

OPERATION MANUAL



MODELS
MQD2HA
MQD3HA
DIAPHRAGM PUMP
(HONDA GX120UT1QX2 GASOLINE ENGINE)

Revision #1 (10/08/20)



THIS MANUAL MUST ACCOMPANY THE EQUIPMENT AT ALL TIMES.

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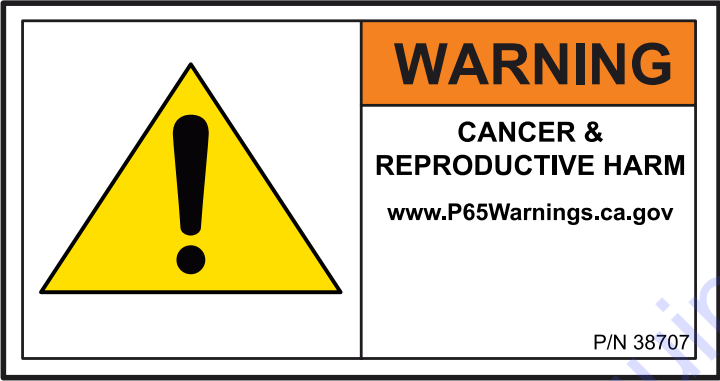
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PROPOSITION 65 WARNING



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MQD2H/3H Diaphragm Pumps

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NOTICE

Specifications and part numbers are subject to change without notice.

SAFETY INFORMATION

Do not operate or service the equipment before reading the entire manual. Safety precautions should be followed at all times when operating this equipment. Failure to read and understand the safety messages and operating instructions could result in injury to yourself and others.



SAFETY MESSAGES

The four safety messages shown below will inform you about potential hazards that could injure you or others. The safety messages specifically address the level of exposure to the operator and are preceded by one of four words: **DANGER**, **WARNING**, **CAUTION** or **NOTICE**.

SAFETY SYMBOLS

! DANGER

Indicates a hazardous situation which, if not avoided, **WILL** result in **DEATH** or **SERIOUS INJURY**.

! WARNING

Indicates a hazardous situation which, if not avoided, **COULD** result in **DEATH** or **SERIOUS INJURY**.

! CAUTION

Indicates a hazardous situation which, if not avoided, **COULD** result in **MINOR** or **MODERATE INJURY**.

NOTICE

Addresses practices not related to personal injury.

Potential hazards associated with the operation of this equipment will be referenced with hazard symbols which may appear throughout this manual in conjunction with safety messages.

Symbol	Safety Hazard
	Lethal exhaust gas hazards
	Explosive fuel hazards
	Burn hazards
	Respiratory hazards
	Accidental starting hazards
	Eye and hearing hazards
	Pressure hazards

SAFETY INFORMATION

GENERAL SAFETY

CAUTION

- **NEVER** operate this equipment without proper protective clothing, shatterproof glasses, respiratory protection, hearing protection, steel-toed boots and other protective devices required by the job or city and state regulations.



- Avoid wearing jewelry or loose fitting clothes that may snag on the controls or moving parts as this can cause serious injury.

- **NEVER** operate this equipment when not feeling well due to fatigue, illness or when under medication.



- **NEVER** operate this equipment under the influence of drugs or alcohol.



- **ALWAYS** clear the work area of any debris, tools, etc. that would constitute a hazard while the equipment is in operation.

- No one other than the operator is to be in the working area when the equipment is in operation.

- **DO NOT** use the equipment for any purpose other than its intended purposes or applications.

NOTICE

- This equipment should only be operated by trained and qualified personnel 18 years of age and older.

- Whenever necessary, replace nameplate, operation and safety decals when they become difficult read.

- Manufacturer does not assume responsibility for any accident due to equipment modifications. Unauthorized equipment modification will void all warranties.

- **NEVER** use accessories or attachments that are not recommended by Multiquip for this equipment. Damage to the equipment and/or injury to user may result.

- **ALWAYS** know the location of the nearest fire extinguisher.



- **ALWAYS** know the location of the nearest first aid kit.



- **ALWAYS** know the location of the nearest phone or **keep a phone on the job site**. Also, know the phone numbers of the nearest **ambulance, doctor and fire department**. This information will be invaluable in the case of an emergency.



SAFETY INFORMATION

PUMP SAFETY

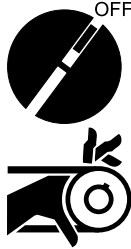
DANGER

- **NEVER** operate the equipment in an explosive atmosphere or near combustible materials. An explosion or fire could result causing severe **bodily harm or even death.**



WARNING

- Accidental starting can cause severe injury or death. **ALWAYS** place the ON/OFF switch in the OFF position.
- **DO NOT** place hands or fingers inside pump when pump is running.
- **NEVER** disconnect any **emergency or safety devices.** These devices are intended for operator safety. Disconnection of these devices can cause severe injury, bodily harm or even death. Disconnection of any of these devices will void all warranties.



CAUTION

- **DO NOT** restrict the flow of the discharge hose as it may cause overheating.
- Be careful of discharge whipping under pressure.

NOTICE

- **NEVER** operate the pump at extreme angles or slopes.
- **DO NOT** allow up to freeze in water.
- **NEVER** leave an open pump chamber unattended.
- **ALWAYS** keep the machine in proper running condition.
- **DO NOT** attempt to thaw-out a frozen pump by using a torch or other source of flame. Application of heat in this manner may heat the oil in the seal cavity above the critical point, causing pump damage.
- **DO NOT** pump water greater than 104° F.
- **DO NOT** pump liquids containing acid or alkali.
- **ALWAYS** check strainer before pumping. Make sure strainer is not clogged. Remove any large objects, dirt or debris from the strainer to prevent clogging.
- **ALWAYS** use a large basket strainer when pumping water that contains large debris.

- **ALWAYS** flush pump (clean) after use when pumping water concentrated with heavy debris. It is very important to always flush the pump before turning it off to prevent clogging.
- Fix damage to machine and replace any broken parts immediately.
- **ALWAYS** store equipment properly when it is not being used. Equipment should be stored in a clean, dry location out of the reach of children and unauthorized personnel.
- **NEVER** lubricate components or attempt service on a running machine.
- **ALWAYS** allow the machine a proper amount of time to cool before servicing.
- Keep machine in proper running condition.

LIFTING SAFETY

CAUTION

- When raising or lowering of the pump is required, always attach an adequate rope or lifting device to the correct lifting point (handle) on the pump.

NOTICE

- **DO NOT** lift machine to unnecessary heights.
- **NEVER** lift the equipment while the engine is running.

TRANSPORTING SAFETY

NOTICE

- **ALWAYS** shutdown pump before transporting.
- **ALWAYS** tie down equipment during transport by securing the equipment with rope.

ENVIRONMENTAL SAFETY

NOTICE

- Dispose of hazardous waste properly. Examples of potentially hazardous waste are used motor oil, fuel and fuel filters.
- **DO NOT** use food or plastic containers to dispose of hazardous waste.
- **DO NOT** pour waste, oil or fuel directly onto the ground, down a drain or into any water source.



SPECIFICATIONS

Table 2. Specifications (Pump)			
Pump	Model	MQD2HA	MQD3HA
	Type	Diaphragm Pump	Diaphragm Pump
	Suction & Discharge Size	2.00 in. (50.8 mm)	3.00 in. (76.2 mm)
	Maximum Pumping Capacity	50 gallons/minute (189.2 liters/minute)	90 gallons/minute (340.7 liters/minute)
	Max. Solids Diameter	1.50 in. (38.1 mm)	1-5/8 in (41.275 mm)
	Maximum Suction Lift	26 ft. (7.92 meters)	26 ft. (7.92 meters)
	Max. Head	25 ft. (7.62 meters)	25 ft. (7.62 meters)
Dry Net Weight		140 lbs. (63 Kg.)	160 lbs. (72 Kg.)

Table 1. Specifications (Engine)		
Engine	Model	HONDA GX120UT1QX2
	Type	Air-cooled 4 stroke, Single Cylinder, OHV, Horizontal Shaft Gasoline Engine
	Bore x Stroke	2.4 in. x 1.7 in. (60 mm x 42 mm)
	Displacement	119 cc (7.2 cu-in)
	Max Output	4.0 H.P./2,750 R.P.M.
	Fuel Tank Capacity	0.66 US gal. (2.5 liters)
	Fuel	Unleaded Automobile Gasoline
	Lube Oil Capacity	0.63 quart (0.60 liter)
	Speed Control Method	Centrifugal Fly-weight Type
	Starting Method	Recoil Start
Dimension (L x W x H)		11.7 x 13.4 x 12.5 in. (297 x 341 x 318 mm)
Dry Net Weight		28.7 lbs (13 Kg.)

Performance Curve - Diaphragm Pump
Pumps: MQD2HA / MQD3HA Engine: HONDA GX120
Power: 3.5 HP Suction: 2" & 3" Discharge: 2" & 3"

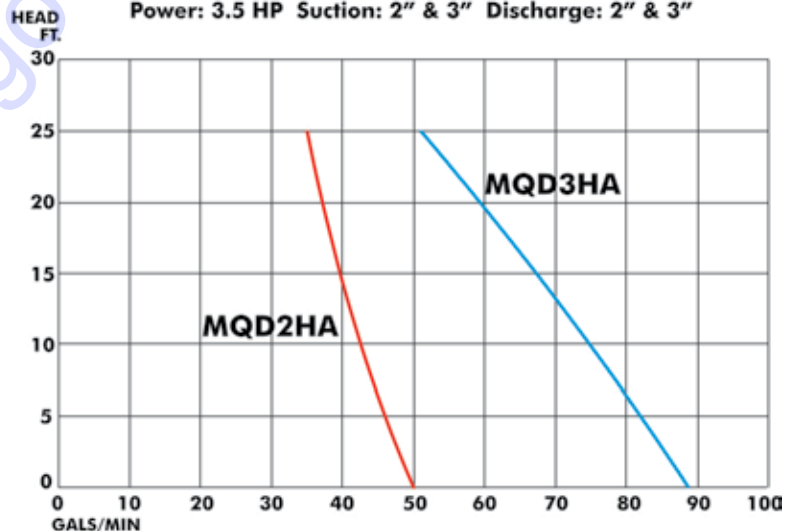


Figure 1. MQD2HA/MQD3HA Performance Curve

DIMENSIONS

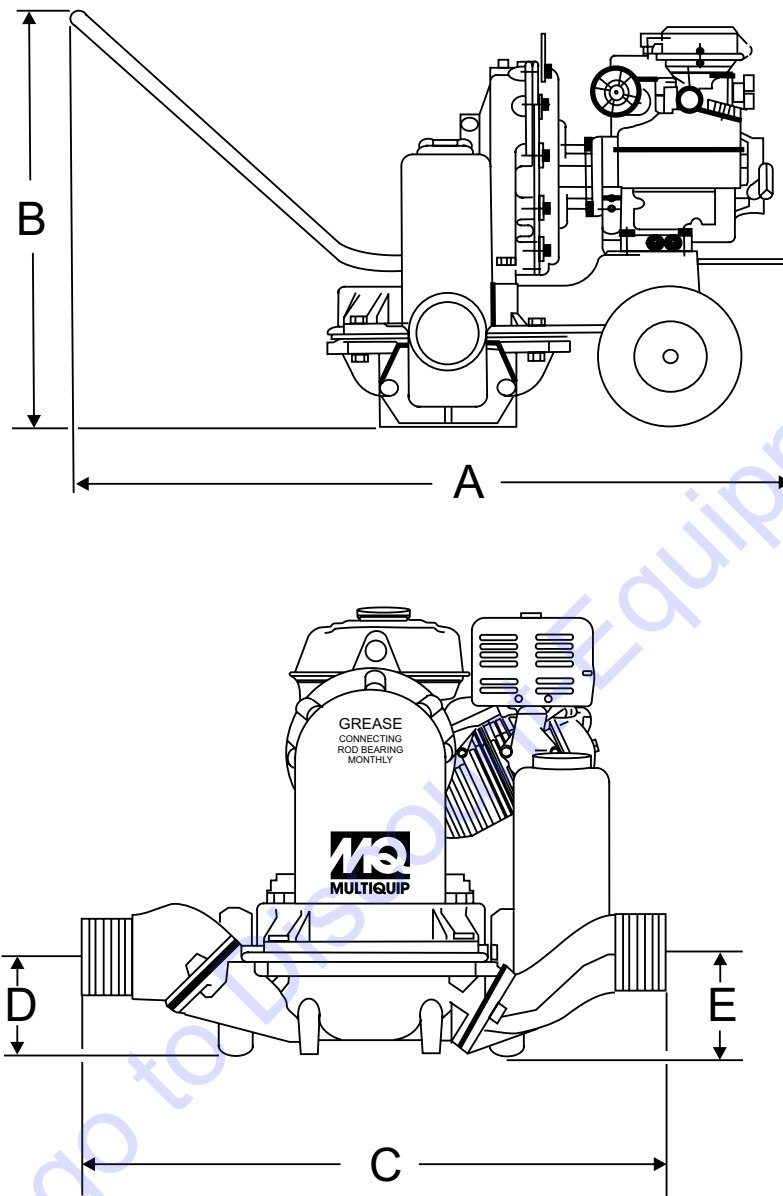


Figure 2. MQD2HA/3HA Dimensions

Table 3. Dimensions					
Model	A Length	B Height	C Width	D Discharge	E Suction
MQD2HA	39 in (99.06 cm.)	27.53 in. (69.93 cm.)	25.68 in. (65.23 cm.)	7.34 in. (18.64 cm.)	5.62 in. (14.27 cm.)
MQD3HA	41.5 in. (105.41 cm.)	22 in. (55.88 cm.)	30 in. (76.2 cm.)	6.2 in. (15.75 cm.)	6.3 in. (16 cm.)

GENERAL INFORMATION

APPLICATION

The MQD2H The models MQD2HA & MQD3HA diaphragm pumps are designed to be used on selected dewatering applications. The suction and discharge ports are NPT threaded and are 2" diameter for the MQD2HA and 3" in diameter for the MQD3HA.

The pumping flow rates (GPM) are dependent on the application, hose lengths, operating elevation, and fluid viscosity.

Power Plant

These diaphragm pumps are powered by a 4.0 horsepower air cooled, 4-stroke, single cylinder HONDA GX120 gasoline engine that incorporates a low "Oil Alert Feature". The drive shaft of the engine is coupled to an offset connecting rod that is coupled to a flexible diaphragm. The connecting rod alternately raises (expands) and lowers (contracts) the diaphragm at a rate of 60 cycles per minute at maximum engine RPM (2,750).

Oil Alert Feature

In the event of low oil or no oil, the HONDA GX120 engine has a built-in oil alarm engine shut-down feature. In the event the oil level is low the engine will automatically shut down.

Suction Lift

This pump is intended to be used for dewatering applications and is capable of suction lifts up to 25 feet at sea level. For optimal suction lift performance keep the suction hose or line as short as possible. In general, always place the pump as close to the water as possible.

Pump Support

The pump should always be placed on solid stationary ground in a level position.

NEVER place the pump on soft soil. The suction hose or pipe connection should always be checked for tightness and leaks. A small suction leak in the hose or fittings could prevent the pump from priming.

Elevation

Higher elevations will effect the performance of the pump. Due to less atmospheric pressure at higher altitudes, pumps do not have the priming ability that they have at sea level. This is due to the "thinner air" or lack of oxygen at higher altitudes.

A general rule of thumb is that for every 1,000 feet of elevation above sea level a pump will lose one foot of priming ability.

For example, in Flagstaff, Arizona where the elevation is approximately 7,000 feet, the pump would have a suction lift of only 18 feet rather than the 25 feet at sea level. Table 4 shows suction lift at various elevations.

Table 4. Suction Lift at Various Elevations

Altitude Feet (Meters)	Suction Lift in Feet (Meters)			
Sea Level	10.0 (3.048)	15.0 (4.572)	20.0 (6.096)	25.0 (7.620)
2,000 (610)	8.80 (2.680)	13.2 (4.023)	17.6 (5.364)	22.0 (6.705)
4,000 (1,219)	7.80 (2.377)	11.7 (3.566)	15.6 (4.754)	19.5 (5.943)
6,000 (1,829)	6.90 (2.103)	10.4 (3.169)	13.8 (4.206)	17.3 (5.273)
8,000 (2,438)	6.20 (1.889)	9.30 (2.834)	12.4 (3.779)	15.5 (4.724)
10,000 (3,048)	5.70 (1.737)	8.60 (2.621)	11.4 (3.474)	14.3 (4.358)

Table 5 shows percentage drops in performance as elevation increases.

Table 5. Performance Loss at Various Elevations

Altitude Feet (Meters)	Discharge Flow	Discharge Head
Sea Level	100%	100%
2,000 (610)	97%	95%
4,000 (1,219)	95%	91%
6,000 (1,829)	93%	87%
8,000 (2,438)	91%	83%
10,000 (3,048)	88%	78%

PUMP COMPONENTS

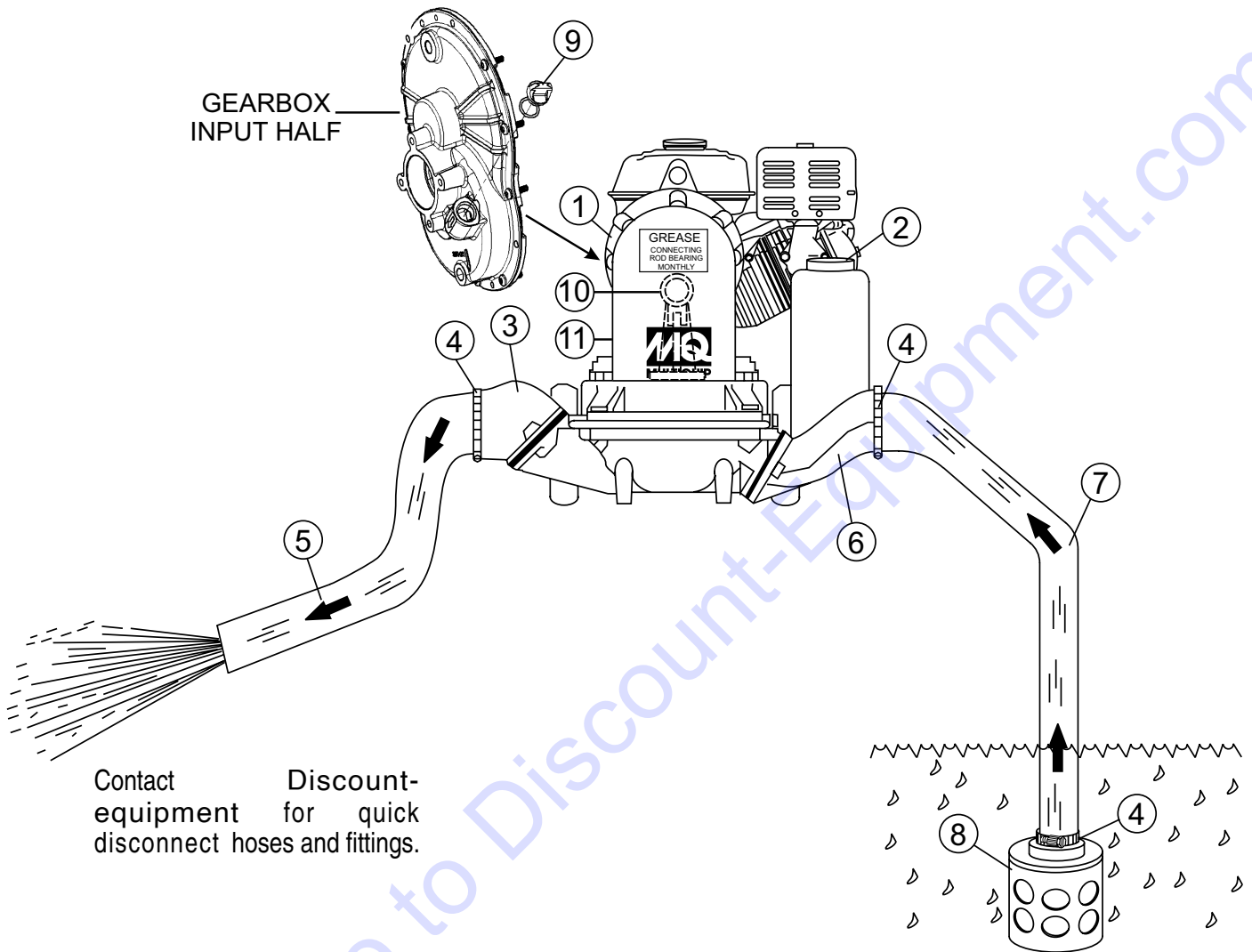


Figure 3. MQD2HA-3HA Key Components

PUMP COMPONENTS

Figure 3 shows key components of the MQD2HA/MQD3HA.

1. **Pump** — The Multiquip Models MQD2HA and MQD3HA are 2-inch and 3-inch diaphragm pumps respectively and are used in general dewatering applications. Typical dewatering applications consist of cleaning out cesspools and septic tanks, draining slow seepage from small excavations, trenches and construction sites, or pumping out industrial waste.
2. **Priming Plug/Suction Priming Chamber** — To help facilitate faster priming operations, fill chamber with clean water and secure priming plug.
3. **Discharge Port** — Connect either a 2-inch or 3-inch discharge hose to this port depending on pump model.
4. **NPT Connection** — Used to secure the hose to the inlet and outlet ports on the pump.
5. **Discharge Hose** — Connect a flexible rubber hose to the discharge port on the pump. Make sure that the hose lays flat and is not kinked. Use only recommended type discharge hose. Contact Discount-equipment for ordering information.
6. **Suction Port** — Connect either a 2-inch or 3-inch inlet hose to this port depending on pump model.
7. **Suction Hose** — Connect a flexible rubber hose to the suction port on the pump. Make sure that the hose lays flat and is not kinked. Use only recommended type suction hose. Contact Discount-equipment for ordering information.
8. **Strainer** — Always attach a strainer to bottom side of the suction hose to prevent large objects and debris from entering the pump. Strainer should be positioned so that it will remain completely under water.
9. **Transmission Oil Fill Plug** — Remove this plug to add SAE 80/90 EP (API GL-5) gear oil to the transmission. Transmission oil capacity is 22 ounces (651 ml).
10. **Connecting Rod** — Grease connecting rod bearing every 25 hours of operation. Remove plunger guard to gain access to bearing.
11. **Plunger Guard** — Protects connecting rod, waterbox, diaphragm and other associated components.

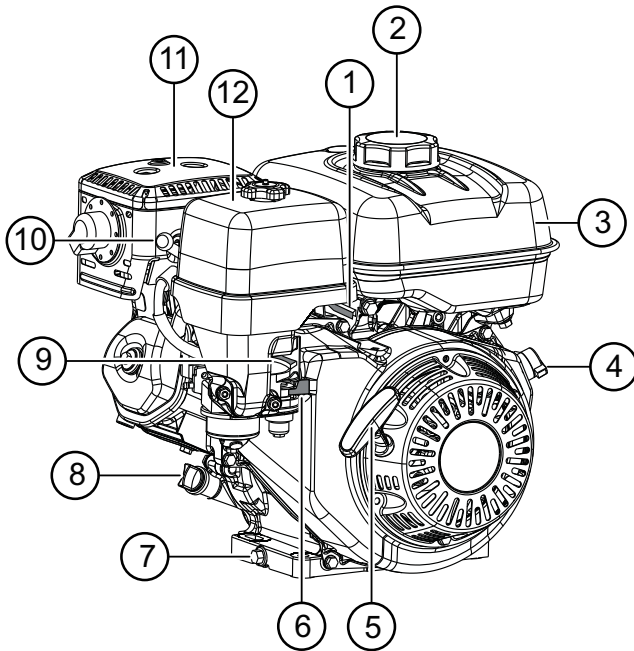


Figure 4. Engine Controls and Components

INITIAL SERVICING

The engine (See Figure 4) must be checked for proper lubrication and filled with fuel prior to operation. Refer to the manufacturer's engine manual for instructions and details of operation and servicing. The engine shown above is a HONDA engine, operation for other types of engines may vary somewhat.

1. **Throttle Lever** — Used to adjust engine RPM speed (lever advanced forward **SLOW**, lever back toward operator **FAST**).

DANGER



Adding fuel to the tank should be done only when the engine is stopped and has had an opportunity to cool down. In the event of a fuel spill, **DO NOT** attempt to start the engine until the fuel residue has been completely wiped up, and the area surrounding the engine is dry.

2. **Fuel Filler Cap** — Remove this cap to add unleaded gasoline to the fuel tank. Make sure cap is tightened securely. **DO NOT** over fill.

3. **Fuel Tank** — Holds unleaded gasoline. For additional information refer to engine owner's manual.
4. **Engine ON/OFF Switch** — ON position permits engine starting, OFF position stops engine operations.
5. **Recoil Starter (pull rope)** — Manual-starting method. Pull the starter grip until resistance is felt, then pull briskly and smoothly.
6. **Fuel Valve Lever** — **OPEN** to let fuel flow, **CLOSE** to stop the flow of fuel.
7. **Oil Drain Plug** — Remove this plug to remove oil from the engine's crankcase.
8. **Dipstick/Oil Filler Cap** — Remove this cap to determine if the engine oil is low. Add oil through this filler port as recommended in Table 1.
9. **Choke Lever** — Used in the starting of a cold engine, or in cold weather conditions. The choke enriches the fuel mixture.
10. **Spark Plug** — Provides spark to the ignition system. Set spark plug gap to 0.6 - 0.7 mm (0.028 - 0.031 inch). Clean spark plug once a week.
11. **Muffler** — Used to reduce noise and emissions.

WARNING



Engine components can generate extreme heat. To prevent burns, **DO NOT** touch these areas while the engine is running or immediately after operating. **NEVER** operate the engine with the muffler removed.

12. **Air Filter** — Prevents dirt and other debris from entering the fuel system. Remove wing-nut on top of air filter cannister to gain access to filter element.

NOTICE

Operating the engine without an air filter, with a damaged air filter, or a filter in need of replacement will allow dirt to enter the engine, causing rapid engine wear.

INSPECTION (ENGINE)

CAUTION



DO NOT attempt to operate the pump until the Safety Information, General Information and Inspection sections of this manual have been read and thoroughly understood.

BEFORE STARTING

1. Read safety instructions at the beginning of manual.
2. Clean the pump, removing dirt and dust, particularly the engine cooling air inlet, carburetor and air cleaner.
3. Check the air filter for dirt and dust. If air filter is dirty, replace air filter with a new one as required.
4. Check carburetor for external dirt and dust. Clean with dry compressed air.
5. Check fastening nuts and bolts for tightness.

Engine Oil Check

1. To check the engine oil level, place the pump on secure level ground with the engine stopped.
2. Remove the filler dipstick from the engine oil filler hole (See Figure 5) and wipe clean.

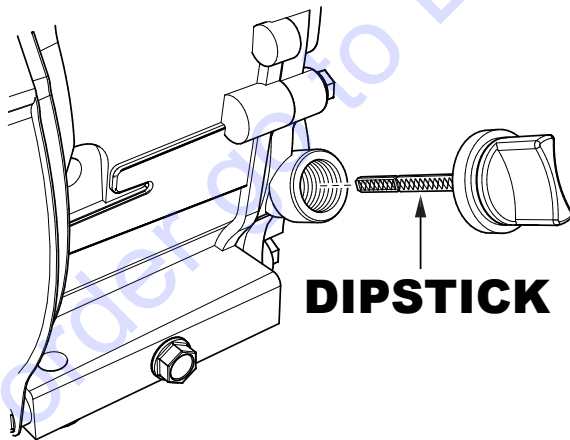


Figure 5. Engine Oil Dipstick (Removal)

3. Insert and remove the dipstick without screwing it into the filler neck. Check the oil level shown on the dipstick.
4. If the oil level is low (See Figure 6), fill to the edge of the oil filler hole with the recommended oil type (Table 6). Maximum oil capacity is 0.63 quarts (0.6 liters).

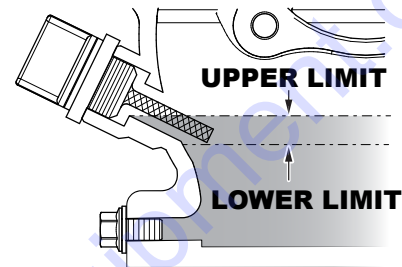


Figure 6. Engine Oil DipStick (Oil Level)

Table 6. Oil Type

Season	Temperature	Oil Type
Summer	25°C or Higher	SAE 10W-30
Spring/Fall	25°C~10°C	SAE 10W-30/20
Winter	0°C or Lower	SAE 10W-10

DANGER



Motor fuels are highly flammable and can be dangerous if mishandled. **DO NOT** smoke while refueling. **DO NOT** attempt to refuel the pump if the engine is **hot or running**.

Fuel Check

1. Remove the gasoline cap located on top of fuel tank.
2. Visually inspect to see if the fuel level is low. If fuel is low, replenish with unleaded fuel.
3. When refueling, be sure to use a strainer for filtration. **DO NOT** top-off fuel. Wipe up any spilled fuel **immediately!**

HANDLE INSTALLATION

CAUTION

Failure to follow instructions and properly install handle, mounting screws with washers, and torque mounting screws, will result in damage or premature failure to gearbox, base or other pump components.

The MQD2HA/D3HA diaphragm pumps are completely assembled except for the steering handle. Attach the steering handle to the pump base as referenced below:

1. Align handle mounting holes with front holes on gearbox feet as shown in Figure 7.
2. Insert 1/2"-13 hex screw (2) with 1/2" washer (2) through hole opening in handle and attach to gearbox feet.
3. Secure handle using two 1/2"-13 flange nuts. Tighten securely.

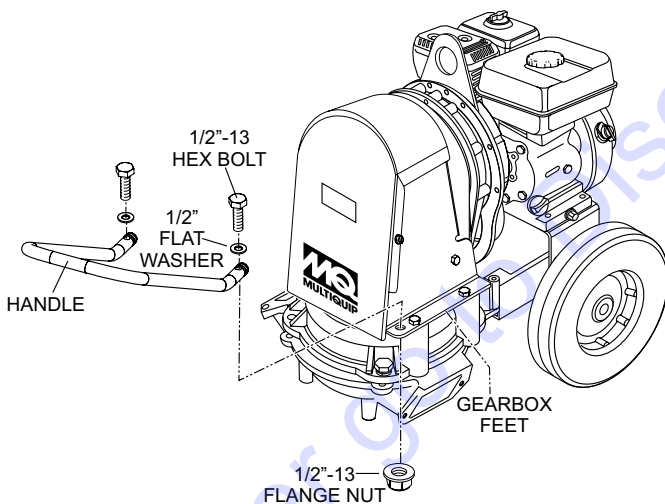


Figure 7. Handle Installation

BEFORE STARTING

1. Read safety instructions at the beginning of manual.
2. Place pump as near to the water as possible, on a firm, flat and level surface.

WARNING

DO NOT open fill cap if pump is hot! Water inside may be under pressure.

HOSES AND CLAMPS

1. Check that all hoses are securely attached to the pump. Make certain suction hose (Figure 2) does not have any air leakage. Use teflon tape or pipe dope on NPT threads.
2. Remember suction hoses must be rigid enough not to collapse when the pump is in operation.
3. Check that the discharge hose (Figure 2) is not restricted. Place hose so that it lays as straight as it is possible on the ground. Remove any twists or sharp bends from hose which may block the flow of water.

NOTICE

Suction and discharge hoses are available from Multiquip. Contact Discount-equipment for more information.

4. The discharge hose is usually a collapsible (thin-walled) hose, however if a thin-walled discharge hose is not available, a rigid suction hose can be substituted in its place.
5. Make sure the suction strainer (Figure 2) is clean and securely attached to the water end of the suction hose. The strainer is designed to protect the pump by preventing large objects from being pulled into the pump.

CAUTION

Transmission fluid needs to be added prior to operation.

CAUTION

The strainer should be positioned so it will remain completely under water. Running the pump with the strainer above water for long periods can damage the pump.

CAUTION

DO NOT pump flammable fluids, corrosive chemicals or fluids containing toxic substances. These fluids can create potentially dangerous health and environmental hazards. Contact local authorities for assistance.

GEAR REDUCTION OIL (TRANSMISSION)

1. Remove the the two 1/4"-20 X 3/4" hex flange screws (Figure 9) that secure the plunger guard to the gearbox feet. Set plunger guard aside.
2. Next, remove the transmission oil fill plug and o-ring from gearbox input half as shown in Figure 8.

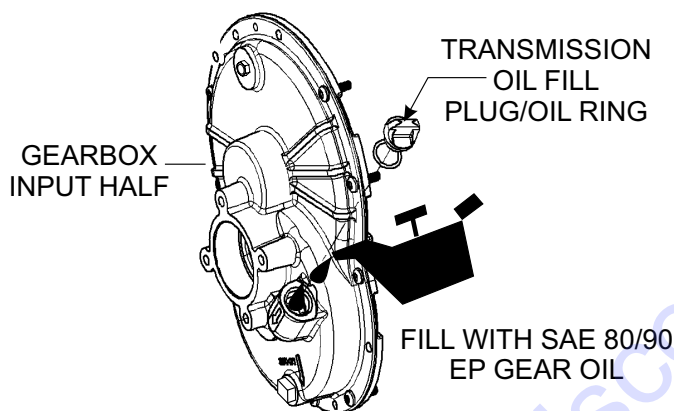


Figure 8. Transmission Oil Level

3. Fill with SAE 80/90 EP (API GL-5) gear oil to the proper operating level. Transmission oil capacity is capacity is 22 ounces (651 ml).
4. Reinstall plunger guard and transmission oil level plug.

NOTICE

Diaphragm pumps will handle fluids containing considerable solids (see Table 2 for maximum solids diameter), however, if the mixture is too heavy to be pumped, water must be added until the mixture becomes sufficiently fluid for pumping.

CONNECTING ROD BEARING LUBRICATION

1. Remove the two 1/4"-20 X 3/4" hex flange screws that secure plunger guard to the gearbox feet (Figure 9).

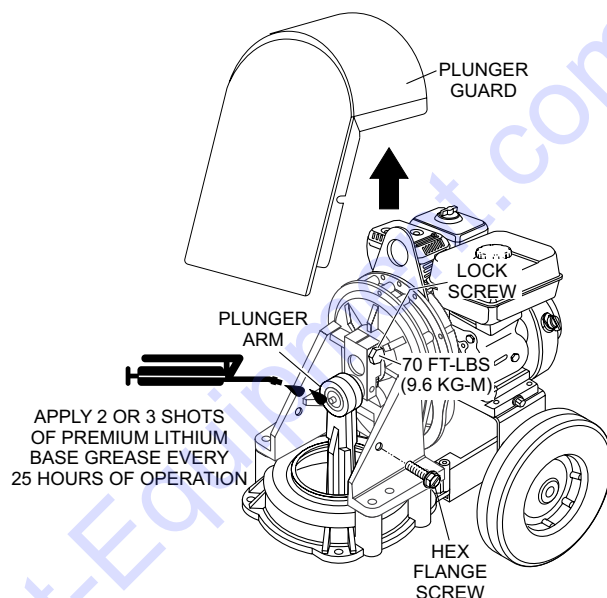


Figure 9. Connecting Rod Bearing Lubrication

2. Next, remove plunger guard and set aside.
3. Grease connecting rod bearing thru the access hole (Figure 8) every 25 hours of operation.
4. Use only premium lithium based grease, conforming to NLG1 Grade #2 consistency.
5. Reinstall plunger guard.

HELPFUL HINTS

The capacity of this diaphragm pump will vary greatly depending on the height of the suction lift and length of the discharge hose. A discharge hose which is too small, long or high will cause the following:

- Excessive bulging of diaphragm on the down stroke.
- Valves closing with a loud snap.
- Rough operation.
- Engine overloads and slow downs.
- Reduced efficiency.

OPERATION

CAUTION

This section is intended to assist the operator with the initial startup of the pump. It is extremely important that this section be read carefully before attempting to use the pump in the field.

STARTING THE ENGINE

1. Place the engine fuel valve lever (See Figure 10) to the **ON** position.

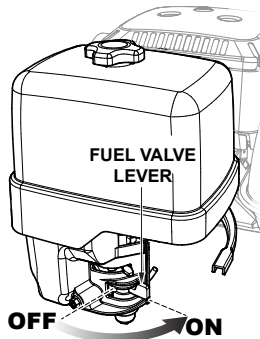


Figure 10. Engine Fuel Valve Lever (ON Position)

2. Move the throttle lever (See Figure 11) to idle position.

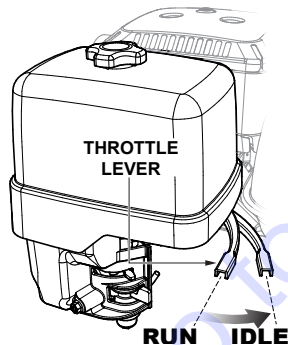


Figure 11. Throttle Lever (Idle Position)

3. Place the choke lever (See Figure 12) in the **CLOSED** position if starting a cold engine.

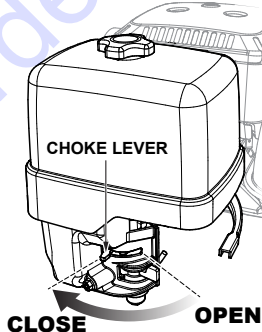


Figure 12. Engine Choke Lever (Closed)

4. Place the choke lever (See Figure 13) in the **OPEN** position if starting a warm engine or the temperature is warm.

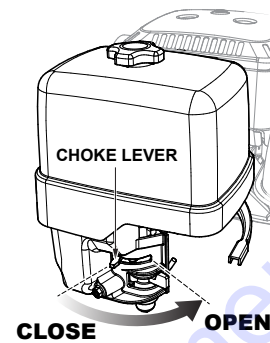


Figure 13. Engine Choke Lever (Open)

5. Place the engine **ON/OFF** switch (See Figure 14) in the **ON** position.

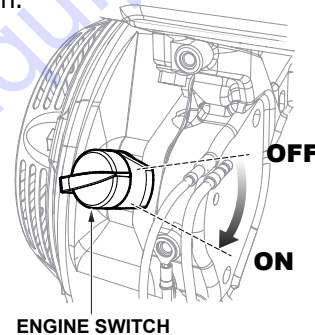


Figure 14. Engine ON/OFF Switch (ON Position)

6. Grasp the starter grip (See Figure 15) and slowly pull it out. The resistance becomes the hardest at a certain position, corresponding to the compression point. Pull the starter grip briskly and smoothly for starting.

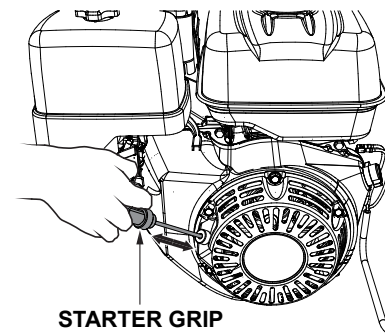


Figure 15. Starter Grip

7. If the engine has started and the choke lever was moved to the **CLOSED** position to start the engine, gradually move the choke lever to the **OPEN** position (Figure 16) as the engine warms up. If the engine has not started repeat steps 1 through 6.



Figure 16. Choke Lever (Open)

8. Before the pump is placed in to operation, run the engine for several minutes. Check for fuel leaks, and noises that would associate with a lose component.
9. To begin pumping, place the throttle lever (See Figure 17) in the **RUN** position. If water is not flowing out of the discharge port, turn off the engine and check for and clear any obstructions within the suction hose.

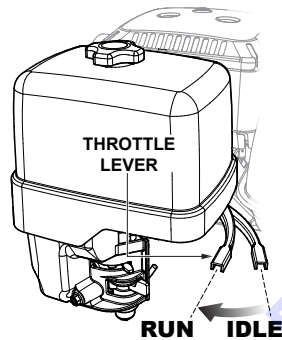


Figure 17. Throttle Lever (Run)

NOTICE

Pump speed can be regulated with the engine throttle control from full. volume, 65 strokes per pinute, to about 40 strokes per minute for lesser volume seepage. Smoothest operation can be determined by trying to pump at several speeds. Limit maximum speed to 65 strokes per minute of the diaphragm (2,800 RPM engine speed).

STOPPING THE ENGINE

Normal Shutdown

1. Move the throttle lever to the **IDLE** position (See Figure 18) and run the engine for three minutes at low speed.

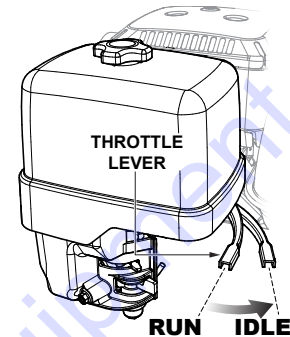


Figure 18. Throttle Lever (Idle)

2. After the engine cools, turn the engine **ON/OFF** switch to the **OFF** position (See Figure 19).

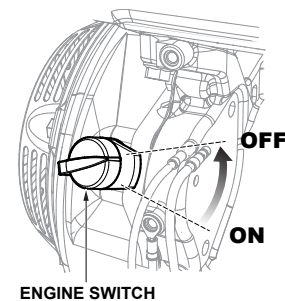


Figure 19. Engine ON/OFF Switch (OFF)

3. Place the fuel shut-off lever (See Figure 20) in the **OFF** position

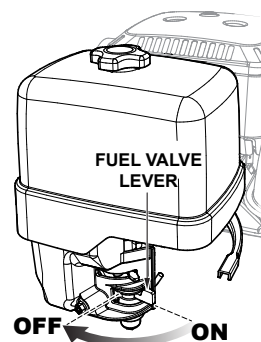


Figure 20. Fuel Valve Lever (OFF)

Emergency Shutdown

1. Move the throttle lever quickly to the **IDLE** position, and place the engine **ON/OFF** switch in the **OFF** position.

MAINTENANCE (PUMP)

PUMP VACUUM TEST

To perform the pump vacuum test do the following:

1. Start the engine as outlined in the initial start-up section, and wait for the pump to begin pumping.
2. Check and make sure that there are no air leaks between the vacuum tester and the inlet port on the pump (Figure 22). If air leaks are present reseal vacuum tester.
3. Run the pump for a few minutes while monitoring the vacuum gauge. If the gauge indicates a reading between -25 and -20 in. Hg. (inches of mercury) then it can be assumed that the pump is working correctly.

NOTICE

25 in. Hg (inches of mercury) translates into 25 feet of lift at **sea level**.

4. If the vacuum tester gauge indicates a reading below -20 in. Hg, it can then be assumed that the pump is not functioning correctly, and corrective action needs to be taken.
5. To test the flapper valve, shut down the engine. The vacuum tester should remain attached to the pump suction inlet port by vacuum. This indicates the pump's flapper valve is seating properly to hold water in the suction hose when the engine is stopped. This prevents backflow and allows for faster priming when the engine is restarted.

FLAPPER VALVE REPLACEMENT

1. Remove the two bolts that secure the suction port chamber (Figure 21) to the pump well. Remove suction port chamber. Replace valves as required and reassemble.

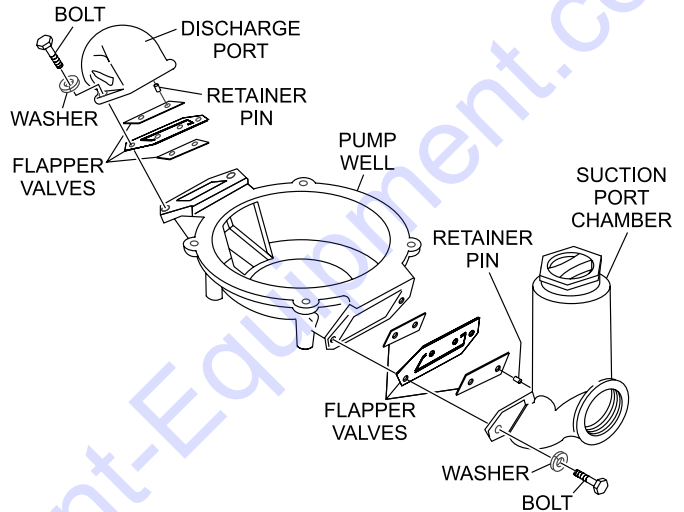


Figure 21. Flapper Valve Replacement

2. Remove the two bolts that secure the discharge port to the pump well. Remove discharge port plate. Replace valves as required and reassemble.

MAINTENANCE (PUMP)

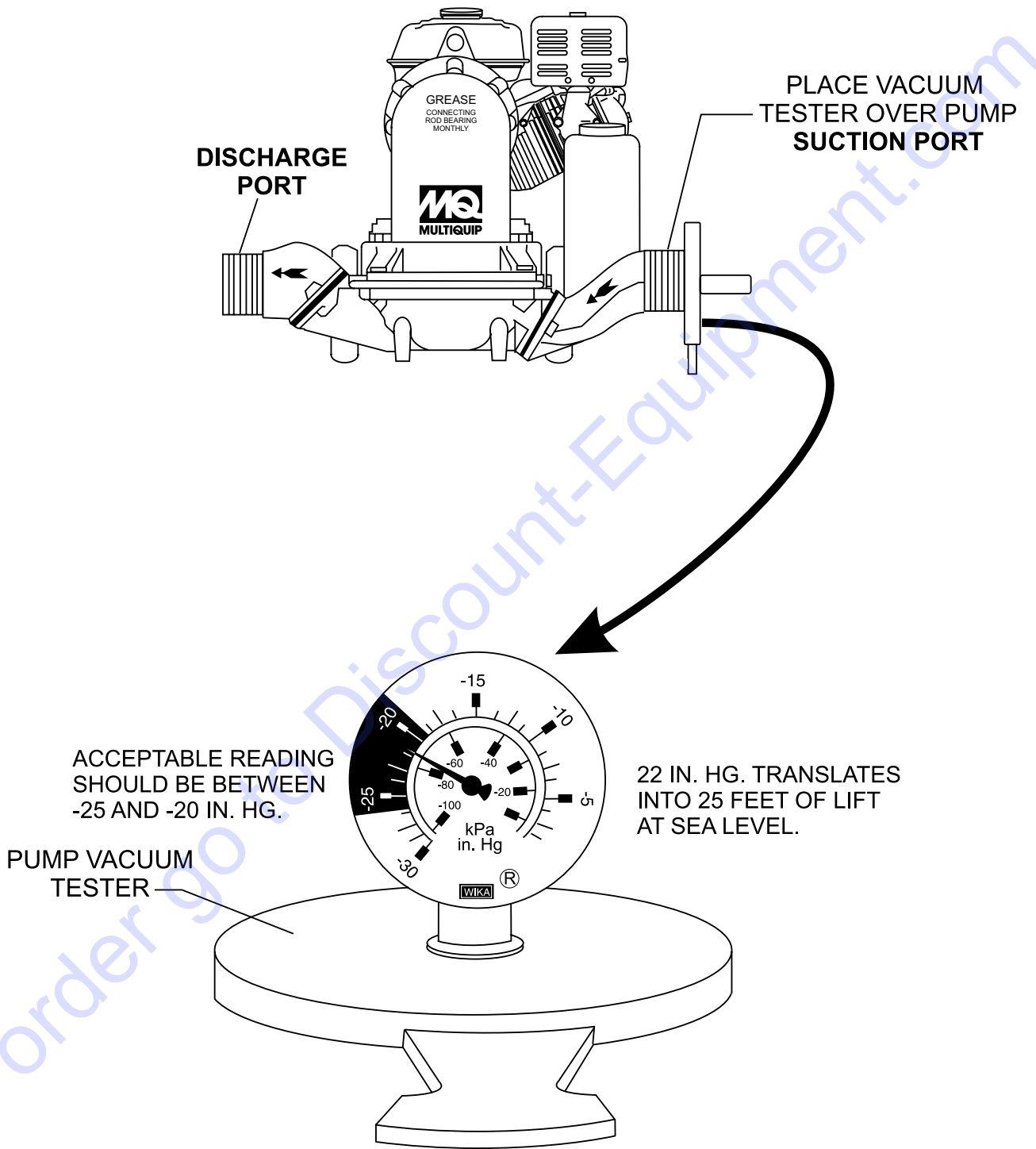


Figure 22. Pump Vacuum Tester

MAINTENANCE (PUMP)

ROTATION OF SUCTION AND DISCHARGE PORTS

In some applications, it may be preferable to have suction/discharge ports rotated 90° (Figure 23) to be in-line with the pump wheels. Perform the following procedure to rotate ports:

1. Remove the four hex head cap screws, hex nuts, flat washers and lock washers from the pump base.
2. Push pump well downwards to separate from pump base.
3. Rotate pump well 90° clockwise so that driver is positioned over top of discharge plate.
4. Align pump well, pump base, and diaphragm with each other. Once all components have been properly aligned, reinstall the four hex head cap screws, hex nuts, flat and lock washers and tighten securely.

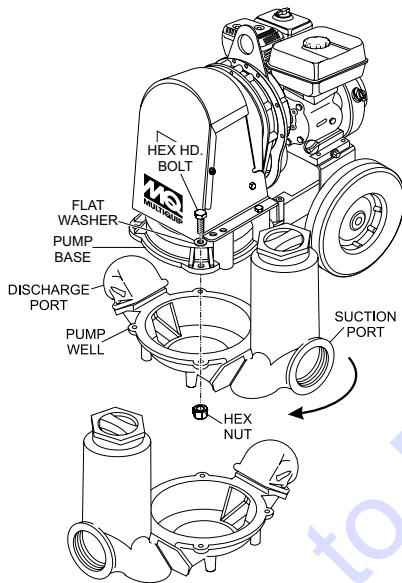


Figure 23. Suction/Discharge Port Rotation

CLEARING A JAM

If large solids or an accumulation of sand, silt or other sediment gather and become lodged in the pump well, the plunger arm may be prevented from making a normal full stroke. This action may cause the pump to stall, the crank to slip on the output shaft, and ultimately cause damage to the plunger arm.

Similarly, large damaging solids and debris may build in the pump well and if not removed, may cause extreme damage to the plunger arm and pump casing. If a jam or suspected debris build-up occurs, the pump must be thoroughly cleaned as described in the “Stalled/Stopped/Damaging Debris” Section.

CAUTION

During the course of pumping operations that include heavy debris laden fluids, the pump well **must** be checked for build-up of rocks, silt, sand and general debris. Failure to clean out the pump cavity (well) could result in damage to the plunger arm, and pump casing.

STALLED/STOPPED/DAMAGING DEBRIS

If pump has stalled, stopped, or has been engaged in moving heavy debris laden fluids, perform the following procedure:

1. Remove the four hex head cap screws, hex nuts, flat washers and lock washers from the pump base.
2. Push pump well downwards (Figure 24) to separate from pump base.
3. Clean and remove all dirt and debris from pump well.
4. Align pump well, pump base, and diaphragm with each other. Once all components have been properly aligned, reinstall the four hex head cap screws, hex nuts, flat and lock washers and tighten securely.

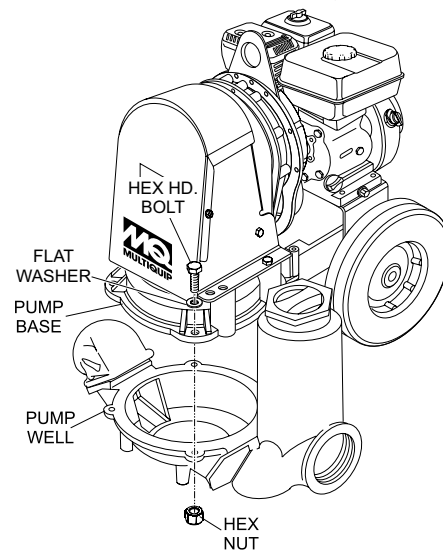


Figure 24. Pump Well (Clean-out)

WARNING

Pump jamming with an over-torqued lock screw (plunger arm) may cause internal damage. Under torquing may allow the output shaft to spin and wear parts prematurely causing replacement.

MAINTENANCE (PUMP)

SEIZED PLUNGER

If the plunger arm has seized, perform the following:

1. Remove plunger guard (Figure 25) by removing the two 1/4"-20 X 3/4" hex flange screws that secure plunger guard to the gearbox feet
2. Disassemble pump and clean as described in steps 1 thru 4 in the "Stalled Pump" section.
3. Using a torque wrench, torque lock screw (Figure 25) to 70 ft.-lbs. (9.6 kg-m).

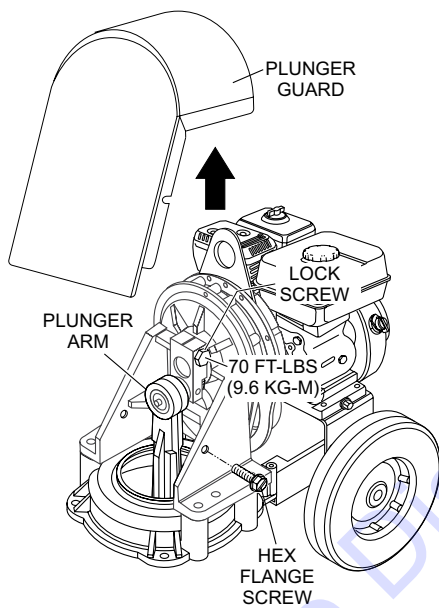


Figure 25. Lock Screw Torquing

DIAPHRAGM REPLACEMENT

1. Remove plunger cover as shown in step 1 of the "Seized Plunger" section.
2. Rotate pump output shaft until plunger arm is in the down position.
3. Remove the four hex head cap screws, hex nuts, flat washers and lock washers from the pump base.
4. Push pump well downwards to separate from pump base.
5. Remove the four nuts (Figure 26) that secure the diaphragm retaining plate to the plunger arm base. Remove diaphragm.
6. Replace diaphragm, reassemble in reverse order.

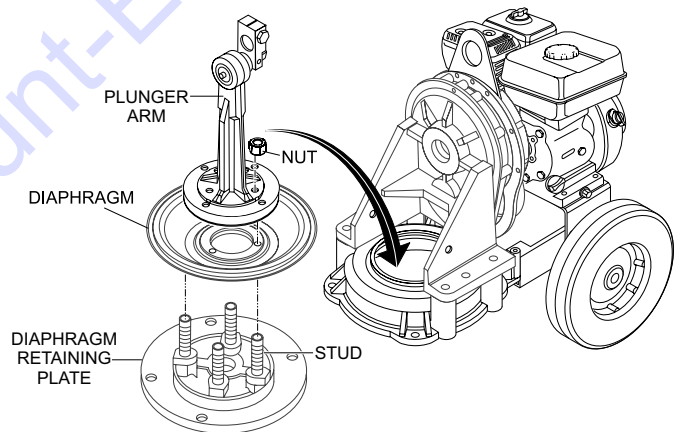


Figure 26. Diaphragm Replacement

MAINTENANCE (ENGINE)

ENGINE MAINTENANCE

Perform engine maintenance procedures as referenced by Table 7 below:

Table 7. Engine Maintenance Schedule								
Description (3)	Operation	Before	First Month or 10 hrs	Every 3 Months or 25 hrs	Every 6 Months or 50 hrs	Every Year or 100 hrs	Every 2 Years or 200 hrs	
Engine Oil	CHECK	X						
	CHANGE		X					
Air Cleaner	CHECK	X						
	CHANGE			X (1)				
All Nuts and Bolts	Re-tighten If Necessary	X						
Spark Plug	CHECK-CLEAN				X			
	REPLACE						X	
Cooling Fins	CHECK				X			
Spark Arrester	CLEAN					X		
Fuel Tank	CLEAN					X		
Fuel Filter	CHECK					X		
Idle Speed	CHECK-ADJUST					X (2)		
Valve Clearance	CHECK-ADJUST						X (2)	
Fuel lines	CHECK		Every 2 years (replace if necessary) (2)					

1. Service more frequently when used in **DUSTY** areas.
2. These items should be serviced by your service dealer, unless you have the proper tools and are mechanically proficient. Refer to the HONDA shop Manual for service procedures.
3. For commercial use, log hours of operation to determine proper maintenance intervals.

NOTICE

Refer to manufacturer engine manual for specific servicing instructions.

MAINTENANCE (ENGINE)

DAILY

1. Thoroughly remove dirt and oil from the engine and control area. Clean or replace the air cleaner elements as necessary. Check and retighten all fasteners as necessary. Check the spring box and bellows for oil leaks. Repair or replace as needed.

WEEKLY

1. Remove the fuel filter cap and clean the inside of the fuel tank.
2. Remove or clean the filter at the bottom of the tank.
3. Remove and clean the spark plug (Figure 27), then adjust the spark gap to 0.028~0.031 inch (0.6~0.7 mm). This unit has electronic ignition, which requires no adjustments.

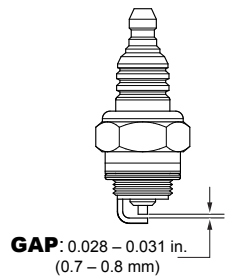


Figure 27. Spark Plug Gap

ENGINE OIL

1. Drain the engine oil when the oil is **warm** as shown in Figure 28.
2. Remove the oil drain bolt and sealing washer and allow the oil to drain into a suitable container.
3. Replace engine oil with recommended type oil as listed in Table 5. Engine oil capacity is 0.63 quarts (0.6 liters). **DO NOT** over fill.
4. Install drain bolt with sealing washer and tighten securely.

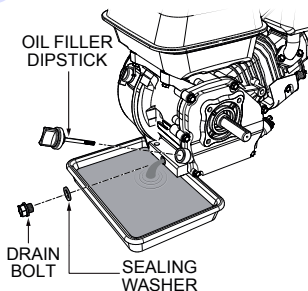


Figure 28. Engine Oil (Draining)

DANGER



DO NOT use gasoline as a cleaning solvent, because that would create a risk of fire or explosion.

ENGINE AIR CLEANER

1. Remove the air cleaner cover and foam filter element as shown in Figure 29.
2. Tap the paper filter element (See Figure 29) several times on a hard surface to remove dirt, or blow compressed air [not exceeding 30 psi (207 kPa, 2.1 kgf/cm²)] through the filter element from the air cleaner case side. **NEVER** brush off dirt. Brushing will force dirt into the fibers. Replace the paper filter element if it is excessively dirty.
3. Clean foam element in warm, soapy water or non-flammable solvent. Rinse and dry thoroughly. Dip the element in clean engine oil and completely squeeze out the excess oil from the element before installing.

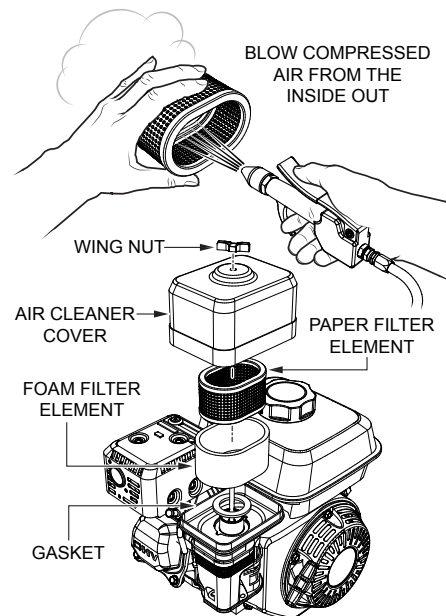


Figure 29. Engine Air Cleaner

MAINTENANCE (ENGINE)

SPARK ARRESTER CLEANING

Clean the spark arrester every 6 months or 100 hours.

1. Remove the 4 mm screw (3) from the exhaust deflector, then remove the deflector. See Figure 30.
2. Remove the 5 mm screw (4) from the muffler protector, then remove the muffler protector.
3. Remove the 4 mm screw from the spark arrester, then remove the spark arrester.

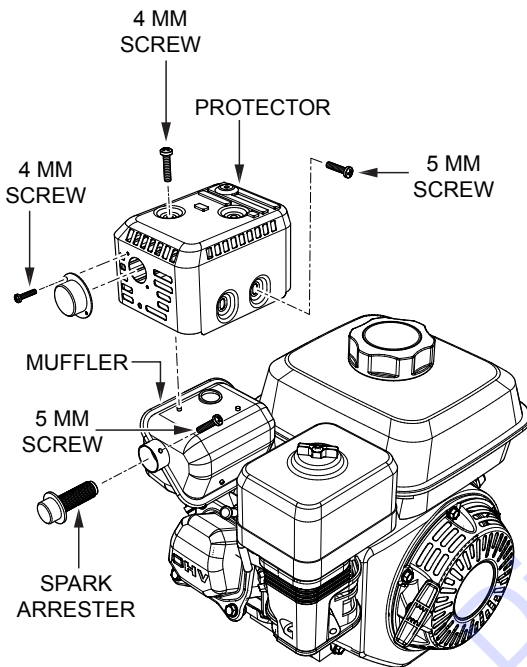


Figure 30. Spark Arrester Removal

4. Carefully remove carbon deposits from the spark arrester screen (Figure 31) with a wire brush.

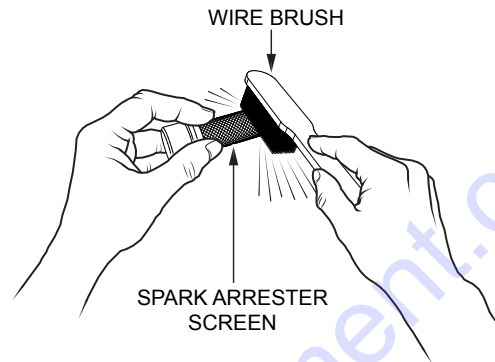


Figure 31. Cleaning The Spark Arrester

5. If the spark arrester is damaged and has breaks or holes, replace with a new one.
6. Reinstall the spark arrester and muffler protector in reverse order of disassembly.

PUMP STORAGE

For storage of the pump for over 30 days, the following is required:

- Drain the fuel tank completely.
- Run the engine until the fuel is completely consumed.
- Completely drain used oil from the engine crankcase and fill with fresh clean oil, then follow the procedures described in the engine manual for engine storage.
- Remove the pump cover and clean inside of pump housing. Coat inside of pump housing with a light film of oil to reduce corrosion. A spray can of oil works well for this application.
- Cover suction and discharge ports with duct tape to prevent any foreign matter from falling into pump.
- Cover pump and engine with plastic covering or equivalent and store in a clean, dry place.

TROUBLESHOOTING (ENGINE)

Table 8. Engine Troubleshooting

Symptom	Possible Problem	Solution
Difficult to start		
Fuel is available but spark plug will not ignite. (Power available at high tension cable).	Ignition plug being bridge?	Check ignition system.
	Carbon deposit at ignition?	Clean or replace ignition.
	Short circuit due to defective insulators?	Replace insulators.
	Improper spark gap?	Set spark plug gap to the correct gap.
Fuel is available but spark plug will not ignite. (Power NOT available at high tension cable).	Short circuit at stop switch?	Check stop switch circuit. Replace stop switch if defective.
	Ignition coil defective?	Replace ignition coil.
Fuel is available and spark plug ignites (compression normal).	Muffler clogged with carbon deposits?	Clean or replace muffler.
	Mixed fuel quality is inadequate?	Check fuel to oil mixture.
	Fuel in use inadequate (water, dust)?	Flush fuel system and replace with fresh fuel.
	Air Cleaner clogged?	Clean or replace air cleaner.
Fuel is available and spark plug ignites (compression low).	Defective cylinder head gasket?	Tighten cylinder head bolts or replace head gasket.
	Cylinder worn?	Replace cylinder.
	Spark plug loose?	Tighten spark plug.
Operation not satisfactory		
Not enough power available (compression normal, no miss-firing).	Air cleaner clogged?	Clean or replace air cleaner.
	Air in fuel line?	Bleed (remove air) from fuel line.
	Fuel level in carburetor float chamber improper?	Adjust carburetor float.
	Carbon deposits in cylinder?	Clean or replace cylinder.
Not enough power available (compression normal, miss-firing).	Ignition coil defective?	Flush fuel system and replace with fresh fuel.
	Ignition plug often shorts?	Replace ignition wires, clean ignition.
	Fuel in use inadequate (water, dust)?	Flush fuel system and replace with fresh fuel.
Engine overheats.	Excessive carbon deposition in combustion chamber?	Clean or replace crankcase.
	Exhaust or muffler clogged with carbon.	Clean or replace muffler.
	Spark plug heat value incorrect?	Replace spark plug with correct type spark plug.

TROUBLESHOOTING (ENGINE/PUMP)

Table 8. Engine Troubleshooting

Symptom	Possible Problem	Solution
Operation not satisfactory		
Rotational speed fluctuates.	Governor adjustment improper?	Adjust governor to correct lever.
	Governor spring defective?	Clean or replace ignition.
	Fuel flow erratic?	Check fuel line.
	Air taken in through suction line?	Check suction line.
Recoil starter not working properly.	Dust in rotating part?	Clean recoil starter assembly.
	Spring failure?	Replace spiral spring.

Table 9. Pump Troubleshooting

Symptom	Possible Problem	Solution
Pump does not take on water.	Not enough priming water in the housing?	Add water to suction chamber.
	Engine speed too low?	Increase throttle.
	Strainer plugged?	Clean strainer.
	Suction hose damaged?	Replace or repair hose, and clamps.
	Air leak at suction port?	Check that fittings are tight and properly sealed.
	Pump is located too high above water line?	Move pump closer to water.
	Debris collecting in pump housing?	Clean pump housing.
	Valves not seated correctly?	Check that valves are seated correctly. Pour water in in suction chamber to help seal valves.
	Pump does not prime correctly?	Check diaphragm for breaks or leaks.
Pump takes in water, little or no discharge.	Engine speed too low?	Increase throttle speed.
	Suction hose leaks at inlet?	Clean strainer.
Suction hose leaks at inlet.	Teflon Tape/Pipe Dope not used?	Apply teflon tape or pipe dope to NPT fittings.
	Hose diameter is too large?	Use smaller diameter hose or replace hose.
Discharge does not stay on coupling.	Pressure too high?	Check pressure, add additional clamp.
	Hose kinked or end blocked?	Check hose.

TROUBLESHOOTING (PUMP)

Table 9. Pump Troubleshooting (Continued)

Symptom	Possible Problem	Solution
Flow rate is slow.	Incorrect engine speed speed?	Increase engine speed.
	Piping is clogged or damaged?	Clean or replace piping.
	Clogged pump?	Clean pump well.
	Discharge line restricted or undersize?	Flush out piping or replace.
	Collapsible disc hose?	Replace with rigid or non-collapsible hose.
	Too many hose bends?	Straighten hose.
	Hose lines too long?	Shorten hose lines.
Pump runs but no fluid.	Faulty suction piping?	Replace piping.
	Pump located too far from fluid source?	Move pump closer to source.
	Gate valve closed?	Open gate valve.
	Clogged strainer?	Clean or replace strainer.
	Discharge height too high?	Lower the height.
Pump starts and stops pumping.	Leak in suction line?	Repair suction line.
	Leak in foot valve?	Repair or replace valve.
	Diaphragm has a crack or hole?	Replace diaphragm.
	Defective or clogged flapper valves?	Clean or replace flapper valves.
Excessive noise while pump is in operation.	Pump not secured properly?	Secure pump
	Restricted suction line?	Clean or correct restriction.
Water can be seen on top of diaphragm.	Diaphragm has crack or hole?	Replace diaphragm.
	Screw loose holding diaphragm?	Tighten screw.
Pump stalls repeatedly or stops for no apparent reason.	Discharge height is over 25 feet (7.62 meters) of head?	Lower height
	Material jammed in pump well?	Clean out pump well.

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