WATERAX

MINI-MARK® Watson Edition

Owner's Manual

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WE MOVE WATER

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Contents

IMPORTANT SAFETY INSTRUCTIONS

Personal Safety Advisory

READ THIS MANUAL BEFORE OPERATING YOUR PUMP!

The improper use of the *WATERAX* pump could result in serious injuries as well as damage to the pump. This manual contains very important safety information that **MUST** be read, understood, and followed to safeguard you and your equipment from harm, as well as specific information on the proper use and care of your engine. Any operator should familiarize himself with the apparatus and its capabilities before trying to operate the equipment in an emergency situation. Please read this entire manual before using your *WATERAX* pump and follow all Personal Safety Advisories. **This pump must only be operated by trained personnel.**

Warnings

- Do not operate if mentally or physically fatigued.
- Always inspect hoses and piping to avoid burst injuries.
- No modification and/or alteration may be made to the pump. Any such modification not only voids the pump warranty but can endanger pump operators.
- Do not operate the pump higher than the maximum rated pressure. Always run the unit at the lowest pressure required for the application to enhance operator and equipment safety.
- Use only pipe, hose, and fittings that are rated at or above the maximum pressure rating of the pump, or according to what maximum pressure the system was designed for, whichever is lower.
- Maximum Pressure Rating: 120 (8.3 bar)
- Maximum Allowable Pump Intake Pressure: 100 PSI (6.9 bar)
- Slowly close valves and use slow close valves wherever possible to prevent danger to other line operators and to prevent water hammer which could damage the pump and its piping components.

- **Always wear eye and ear protection** when operating the pump unit.
- Ensure sufficient lighting (5 lx min.) during operation.

- **Never run the engine in a closed or confined area**. Exhaust gas contains carbon monoxide which is poisonous. Avoid inhalation of exhaust gas.

- **Refuel engine with care**. Gasoline is extremely flammable, and gasoline vapor can explode. Refuel in a well-ventilated area, with the engine stopped. Use only fuel and oil type as recommended.

- **Be alert and never touch any part of the engine exhaust system while the engine is running**. Always allow enough time, after stopping the unit, for proper cooling of these parts and surrounding area. Wear protective gloves.
- Leaving the pump running with all the discharge valves closed is called deadheading the pump (shut-off). **The pump should not be left in this mode for more than a minute**. Leaving in this condition for any length of time will cause the pump to overheat and can damage the pump. Additionally, the pump end and the water inside it can become extremely hot and cause severe burns. **Be careful when opening the discharge valve and avoid touching the pump end.** To avoid overheating the pump, a re-circulation line

(if provided) should be opened, or a discharge line left slightly open to allow fresh water to continue to enter the pump.

- **Be careful not to pinch your fingers**. Do not place your fingers near the pump clutch and engine output shaft when the engine is running.
- Relieve all system pressure before doing any service work on the pump.

PREVENTING DAMAGE TO EQUIPMENT

The following recommendations will help avoid damage to your equipment:

- Always use the proper fuel mixture.
- Do not run the engine at full speed until thoroughly warmed up.
- Do not lift strainer out of the water while pump is operating.
- Do not run engine with pump disconnected.
- Do not run the pump when dry.
- Always draft water using a foot valve suction hose strainer.
- Position the foot valve to avoid drawing any type of sediments into the pump. Sand, silt, and mud are abrasive: do not allow the foot valve strainer to rest on bottom of lake or riverbed.
- Position the foot valve to avoid drawing air into the pump. Keep foot valve approximately 1 foot (30 cm) below the water surface. Securely attach in the presence of waves.
- Check strainer frequently to make sure that it is not clogged with moss, leaves, etc.
- Flush the pump with fresh water if the pump has been used to pump salty, brackish, high mineral content water, water containing debris, or foam injected water. Check that debris is cleared before using pump again.
- Drain pump after final use.
- During freezing weather, drain the pump and lines of all water. You can also pour some plumbing antifreeze into the pump and circulate it through the pump and plumbing system.
- Pumps should not be operated without water for any extended period of time or without discharging water. Operating the pump in such a manner can overheat the pump causing damage to seals, or pump internals.
- It is recommended that all parts be replaced with genuine *WATERAX* parts.

INTRODUCTION

About this Manual

This manual contains general operation, care and servicing procedures for the WATERAX MINI-MARK® Watson Edition portable pump consisting of a single-stage pump end paired with a Maruyama CER500 50cc 2.3 HP two cycle (two-stroke) engine.

These instructions cover most wildland and municipal pump applications. If the application the pump is being used for does not fall into these general guidelines, consult WATERAX Inc. for any additional safeguards, operating, or maintenance considerations that may be required.

For full service and maintenance instructions regarding the pump, please refer to the Service section. For maintenance instructions regarding the engine, as well as for oil and fuel recommendations, refer to the engine manufacturer's manual.

The procedures listed in this manual are general operating and maintenance procedures. They should be taken in addition to any procedures, policies and guidelines established by the authority having jurisdiction or the apparatus manufacturer. Where conflicts arise, all parties (authority having jurisdiction, the apparatus manufacturer, and *WATERAX* Inc.) will need to be contacted to determine the best resolution. The solution will need to address the safety of the operator along with the proper performance and life expectancy of the unit.

Please consult www.waterax.com for additional documentation related to this product such as the WATERAX product guide, parts catalog, technical notes, news, and other updates about WATERAX and its goods and services. Refer to "Tech-Notes" for the latest engineering changes and recommendations, which have been introduced since the publication of this manual.

Abbreviations and Terms

The following terms and abbreviations are used in this manual:

Cavitation	Formation of air bubbles in a liquid inside a centrifugal pump, causing low pressure points and loss of pump capacity.
Dead heading	Also called shut-off. Leaving the pump running with all the discharge valves closed. The pump should not be left in this mode for more than a minute since the pump can overheat and become damaged. To avoid this, a re-circulation line (if provided) should be opened or a discharge line left slightly open to allow fresh water to continue to enter the pump.
Drafting	Process of using vacuum (suction) to take water from a stream or impoundment.
NPSH	National Pipe Straight Hose. This is a type of thread that is slightly smaller in diameter than NH, with more threads per inch than the same nominal size of NH thread. NPSH is also called IPT (Iron Pipe Thread).
RPM	Revolutions Per Minute.

About the MINI-MARK® Watson Edition

Features

For full specifications and performance curves, see the Product Data Sheet.

Applications of the **WATERAX MINI-MARK** series include:

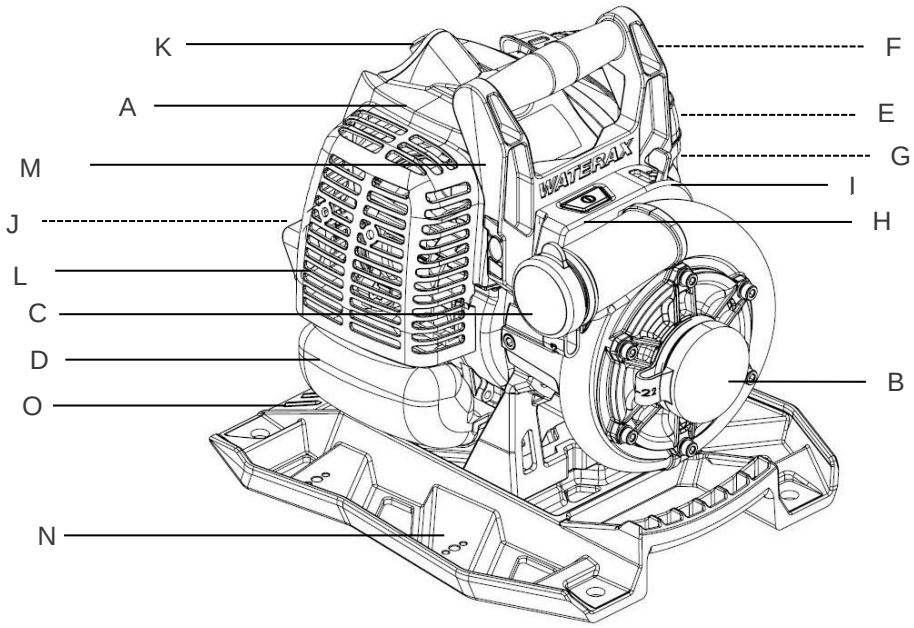
- Attack line firefighting
- Sprinkler operations
- Tandem pumping over long distances

Features and Benefits of the **WATERAX MINI-MARK** series include:

- Lightweight composite and aluminum alloy pump components for lighter weight
- Portable and compact
- Compatible with foam applications
- Comprehensive manuals
- CARB & EPA Certified

Parts Identification

A. Engine
B. Pump Intake (suction)
C. Pump Discharge
D. Fuel Tank
E. Air Filter (not shown)
F. Choke (not shown)
G. Carburetor Purge Bulb (not shown)
H. Control Button
I. Throttle
J. Rewind Starter (not shown)
K. Spark Plug
L. Muffler & Heat Guard
M. Carry Handle
N. Frame



PUMP OPERATION

Pre-Operation Checklist

Before using your pump, follow this verification procedure:

1. Visually inspect products. When you first receive your pump, inspect the product and check for any damage. Notify the supplier if any damage is found.
2. Check that all suction and discharge hoses are structurally sound and do not leak.
3. Inspect all safety features and verify that they are in good order before using the pump.
4. Each time you plan to use the pump, check for damage that may have occurred during previous use. Notify your manager that the equipment requires repair. Remember that damaged equipment can expose you to safety hazards.

Clutch Drive

Note that the MINI-MARK® Watson Edition is equipped with a clutch drive. The clutch will engage the pump end at 3900 ± 300 RPM and build pressure.

The pump will not build pressure if the clutch is not engaged.

Control Button

The Control Button Assembly continuously monitors the engine speed. In the event of an overspeed condition (e.g., loss of prime), the Control Button will automatically shut down the engine to prevent the risk of damage.

Fuel Supply

Fuel mixture

The MINI-MARK® Watson Edition is powered by a 50cc two-cycle (two-stroke) Maruyama engine. For lubrication, the engine requires a premixed fuel mixture of gasoline and oil.

GASOLINE: Minimum 87 octane unleaded quality automotive grade gasoline (maximum 10% ethanol)

OIL: High quality two-cycle mixing oil specifically designed for use on **air cooled** engines with **API-TC, JASO-FD and ISO-L-EGD** certification. *WATERAX* recommends **Amsoil Saber® Professional Synthetic.**

FUEL MIX RATIO: **50:1** (gas to oil)

Important: Not enough emphasis can be placed on the use of the correct gasoline and oil mixture. Using less than the recommended portion of oil will cause overheating and possible engine damage. Using more than the recommended proportion of oil will cause spark plug fouling, erratic carburetion, excessive exhaust smoke and rapid carbon deposits.

Important: Do not use two-cycle mixing oil made for water cooled engines (TCW).

Gasoline, octane, and ethanol

WATERAX recommends using high quality automotive grade gasoline with a minimum octane rating of 87 (AKI) and a maximum ethanol concentration of 10% in its fuel mix for the MARK-3®.

It is important to note that gasoline has a shelf life. Depending on storage conditions, gasoline can go stale in a matter of weeks. Gasoline will deteriorate in three ways:

1. The more volatile components of the gasoline evaporate, leaving behind a heavier gasoline which can lead to inferior engine performance and a more difficult engine to start.
2. Certain hydrocarbons in the gas react with oxygen (oxidation) producing new and harmful compounds. The stale gasoline will smell sour, its color will go dark, and gummy particles can appear in the gas. This can lead to poor engine performance and reliability issues with the carburetor.
3. Water contamination, which is normally caused by condensation, can be catastrophic to the engine. Gasoline containing ethanol is more susceptible to that problem. Ethanol is hydrophilic, which means that it tends to draw in moisture. If the water contamination is severe enough, the ethanol will separate from the gasoline and drop to the bottom of the fuel tank. Since water and oil do not mix well, this ethanol and water blend can cause severe engine problems due to the lack of lubrication.

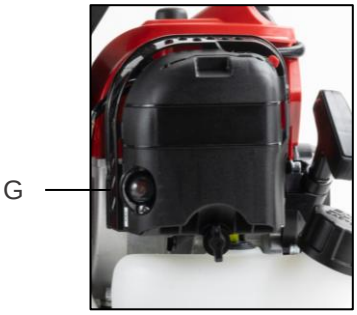
To prevent any damage to the engine, it is highly recommended to only use **fresh gasoline**. Depending on storage conditions and ethanol content, gasoline typically has a shelf life of three to six months. Gas stabilizers (e.g., STA-BIL®) can be used to increase the gasoline's shelf life; however, it will not restore back bad gasoline.

Winter vs. summer-grade gasoline

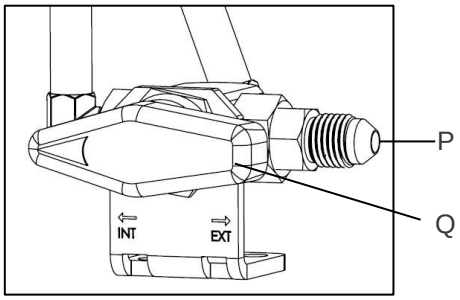
Winter-grade gasoline as a higher Reid Vapor Pressure (RVP), which is a measure of how easily petroleum liquids evaporate. The RVP changes to accommodate seasonal temperature variations that affect both the performance of gasoline in an internal combustion

engine and emissions. In the winter, higher RVP ensures that gasoline combusts quickly at low ambient temperatures. In the spring and summer when ambient temperatures are warm, a lower-RVP gasoline prevents vapor lock, when too much vapor may prevent an engine from starting or running properly. Thus, *WATERAX* strongly **recommends using summer-grade gasoline** with the MINI-MARK, especially when ambient temperatures are hot, to ensure optimal startability, operation and performance.

Supply recommended fuel to engine



1. Carefully mix the fuel as recommended in the Fuel mixture section. Mix well.
2. Carefully pour the fuel mix in the MINI-MARK fuel tank.
3. Prime carburetor by pressing purge bulb (G) successively until fuel travels up the clear fuel line and appears in the purge bulb.
4. If equipped with an **optional Fuel Valve Kit** for external fuel tank:
    a. Connect fuel supply line to fuel tank.
    b. Prime fuel supply line by recirculating excess fuel into the tank to eliminate air bubbles and avoid air locks.
    c. Connect fuel supply line to the Fuel Valve Kit fuel connection (P).
    d. Set valve selector knob (Q) to EXT (external fuel tank).
    e. Prime carburetor by pressing purge bulb (G) successively until fuel travels up the clear line and appears in the purge bulb.



Important: The use of the purge bulb will not flood the engine. However, excessive use of the purge bulb will fill the internal fuel tank of the MINI-MARK when using an external fuel tank.

Important: When refueling the fuel tank, it is recommended to use a fine strainer to capture particles and prevent damage and/or clogging of the carburetor.

Important: It is recommended to keep the fuel tank at the same level as the pump unit to help prevent fuel cavitation. Ensure that the height between the bottom of the fuel tank and the carburetor does not exceed 2 ft (0.6 m).

Important: It is recommended to keep the length of the fuel supply line to a maximum of 6 ft (1.8 m) to help prevent fuel cavitation. The fuel supply line should be just long enough to allow to position an external fuel tank in a secure location, away from a heat source (i.e., muffler).

Warning: Ensure that the fuel tank is positioned away and at a safe distance from the muffler to avoid any potential accident. Always refuel with care.

Flooded engine

Flooding an engine refers to an accumulation of excess fuel in the cylinder and crankcase due to an excessive use of the choke. This condition makes the engine nearly impossible to start without clearing the engine of the excess fuel.

Clearing a flooded engine

1. Disconnect the spark plug cable and remove the spark plug.
2. Re-connect the spark plug cable to the spark plug. Place the spark plug in contact with the engine aluminum casing to ground the spark plug.

Important: Failure to ground the spark plug can damage the ignition when cranking the engine.

3. With both choke and throttle in fully open position, pull starter rope several times until excess fuel is exhausted.
4. Before reinstalling spark plug, clean and dry the electrode and insulator tip.

Pump Connection and Priming

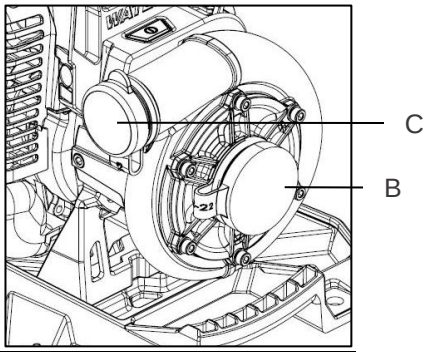
1. Connect foot valve strainer to male end of suction hose, then fill suction hose with water. Connect hose to the pump intake (B). Tighten coupling firmly with coupling wrench.

   Manual Priming:

   Pump can be primed by "jerking" the suction hose until water flows from pump's discharge port.

   ***WATERAX* Hand Primer:** Connect hand primer to discharge port (C) and pump until water is drawn into pump.

2. Connect discharge hose, nozzles, etc. to pump discharge (C); tighten coupling firmly with wrench.



Important: To provide proper operation of the pump, the suction hose/strainer should be submerged a minimum of 4 to 6 times the hose diameter into the water source.

DO NOT run pump dry.

DO NOT allow foot valve strainer to rest on bottom of lake or riverbed. Check strainer frequently to make sure that it is not clogged with moss, leaves, etc.

DO NOT lift strainer from water while the pump is operating. Use a rope or other means to keep strainer at proper height, approximately 1 foot (30 cm) below water surface. If strainer is too close to the water surface, it will draw air and pump may lose prime.

To maintain optimum performance from your pump, follow these recommendations for selecting and installing your **suction hose**:

- Use the shortest length possible; place the pump as close to the water as possible.
- Select reinforced crush resistant (non-collapsible) hose.
- To avoid air locks, flexible hose should rise gently from the water source to the suction/inlet port without excessive dips, bumps, sharp angles or rise in its lay.
- Fit a foot valve suction strainer to prevent foreign matter from entering the pump.
- The installation and use of a suction float will aid in the performance of your pump, by keeping suction away from the debris at the bottom of the dam or river.
- Ensure that the suction hose is completely submerged.

Limitations

Several factors can affect the pump's ability to efficiently draft water. The following limitations should be considered:

- Water temperatures above 95 °F (35 °C) can cause noticeable loss in performance.
- Barometric pressures below 29 in Hg (98 kPa) can also cause noticeable loss in pump performance (specifically elevations > 2000 feet (610 m) above sea level).
- Restrictive hose and strainers can significantly decrease pump performance.
- Intake hose runs in excess of 10 feet (3 m) can reduce pump performance.
- Minimize the suction lift to prevent cavitation and minimize performance degradation. In high suction lift setup, reduce the throttle to prevent tripping the overspeed cut-off.

Engine Startup

1. Close/engage choke (F), if engine is cold.
2. Move throttle lever to "START/WARM UP" (3 increments from "IDLE").
3. Slowly crank engine until resistance (past compression).
4. Give the starter cord a quick and steady pull.
5. Once engine fires, disengage choke and pull start again if necessary.
6. Allow engine to warm up (approx. 2 min.).
7. Once engine is warm, the unit can be throttled up.

Failure to allow engine to warm up may lead to piston scoring and possibly more serious engine damage.

Discharge

Once the pump is primed, and with the engine running, you can begin to discharge water.

a) If pressure does not build in the discharge hose when engine speed is above 3900 ± 300 RPM, the pump is not fully primed. Verify that there is no leak between the suction hose and the pump end. Prime the pump again.

b) The engine works best at wide open throttle. Vary the discharge nozzle opening to adjust the pump performance.

Warning: Leaving the pump running with all the discharge valves closed is called deadheading the pump (**shut-off**). The pump should not be left in this mode for more than a minute. Leaving in this condition for any length of time will cause the pump to overheat and can damage the pump. Additionally, the pump end and the water inside it can become extremely hot and cause severe burns. **Be careful when opening the discharge valve and avoid touching the pump end.** To avoid overheating the pump, a re-circulation line (if provided) should be opened, or a discharge line left slightly open to allow fresh water to continue to enter the pump.

Important: If the engine throttle is increased and the engine RPM increases without an increase in pump pressure, the pump may be **cavitating**. Refer to the limitations listed at the beginning of this section and see the troubleshooting section for a verification checklist and possible solutions.

Warning: Avoid running out of fuel when the engine is running at wide open throttle to avoid lean conditions and potential engine premature wear.

Shutdown

Shut down the pump

1. After completing the pump operation, gradually reduce the engine speed to idle (lowest speed).
2. Allow unit to run for approximately 2 minutes with throttle in this position for proper cool down.
3. Press and hold the “OFF” button until engine shuts down.

After final use

4. Drain the pump end. If the pump was last run with foam or water that is salty, brackish, or high in mineral content, **flush the pump with fresh water** for a minimum of 2 minutes or until the water is clear, and **drain the pump end**.

Cold Weather Operation

The pump can be run in below freezing temperatures if certain precautions are taken to avoid the formation of ice in the pump.

1. After priming the pump, the unit should be run at low speed for a short period of time to allow all components to warm up before continuing with the remaining operating procedures.
2. Unless wrapped in a heater, drain the pump of all water if it is stopped for any length of time. The engine/drive unit should be turned over a few revolutions to make sure all water has been removed from the pump.
3. After use, drain the pump, manifolds, and lines of all water. You can also pour plumbing antifreeze into the pump and circulate it through the pump and plumbing system.

Removing or Attaching the Pump End

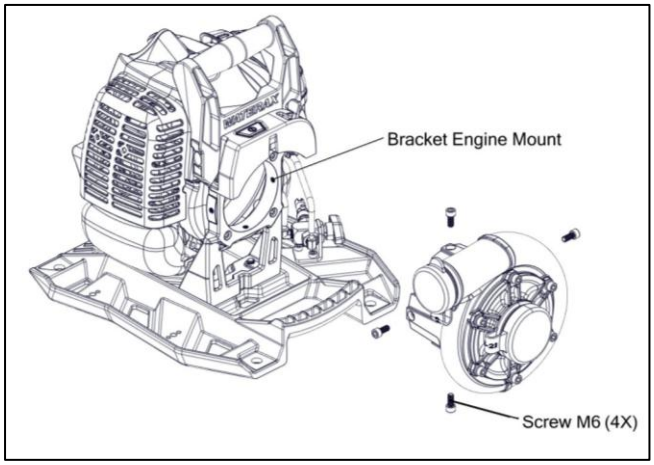
The MINI-MARK® Watson Edition pump uses 4 screws to fix the pump to the engine. Removing these 4 screws with a 5 mm Allen Key facilitates the servicing of the pump-end and minimizes down-time in the field by allowing the quick replacement of pump ends.

To remove pump from engine:

1. Remove 4 screws.
2. Remove pump from Engine Mount.

To attach the pump end to the engine:

1. Align the pump-end mounting cross to the Engine Mount mating diameter.
2. Fit the pump-end on the Engine Mount.
3. Install the four M6 screws. Engage all four screws before tightening. Tighten to **5.2 lb.-ft (7 Nm)** in a crisscross pattern.



Basic Care and Storage

The basic care described in this section does not require any disassembly of the pump. For any servicing procedures that require removing any part of the pump to access a component, please see the Service section.

After each use:

1. Visually inspect the pump unit.
2. Make sure the mechanical rotary seal is not leaking.
3. Check the pump for external leaks.
4. Check the engine for leaks.
5. Clean any dirt or debris from the pump unit. Use a mild soap and water solution.
6. Clean air filter.
7. Make sure cooling passages and cylinder fins are clean.
8. Make sure that spark plug is cleaned and has proper gap setting. If the spark plug gap exceeds the recommended value of .024”-.028” (0.6-0.7 mm), replace.
9. Check throttle and choke control for proper operation.
10. Check the muffler for excessive carbon build-up. Clean if necessary.
11. Check the spark arrestor for excessive carbon build-up. Clean or replace if necessary.
12. Check fuel filter. Replace if necessary.
13. Check fuel line and fittings for signs of wear, etc.
14. Check starter rope and mechanisms and replace if there are signs of wear.
15. Note and report any performance irregularities or any abnormal mechanical sounds.
16. Make sure all necessary tools, spares, and accessories are with the pump.

Long-term storage

1. Completely drain the pump of all water.
2. Drain the carburetor. The engine can be run at idle with the fuel line disconnected (if equipped with the optional Fuel Valve Kit) until the engine stops to drain the system
3. Follow any other products, components, apparatus, and departmental procedures and/or guidelines before placing the unit in storage.

Troubleshooting

This section provides brief troubleshooting instructions for verifying the set-up and operation of the pump. Each section describes a condition and lists possible causes along with a list of items to check to identify the source of the problem and resolve it.

Pump Loses Prime or Will Not Prime

Air Leaks	■ Verify that suction hose coupling is securely tightened. ■ Check suction hose gasket. ■ Check sealing face on pump end suction cover.
Pump not building pressure	■ Engine clutch will engage at speeds of 3900 ± 300 RPM. ■ Increase throttle to check if the pump now builds pressure.
Air Trapped in Suction Line	■ Check that no part of the suction hose is higher than the pump intake. Pump suction hose must be laid out with a continuous decline to the water source from the pump intake.
Blocked or Restricted Intake Hose or Strainer	■ Remove blockage from the intake hose or strainer. ■ Strainer should not be sitting at the bottom of the water source where debris can be picked up. Clean off the strainer and raise to a position that is off the bottom of the water source (floating strainers are available).
Pump Suction Lift Requirements are Too High	■ DO NOT attempt pump lifts exceeding 22 feet (6.7 meters) except at elevations lower than 2000 feet (610 meters) above sea level. ■ As elevation increases above 2000 ft (610 meters) above sea level, maximum lift heightswill diminish. Check that the lift for the elevation the pump is being required tooperate at is achievable.
Air Lock in the Discharge	■ Open the discharge valve to allow for the air to evacuate during the priming operation.

Pump Does Not Meet Performance

Incompatible Suction Hose	■ Verify suction hose diameter is at a minimum of 2” (51 mm). Any smaller diameter hose will negatively impact the pump performance and suction lift.
Pump End Low Performance	■ Pump end impeller and diffuser is worn off and require replacement. ■ Debris in the pump end. Clean.
Insufficient Engine Power	■ Check the engine manual and complete engine repairs if required. ■ An engine tune up may be needed to bring engine back to peak performance.
Gauge or Instrument Failure	■ Check that all gauges are calibrated, and that all equipment is in proper condition. Nozzles with dented edges and bent or damaged pitot tubes will produce faulty readings.
Blockage	■ Check hoses and suction strainer; remove any obstructions found. ■ Check for debris wedged or caught in the impeller, diffuser, and suction cover. Remove any obstruction found.
Ambient Conditions	■ An engine will lose approximately 3.5% of its power per every 1000 feet (305 meters) above sea level (lower air density). ■ High ambient temperatures, low barometric pressure, and high humidity will negatively affect pump performance (lower air density).

Pump Cavitating	
Lift Too High	■ Restrictive or malfunctioning foot valve. Replace. ■ Clogged strainer. Clean. ■ Move pump closer to water source. ■ Decrease pump's intake hose length. ■ Increase pump's intake hose size.
Restrictions	■ Check that the bottom of the suction hose at a minimum of 2 feet (0.6 meters) from the bottom of the water source and correct if necessary. ■ Check that the bottom of the suction hose/strainer is 4 to 6 times the hose diameter below the water supply surface level and correct if necessary.

MAINTENANCE

Regular maintenance

Regular maintenance is a schedule of continuous systematic maintenance, designed to prevent frequent or major breakdowns before they occur.

Refer to **Maruyama's Engine Owner's Manual** for the engine maintenance chart.

Warning: Before doing any maintenance to the pump, always ensure that the equipment cannot be accidentally started. Follow any apparatus and/or departmental procedures or guidelines regarding locking out the equipment.

Important: Maintenance on a fire pump should not be done on the fire line. Always check your pump unit immediately after use.

SERVICE

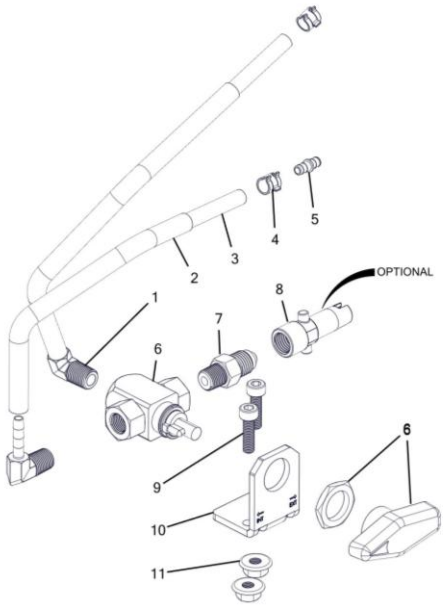
This section includes instructions for the complete servicing of the unit. Servicing should be completed by a trained and experienced mechanic/technician. For any question regarding servicing, contact *WATERAX* technical support.

Warning: It is important to respect the specified torque and application of Loctite® where specified. **Refer to the torque table at the end of the manual for torque values and Loctite® requirements.**

Optional Fuel Valve Kit

Parts breakdown

ID	ITEM NO	DESCRIPTION	QTY
--	702230	FUEL VALVE KIT MINI-MARK®	--
1	702228	ELBOW BARB 3/16 TO MNPT 1/8 BRASS	2
2	702227	SLEEVE ELECTRICAL BRAIDED OVERLAP BLACK 3/8"ID	2
3	702225	TUBING 4MM ID X 7MM OD YELLOW TYGON	2
4	702263	HOSE CLAMP SPRING BAND .25-.28" 9/32" WIDE GALV.	2
5	702226	COUPLER BARB STRAIGHT 4MM BRASS	1
6	800796	PART-24 1/8 -3WAY VALVE	1
7	800814	R-732 CONNECTOR 1/4"TUBE X 1/8"NPT	1
8	702057	CONNECTOR FUEL MERCURY MALE TO SAE FEM. WATSON	1
9	702224	SCREW M5X0.8X18 HEX SOCKET CAP SS DIN 912	2
10	702223	BRACKET FUEL VALVE MINI-MARK®	1
11	702070	NUT M5X0.8 HEX FLANGE ZINC	2



Mercury fitting

If using a fuel line with a Mercury quick-connect fitting, install the male Mercury quick-connect fitting on the fuel block. Tighten firmly using an adjustable wrench.

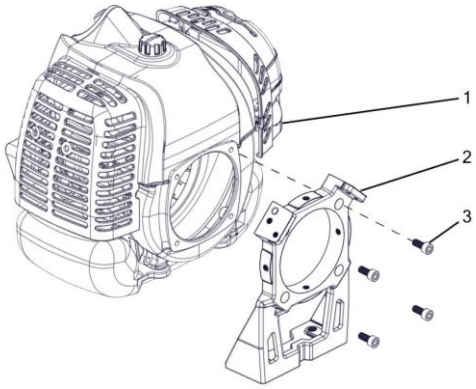
Servicing

Replace the Mercury connector if the locking tabs or the connector surface is damaged to prevent air leak. Replace the Tygon (F-4040-A) hoses if they become hard.

Engine Mount Bracket

Parts breakdown

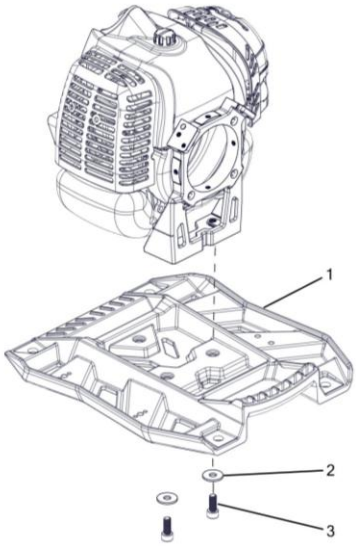
ID	ITEM NO	DESCRIPTION	QTY
1	702196	ENGINE, MARUYAMA-CER500 2.3 HP	1
2	702183	BRACKET ENGINE MOUNT MINI-MARK® - MACHINED	1
3	702213	SCREW M6X1.0X14 HEX SOCKET CAP SS DIN912	4



Frame Assembly

Parts breakdown

ID	ITEM NO	DESCRIPTION	QTY
1	702187	FRAME BASE MINI-MARK®	1
2	702245	WASHER M8 FLAT 8.4MM X 24MM SS DIN9021	2
3	702211	SCREW M8X1.25X20 HEX SOCKET CAP SS DIN912	2



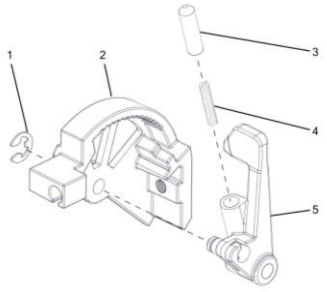
Servicing

If the unit shows signs of a severe drop or impact, inspect the frame, replace if necessary. The frame will be worn with usage. The wear rate will depend on the ground where it is operated. Replace if the frame is too worn out and is structurally compromised.

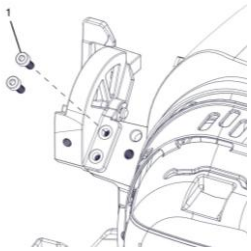
Throttle Assembly

Parts breakdown

ID	ITEM NO	DESCRIPTION	QTY
1	701931	RETAINING RING EXTERNAL 7/32" 15-7 PH SS	1
2	702181	QUADRANT THROTTLE MINI-MARK®	1
3	700011	A-4027 INDEX PIN, BRASS	1
4	800316	A-4028 SPRING SS	1
5	702182	LEVER THROTTLE WITH SHAFT MINI-MARK®	1



ID	ITEM NO	DESCRIPTION	QTY
1	701988	SCREW M4X0.7X10 HEX SOCKET CAP SS DIN 912	2



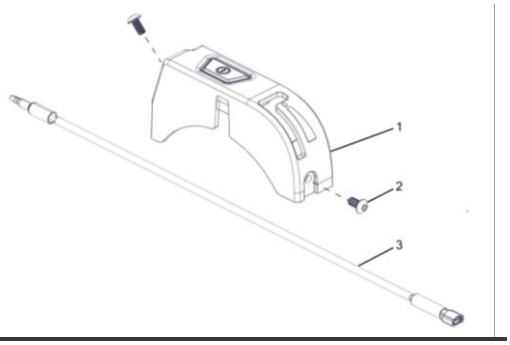
Servicing

If the throttle assembly shows sign of wear such as lever not 'clicking' properly when increasing or decreasing throttle, inspect the quadrant and index pin, replace if necessary.

Electronics

Parts breakdown

ID	ITEM NO	DESCRIPTION	QTY
1	702195	CONTROL BUTTON ASSEMBLY MINI-MARK®	1
2	702244	SCREW M5X0.8X10 HEX SOCKET BUTTON SS BLACK OXYDE	2
3	702247	WIRE ASSY STOP MINI-MARK®	1

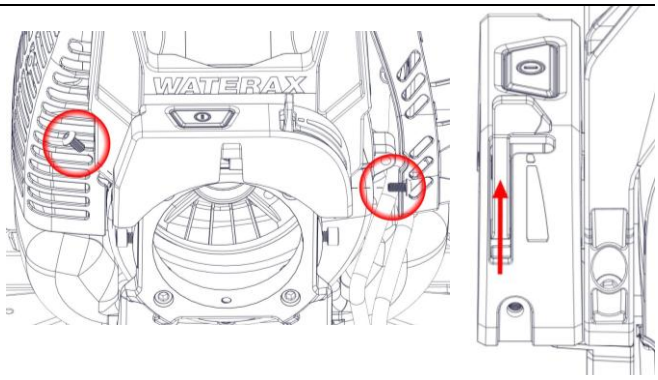


Troubleshooting

Overspeed protection not shutting down the engine. **OR** **OFF Button Not Shutting Down the Engine.**	■ Connect the wire assembly to the correct bullet connector. ■ Tighten Control Button Assembly screws to ensure that the grounding strip is in contact with the Engine Mount Bracket. ■ Defective Control Button Assembly. Replace the Control Button Assembly. ■ Broken connector on the Control Button Assembly. Replace the Control Button Assembly.

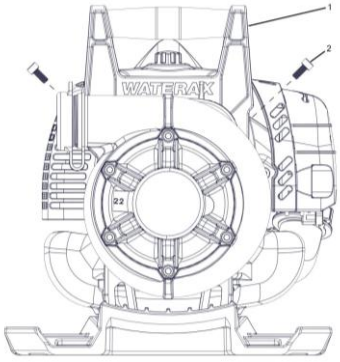
Assembly

1. Ensure that the throttle is in the idle position.
2. Plug the wire onto the 1/4in spade terminal of the Control Button Assembly.
3. Install the Control Button Assembly in place.
4. Install the two M5 button head screws to firmly secure the assembly. Apply Loctite 222 and torque to 3 N-m.



Carry Handle

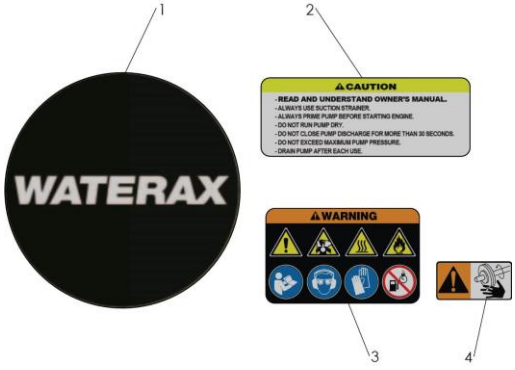
ID	ITEM NO	DESCRIPTION	QTY
1	702186	CARRY HANDLE MINI-MARK®	1
2	702213	SCREW M6X1.0X14 HEX SOCKET CAP SS DIN912	2



Decals

Parts breakdown

ID	ITEM NO	DESCRIPTION	QTY.
1	702197	DECAL WATERAX LOGO ROUND 2.657" BLACK	1
2	702242	DECAL CAUTION MINI-MARK®	1
3	701895	DECAL WARNING AIR BOX WATSON	1
4	702079	DECAL FINGER PINCHING .850"X.425"	1



Servicing

To ensure proper adhesion of the decals, thoroughly clean the surfaces with isopropyl alcohol.

Disassembly and Assembly of the Pump End

The pump end does not require any special maintenance. The frequency of the part replacement will largely depend on the fluid that is pumped through. Pumping water with high concentrations of abrasive material (e.g.: sand, pebbles) and corrosive agents (e.g.: brackish water, salt water, chlorinated water) will eventually wear out the components. Performance will degrade and servicing will be necessary.

With the composite impellers and diffusers, galvanic corrosion in the pump end is greatly reduced. However, it is highly recommended to flush with clean water and to dry the pump to avoid corrosion of the metal parts.

Before Disassembly or Assembly

- Read and follow all instructions thoroughly and carefully.
- Ensure shaft, bores, screws, etc. are free of burrs and lubricants.

Standard Tools Required

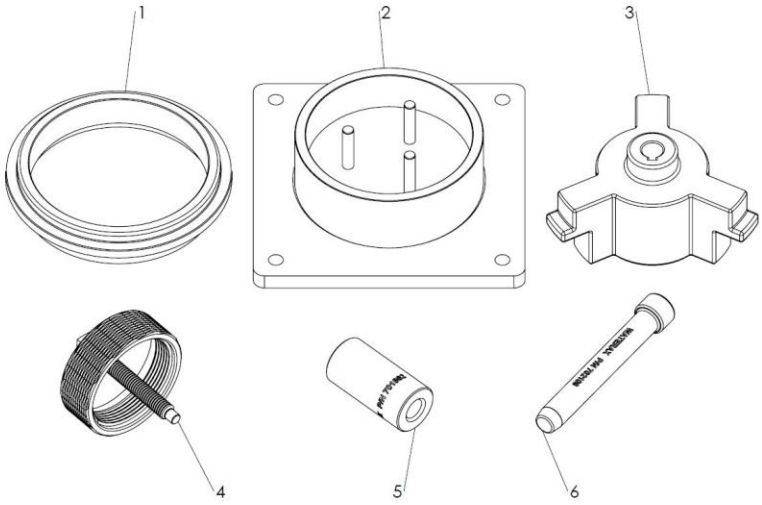
- SAE Socket wrench with the following socket:
  - 17 mm deep socket
- Strap Wrench
- Hex Bit Socket (Socket Drive Allen):
  - 5mm
- Retaining Ring Pliers for internal retaining rings.

MINI-MARK® Pump End Tools

Note that the assembly and disassembly of the pump-end can be achieved without the tools below. However, these tools will make it easier to service the pump-end. Consider acquiring a set of tools if you regularly service several pump-ends.

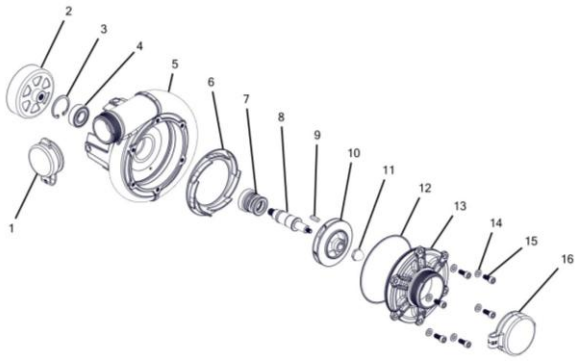
Parts breakdown

ID	ITEM NO	DESCRIPTION	QTY.
1	702265	FIXTURE DISASSEMBLY PUMP END MINI-MARK	1
2	702266	FIXTURE ASSEMBLY PUMP END MINI-MARK	1
3	702267	FIXTURE SHAFT ASSEMBLY PUMP END MINI-MARK	1
4	600079	A-1888 TOOL SUCTION COVER PULLER	1
5	701862	TOOL BEARING PRESSING PUMP END WATSON	1
6	702109	TOOL PRESSING PIN DISASSEMBLY PUMP END WATSON	1



Parts breakdown

ID	ITEM NO	DESCRIPTION	QTY
--	600636	PUMP END MINI-MARK®	--
1	700023	A-5536 PROTECTIVE CAP FOR 1-1/2" DISCHARGE	1
2	702180	BELL CLUTCH MINI-MARK®	1
3	702212	RETAINING RING INTERNAL 35MM BLACK PHOSPH. STEEL	1
4	702198	BALL BEARING MINI-MARK®	1
5	702205	PUMP BODY MACHINED PAINTED MINI-MARK®	1
6	702188	VANE INSERT MINI-MARK®	1
7	700002	C-6970-5 SEAL TYPE 21 CUP SEAT	1
8	702194	SHAFT PUMP MINI-MARK®	1
9	702214	MACHINE KEY ROUND 4X4X18MM SS MINI-MARK®	1
10	702200	IMPELLER MINI-MARK®	1
11	701871	NOSE SUCTION WATSON	1
12	701841	O-RING #046, BUNA-N, 70 DURO	1
13	702201	SUCTION COVER MACHINED PAINTED MINI-MARK®	1
14	701935	WASHER M6 FLAT 6.3MM X 12MM SS DIN125	6
15	702213	SCREW M6X1.0X14 HEX SOCKET CAP SS DIN912	6
16	700022	A-5537 PROTECTIVE CAP FOR 2" SUCTION	1



Disassembly

The numbers in the procedures below refer to the parts breakdown above.

1. Place the pump end on the assembly fixture 702266. Make sure the bell clutch (2) openings align with the pins of the fixture.
2. Remove the suction nose (11) using a 17 mm deep socket.
3. Remove the suction cover screws (15).
4. Remove the suction cover (13) using the suction cover puller 600079.
5. Remove the impeller (10).
6. Remove the vane insert (6) from the pump body (5).
7. Place the pump end facing down on the shaft assembly fixture 702267 making sure that the shaft key (9) is still in place.
8. Remove the bell clutch (8) using a 17mm socket.
9. Remove the pump end and place the disassembly fixture 702265 onto the assembly fixture 702666.
10. Place the pump end upside down on the disassembly fixture 702265.
11. Press out the shaft (8) from the bearing (4) using the pressing pin tool 702109. The rotating part of the seal (7) should come out with the shaft
12. Remove the retaining ring (3) using retaining ring pliers.
13. Place the pump end facing up on the assembly fixture 702266 and press out the bearing (4) through the mechanical seal's (7) inner diameter.
14. Place the pump upside down on the disassembly fixture 702265 and press out the stationary part of the mechanical seal (7) from the pump body (5).

Important: It is recommended to discard the O-ring and replace it with a new one.

Important: The mechanical rotary seal should be replaced after pump end disassembly to prevent the risk of leakage.

Important: When reusing components, carefully inspect the parts. Ensure that key dimensions are within acceptable limits. Visually inspect the parts for pitting, worn vanes, damaged threads, damaged gasket faces, excessive corrosion, deformation, etc. Discard any component that is not within acceptable standards. Ensure that the components are clean before installing.

Warning: It is important to respect the specified torque and application of Loctite® where specified. **Refer to the torque table at the end of the manual for torque values and Loctite requirements.**

Assembly

The numbers in the procedures below refer to the parts breakdown above.

1. Slide the bearing (4) in the pump body (5).
2. Place the pump body (5) on the assembly fixture 702266.
3. Install the seal seat (7) (portion with a cup gasket) into the pump body (5).
   a) Apply **P-80 lubricant** on the cup gasket.
   b) **Carefully** press the seal seat until it bottoms out. **Verify that the seat is properly seated.**
   c) Using a lint free wipe and 99% isopropyl alcohol, clean the seal seat face to remove any trace of contaminants.

Important: Do not apply grease as a lubricant. Grease can contaminate the sealing face and cause the seal to leak.

4. Install the rotary portion of the seal (7) onto the shaft (8).
   a) Apply P-80 lubricant on the seal (7) Viton® bellows and the pump shaft.
   b) Carefully slide and set the seal onto the shaft. Ensure that spring cup is present.
   c) Using a lint free wipe and 99% isopropyl alcohol, clean the seal's carbon face to remove any trace of contaminants.
   d) Install the key on the shaft.
   e) Flip the shaft upside down and slide the shaft (8) with the seal in place into the shaft assembly fixture 702267.
   f) Using a lint free wipe and 99% isopropyl alcohol, clean the seal carbon face to remove any trace of contaminants.

Important: P-80 is a temporary lubricant that dries off. Install the components quickly; otherwise, the seal could get damaged during the installation.

5. **Carefully** slide the pump body onto the seal and shaft.
6. Align the bearing bore with the shaft (4) also align the bearing pressing tool 701862 with the bearing inner race and press the bearing all the way down. This will move the pump body down on the shaft.
7. Install the retaining ring (3) to fix the bearing in place.

8. Install the bell clutch (2) onto the shaft threads. Apply **Loctite 243** on the bell clutch (2). Tighten to **18.4 lb-ft (25 Nm)** using a 17 mm socket.
9. Place the pump end on the assembly fixture, aligning the clutch bell openings align with the fixture pins.
10. Install the volute vane insert (6) in the pump body (5). Align the position post to the corresponding hole in the volute.
11. Slide the impeller (10) on the shaft (8) until it bottoms out.
12. Apply a light amount of O-ring lubricant (Molykote 55) and install the O-ring (12) on the suction cover (13).
13. Apply P-80 lubricant on the interior wall of the pump body (5).
14. Align suction cover (13) holes with corresponding threaded holes in the pump body (5). Press suction cover into the pump body (5).
15. Install the suction cover screws and washers (15, 14) using a **torque of 5.2 lb-ft (7 Nm)** in a crisscross pattern.
16. Install the suction nose (11). Apply **Loctite 243** and tighten to **5.2 lb-ft (7 Nm)**.

Fuel Line

Parts breakdown (Mercury)

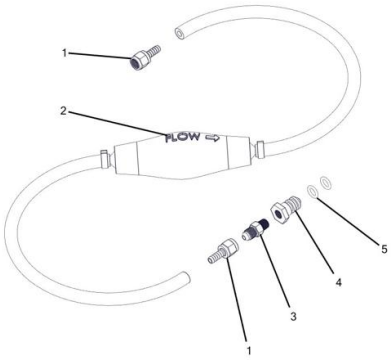
ID	ITEM NO	DESCRIPTION	QTY
--	600605*	12-401B-NSC COMPLETE FUEL LINE, STANDARD STYLE	--
1	800864	FA-451 FEM QUICK-CONNECT	1
2	600389	12-405-1 FUEL LINE PRIMING BULB	1
3	700017	12-65 COUPLING SWIVEL	1
4	800814	R-732 CONNECTOR 1/4"TUBE X 1/8"NPT	1
5	700100	A-7487 DUST CAP - FEM CONNECTOR, NITRILE	1
6	800802	R-712 HANDLE QUICK CONNECT, FEM	1

* Fuel line compatible with FA-552Q fuel air transport tank (600429)

Parts breakdown (USFS)

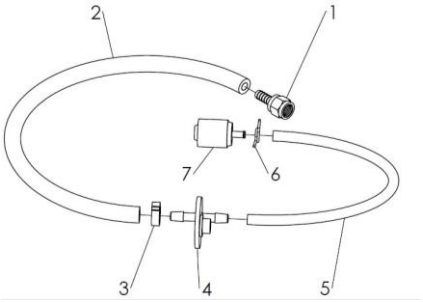
ID	ITEM NO	DESCRIPTION	QTY
--	600136	R-1206A-GSA 5' FUEL LINE PRIMING BULB SAE FEM END	--
1	700017	12-65 COUPLING SWIVEL	2
2	600389	12-405-1 FUEL LINE PRIMING BULB	1
3	800814	R-732 CONNECTOR 1/4"TUBE X 1/8"NPT	1
4	700660	A-7505 MALE PLUG	1
5	700715	O-RING-10 O-RING 9/16""ODX3/8"IDX3/32"THK	2

* Fuel line compatible with FA-352GSA-N jerry can (600376)



Parts breakdown

ID	ITEM NO	DESCRIPTION	QTY.
--	600638	FUEL LINE W VACUUM RELIEF SAE45 WATSON	--
1	700017	12-65 COUPLING SWIVEL	1
2	800866	QHOSFS1/4X1B BRAIDED HOSE 1/4"ID X1/2"OD	3.54
3	800440	12-406N SINGLE EAR OETIKER CLAMP .476" TO .551"	1
4	302328	VACUUM RELIEF DISC FOR FUEL TANK	1
5	700728	QGASLIHOSE HOSE 3/16"ID X 5/16""OD. /FT	1.75
6	800406	B-5880-7 CLIP, RETAINING	1
7	800151	B-5880-9 BACK-UP FILTER	1



Fuel Tank

Parts breakdown (Mercury)

ID	ITEM NO	DESCRIPTION	QTY
--	600429	FA-552Q FUEL AIR TRANSPORT TANK WITH QUICK CONNECT	--
1	700698	FA-131M FUEL TANK, OLIVE DRAB	1
2	600064	B-7462 FUEL LINE SUB-ASSEMBLY FOR FA-552Q	1

Parts breakdown (USFS)

ID	ITEM NO	DESCRIPTION	QTY
1	600376	FA-352GSA-N 5 GAL (19L) JERRY CAN, METAL	1

TECHNICAL DATA

Specifications – Pump Unit

Dimensions (L x W x H)	13.1 x 12 x 12.8 in	333 x 305 x 324 mm
Weight (dry)	18.5 lbs	8.4 kg
Sound level	Maximum 105 dBA	
Exhaust	Stainless steel with protective heat shield	
Air filter	Foam	
Fuel system	Diaphragm carburetor with integrated fuel pump and stand-alone purge bulb	
Fuel	87 octane unleaded automotive gasoline, max. 10% ethanol Two-cycle mixing oil for air cooled engine. Recommended certification: API-TC, JASO-FD and ISO-L-EGD. Recommended: Amsoil Saber® Professional Synthetic Fuel mix ratio: 50:1 (gasoline to oil)	
Optional Fuel connections	Fuel Valve Kit with SAE 45°. Mercury adaptor available as an add-on.	
Starter	Mechanical rewind starter	
Spark plug	NGK BPM8Y, M14	
Ignition	CDIM, capacitive discharge ignition module	
User Interface Module	Off button with overspeed safety cut-off	
Backpackable frame	Composite frame with integrated backboard	
Carry handle	Composite handle	

Specifications – Pump End

Type	Centrifugal, detachable	
Number of stages	One	
Suction (intake) port	2” [51 mm] NPSH male	
Discharge port	1-1/2” [38 mm] NPSH male	
Maximum head	196 ft	60 m
Maximum pressure	85 psi	6 bar
Maximum flow	102 US gpm	386 L/min
Volute and cover	Anodized aluminum alloy	
Impeller	Composite PPS GF reinforced	
Volute Vane Insert	Composite PPS GF reinforced	
Seal	Balanced elastomeric bellows and silicon carbide mechanical rotary seal	
Bearing	Maintenance-free 5/8in single row sealed ball bearing	
Shaft	Stainless steel	
Coupling	Clutch Bell, plated steel for corrosion resistance.	

Torque Values

Component	Fastener	Thread Size	Torque			Loctite®
			Nm	Lb-in	Lb-ft	
Engine Bracket to Engine	Screw	M6	7	62	5.2	243
Frame to Engine Bracket	Screw	M8	25	221	18.4	243
Throttle Assembly	Screw	M4	4	35.4	2.9	243
Control Button Assembly	Screw	M5-Button	3	26.6	2.2	222
Pump End – Bell Clutch	-	M10	25	221	18.4	243
Pump End – Nose Suction	-	M6	7	62	5.2	243
Pump End – Suction Cover	Screw	M6	7	62	5.2	-
Pump End – Engine Bracket	Screw	M6	7	62	5.2	-
Carry Handle	Screw	M6	7	62	5.2	-

NOTES

WARRANTY

WHEREAS subject to the following general and specific terms and conditions, WATERAX Inc. (the "**Seller**") hereby warrants to the original purchaser of the products from WATERAX, (the "**Purchaser**") that its products, including any pump parts products manufactured by WATERAX (the "**Products**") sold under Seller's brands will be free of defects in material and workmanship for the applicable Warranty Period (as set out in full at www.waterax.com/eng/warranty).

Product	Warranty Period	Coverage
4-Stroke Powered Pumps	Two (2) Years	Limited
2-Stroke Powered Pumps	Earlier of Two (2) Years or One hundred (100) run hours	Limited
Control Panels, Electronics Manifolds	One (1) Year	Limited
Genuine Parts	Ninety (90) Days	Limited

1. **Limitations, exclusions and other terms and conditions applicable for all Products:**

   a. The Warranty shall be voided upon the occurrence of any of the following events: (a) the Product is used for an application, with products or in a manner other than the application, products and manner for which such Product is designed and intended; (b) the Product is subjected to a use, service, condition or environment other than a use, service, condition or environment for which such Product is designed and intended; (c) the Product is not properly installed by the Purchaser or its agent or representative; (d) the Product is not properly tested and maintained in accordance with Seller's product manuals and supplemental instructions and guidelines, applicable industry standards and guidelines, and applicable legal and regulatory requirements; (e) the Product is altered, modified, serviced (with the exception of routine maintenance performed in accordance with the Seller's product manuals and supplemental instructions as set out in full at www.waterax.com/eng/warranty, and industry accepted standards and guidelines), or repaired by a person other than the Seller or a person authorized by the Seller to make such alteration or modification or perform such service or repair; (f) the Seller is not paid the full amount of the purchase price for the Product when due; (g) any bad faith invocation of a warranty claim or breach of a purchase agreement by the Purchaser.

   b. The following are excluded from Warranty coverage: (a) non-defective parts worn, exhausted or consumed through normal usage of the Product; (b) any consumable parts normally subject to routine replacement, including but not limited to pump packing, O- rings, gaskets, intake screens, anodes or filters; (c) routine maintenance as specified and in accordance with the Seller's product manuals and supplemental instructions and guidelines as set out in full at www.waterax.com/eng/warranty; (d) failure due to compliance with a specification or design provided or required by Purchaser; (e) failure due to improper operation, excess pressure, excess voltage, abuse, misuse, negligence or accidents or other similar causes; (f) failure due to operator error; (g) damage during or after shipment and failure attributable thereto or resulting there from; (h) failure attributable to or resulting from the failure or substandard, inadequate or improper performance of any part, component or equipment not supplied by the Seller; (i) failure attributable to or resulting from the failure or substandard, inadequate or improper performance of any third party part, component, product or equipment, whether or not combined, packaged, incorporated, installed or used with a Seller brand part, component, product or equipment.

2. **Claim Procedure.** The claim procedure applicable under this warranty, including any applicable notice and documentation requirements, are set out in full at www.waterax.com/eng/warranty and constitute an essential term of this Warranty.

3. **Repaired and Replacement Product.** If requested to do so by the Purchaser the Seller may, at its sole option and in its sole discretion, supply a replacement Product or part to the Purchaser prior to making a final determination as to whether Warranty Coverage is available.

   If the Seller ultimately determines that no Warranty Coverage is available for a Product claimed to be defective, the Purchaser shall have the option of either (a) having the Product returned to it freight collect without repair or replacement; or (b) if Seller determines that the Product is repairable, have the Product repaired by Seller or another party designated by it on a time and materials basis at Seller's then current standard charges for non-warranty repairs and then returned to Purchaser freight collect. The Seller reserves the right to use reconditioned parts for Warranty repairs and to use reconditioned Products for Warranty replacements. Repaired Product and replacement Product shall be warranted only for the remainder of the original Warranty Period.

4. **Limitation of Liability:** SELLER'S WARRANTY AS SET FORTH HEREIN IS SELLER'S SOLE AND EXCLUSIVE WARRANTY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ALL WARRANTIES OF MERCHANTABILITY, QUALITY, COURSE OF DEALING, USAGE OF TRADE, FITNESS FOR A PARTICULAR PURPOSE AND NON-INFRINGEMENT. THE RIGHTS AND REMEDIES SET FORTH HEREIN ARE THE SOLE AND EXCLUSIVE RIGHTS AND REMEDIES AGAINST SELLER, EXCEPT FOR THE SPECIFIC LIABILITIES AND OBLIGATIONS PROVIDED HEREIN, SELLER SHALL HAVE NO LIABILITY OR OBLIGATION WITH RESPECT TO ANY PRODUCT CLAIMED TO BE DEFECTIVE IN ANY MANNER

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To help you stay **#ReadyForWildfires**, we've made a few changes, placing 100% of our focus on manufacturing our core products, portable fire pumps. To do so, we've established a network of trusted supply and distribution partners that can help us provide *WATERAX* pumps quickly in addition to water-handling equipment and accessories.

For immediate assistance when it comes to pumps and water-handling accessories, please contact your local dealer.

For genuine spare parts, visit our online store.