SIMPLEX®

Insight Onsite


# RELIANT

# FUEL TANK

## Last Revision Date: June 8, 2021

For the most up-to-date information for this product and others, please contact Simplex, Inc. at (800) 637-8603 or visit us on the web at http://www.simplexdirect.com.

# Table of Contents

# Table of Figures

# 1 WARNINGS AND CAUTIONS

## Safety Information Symbols

The following images indicate important safety information:

This **General** warning symbol points out important information that, if not followed, could endanger personal safety and/or property.

This **Explosion** warning symbol points out potential explosion hazards.

This **Fire** warning symbol points out potential fire hazards.

This **Electrical** warning symbol points out potential electrical shock hazards.

## Cautions

- Improper operation of this equipment such as neglecting its maintenance or being careless can cause possible injury or death. Permit only responsible and capable persons to install, operate, and/or maintain this equipment.
- Potentially lethal voltages and amperages are present in these machines. Ensure all steps are taken to render the machine safe before attempting to work on the equipment.
- All hardware covered by this manual have dangerous electrical voltages and can cause fatal electrical shock. Avoid contact with bare wires, terminals, connections, etc., on the hardware, if applicable. Ensure all appropriate covers, guards, grounds, and barriers are in place before operating the equipment. If work must be done around an operating unit, stand on an insulated dry surface to reduce shock hazard.
- Do not handle any kind of electrical device while standing in water, while barefoot, or while hands or feet are wet. DANGEROUS ELECTRICAL SHOCK MAY RESULT.
- If trained personnel must stand on metal or concrete while installing, servicing, adjusting, or repairing this equipment, place insulative mats over a dry wooden platform. Work on the equipment only while standing on such insulative mats.
- The National Electrical Code (NEC), Article 250 requires the frame of the equipment to be connected to an approved earth ground and/or grounding rods. This grounding will help prevent dangerous electrical shock that might be caused by a ground fault condition or by static electricity. Never disconnect the ground wire.
- Wire gauge sizes of electrical wiring, cables, and cord sets must be adequate to handle the maximum electrical current

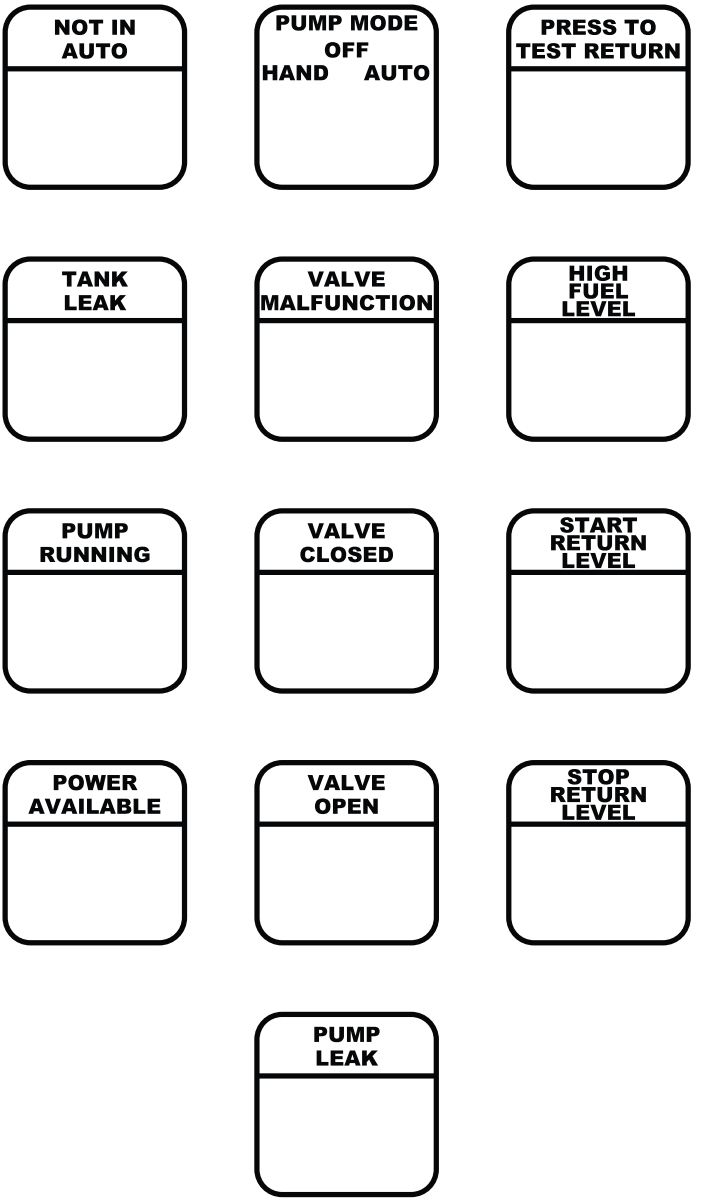
(ampacity) to which they will be subjected.

- Before installing or servicing this (and related) equipment, make sure that all power voltage supplies are completely turned off at their source. Failure to do so will result in hazardous and possibly fatal electrical shock.
- In case of accident caused by electric shock, immediately shut down the source of electrical power. If this is not possible, attempt to free the victim from the live conductor. AVOID DIRECT CONTACT WITH THE VICTIM. Use a nonconducting implement, such as a dry rope or board, to free the victim from the live conductor. If the victim is unconscious, apply first aid and seek immediate medical attention.
- Never wear jewelry when working on this equipment. Jewelry can conduct electricity resulting in electric shock or may get caught in moving components causing injury.

- Keep a fire extinguisher near the hardware at all times. Do NOT use any carbon tetra-chloride type extinguisher. Its fumes are toxic, and the liquid can deteriorate wiring insulation. Keep the extinguisher properly charged and be familiar with its use. If there are any questions pertaining to fire extinguishers, please consult the local fire department.

- The illustrations in this manual are examples only and may differ from your unit.
- Main Disconnect to be provided by installer, rated 600V maximum, sized 150% maximum of rated current.
- The system shall be for use with fuel oil as described by NFPA321, "Basic Classification of Flammable and Combustible Liquids." As defined by this standard, the fuel supply system shall be for use with "combustible liquids," those having a flash point at or above 100°F and further defined as Class II or Class III liquids. In no case shall a liquid having a flash point less than 100°F be used. In every case, the system shall not be used or applied at a temperature in excess of the flash point of the contents. Electrical equipment used in the system shall be in accordance with NFPA30, section 5-7, wherein it states "For areas where Class II or Class III liquids only are stored or handled at a temperature below their flash points, the electrical equipment may be installed in accordance with provisions of NFPA70, National Electrical Code, for ordinary locations..."

# 2 NAMEPLATES AND PLACARDS



# 3 DESCRIPTION AND SPECIFICATION

The Simplex Reliant Series is a standard line of fuel tanks that can be used as day tanks and other tank applications featuring integration of intelligent control with pumping and gauging systems.

The Reliant Series is can be networked with the full line of Simplex Fuel Supply Systems, including packaged pump systems, tank filling systems, filtration systems, digital fuel and tank management systems, and digital monitoring and data systems. The Reliant Series, when supplied with a Simplex digital controller, is MODBUS and Ethernet compatible with most tank gauging systems.

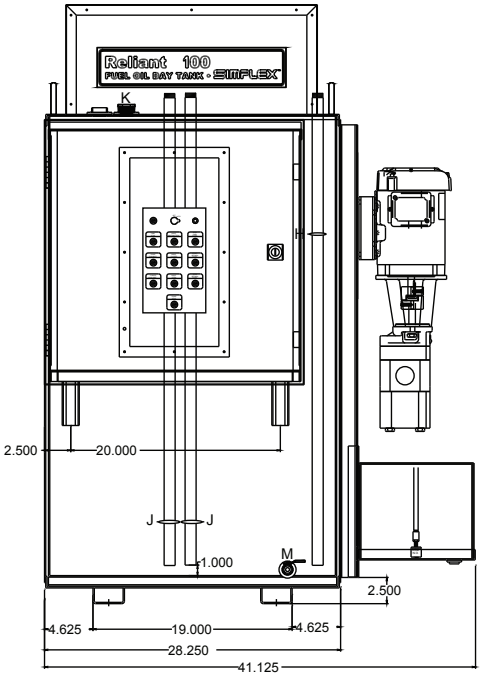



Figure 1 Front view

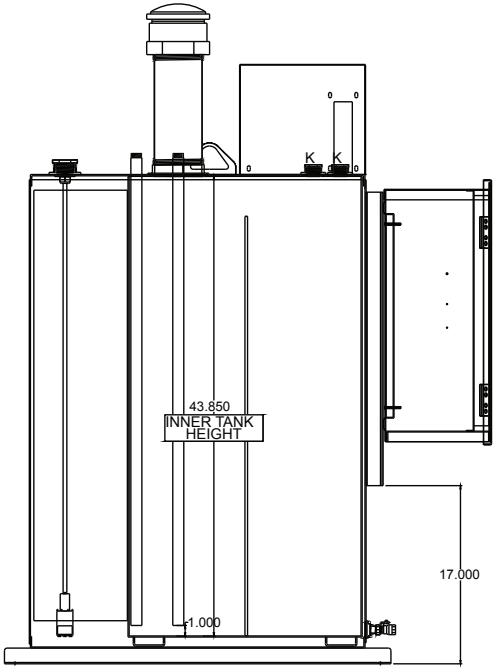



Figure 2 Left view

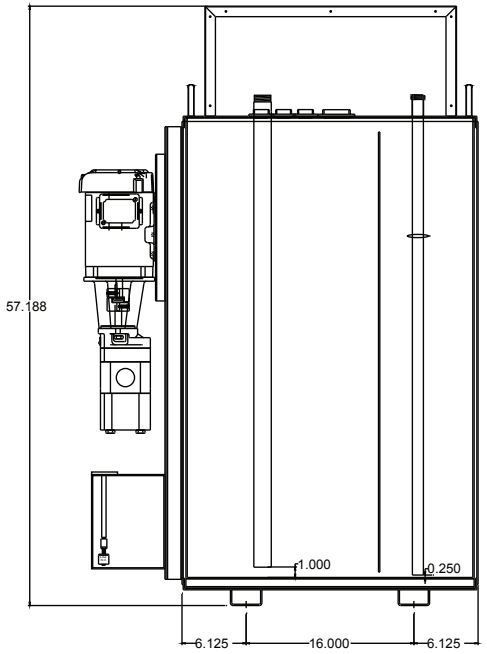



Figure 3 Rear view

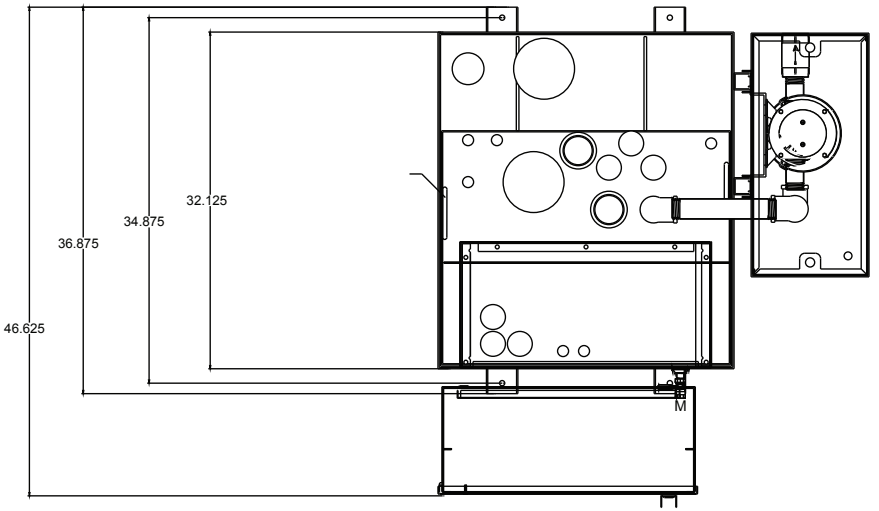



Figure 4 Top view

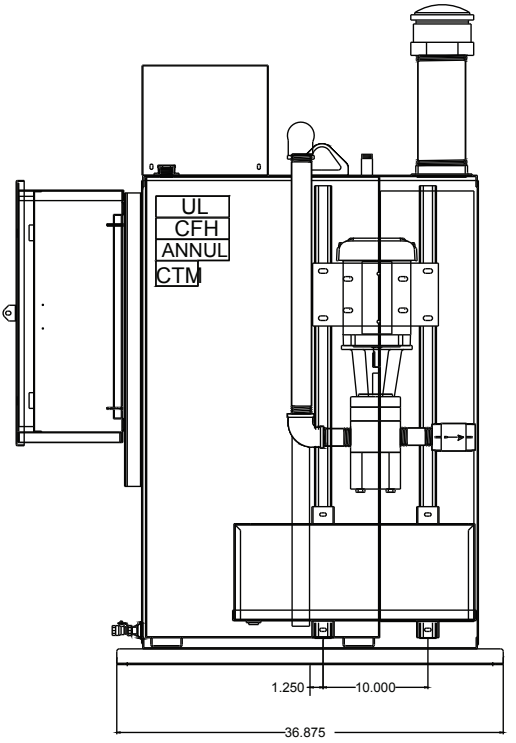



**Figure 5 Right View**

# 4 UNPACKING

## Included Components and Parts

The following items are included with your fuel tank. If any of the following are not included, please contact Simplex Direct, Inc., at 800-637-8603, ext. 4.

1. Fuel Tank
2. Manual
3. Electrical drawings package

## Primary Inspection

Preventative visual inspection of the shipping crate and the fuel tank is advised. Physical or electrical problems due to handling and vibration may occur. Never apply power to a fuel tank before performing this procedure. The following four-point inspection is recommended before installation and as part of a 6-month maintenance schedule or as a fuel tank is relocated:

**If any problems are observed during Primary Inspection, call Simplex 24 hours a day at 800-637-8603**

1. If the crate shows any signs of damage, examine the fuel tank in the corresponding areas for signs of initial problems.
2. Check the entire outside of the cabinet for any visual damage, which could cause internal electrical or mechanical problems due to reduced clearance.
3. Inspect all relays and control modules. Make sure all components are secure in their bases and safety bails are in place. Spot check electrical connections for tightness. If any loose connections are found, inspect and tighten all remaining connections.
4. Examine all accessible internal electrical components such as fuses, contactors, and relays. Check lugged wires at these components.

# 5 INSTALLATION

Location of the fuel tank is of prime importance and should be done by trained personnel. It is one of the most critical factors involved in reliable and safe operation. The fuel tank must be positioned and installed according to the main fuel storage tank and engine location. In general locate the fuel tank as close to the engine as possible consistent with applicable local and national plumbing and electrical codes.

- Always position the fuel tank so that the highest fuel level in the tank is lower than the engine injectors.
- The fuel tank must be located not farther than 200' from the main fuel tank.
- The fuel tank must not be more than 18' higher than the lowest fuel level in the main fuel tank.
- Never locate the fuel tank in a confined space without consideration for accidental fuel spillage.
- Use a rupture basin when necessary.
- Never locate the fuel tank near a surface or object which may be adversely affected by fuel oil.
- Never locate a fuel tank system above a residential living space.
- All plumbing to and from the fuel tank should be black iron pipe or copper tubing.
- All plumbing connections at the tank should be made with pipe unions to facilitate installation and service.
- Special attention must be given to pump suction pipe connections to avoid possible air leaks and subsequent loss of pump prime.
- Never allow the fuel tank pump to run dry, as immediate pump damage will occur.
- Before applying power to the pump/motor, be sure all fuel connections have been made and tightened and all holes are plugged.
- An auxiliary hand pump is recommended for installation on all fuel tanks with motor-pumps. The hand pump is used for initial priming of the fuel line from the main tank and as a back-up to the motor-pump.

1. Remove the fuel tank top. Check all visible hardware for tightness. Attach the vent pipe. This is a NPT internal connection. The vent pipe allows equalization of internal fuel tank pressure. DO NOT INSTALL A VALVE IN THE VENT

LINE! Venting provides pressure relief in case of overfill, rapid expansion, or gasification of contents in the event of fire. The fuel tank may become permanently distorted at pressures above 5PSI (10 and 25 gallon tanks) and 3PSI (50–400 gallon tanks) and may rupture at pressures above the maximum withstand pressure of 25PSI (10 and 25 gallon tanks) and 15PSI (50–400 gallon tanks). Fuel tank operation without a vent pipe is strictly not recommended. The vent pipe should be at least 5 feet higher than any other pipe and should terminate outdoors. The vent pipe must not extend or terminate more than 12 feet above the fuel tank. There should be no low portions or sags in the vent pipe that can trap liquid. The end of the pipe should be fitted with a 180° weather-protected vent cap to shed water and should be screened to keep out pests, leaves, etc.

2. Attach the Overflow Pipe. This is a NPT internal connection. The overflow pipe runs from the fuel tank back to the main storage tank and allows for draining of the tank should it become overfilled. This pipe should be sized at least twice the diameter of the pump fill pipe (minimum 1" I.D. for 10 and 25 gallon tanks; minimum 2" I.D. for 50-500 gallon tanks). If the tank becomes overfilled and the overflow line is not connected or is obstructed, the tank will distort and possibly rupture. In installations where the main fuel tank is above ground, the overflow pipe should be connected to an overflow tank. DO NOT INSTALL A VALVE IN THE OVERFLOW LINE!
3. Attach the fuel tank intake line (fill pipe) from the main fuel tank to the pump inlet. This is a NPT internal connection. Use black pipe with a union and size per the installation drawing in this manual. A fuel strainer with #60 mesh is recommended.
4. Attach the Engine Supply Line. This is a NPT external connection. Use black pipe with a union and size per the dimensioanl drawing in this manual.
5. Attach the Engine Return Line. This is a NPT internal connection. Use black pipe with a union and size per the installation drawing in this manual.
6. WARNING! Put the fuel tank's mode selector switch in the "Off" position. Supply a 208-volt, three-phase, 15-amp circuit breaker protected circuit from a reliable power bus to TB-PS-1-3. GROUND THE FUEL TANK! Secure the conduit end to the left side of the cover at the holes provided. Replace the cover.
7. The pump has been pre-lubricated with heavy oil before ship-

ment. Prime the system by using the hand pump to transfer fuel from the main tank to the fuel tank. If the fuel tank is not equipped with a hand pump, remove the tank inlet priming tee plug and fill the entire inlet line with fuel. Replace the tee plug. Energize the fuel tank's pump/motor by placing the mode selector switch in the automatic position. Ensure that fuel is exiting the pump by watching the clear pump outlet tubing. If not, repeat this procedure and prime the pump also at the pump priming tee. Make sure all unused holes are plugged, all pipe connections are secure and no leaks are present. The fuel tank is now ready for unattended automatic operation. If the fuel tank has been stored for extended periods of time, pre-lube the pump with oil at the pump priming tee.

## Priming the Siphon Drain

The siphon drain drop tube exits the top of the tank and drops to nearly the bottom of the tank. The siphon drain is used for service draining of the tank and is the only means of draining the tank. At the time of initial filling and start-up of the tank, prime the siphon drain as follows:

1. Fill the tank to its normal maximum full level.
2. Remove the plug in the siphon drain priming tee.
3. Be sure the lower end of the siphon drain tube is closed.
4. Using a funnel, manually fill the priming tube.
5. When the tube is full, plug the priming tee. Be sure to use pipe thread sealant.
6. Test the siphon drain by opening the drain valve and drain into a bucket.
7. Repeat steps 1-6 if required to make prime.
8. Close drain valve.
9. The siphon drain should hold prime and be available for tank draining at any time.

Once primed, the siphon-drain may be connected via a shut-off valve or solenoid valve to the overflow-return to the main tank provided that the main tank is below the level of the fuel tank and all flow is by gravity. Any run of pipe above the level of the drain termination may require priming. With the siphon drain connected to the fuel tank's overflow return line, manual or automatic draining of the tank back to the main tank is possible.

A manual or electric pump may be connected to the siphon drain at either the lower termination or at the priming tee plug.

## Priming the Pump

The fuel tank's pump is shipped from the factory pre-primed with SAE 30 oil. On initial start-up, the pump must be manually pre-primed. Do not prime the system by running the pump motor! Normally it is not necessary to fill the supply line with fuel to prime the pump.

1. Remove the steel plug from the pump priming tee, insert a short piece of pipe in the pump priming tee, and attach a reducing coupler or funnel.
2. Fill the line from the check valve to the pump with fuel oil or lube oil. Energize the pump/motor and observe fuel flowing through the clear flex hose. Allow the pipe to drain about halfway, then hold your hand on the top of the pipe to temporarily seal the open tee. The oil drawn into the pump will act to seal the pump and allow a large vacuum to be generated. Repeat as required until the line is primed. After the pump is primed, remove the pipe or funnel and replace the plug in the pump priming tee.

## Installing a Pump-Running Relay

To connect a pump-running relay to alert another system when the pump/motor is active, installing a relay with the coils connected to TB-A-19-20. When the pump is running, the relay will close.

## Installing Alarm Dry Contacts

The Reliant fuel tank features a set of dry contacts to alert your BMS setup that the fuel tank has registered an error. To enable this functionality, connect your system to TB-A-9-11. Continuity between TB-A-9 and TB-A-11 indicate normal operation, and continuity between TB-A-9 and TB-A-10 indicate a fault.

## Installing Ball Valves

Ensure that the Manual Override Switches on each ball valve are set to "(A) Auto." (See **Figure 6**.)

Install the valves at a location of your choice between the junction and the tanks.

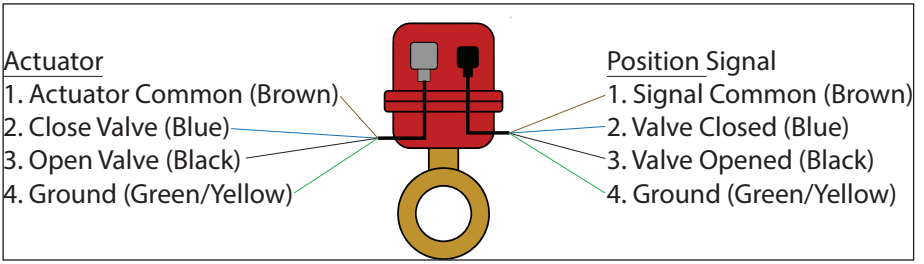
Connect the two cables provided with the valve for Tank 1 to the

**Figure 6 Manual Override Switch**

fill controller as follows (see **"Figure 8 Ball Valve" on page 13** for wire assignments:)

1. Neutral to TB-MBV-1
2. Open Valve to TB-MBV-2
3. Close Valve to TB-MBV-3
4. Actuator Ground to TB-MBV-4
5. Position Ground to TB-MBV-5
6. Valve Opened to TB-MBV-6
7. Valve Closed to TB-MBV-7
8. Status Common to TB-MBV-8

**Figure 7 Valve Connectors**




**Shown here are pinouts for the two ball valve connectors. Confirm pin-to-wire connections via a continuity test before connecting to fill controller. Incorrect wiring may damage the controller and/or ball valve and will void your warranty.**

**Figure 8 Ball Valve**

# 6 OPERATING INSTRUCTIONS

The Fuel Tank Controller provides automatic, hands-free fuel level maintenance. When the day tank fuel level reaches a fill start level (50%), the controller opens fill valves and the tank begins to drain. When the tank fuel level reaches a stop level (10%), the valves close.

Should the fuel tank reach a High fuel level (60%), an alarm will be indicated on the front control panel and the alarm horn will sound.

Should the tank develop a leak, the fill start signal will be terminated and all the valves will close. An alarm will be indicated on the front control panel and the alarm horn will sound.

## H-O-A SWITCH

A three-way H-O-A mode switch is provided on the HMI Interface Panel. Normally, the switch should be left in Auto Mode. The Off Mode is provided so general maintenance and service can be performed. Hand mode is available for emergency manual filling.

Use caution when putting the tank in Hand Mode. Never leave a tank in Hand Mode unattended. Return the tank to Auto Mode as soon as possible.

## FILL TEST BUTTON

The Test Return button tests the fill valve functionality. Pressing and releasing the button opens the fill valve, filling the tank to the full level (50%). Pressing and holding the button fills the tank to the high fuel level (60%)

# 7 ALARMS AND WARNINGS

The HMI panel can indicate five alarms, which also trigger the alarm horn:

1. Not in auto
2. Valve malfunction
3. Pump leak
4. Tank leak
5. High fuel level

# 8 MAINTENANCE/TROUBLESHOOTING

**Remove all power before servicing the fuel tank. Never operate or service a fuel tank that is not grounded.**

The Simplex Reliant has been designed to require minimum maintenance. All components have been chosen for a long, reliable life. The fuel tank is constantly lubricated by the diesel fuel it transfers. Inspect this tank at least once every year for damage, leakage, or rust on both inside and outside the tank. Promptly repair or replace the tank if it becomes significantly damaged or deteriorated. Two basic intervals of maintenance are required: each year and after the first 3 years.

EACH YEAR

1. Water and sediment should be drained from the tank each year. If normal use does not consume one tank full of fuel each year, the tank should be drained and refilled with fresh fuel.
2. Remove the inspection port and examine the interior of the tank. Examine all internal components. With the tank drained, test sending unit operation. Install a new inspection port gasket and replace the inspection port cover.
3. Press the Test Fill button and observe pump and motor performance.
4. Inspect pump/motor alignment and wear. Inspect the pump for leaks.
5. Re-tighten hose clamps at pump/hose connections. Re-tighten the pump bracket, motor bracket, and pump/motor coupler hardware.
6. Inspect all plumbing connections for leaks. Test all options and fuel level alarms for proper operation.
7. Re-tighten all electrical connections.

AFTER THE FIRST 3 YEARS

After three years of normal use, re-oil the motor with 10 drops of 5W30 or 10W oil. Do not over oil the motor.

## Table 1 Troubleshooting

| Problem | Solution |
|---|---|
| No fuel delivered | 1. Pump not primed.<br>2. Lift is too high.<br>3. Rotation direction incorrect.<br>4. Check valve installed backwards. |
| Motor does not turn or turns intermittently | 1. Control power not available.<br>2. Motor thermal overload condition.<br>3. Pump failed and seized.<br>4. Motor failure. |
| Insufficient fuel delivered | 1. Air leak at inlet.<br>2. Defective solenoid valve or check valve.<br>3. Lift too high.<br>4. Pump worn.<br>5. Inoperative foot valve.<br>6. Piping improperly installed.<br>7. Fuel strainer plugged. |
| Rapid pump wear | 1. Dirt or grit in fuel.<br>2. Pipe strain on pump causing bind.<br>3. Worn pump/motor coupler.<br>4. Pump has been run dry or with insufficient fuel. |
| Pump requires too much power | 1. Air in plumbing lines.<br>2. Liquid heavy or too viscous.<br>3. Bent pump shaft, binding rotating element.<br>4. Misalignment of pump/motor coupler. |
| Noisy Operation | 1. Insufficient fuel supply.<br>2. Air leaks in the inlet pipe.<br>3. Air or gas at the inlet connection.<br>4. Pump and motor out of alignment.<br>5. Worn out spider coupling.<br>6. Pump coupler out of balance. |

| Problem | Solution |
| --- | --- |
| **Pump requires frequent re-priming** | 1. Inoperative foot valve.<br>2. Inoperative check valve.<br>3. Inoperative solenoid valve.<br>4. Pump cavitation.<br>5. Plumbing air leaks.<br>6. Lift too high.<br>7. Pump seals leaking. |
| **Pump leaks fuel** | 1. Loose pump plumbing fittings.<br>2. Worn pump shaft seal.<br>3. Pump pressure relief valve failure.<br>4. Fuel leak elsewhere running towards pump area.<br>5. Excessive head from overhead storage tank.<br>6. Worn pump O-rings. |
| **Pump delivers for short period and quits** | 1. Leak at inlet.<br>2. End of inlet not deep enough.<br>3. Air or gas in fuel.<br>4. Supply exhausted.<br>5. Vaporization of fuel at inlet.<br>6. Air or gas in inlet line.<br>7. Sand or abrasives in fuel. |

Simplex, Inc.
5300 Rising Moon Road
Springfield, IL 62711-6228

(800) 637-8603
www.simplexdirect.com