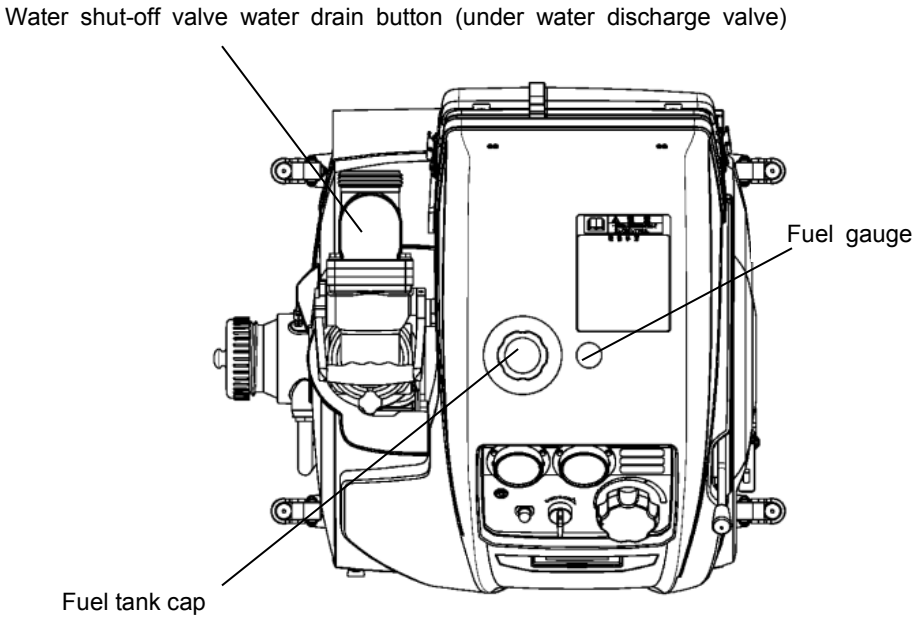


2. Name of components

Pump side



Top side



3. Functions of monitor lamps

The pump is started by setting the main switch to the “Operation” position. When the power switch is turned ON, all of the 3 lamps light up. If any one of the lamps does not light up, the battery voltage is low or circuit has failed. Repair as required in such a case. All of the lamps go out several seconds later.

At normal condition, all of the lamps are OFF while water is being discharged. However, the lamps may light up when the self-starter motor is activated since the battery voltage drops.

Monitor lamps keeping ON during pump operation or water discharge indicate some trouble. Check and correct referring to the table below.

Indication	Meaning	Condition	Remedy
 Fuel	Fuel indicates timing to replenish the fuel.	Lights up when the remaining fuel in the fuel tank decreases.	Replenish the regular gasoline
 2-cycle engine oil	Indicates timing to replenish the 2-cycle engine oil	Lights up when the remaining 2-cycle engine oil in the oil tank decreases and stops the engine.	Replenish the 2-cycle engine oil (oil tank capacity is about 1.4 L).
 Radiator	Indicates timing to replenish the engine coolant.	Lights up when the residual coolant in the cylinder head decreases and stops the engine.	Replenish the coolant (about 600 mL)

4. Handling of pump (Before starting operation)

1. Unpacking

(1) Check the name of the machine shown on the box surface to see whether it is what you ordered.
(2) Cut the band bound on the box.
(3) Pull up the box; the main unit of the machine and accessories will came out.
(4) Check that the following components are included.

A. Main machine unit (One as ordered? Not damaged?)	1
B. Battery	1
C. Charger	1
D. Tool bag	1
E. Pump cover	1

The main unit is covered with a thin vinyl cover. Be sure to remove it before operating the machine.

2. Mounting the components delivered separately

Mounting the battery

⚠ Caution

○ Read the warning on the battery to use the battery correctly.

(1) Install the battery to the bed with the 2 rods and 1 holder in the tool box.
(2) Connect the two (+) battery cords (one wound with red vinyl tape and red cord) and then (-) cord (wound with black vinyl tape) with the attached hexagon bolts and nuts.

⚠ Caution

○ When disconnecting the battery cords, disconnect the (-) cord first and connecting, connect the (+) cord first.
● If not, short circuit may result leading to a fire or you may get burnt.

(3) Charge the battery for 2 to 3 hours.

This battery is sealed type requiring no water replenishment. See the operation manual for the battery for details.

4. Handling of pump (Before starting operation)

3. Removing / installing the cover

The cover should be removed when replenishing the coolant or for other maintenance services. During the attachment and detachment of the cover, please not defeat the order and method of attachment and detachment. There is a possibility that the cover is broken.

(1) Removing the cover

① Water discharge so that the outlets will be in the same direction as the water intake. It will change the direction of the valve.
② Remove the front cover.
③ Unlock the fasteners that are Coupled with the recoil side cover and the pump-side cover.

④ Turn the two removable knobs counter-clockwise direction at the bottom of the front cover front.

⑤ Lift slowly the front cover upward from the front side.

4. Handling of pump (Before starting operation)

⑥ Remove the recoil side cover.
⑦ Turn the removable knob counter-clockwise direction on the front bottom right-hand side.

⑧ Turn the two removable knobs counter-clockwise direction on rear left upper and lower.

⑨ Standing on the recoil side, and lift slowly the recoil side cover in the upward direction.

4. Handling of pump (Before starting operation)

⑩ Remove the pump side cover.
⑪ Turn the removable knob counter-clockwise direction on front lower left side.

⑫ Turn the two removable knobs counter-clockwise direction on rear right upper and lower.

⑬ Standing on the pump side, and lift slowly the pump side cover in the upward direction.

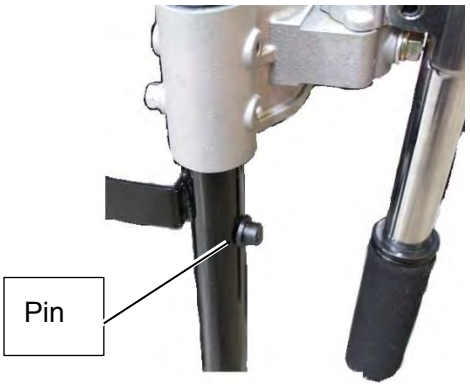
4. Handling of pump (Before starting operation)

(2) Installing the cover

① Water discharge so that the outlets will be in the same direction as the water intake. It will change the direction of the valve.
② Attach the pump side cover.
③ Attach the hook located inside of the pump side cover to the pin of the frame.

Pump side cover (inside)

Frame



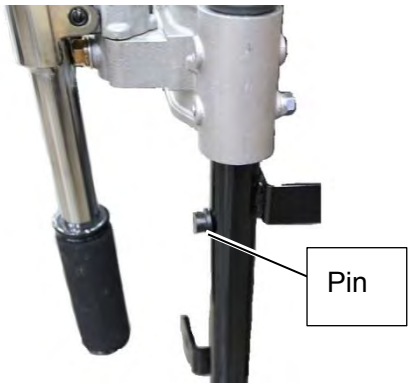
④ Turn in a clockwise direction while pushing the two removable knobs into the holes of frame on rear right up and down.

⑤ Turn in a clockwise direction while pushing the removable knob into the hole of frame on front left bottom.

4. Handling of pump (Before starting operation)

⑥ Attach the recoil side cover.
⑦ Attach the hook located inside of the recoil side cover to the pin of the frame.

Frame



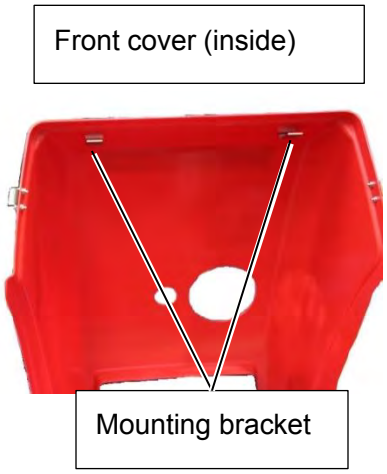
Pump side cover (inside)

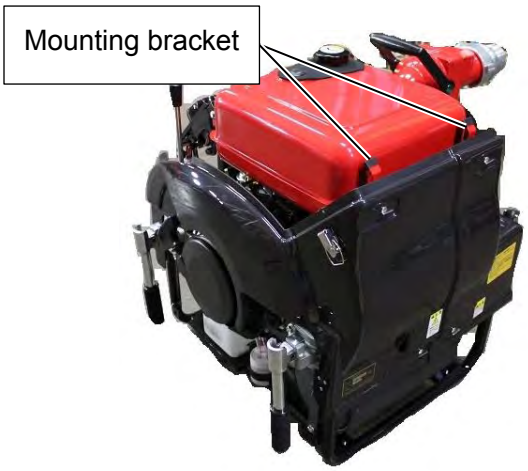
⑧ Turn in a clockwise direction while pushing the two removable knobs into the holes of frame on rear left up and down.

⑨ Turn in a clockwise direction while pushing the removable knob into the hole of frame on front right bottom.

4. Handling of pump (Before starting operation)

⑩ Attach the front cover.
⑪ Place the front cover to the topside of the fuel tank.
During this work, please be careful to cover is not touched on the throttle lever of the operation panel.
⑫ Place the front cover in such a manner that the fuel tank side of the mounting bracket between the front cover and the front cover the inside of the mounting bracket.





⑬ Turn in a clockwise direction while pushing the two removable knobs into the holes of frame on front bottom.

⑭ Fix the fasteners those are connected with the recoil side cover and the pump-side cover.

⚠ Caution

○ Please be sure to attach the cover during operation.
● You may be injured or burnt.

4. Handling of pump (Before starting operation)

4. Replenishing the fuel

(1) Supply the fuel into the tank (tank capacity 14.5L).
The engine of this firefighting pump is fueled independently of the lubricating tank. Supply automobile regular gasoline up to the “F” mark of the fuel gauge. Do not use mixed gasoline and Bio-gasoline.

⚠ Caution

- ○ Do not bring a fire close to the engine when supplying fuel.
- ○ Do not allow the fuel to exceed the “F” mark of the fuel gauge.
- ○ If the fuel spills, wipe it away immediately with cloth. Do not bring that cloth to a fire.
- ● It may catch fire and explode.

⚠ Caution

- ○ After supplying the fuel, tighten the fuel tank cap positively.
- ● If not, the fuel may catch fire and explode.

(2) Supply 2-cycle engine oil (tank capacity 1.4L)
The fire pump is a separate filling type. Supply the 2-cycle engine oil to the engine oil tank provided on the lower part of the pump.

⚠ Caution

- ○ If you want to supply the 2-cycle oil, please put the oil of same brand and same grade.
- ○ At the time of 2 cycle oil supply, please prevent water and dirt from the oil inlet.
- ● Cause of the malfunction or equipment failure of the engine.

⚠ Caution

- ○ Oil spills, please wipe completely with a cloth or the like.
- ● There is a risk of injury by falling slipped.

4. Handling of pump (Before starting operation)

(3) Check the engine coolant level.
This firefighting pump is equipped with the radiator type water-cooled engine.

① Put the firefighting pump into a horizontal position when the engine is cold. After removing the cover, open the radiator cap, to see if there is coolant to mouth.

② If the coolant is not entered until the mouth, please supply the coolant to the vicinity of the mouth. When the supply is finished, close the radiator cap.
Caution: Radiator cap is turning to the right until it hits the stopper, securely attached.

③ Attaching the cover. At the time of shipment, anti-freezing solution (long-life coolant) made up to -30 ℃ is filled in.

5. Transportation

The carrying handle can be turned by 90 degrees. Set it to a position easy to carry the pump.

⚠ Caution

○ When holding the carrying handle, do not touch the folded point.
● Your finger may be pinched and hurt.

⚠ Caution

○ The firefighting pump should be carried, loaded or unloaded by four persons.
● The pump may drop on your foot and injure, or you may get a crick in the back.

6. Installation

(1) Install the pump on a flat place close to a water source.

⚠ Warning

○ Install the pump more than 3 m from combustibles.
○ Remove dried grass and other objects which may catch fire easily before installing the pump.
● If not, fire may break out by the heated muffler.

4. Handling of pump (Before starting operation)

⚠ Warning

○ Do not install the pump indoors or in the tunnel or the like where is badly ventilated.
● If not, you may get poisoned by exhaust gas.

(2) Be sure to attach a strainer and a rattan basket to the water inlet of the water suction pipe and position it more than 30 cm below the water level. If it is positioned above the specified level, air may be sucked in preventing water discharging.
(3) Arrange so that the water suction height is more than 3 m below the water level as far as possible. When it is too high, the pumping capacity may deteriorate or water may fall.
(4) Arrange the water suction pipe to go up toward the pump and tighten it positively to the water inlet of the pump. If the pipe goes up or down unevenly, water may not be discharged smoothly.
(5) Water discharge valve is 180 ° swing; you can lock every 45 °. After rotating the water discharge valve by pulling up on the lock lever, please make sure that the swing is locked Release the lock lever.

⚠ Caution

○ Connect the fire hose securely and make sure it does not fall out.
● If the hose falls out while water is being discharged, it may injure people around it.

⚠ Caution

○ Avoid bending, twisting or sharp turn of the hose when installing.
● The hose may leap up and injure people around it.

7. Operator

(1) Though the firefighting pump is small-sized, it is a high performance machine generating strong power. If it is operated in a wrong way, serious accident including death may be caused.

4. Handling of pump (Before starting operation)

⚠ Warning

○ The firefighting pump should be operated only by such a man among fire officers, firemen, volunteer disaster prevention expedition team members, self-defense firefighting team members or maintenance/inspection service men that has been specifically trained for safe operation.

(2) Clothing should be suited to work.

⚠ Warning

○ Headband, towel around neck, necktie, or towel carrying at the waist is prohibited. Wear a helmet, shoes with creepers, and clothes without looseness.

● If not, you may be caught in the machine, slip and fall, and get hurt.

(3) Do not operate the pump when you feel unwell.

⚠ Caution

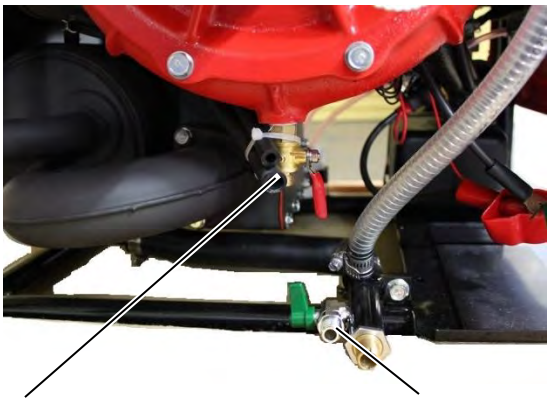
○ Do not operate the firefighting pump if you cannot concentrate your attention on operation when you are drunken, fatigued, sick or under influence of drugs.

● If you do, serious accident may result.

4. Handling of pump (Operating method)

1. Starting the engine

Before starting the engine, close the water discharge valve, pump drain cock and reflux cooling water drain cock.

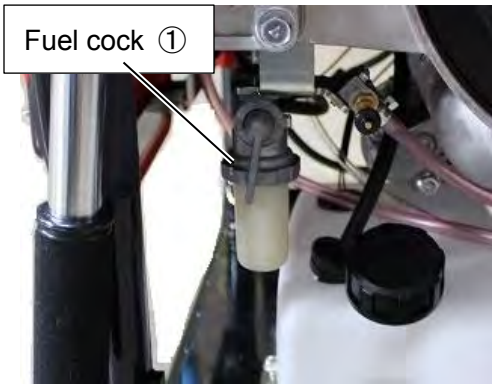


Water discharge valve　　Pump drain cock　　Reflux cooling water drain cock

(1) Open the fuel cock ①.
Pull down the fuel cock lever to the lowest point open the fuel cock.

(2) In a cold season, use the tickler of the carburetor.

- ○ When starting the engine is difficult only by using the auto choke, push the tickler of the carburetor for several seconds.
- ○ Do not use the tickler when the engine is still warm after operation. If the tickler is used at such a condition, too much fuel is supplied preventing the engine from starting.
- ○ If the engine does not start because the tickler is excessively used, close the fuel cock, drain the fuel from the drain cock of the carburetor and then start the engine again.
- ○ Discharge the fuel accumulated in the fuel drain tank each time of operation.



4. Handling of pump (Operating method)

Caution

○ After operating the tickler or discharging the fuel from the carburetor, wipe away the spilt fuel immediately.
● If not, the fuel may catch the fire.

(3) Position of throttle lever
When starting the engine initially while the engine is cold, set the throttle lever ② to the “START” position.

(4) Turn the main switch ③ fully clockwise to start the self-starter motor and start the engine.
- ○ After the engine is started, set the switch to “RUNNING” position.
- ○ When the engine is operating at the “RUNNING” position, the battery is charged by the charging circuit incorporated in the firefighting pump.

(5) When starting firefighting pump by recoil starter.
- ○ Pull the recoil starter handle until it is felt a little heavy as shown in the right Photo and then pull it forcibly.

Caution

○ Be sure to operate with the battery connected even when starting the engine manually.
● If the engine is operated with the battery disconnected, the monitor lamp may function incorrectly or fail.

4. Handling of pump (Operating method)

⚠ Caution

○ When starting the engine with the rope, be careful not to allow the clothes or gloves to be entangled.
● You may get injured.

⚠ Caution

○ When starting the engine using a rope, do not allow people to be within 2 m around the pump.
● They may be beaten by your elbow or the rope and injured.

⚠ Warning

○ When operating the pump, be sure to install the front cover, recoil side cover and pump side cover.
● You may be hurt or get burnt.

⚠ Warning

○ Be sure to close the recoil starter securely during operation.
● You may be caught by the pulley or belt and get wound.

2. Sucking up the water

(1) Set the throttle lever ② to the "SUCTION" position.
(2) Pull the water suction lever ⑤ toward you and operate the vacuum pump to suck up the water.
  ○ When the pointer on the pressure gauge starts to move, return the water suction lever promptly.

3. Discharging the water

(1) Open the water discharge valve lever gradually in the "→O" direction until it stops.

4. Handling of pump (Operating method)

- ○ Communicate with the person at the snout and discharge water adjusting the pressure with the throttle lever ② depending on the situation of the fire site.
- ○ Keep the pointer on the pressure gauge and compound gauge in the green range when discharging the water.

(2) When waiting water discharge
When waiting for the water discharge after closing the water discharge valve during the operation, be sure to set the engine to a low speed (idling).

(3) Use of safety nozzle

- ○ If water is discharged without attaching the nozzle to the hose when putting out remaining fire or changing the water in the tank, for instance, cavitation may be generated so that the engine or pump may be broken down.

- ○ Be sure to attach the supplied safety nozzle to the intermediate coupling when discharging the water.

(4) To light up the search light, insert the plug of the search light to the outlet.

⚠ Caution

- ○ Be sure to open or close the water discharge valve only after returning the engine to a slow speed.
- ○ Hold the nozzle at the end positively and wear the back band before discharging the water.
- ● If not, you may lose control of the nozzle at the end and be injured when water discharging is started.

⚠ Caution

- ○ Operate the water discharge valve lever gently.
- ● If not, your hand may be caught or hit and injured.

4. Handling of pump (Operating method)

Caution

○ Do not direct the nozzle to other people or do not peep into it.
● You may be sent flying by high pressure and injured.

Caution

○ Do not touch the ignition plug or high-tension cord during operation.
● You may receive electric shock.

Caution

○ Never touch the muffler and exhaust pipe during operation since they become very hot.
● You may get burnt.

Caution

○ Do not approach the cylinder head drain pipe during operation.
● Hot water may spout and you may get burnt.

Caution

○ Do not open the radiator cap while it is too hot to touch with empty hands.
● Hot water may spout and you may get burnt.

4. Stopping the engine

(1) Set the throttle lever ② to the “SLOW” position.
　○ If the engine is hot, cool it down by continuing low speed operation for about 1 minute.

(2) Turn the water discharge valve lever in the “→ S” direction and close the water discharge valve.

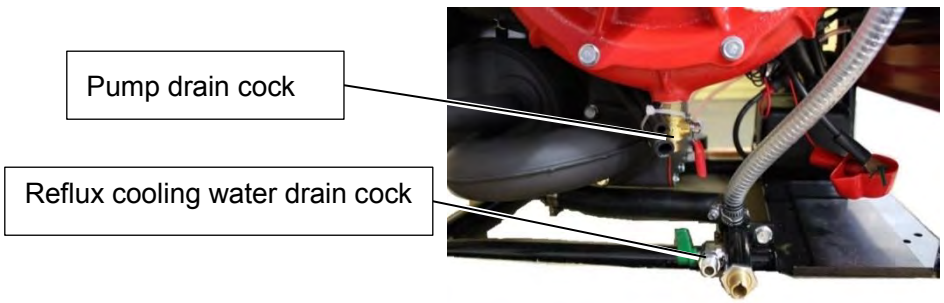
4. Handling of pump (Operating method)

(3) Set the main switch ③ to the “Stop” position.

5. Draining the water

After the firefighting pump was operated, much water remains inside. If the water is left in the pump, rust may be generated or the pump may be damaged due to frozen water in the cold season. Be sure to drain water before storing the firefighting pump.

(1) After sea water or dirty water is used, be sure to keep clear water discharged for more than 5 minutes.
(2) Open and close the water discharge valve lever.
(3) Open the pump drain cock and reflux cooling water drain cock.
(4) Push the water drain button of the water shut-off valve.
(5) Close the pump drain cock and reflux cooling water drain cock.
(6) Screw in the cap of the water inlet.
(7) Start the engine and pull the water suction lever for about 5 seconds.
(8) Stop the engine.
(9) Open the pump drain cock, release the vacuum and close the drain cock again.
If the vacuum is not released, rubber of valves may be deformed shortening its service life.



4. Handling of pump (Operating method)

6. Storing the pump

The firefighting pump is such a machine that is usually out of operation after being operated for a short time. Therefore, storing it under proper condition is essential in order that the pump operates satisfactorily when required next time or to secure its long life.

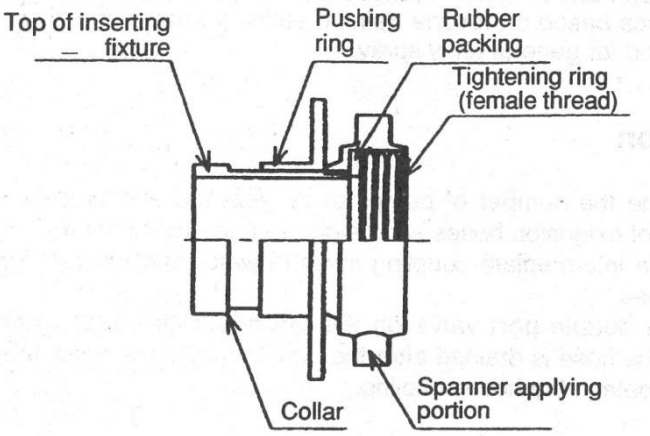
(1) Environment
Place the pump at a dry and cool place avoiding dust or direct sun beams.
(2) Supply fuel, lubricating oil and cooling water respectively to the specified levels.
(3) After close the fuel cock, drain the fuel in the carburetor from the carburetor drain cock on the recoil starter side.

⚠ Caution

○ After operating the tickler or discharging the fuel from the carburetor, wipe off the spilt fuel immediately.
● If not, the fuel may catch fire.

(4) Cover the pump with the pump cover.

7. Connecting a hose



⚠ Warning

○ Insert the plug-in intermediate fixture until clicking. Hold the receiving fixture and pull the plug-in fixture to check that the claw is hitched on the collar and joined firmly.
● In case of a screw type intermediate fixture, tighten positively until the packing of the receiving fixture (female screw) touches the plug-in fixture (male screw).
○ While the plug-in type intermediate fixture is used (while water is being discharged), never touch the pushing ring. If the pushing ring is pushed in while the water is being sent, the fixture may be disconnected, causing an accident resulting in injury or death.

4. Handling of pump (Discharging with multiple pumps)

In the mountains and forests or in urban areas which are inconvenient for water transportation, multiple pumps will be required in order for the water to reach the fire by relaying the pumps. In this case, pumps are separated far from each other and firemen are required judgment based on the existing state and systematic activities based on training. General method of relay operation is described below.

1. Installation

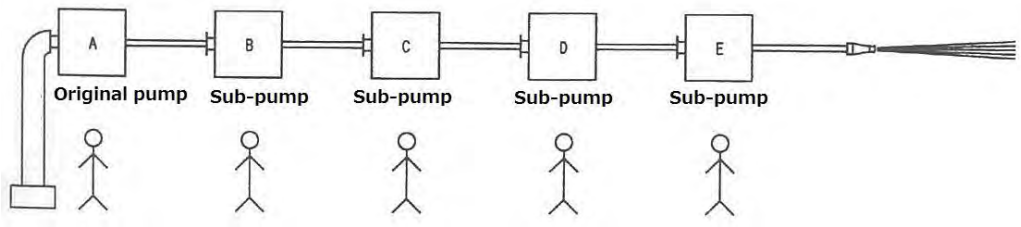
(1) Determine the number of pumps and places of their installation depending on the number of extension hoses and height from the water source.
(2) Screw in the coupler to the water suction port to connect the fire hose.
(3) Fit a two-way valve to the coupler of the water discharge valve beforehand. The hose coupler may not be removed until the water in the hose is drained after the water is discharged.

2. Operation (Necessary an operator for all of pump each)

(1) Open the water discharge valve or all sub-pump in advance.
(2) Send water to the original pump first and then to others sequentially.
(3) Check the pressure scale in the sub pumps and increase the engine speed regulate the discharging water.
The sub pump: Should be more than 0.05MPa in a scale of compound gauge pressure, be less than 1.2MPa in a scale of power.
(4) If there is not enough the power of water discharge at the tip of hose, increase the engine speed of the original pump, then the second of one which is closer from the original, sequentially.
(5) When stopping water discharging, decrease the engine speed of the last pump first and stop gradually.

⚠ Caution

○ If the nozzle at the end of the hose or water discharge valve is closed while water is being discharged, the pressure in the pump may increase extraordinarily, and the pump or hose may be broken.



4. Handling of pump (Suction and discharge of water from Fire hydrant)

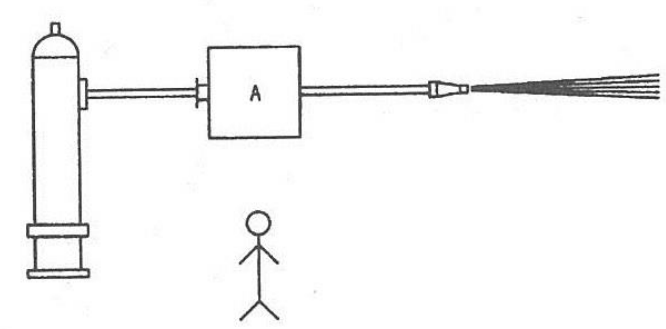
1. Suction and discharging of water from Fire hydrant

(1) Capacity for supply water of the fire hydrant
It is necessary to check an enough volume for discharging water from the fire hydrant in advance.
It would be impacted by some factors, diameter of the hydrant, the condition of piping, an initial water pressure and so on.
The capacity of supply water would be less if the diameter was so small although the initial water pressure is high.
In the other hand, it can be high capacity for water supply with wider diameter in spite of low water pressure.

(2) Method of water supply
① Avoiding from any damage of the suction hose with the higher water pressure, choose a fire hose only with a coupler for hose connected.
② Before connection with the hose, discharge some water from the hydrant for removing contamination.
③ Basically, the discharge valve of the hydrant should open completely, except too much high water pressure.

2. Discharge

(1) One pump
① Open the water discharge valve of the pump, including a nozzle of installed.
② Open the valve of the hydrant before an engine start, and check the pressure scale of the pump.
③ Start the engine and discharge water.
④ Adjust the engine speed for enough pressure of water at the discharge.
⑤ In case of less water pressure, change the number of hose.
⑥ When stopping water discharging, close the valve of the hydrant at first, and then decrease the engine speed. Finally stop the engine.



4. Handling of pump (suction and discharge of water from Fire hydrant)

(2) Plural pumps

① Open the water discharge valve for ALL of pumps at first.

② Open the valve of the hydrant before an engine start, check the pressure scale of the original pump.

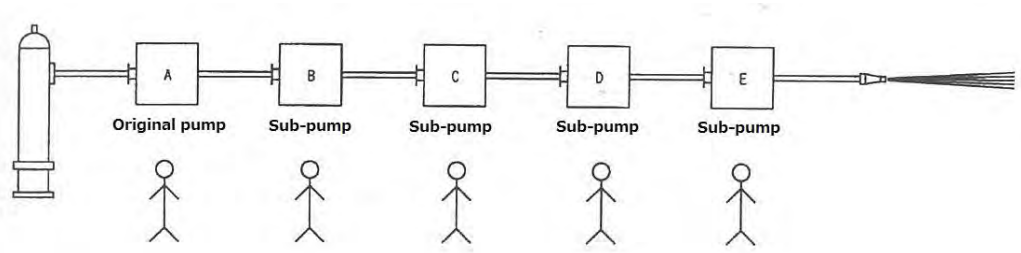
③ Start the engine for the original pump at first, then it can send water sucked from the hydrant to the next pump.

④ Start the engines for the next following pumps.

⑤ Check the pressure scale of the last pump and increase the engine speed for the proper pressure and discharge of water.

⑥ In case of less water pressure at the nozzle, change the pump location and the number of the pump.

⑦ When the water discharge stop, decrease the engine speed for the pump which is closer from the nozzle for water discharge, then the engine stop. Finally the valve of the hydrant may close.

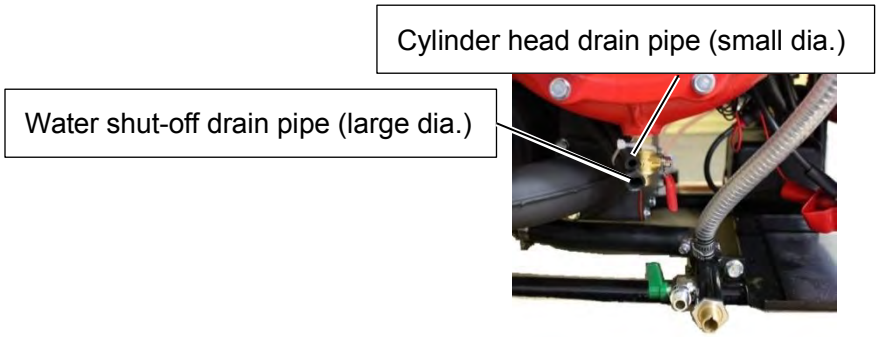


4. Handling of pump (When overheated)

If the engine is overheated, coolant flows out from the cylinder head drain pipe. Meanwhile a large quantity of steam gushes out of the cylinder head drain pipe. If operation is continued, the safety device is activated and the engine stops.

How to cope with

(1) When the pump is operated for 15 minutes before sucking in water, steam gushes out of the cylinder head drain pipe.
- ○ The steam stops when water discharge is started.



(2) When water discharge is suspended, steam gushes out of the cylinder head drain pipe. Open the reflux cooling water drain cock and discharge the cooling water.

(3) While water is being discharged, steam gushes out of the cylinder head drain pipe.
- ○ If the water is discharged without attaching the nozzle, be sure to connect the safety nozzle to the intermediate coupler. For the installing method, refer to “4.Handling of pump (operating method), 3.Discharging the water, (3) Use of safety nozzle: p25”.

(4) Steam gushes out of the cylinder head drain pipe for a reason other than (1) to (3).
- ○ Concentration of the coolant may have increased to more than 70% (water accounting for 30%). Adjust the concentration. For the concentration adjusting method, see “D) Freezing concentration” of “5. Periodical inspections: p39”.
  After the steam gushes out of the cylinder head drain pipe for above reason, open the radiator cap and supply coolant into the cylinder head. At an emergency, operation can be continued by supplying clear water. In such a case, change the clear water with anti-freezing solution later.

⚠ Caution

- ○ Do not open the radiator while it is too hot to touch with empty hands.
- ○ Do not approach the cylinder head drain pipe during operation.
- ● Hot water may spout and you may get burnt.

4. Handling of pump (Operation in cold districts in winter)

1. Before starting the engine

(1) In the cold season, battery capacity is remarkably deteriorated. Charge the battery periodically as far as possible.
(2) At the time of shipment from the factory, coolant of freezing temperature adjusted to -30℃ is supplied to the engine. When replenishing the coolant, take care about the freezing temperature. (For the concentration, refer to “D) Freezing concentration”, of “5. Periodical inspections: p39”.)
(3) Pull the rope of the recoil starter gently to check that the pump is operated.
   ○ If the pump does not operate, supply warm water from the water inlet of the pump or melt the water in a warm room.
(4) Turn the belt of the vacuum pump by hand to check if the vacuum pump operates.
   ○ If not, blow warm air to the outside of the vacuum pump or melt the water in a warm room.

⚠ Caution

○ Do not use fire to melt the frozen water.
● The fuel may catch the fire and explode.

2. Starting the engine

(1) When starting the engine in the cold season, push the tickler for several seconds.
(2) Immediately after the engine is started, the operation may not be smooth. Idle the engine for several minutes at a low speed until the coolant is warmed.

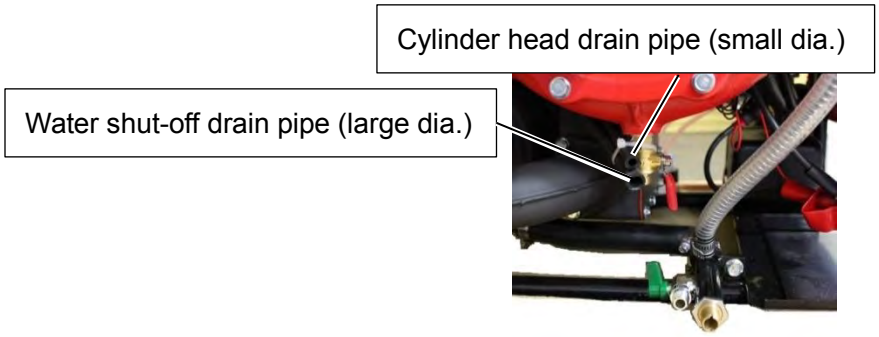
3. Treatment after discharging water (anti-freezing): Required only in the season when the open air temperature is below 0 ℃.

(1) Anti-freezing of pump
   ① Drain water from the pump (see “5. Draining the water” of “4. Handling of pump (operating method)” p27).
   ② Close the water inlet cap.
   ③ Connect the reflux cooling water drain cock and vessel of the anti-freeze mixture with a hose.
   ④ Start the engine.
   ⑤ Pull the water suction lever to evacuate the pump.
   ⑥ Open the reflux cooling water drain cock and suck in the anti-freeze mixture.

4. Handling of pump (Operation in cold districts in winter)

⑦ Pull the water suction lever again, and stop the engine when the anti-freeze mixture begins to come out of the vacuum pump discharge port.

⑧ Close the reflux cooling water drain cock, open the pump drain cock a little and release the vacuum. Then close the pump drain cock.



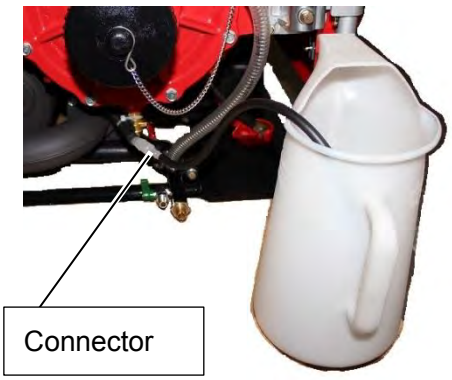
(2) Anti-freezing of vacuum pump

① Connect the hose to the water shut-off drain pipe with the connector and place the hose into the vessel of the anti-freeze mixture.

② Start the engine.

③ Pull the water suction lever and suck in the anti-freezing solution.

④ Stop the engine when the anti-freeze mixture begins to come out of the exhaust port of the vacuum pump.



(3) Coat the hose fixtures with the anti-freeze mixture.

Caution: Do not use alcohol since it damages the rubber parts.

5. Periodical inspections

1. Periodical inspection schedule

Item	Every running	Every month	Every 6 months	Every year
Replenishment of fuel	●			
Replenishment of 2 cycle engine oil	●			
Replenishment of engine coolant	●			
Cleaning of dust, etc. from outside	●			
Battery charging		●		
Cleaning of fuel filter			●	
Changing fuel in tank			●	
Change of engine coolant				●
Cleaning of ignition plug			●	
Inspection of V belt			●	
Starting and vacuum test		●		
Water suction and discharge test		●		

Caution:

Above table indicates inspection timing under general operating condition. If the pump is operated under special condition, inspect it without regard to the above schedule.

⚠ Caution

○ Be sure to carry out the periodical inspections.

● If not, accidents due to failure may occur or the firefighting activities may be interfered.

5. Periodical inspections

2. Inspection method

To keep the safety of the firefighting pump and make use of every possible function, periodical inspections are essential. Inspect the firefighting pump correctly and in safe following the procedure below.

⚠ Caution

○ Start the inspections and services after the engine is stopped and has cooled down sufficiently.
● If not, injury, burnt, or fire may result.

(1) Check and charging of battery
A) Installation and removal of battery.

⚠ Caution

○ When disconnecting the battery cord, remove the (-) cord first and when connecting, connect the (+) cord first.
● If not, short circuit may occur and cause a fire or burn you.

B) Auxiliary charge
Battery charging level decreases day by day due to self-discharge even if the battery is not used. Consumption by the self-charge, starting motor, lamps, etc. should be supplemented by charging.

⚠ Caution

○ Be sure to use the specified charger.
● If not, fire may arise due to overheat, burning of wiring, etc.

⚠ Caution

○ When the battery cap is removed, do not bring a fire close to the battery.
● The electrolyte may catch the fire and explode.

C) Replacing timing
Battery performance is rapidly deteriorated in about 2 years even if the battery is correctly handled. It is recommendable to replace the battery earlier.

5. Periodical inspections

⚠ Caution

○ Entrust a professional industrial waste disposal dealer with disposal of the battery, oil, grease, etc.
● If not, fire, burnt or environmental pollution may result.

(2) Handling of Shibaura full-automatic charger

A) Unpacking
Take out the charger from the box.

⚠ Warning

○ Remove packaging materials from the charger when charging with it.
● If not, a fire may be caused.

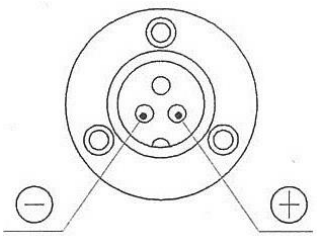
B) Place of installation

⚠ Caution

○ Install the charger at a dry and well ventilated place where the battery does not get well.
● If not, electric shock or fire may result.

C) Battery charger Operating Manual

① Turn off every current consumer which is connected to the Battery and Pump.
② Make sure power switch on the Battery Charger is OFF.
③ Plug the connector of Battery Charger into AC 220V outlet.
④ Plug the Battery Charger cord into the pump socket.
⑤ Turn on the power of the Battery Charger.
POWER LED (RED) will turn on, and will start charging automatically.
⑥ CHARGE UP LED (GREEN) will turn on if the battery has reached more than 80 percent charge level.
Once the battery has reached full charge, it will maintain the battery at full charge (GREEN LED).
⑦ To stop charging battery, turn off the power before unplugging the connector and cord.



5. Periodical inspections

	POWER LED (RED)	CHARGE UP LED (GREEN)
POWER OFF	-	-
CHARGING	ON	-
80% CHAEGED	ON	ON
FULL CHAEGED	-	ON

D) Battery Charger safety function
Safety Function shutdown the circuit when the Battery Charger detects the unusual power current.

E) Troubleshooting

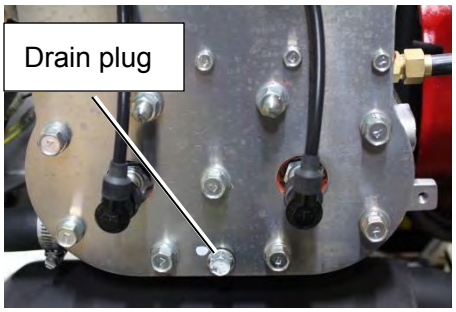
CASE	CAUSE	SOLUTION
POWER LED (LED) will not turn on	Improper connection of power connector	Connect the plug firmly
CHARGE UP LED (GREEN) will not turn on	Improper connection of Battery Charger cord	Connect the cord firmly
	Breaker trip	Get rid of the cause of the breaker trip, and then press the knob to recover battery.
	Over discharged battery	Recharge the battery. Replace the battery if you cannot recharge.
POWER LED (GREEN) turn on too soon	Battery wear out	Replace the battery with a new one.

(3) Handling of engine coolant
Shibaura FK series firefighting pumps are equipped with an indirectly cooled engine with a water-cooled radiator. It is filled with long-life coolant as the coolant. Handle the coolant in the following procedure.

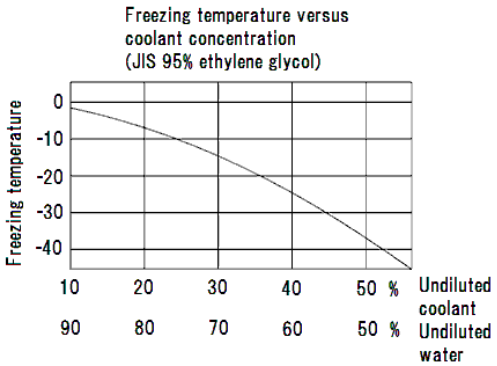
A) Caution for handling
The coolant contains substances which are harmful to human body. Do not drink or allow it to enter your eyes. Particularly, keep it away from children.

B) When replenishing
While the engine is cold, open the radiator cap and replenish the coolant into the cylinder head.

C) When changing
Coolant is deteriorated in one to two years and may corrode the cylinder. Change the coolant periodically. Remove the drain plug at the bottom of the cylinder and loosens the radiator cap, and then the coolant is discharged. Wash the engine inside in water, untighten the drain plug and supply the coolant.
About 1.7 L of coolant can be supplied.



D) Freezing concentration
Freezing temperature of coolant varies depending on the mixing ratio with water. Adjust the concentration based on the lowest temperature in the district where the pump in used. At the time of shipment from the factory, the solution filled is adjusted to -30℃ (45%).



(4) Cleaning of fuel cock filter
A) Close the fuel cock.
B) Untighten and remove the ring nut with pliers or the like.
C) Wipe away the fuel in the cup with cloth or the like.
D) Remove the filter from the fuel cock main unit and wash it in gasoline.
E) Install the filter to the original position. Be sure to open the fuel cock and check that no fuel leaks.
F) After checking, close the fuel cock.

5. Periodical inspections

(5) Change of fuel in tank
After the fuel is stored for a long time, it may deteriorate and not start the engine smoothly. Sediment may attach to the carburetor and generate rust. When the fuel has decreased down to the middle point of the specified fuel level, replenish the fuel to prevent such troubles. Changing the fuel with new one every 6 months is recommendable if the fuel decreases below that level.

⚠ Caution

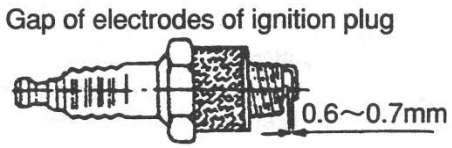
○ Do not close the fire when replenishing fuel.
● The fuel may catch the fire and explode.

(6) Cleaning the ignition plug
Use the ignition plug, NGK B7HS.
Clean the ignition plug when it is stained by exhaust gas or carbon.
A) Stop the engine and wait until it has cooled down sufficiently before starting any work.

⚠ Caution

○ Do not touch the ignition plug or high-tension cord during operation.
● You may get electrical shock.

B) Remove the plug cap and remove the ignition plug using a box spanner for the ignition plug.
C) Clean the outside, inside and electrodes of the ignition plug.
D) Adjust the gap of electrodes as shown in the right figure.
E) Tighten the plug to the cylinder head and push in the ignition plug cap.



(7) Inspecting the V belt
If the V belt has elongated, worn away or cracked, replace it with a new one.
A) Remove the recoil side cover.
B) Open the recoil starter.
C) Remove the belt from the groove of the pulley.
D) Install a new belt into the groove of the pulley.
E) Install the cover to the original position.

(8) Vacuum test

Even if the following water discharge test cannot be performed in daily inspections, be sure to carry out the vacuum test. If the vacuum performance is not enough or vacuum leaks, water may not be sucked up when water should be discharged actually or water may fall while being discharged.

A) Check the presence of the rubber packing in the water suction port cap and tighten the cap firmly.
B) Close the pump drain cock.
C) Start the engine, pull the water suction lever toward you and start the vacuum pump.
D) When the pointer of the compound gauge indicates vacuum or -0.06~0.08MPa, return the water suction lever and stop the engine.
E) Leave the pump at that condition for 1 minute. If the indication on the compound gauge does not change, the vacuum performance is satisfactory.
   If the value indicated on the compound gauge changes, ask the sales agent to repair.
F) Open the pump drain cock to release vacuum and close the drain cock.

(9) Water discharge test

Discharge water actually and check for any trouble.

A) Noise
B) Water fall
C) Slow down of water suction
D) Water leakage
E) Starting response
F) Looseness of tightening points
G) Fuel leakage
H) Others
   If any trouble is noticed, repair according to “6. Troubleshooting”.

6. Troubleshooting

For preventing the fire pump from troubles, routine checkup and maintenance are important. Let us locate any trouble at an early stage and remedy it immediately. For a trouble which is not easy to remove or not mentioned below, contact the sales agent specifying the model and serial number.

1. Engine area

Symptom		Cause	Remedy
Hard to start	Fuel does not flow to carburetor	1. Fuel filter or pipe is clogged 2. Needle valve sticks 3. Short of fuel	1. Clean 2. Ditto 3. Refill
	Fuel does not flow to combustion chamber (check upon removing spark plug)	1. Choke does not close (auto choke) 2. Cranking speed is low (battery provided) 3. Carburetor (needle valve, jet) is clogged	1. Repair or adjust 2. Recharge battery 3. Clean
	Fuel flows to combustion chamber but engine does not start	1. Overflow (excessive fuel) 2. Tickler is abused (excessive fuel) 3. Choke is closed all the way (auto choke) 4. Fuel is not volatile (old) 5. Fuel is mixed with moisture 6. Lubricating oil is excessive	1. Check and adjust carburetor 2. Discharge oil upon removing crankcase seal plug 3. Replace diaphragm or clean pipe 4. Replace 5. Eliminate moisture 6. Adjust properly
	Fuel system is abnormal	1. Fuel filter is clogged 2. Carburetor valve seat is clogged 3. Improperly adjusted or clogged carburetor slow system 4. Carburetor is not tightened securely	1. Clean 2. Ditto 3. Adjust or clean 4. Retighten
	Sparks are poor	1. Ignition plug is broken or contaminated, or gap is improper 2. Leakage from high voltage cord 3. Leakage from plug cap 4. Ignition coil is faulty 5. CDI unit is faulty 6. Starting motor does not rotate properly	1. Replace plug or adjust its gap 2. Replace 3. Ditto 4. Ditto 5. Ditto 6. Recharge battery

6. Troubleshooting

Symptom			Cause	Remedy
Hard to start	No sparks are produced		1. Ground wire is short-circuited	1. Repair short-circuited part
			2. Ignition plug is broken or contaminated	2. Replace
			3. Ignition plug gap is improper	3. Replace plug or adjust its gap
			4. Ignition coil is faulty	4. Replace
			5. CDI unit is faulty	5. Ditto
			6. Wiring is not connected properly or is open-circuited	6. Review and adjust connections
			7. Main switch is faulty	7. Replace
	Compression is poor		1. Piston is worn or seized	1. Replace or correct
			2. Piston ring is seized or broken	2. Replace
			3. Oil seal is worn or broken	3. Ditto
			4. Lubricating oil falls short	4. Refill properly
			5. Cylinder head gasket is broken	5. Replace
Running malfunction	Unusual sound	Mechanical sound	1. Flywheel is loose	1. Retighten
			2. Skirt is hit by on account of worn piston	2. Replace piston
			3. Internal contact of armature plate	3. Reassemble
			4. Foreign matter in crankcase	4. Eliminate foreign matter
			5. Impeller hits foreign matter or is in contact with casing	5. Eliminate foreign matter or correctly reassemble
			6. Loosening	6. Retighten
		Knock sound (fuel system anomaly)	1. Fuel falls short (main jet clogged or wrong diameter part used)	1. Clean or replace
			2. Overload	2. Change nozzle diameter or use safety nozzle
			3. Speed too low or high	3. Adjust to proper speed
			4. Ignition plug is wrong	4. Replace with right ignition plug
	Unsmooth rotation	Fuel system anomaly (misfire, hunting)	1. Carburetor main jet clogged or maladjusted	1. Clean or replace
			2. Fuel filter clogged	2. Clean
			3. Overflow	3. Check and adjust carburetor
			4. Carburetor mounted improperly	4. Correct mounting surface or replace carburetor
			5. Icing	5. Remove the ice and add water removal agent into the fuel tank

6. Troubleshooting

Symptom			Cause	Remedy
Running malfunction	Unsmooth rotation	Governor system anomaly	1. Governor maladjusted 2. Governor actuating part worn 3. Fly weight caulked poorly 4. Governor arm tightened poorly 5. Governor spring tension poor 6. Governor lever link hole is worn or there is too much play	1. Adjust 2. Replace 3. Correct or replace 4. Readjust and retighten 5. Replace 6. Replace or correct
		Cooling system anomaly	1. Cooling water shortage 2. Coolant shortage 3. Excessive operation without discharging water	1. Clean and adjust 2. Replenish 3. Discharge water sometimes

2. Pump area

Symptom				Cause	Remedy
Water suction improper	Vacuum not obtained	Pump proper is abnormal		1. Air is sucked because suction pipe is not tightened properly 2. Air is sucked from top end of suction pipe 3. Drain cock is left open 4. Mechanical seal is faulty 5. Water discharge valve is clogged with contaminants or its sealing is faulty 6. Casing rubber packing is faulty 7. Casing is not tightened properly	1. Tighten securely 2. Plunge completely in water 3. Close securely 4. Replace 5. Eliminate contaminants or replace seal 6. Replace 7. Tighten securely
		Vacuum pump abnormal	Dose not rotate	1. Vacuum pump is broken 2. Locked by foreign matter or frozen inside 3. V belt slipping or broken	1. Replace 2. Eliminate or thaw 3. Replace
			Rotates	1. Vacuum pipe clogged or not tightened properly 2. Vacuum pump worn	1. Clean or retighten 2. Repair

6. Troubleshooting

Symptom			Cause	Remedy
Water suction improper	Deterioration of suction function	Vacuum leakage (water flow discontinues at engine stop)	1. Air is sucked on account of poor tightening of suction pipe 2. Mechanical seal is faulty 3. Oil seal is faulty 4. Vacuum pump cock leaks 5. Casing rubber packing is faulty 6. Water discharge valve rubber is worn or clogged with contaminants 7. Pressure gauge or compound gauge pipe is broken or not tightened securely 8. Water suction lever position is Improper	1. Tighten securely 2. Replace 3. Replace 4. Check and repair 5. Replace 6. Replace or clean rubber 7. Replace or retighten 8. Return lever to stop position
		No vacuum leakage	1. Vacuum pump inside is damaged or worn 2. Vacuum pump operation time is short 3. Engine speed is low 4. V belt slips 5. Vacuum pipe or strainer is clogged 6. Suction strainer is clogged 7. Suction head is large	1. Check and repair 2. Prolong operation time 3. Adjust to standard speed 4. Adjust or replace 5. Clean 6. Ditto 7. Reduce to within 8 m
Improper water discharge	Dose not rise to specified pressure	Engine is abnormal	1. Output is poor 2. Throttle is maladjusted 3. Overload 4. Overheat	1. Repair engine 2. Adjust 3. Change nozzle diameter 4. Decrease load or adjust engine
		Pump proper is abnormal	1. Suction pipe strainer is clogged with contaminants 2. Impeller or casing is clogged with foreign matters 3. Suction head is large 4. Pressure gauge is faulty 5. Air is sucked from suction pipe 6. Inducer or impeller is loose 7. Frozen inside 8. Foreign matters are in casing	1. Eliminate 2. Eliminate foreign matters 3. Reduce to within 8 m 4. Replace 5. Retighten 6. Retighten 7. Thaw 8. Eliminate

6. Troubleshooting

3. Electric

Symptom		Cause	Remedy
Starting poor	Starting motor dose not rotate	1. Battery capacity is poor 2. Magnet switch malfunctions 3. Main switch is faulty 4. Grounding is faulty 5. Fuse is blown	1. Recharge 2. Ditto 3. Check or replace wiring 4. Correct 5. Replace
Battery faulty	Battery is discharged soon	1. Battery is deteriorated 2. Wiring is short-circuited 3. Charging is poor 4. Switch operation is wrong	1. Replace 2. Repair short-circuited part 3. Recharge 4. Operate properly
Wiring faulty	Wiring is burnt	1. Battery is connected reversely 2. Connected is short-circuited 3. Fuse is blown	1. Connect correctly 2. Correct 3. Replace
	Lamp dose not light	1. Grounding is faulty 2. Connection is faulty 3. Lamp is burnt out	1. Correct 2. Ditto 3. Replace
Lamp faulty	Lamp burns out	1. Operation is improper 2. Rectifier is faulty	1. Tum off and then correct 2. Replace
OK monitor faulty	Fuel indicator lamp is faulty	1. Failed monitor panel 2. Fuel sensor is faulty 3. Wiring is faulty or open-circuited 4. Grounding is faulty	1. Replace 2. Replace 3. Correct or replace 4. Correct ground wire
	2 cycle engine oil refill indicator lamp is faulty	1. Switch is faulty 2. Wiring is faulty or open-circuited 3. Grounding is faulty	1. Replace 2. Correct or replace 3. Correct ground wire
	Defective engine coolant replenishment indicator lamp	1. Defective switch 2. Incorrect or disconnected wiring 3. Defective earth	1. Replace 2. Correct or replace 3. Correct the earth wire

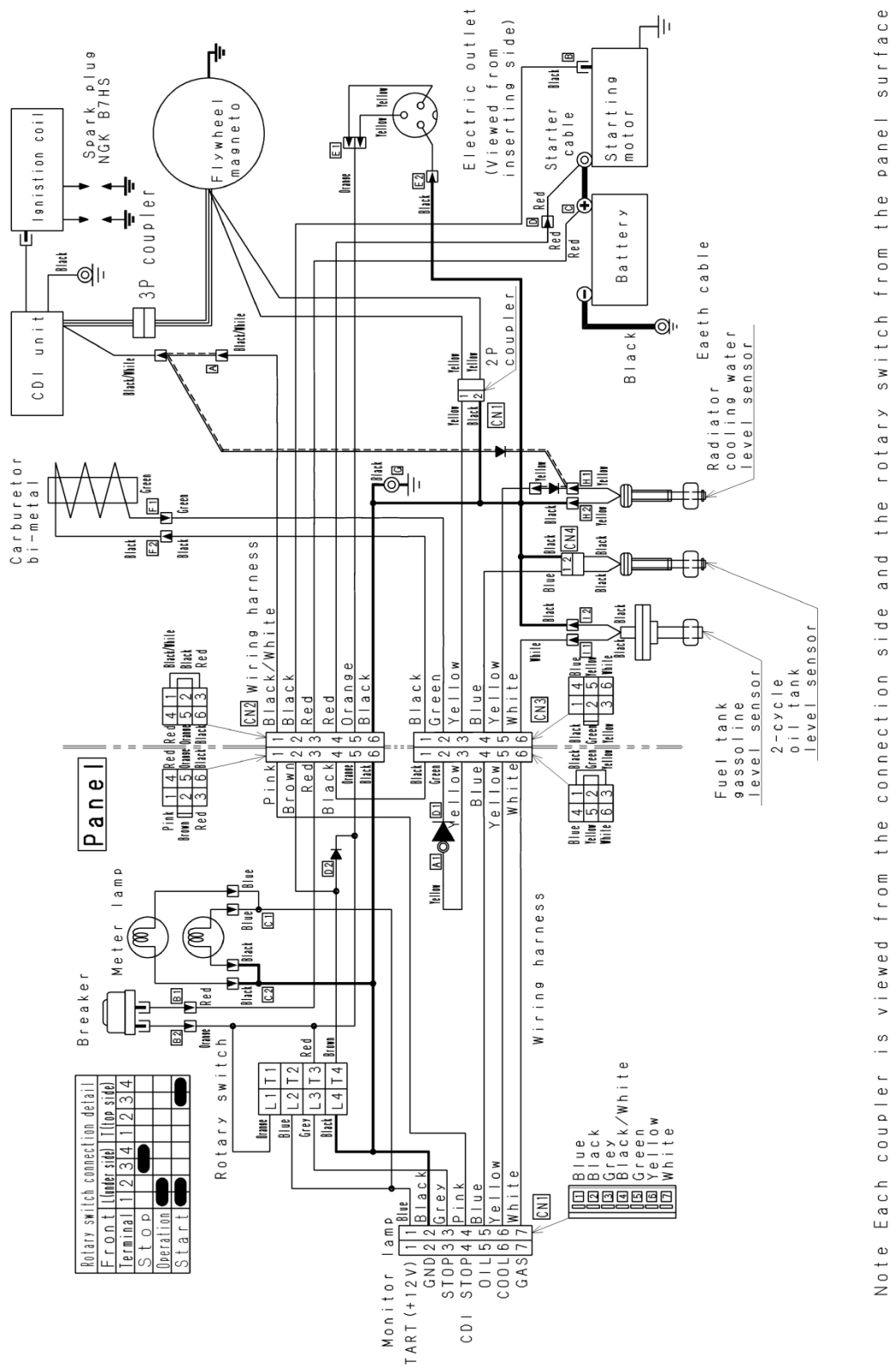
7. Specifications

1. Firefighting pump	
Model	FK500-A
Class	B-2
Long × wide × high	701 ㎜×652 ㎜×735 ㎜
Mass	85 ㎏
Cooing water system	Internally circulated cooling water
2. Pump	
Method	High-pressure 1-stage turbine pump (with inducer)
Discharge water volume	Normal 1.29m^3/min
	High pressure 0.88m^3/min
Pump pressure	Normal 0.70 ㎫
	High pressure 1.00 ㎫
Nozzle diameter	Normal 27.0 ㎜
	High pressure 20.5 ㎜
Speed or revolution	5200 rpm
Water inlet	Nominal 75 ㎜, fire engine threads
Water outlet	Nominal 65 ㎜, fire engine threads (with Machino intermediate fixture)
3. Vacuum pump	
Method	Oil-less vacuum pump : 4-vane eccentric-rotary type
Maximum suction height	Approx. 9m (-0.085 ㎫)
Drive method	V belt clutch type

7. Specifications

4. Engine		
Method	Horizontal 2-cycle 2-cylinder water-cooled radiator	
Model name	L618Z	
Bore×stroke×number	75 ㎜ × 70 ㎜ × 2	
Displacement	618mL	
Authorized output	33.1 ㎾/5200rpm	
Cooling system	Indirect cooling type (with water-cooled radiator)	
Lubrication method	Separate lubrication	
Lubricating oil	For 2 cycle engine	
Starting method	Starting motor, recoil starter	
Fuel	Regular automotive gasoline	
Ignition method	No-contact magneto (CD ignition type)	
Ignition plug	NGK B7HS	
Fuel consumption	Approx. 14L/ h	
Fuel tank capacity	14.5L	
5. Accessories		
Battery	12V-18.0Ah/10h	1 pc
Charger	AC220V – DC12V	1 pc
Tool bag	Tool kit, 1 instruction manual, 4 rubber feet, battery mounting kit	
Pump cover	1	
6. Optional parts		
Search light lamp	12V-35W	1 pc
Search light stand	1 tripod	

8. Wiring diagram



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