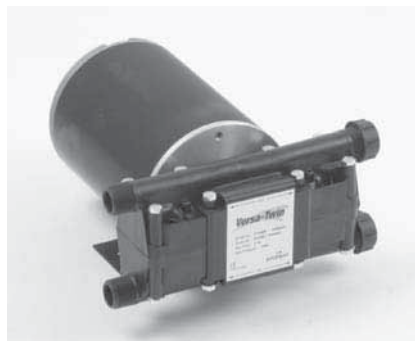
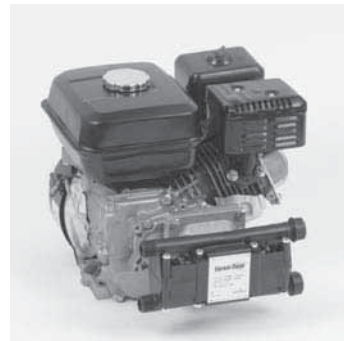


Installation, Operation, Repair And Parts Manual

Description

**DC Version****AC Version****Gas Engine Version****Plunger Pump Models:**

2120P-P18DC	2.7 GPM Max., 150 PSI Max., 18 Amp VDC, Continuous Duty Motor
2120P-P35DC	2.9 GPM Max., 300 PSI Max., 35 Amp VDC, 75% Duty Cycle Motor
2120P-P39DC	2.9 GPM Max., 300 PSI Max., 39 Amp VDC, Continuous Duty Motor
2120P-P05AC	2.5 GPM Max., 300 PSI Max., 1/2 HP, 60 Hz, 115 VAC, Continuous Duty Motor
2120P-P05EU	1.6 GPM Max., 300 PSI Max., 1/2 HP, 50 Hz, 230 VAC, Continuous Duty Motor
2120P-P55GE	2.9 GPM Max., 300 PSI Max., 5.5 HP PowerPro Gas Engine

Diaphragm Pump Models:

2150P-D35DC	7.0 GPM Max., 100 PSI Max., 35 Amp, 12 VDC, 75% Duty Cycle Motor
2150P-D39DC	8.3 GPM Max., 100 PSI Max., 39 Amp, 12 VDC, Continuous Duty Motor
2150P-D05AC	6.7 GPM Max., 100 PSI Max., 1/2 HP, 60 Hz, 115 VAC, Continuous Duty Motor
2150P-D55GE	7.0 GPM Max., 100 PSI Max., 5.5 HP PowerPro Gas Engine

Safety Information

The following special attention notices are used to notify and advise the user of this product of procedures that may be dangerous to the user or result in damage to the product.

NOTE: Notes are used to notify of installation, operation, or maintenance information that is important but not safety related.

CAUTION: Caution is used to indicate the presence of a hazard, which will or can cause minor injury or property damage if the notice is ignored.

WARNING: Warning denotes that a potential hazard exists and indicates procedures that must be followed exactly to either eliminate or reduce the hazard, and to avoid serious personal injury, or prevent future safety problems with the product.

DANGER: Danger is used to indicate the presence of a hazard that will result in severe personal injury, death, or property damage if the notice is ignored.

DANGER: DO NOT pump flammable or explosive fluids such as gasoline, fuel oil, kerosene, etc. DO NOT use in explosive atmospheres. The pump should be used only with liquids compatible with the pump component materials. Failure to follow this warning may result in personal injury and/or property damage and will void the product warranty.

A pressure relief device; such as an unloader, relief valve or balancing regulator, must be installed on the outlet side of the pump. Failure to do so could result in personal injury and/or void the warranty.

- Be sure all exposed moving parts such as shafts, couplers and adapters are properly shielded or guarded and that all coupling devices are securely attached before applying power.
- Do not exceed recommended speed, pressure and temperature for pump and equipment being used.
- Before servicing, disconnect all power, make sure all pressure in the system is relieved, drain all liquids from the system and flush.
- Secure the discharge lines before starting the pump. An unsecured line may whip, causing personal injury and/or property damage.
- Check hose for weak or worn condition before each use. Make certain that all connections are tight and secure.
- Periodically inspect the pump and the system components. Perform routine maintenance as required (see Maintenance section).
- Protect pump from freezing conditions by draining liquid and pumping rust inhibiting solution, such as antifreeze, through the system, coating the pump interior.
- Use only pipe, hose and fittings rated for the maximum (or greater) PSI rating of the pump.
- Do not use these pumps for pumping water or other liquids for human or animal consumption.

System Installation

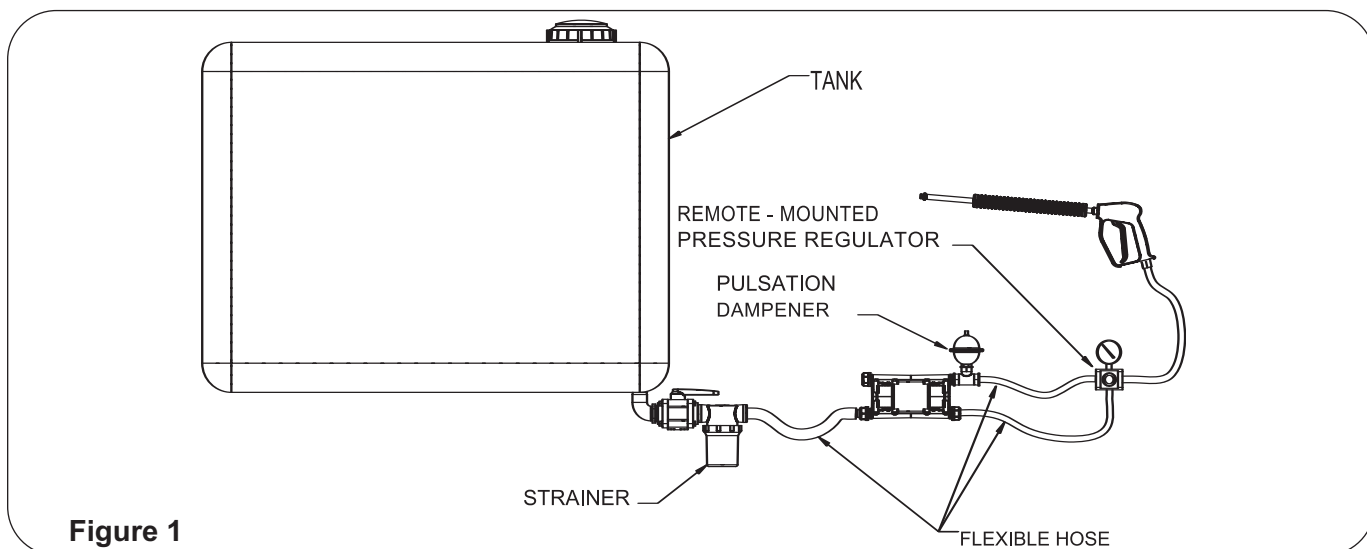


Figure 1

System Installation

Pump Installation

Accessories should be installed with flex hose and be mounted as close to the pump as possible. The hose must be used right after accessories.

NOTE: If remaining installation is solid piping, a two to four foot length of hose must be installed between accessories and solid piping for vibration isolation.

Hose

Selection of the right size and type of hose is vital for good performance. Be sure to hook up to the proper ports on the pump (note markings “IN” and “OUT” on pump).

Suction Hose

Always use a suction hose compatible with the fluids being pumped and at least the same inside diameter as pump ports. If the suction hose is over 5 feet long, use one size larger hose. Keep the suction hose as short as possible and restrictions such as elbows, check valves, etc. at a minimum. Use both inlet ports if the flow is to exceed 6 gpm. **Suction lift not to exceed 5 feet.**

Discharge Hose

High pressure pumps require the use of special high pressure discharge hose (2 rayon braid or equivalent). Use a hose rated at least 50% greater than the highest operating pressure required of pump. **Example:** If required pump pressure is 300 psi, use discharge hose rated at minimum of 450 psi working pressure.

Unloader Valve

The unloader has a very important safety function in your plunger pump hookup. The unloader valve protects the pump by unloading pressure when the gun is shut off or discharge is otherwise blocked. This saves the pump and power because the liquid is bypassed at a very low pressure. If the gun is to be shut off for more than 5 minutes, install a thermal relief valve in the inlet side or stop the pump to prevent heat buildup. The length of time may vary due to the original temperature of the fluid being pumped.

Bypass Valve

Bypass valves incorporate an adjustable spring-loaded poppet that opens to protect the pump from over pressurizing when the pump outlet is shut off. The overflow is diverted back to the inlet of the pump or back to tank. Its main difference from an unloader valve is that it does not reduce the power requirements or pump pressure when the outlet is turned off. Instead, the pressure stays at whatever the set operating pressure is that the pump is working at. Bypass valves must be rated for the max. flow of the pump because they return the full amount of flow when the outlet is shut off. If the pump is to run in shut-off condition for more than five minutes at a time, it is recommended that the bypass flow goes back to tank.

Strainers

Use a suction line strainer with at least 3 to 5 times the suction port area in open screen area. For example, an area of approximately 1.1 to 1.9 square inches for a 1/2" suction port. Be sure the screen is suitable for the liquid being pumped. Keep the filter clean. A clogged strainer will cause cavitation, which usually leads to poor performance and wear of the pump parts.

Compound Gauge (Optional)

The pump should not be subjected to high suction line vacuums. To check on this, install a compound gauge at pump inlet. For ultimate performance and life, the vacuum should be limited to 5 inches of mercury. High vacuum conditions may cause premature product failure and void warranty.

Pulsation Dampener

This device absorbs the shock and smooths out the pump discharge pulsations, providing smoother operation. For the proper operation of many unloader valves, the pulsation dampener should be installed on the discharge side downstream from the unloader valve. However, for maximum system protection, the pulsation dampener may be installed upstream from the unloader valve, provided the unloader valve will function properly. The dampener can be mounted vertically or horizontally.

Pressure Gauge/Dampener

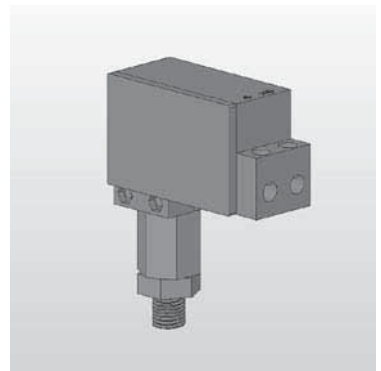
Use gauge capable of reading double the pump working pressure. Use a silicone-filled gauge or a gauge dampener to protect the gauge needle against pressure surges and provide easier reading.

Inlet/Outlet Ports

This pump has dual inlet and outlet ports for your convenience. Use only one outlet port, and cap the other outlet port for best performance. For flows over 6 gpm, use both inlet ports to reduce cavitation in the diaphragm pump.

Pressure Switch/Demand Switch

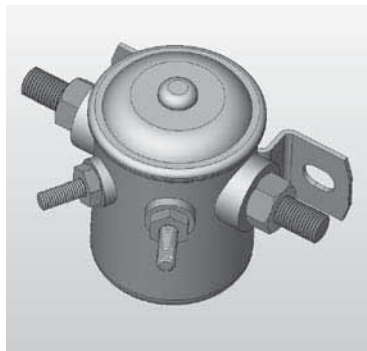
A pressure switch is used to turn the motor and pump off when the pressure at the discharge of the pump reaches maximum operating pressure and when spray nozzles or spray gun have been turned off. Pressure switches are wired through the normally closed (NC) circuit. A normally closed circuit allows power to flow through the switch contacts until it reaches the switching pressure, whereby the contacts open and the



pump is turned off. A pressure switch conserves energy in a DC voltage system by eliminating current draw when output from the pump is not required. The disadvantage of a pressure switch, when used with a positive displacement pump, is that the flow being used by the spray gun or system must exceed the pump's capacity at whatever pressure the pump is operating at. If the flow rate used by the spray gun is too low, the pump will cycle on and off, producing an undesirable effect to the user and harming the motor.

Solenoid DC Power Contacts for 12-Volt Systems

A solenoid contact switch is used in low voltage, direct current (VDC) systems where the current (measured in amperes or amps) of the motor is too high for the rated capacity of a switch or relay. Low voltage systems with high inductive current requirements arc across the contacts and "burn" the switch out as the switch is turned on and off. It is recommended that a solenoid contact switch, the same type that is used in the automotive industry for starters, be used. The switch should be rated for 12 VDC applications with a minimum of 50 amps continuous duty. (White Rogers 70-111244 or equivalent.)



Automotive Fuse

It is important to always use an inline fuse or circuit breaker rated for 12 VDC in direct current applications. It is best to place the inline fuse near the source of power (battery) to safeguard the whole system (wires and motor). Failure to do so can lead to a vehicle fire should a short occur, or extended high amp condition caused by pump over-pressurization. Blade-type, easy-to-install fuses are the industry standard for low-voltage automotive rated for 32 VDC and are UL listed. The Maxi (time delay) fuse is the preferred choice to protect higher current circuits than mini and standard fuses. These fuses will not blow when exposed to harmless, temporary overload currents as the mini and standard fuses do. Fusible links and automotive circuit breakers are also available to be used in this type of application. (Maxi Fuse Types: MAX, AF3, MAX/299.)

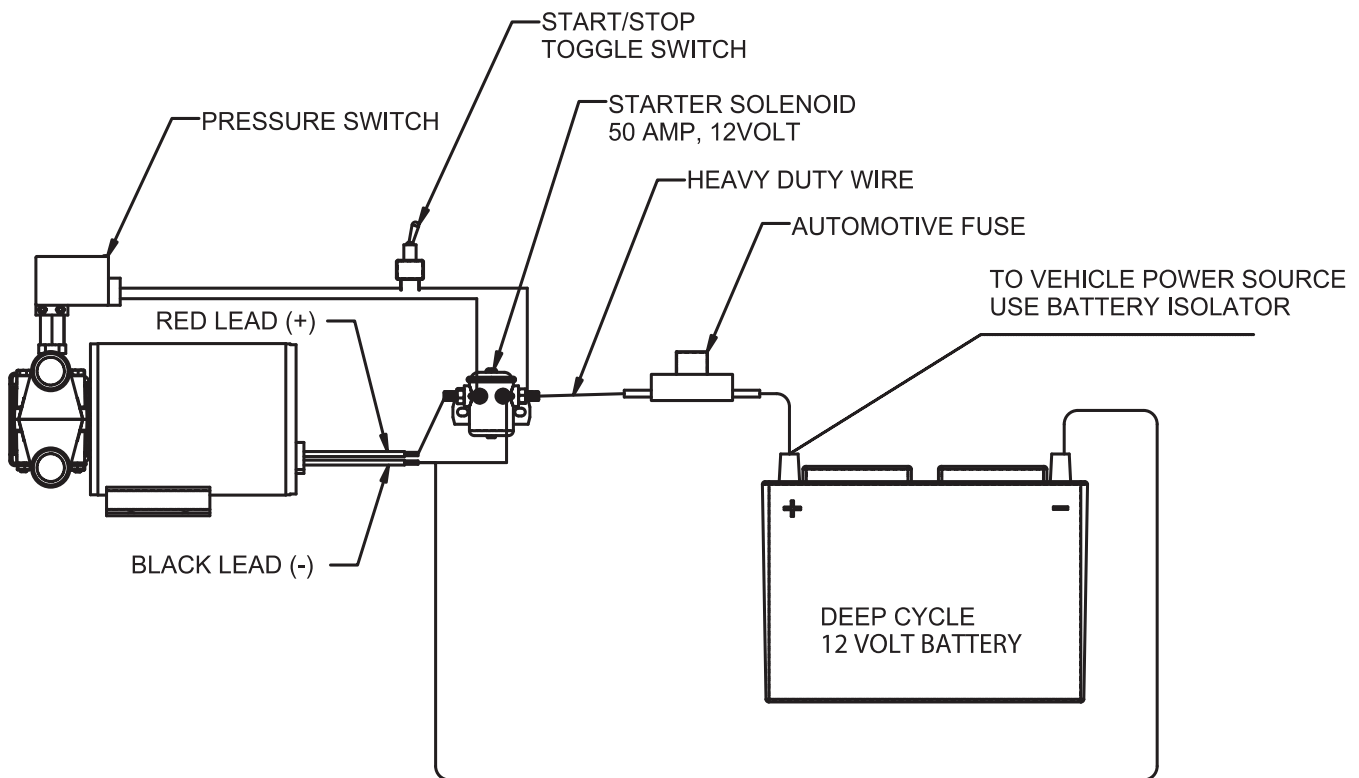
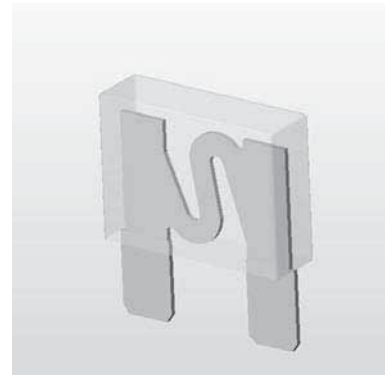


Figure 2

DC Electrical Installation

Remember, the motor and electrical wire must always be fused to protect the electrical system. Use an automotive fuse at or slightly above the motor-rated amps.

When the motor leads are not identified, the pump can operate in either rotation.

Positive Motor Lead (+) to Positive Power Lead (Red, +).

Negative Motor Lead (-) to Negative Power Lead (Black, -).

Figure 4 shows a typical application of a high current draw pump. Note that a solenoid is used for switching the motor on and off. The solenoid has four terminals. The two large diameter posts are for the DC electrical current being switched as it goes to the motor, and the two smaller terminals are for energizing the coil inside the solenoid that pulls the main contacts to the on position (Figure 3). The solenoid permits a low-amp rated on/off switch, or pressure switch, to control the motor and operation of the pump.

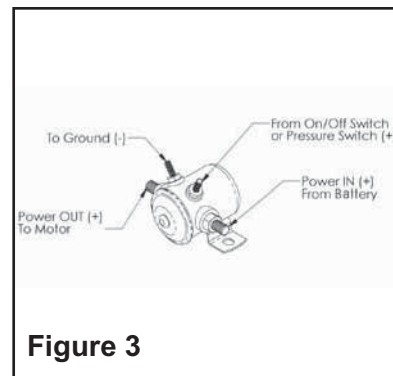


Figure 3

Incorrect sizing of the wire may limit the performance of the pump output. If the gage of wire is undersized, there will be too much resistance in the wire which leads to lower voltage at the motor and lower performance from the pump. For 40 amp applications, 8 gage wire or larger should be used. If lengths over 25 feet are needed, use 4 gage wire. For 20 amp applications, 10 gage or larger should be used.

A time-delayed fuse should be located near the power source (battery) to protect the wire and the motor from exceeding their rated loads. If other systems are also powered on the same line as the pump, it is recommended that the motor be fused separately. Minimize wire length where possible to achieve the best possible performance from the pump.

Battery isolators are recommended to protect both the alternator and battery of your vehicle. Not all vehicles have high amp alternators. An alternator may be damaged if it is overloaded. Be sure to check the output rating of the vehicle or implement, and use battery isolators with a deep cycle battery, or bank of batteries, to protect system from overloading or draining vehicle battery.

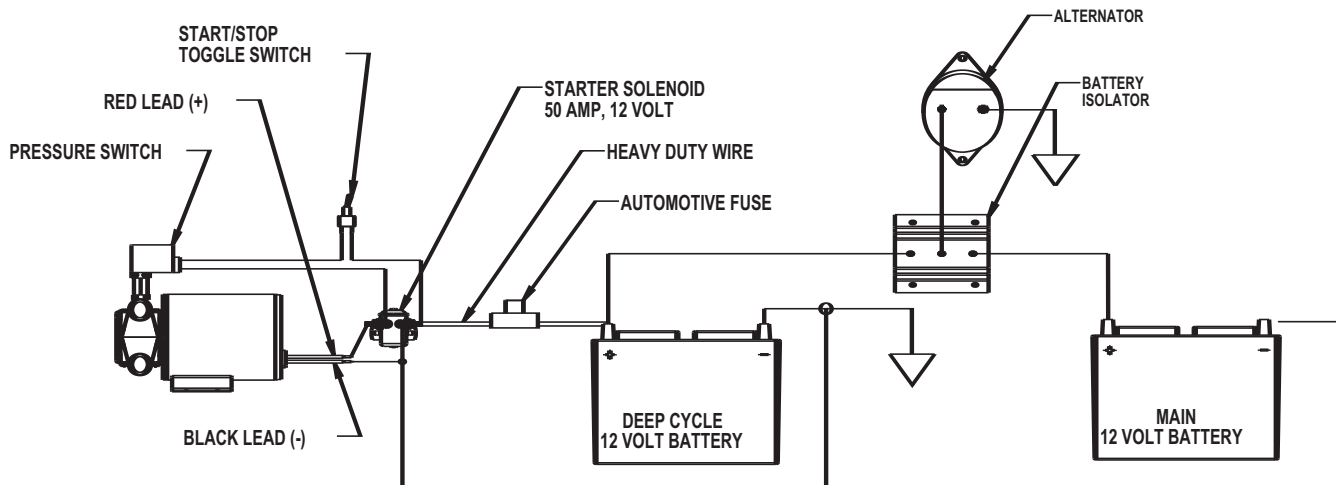


Figure 4

Duty Cycle

Duty cycle is the ratio of motor-on time to total cycle time in one hour. It is used to determine the acceptable level of running time so that the thermal limits of the motor are not exceeded. Inefficiencies cause a temperature rise in a system, and when the temperature reaches a critical point, components can fail. Letting the system rest idle during the cycle allows the motor windings to cool. The duty cycle is limited by the motor thermal internal limits.

Use the following equation and example to determine Duty Cycle:

$$\text{Duty Cycle} = \text{ON TIME} / [\text{Cycle ON TIME} + (60 \text{ Minutes} - \text{Cycle ON TIME})] * 100.$$

(ON TIME cannot exceed 60 minutes.)

An example of a 75% Duty Cycle Motor is = $45 / [45 + (60 - 45)] * 100 = 75\%$ or 45 minutes on time per hour of operation at maximum rated pressure and flow. ON TIME can be extended by reducing the maximum pressure the pump operates at.

AC Electrical Connections

Make sure the power source conforms to the requirements of the equipment being installed.

When wiring an electrically-driven pump, follow all electrical and safety codes, including the most current National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA) requirements in the United States.

To reduce the risk of electric shock, all motors must be adequately grounded to a grounded metal raceway system, or by using separate grounding wire connected to the bare metal on the motor frame or to the grounding screw inside the motor terminal box. Refer to the National Electric Code (NEC) Article 250 (grounding) for further information.

Electrical Connections for Single Phase

Never connect the green (or green and yellow) wire to a live terminal. Doing so may result in severe electrical shock and/or damage to the equipment.

1. Make all electrical connections according to the instructions provided on the electric motor. Select models can be used for 115V or 230V (single phase) 50/60 Hz and can be wired for either portability with a flexible 3-wire cord, or permanent installation using a grounded power supply.
2. To reduce the risk of electrical shock, the motor must be properly grounded. This is accomplished by:
 - Inserting a plug (portable installations only) directly into a properly installed and grounded 3-prong grounding type (GFCI) receptacle.
 - Permanently wiring the unit to a grounded metal frame.
 - Using a separate ground wire connected to the bare metal of the motor frame.

3. Voltage should be within 5% of the motor rating.
4. Motor starters may be used.
5. The green, or green and yellow, conductor in the cord is the grounding wire. The motor must be grounded for your protection against electrical shock.
6. Where a 2-prong receptacle is encountered, it must be replaced with a properly grounded 3-prong receptacle installed in accordance with the National Electrical Code and local codes and ordinances.
7. Use wire of adequate size to minimize voltage drop at the motor. The pump motor should be powered by a separate branch circuit.
8. Connections should be made with flexible conduit to minimize vibration transmission.
9. After making electrical connections, jog the motor momentarily to verify correct rotation (CCW when viewed from front of pump).

Operation

Priming

If the liquid is below the level of the pump, some means should be provided in installation to prime the pump, such as a foot valve or check valve to hold prime. Keep suction lift to a minimum and avoid unnecessary bends in the suction line. Before starting pump, make sure air bleeder valve or spray gun is open, or unloader valve is adjusted to its lowest pressure. After starting pump, open and close gun several times if necessary to aid priming the pump. If pump does not prime within a few seconds, stop motor and inspect installation for suction line leaks or obstructions. Make sure that strainer is not clogged. Be sure that suction line is not obstructed, kinked or blocked. **Suction lift not to exceed 5 feet.**

If the pump is to operate hours at a time, check frequently for:

1. Adequate liquid supply. Plunger pumps must not run dry for more than 30 seconds.
2. Temperature rise. Overheating is harmful to bearings, cups and ceramic plungers.

Care of Pump

Your pump will last longer and give best performance when properly taken care of. Proper pump care depends on the liquid being pumped and when pump will be used again.

After each use, flush pump with a neutralizing solution for the liquid just pumped. Follow with a clean water rinse. This is especially important for corrosive chemicals.

While this flushing is not absolutely necessary for short periods of idleness (as overnight), it is good practice to clean the pump after each use to prevent deposits from forming and damaging the pump. Using antifreeze not only coats the interior of the pump with an inhibitor, but acts as a lubricant as well, keeping valves from sticking - and protecting against any remaining moisture freezing in cold weather.

Operation

For infrequent use and before long periods of storage, drain pump thoroughly. Open any drain plugs, remove suction hose from liquid, and run pump "dry" from 0 to 30 seconds (**not longer**). A rust inhibitor should be injected into the pump before both ports are plugged and the pump is stored. Plug all ports to keep out air until pump is used again.

Lubrication

The lubrication of this pump unit has been done at the factory prior to shipping. No further lubrication is required. If the pump unit is to be repaired or reworked, see work instructions on initial lubrication.

Plunger & Diaphragm Pump Disassembly, Repair & Assembly Instructions

Recommended Shop Tools:

3/16" and 5/32" Allen wrench

7/16" Socket

Blade screwdriver

Bar clamp

High temperature wheel bearing grease

Inverted pliers or seal puller

WARNING: Before disassembly, be sure to follow all precautions to relieve pressure from the pump, and properly flush the pump of all chemicals.

1. **Remove pump head from motor.** Pry nameplate loose from front of pump. Locate the four socket head cap screws inside the dry crankcase of the pump. With a long 3/16" hex allen wrench, remove the four cap screws. Remove pump head.
2. **Disassemble pump head.** With a 7/16" socket, loosen the eight flanged nuts that hold the two body halves together. Remove bolts and gently pry the pump body halves apart. With a flat screwdriver, pry the internal connecting rod and valve casings from the body.
3. **Inspection of Pump Parts**
When disassembling pump, thoroughly inspect all parts and replace if necessary, with special consideration given to the following areas:
 - a. **Cam Bearing:** Rotate bearing. It should turn smooth without a rough or loose feeling to it. Replace if necessary. If bearing has been flooded with solution due to failure of diaphragm, it most likely will need to be replaced.
 - b. **Connecting Rod:** Check clearance on the wear surface with feeler gauge between bearing and flat surface. It should be less than 0.010". Excessive noise and loss of performance will occur if clearance is too great.

- c. **Elastomers:** O-rings, U-cup, and diaphragms should always be replaced when pump is serviced. Elastomers take a set with age and do not energize in a dynamic condition as new parts will. Reusing these parts may cause leaks or premature failure to occur. Running a plunger pump dry for excessive amount of time will cause the U-cup to fail due to the high heat generated by friction on non-lubricated surfaces.
- d. **Valves:** Inspect for pitting and general wear in the valve assembly. Poppets wear against the valve seat. Valves will leak if worn unevenly or pitted, resulting in loss of performance and increased vibration accompanied by reduced flow.
- e. **Carbon Plunger Guide/ Brass Diaphragm Guide:** Inspect guides for wear and replace if necessary. Worn guides and spacers put stress on U-cup or diaphragms and will cause early failure of these parts.
- f. **Plunger / Diaphragm:** Plungers may show discoloration due to the solutions being pumped. Inspect for pits, fissures & cracks. Replace if any are found. Ceramic material cracks from thermal shock are usually caused by running the pump dry followed by a sudden shock of cold solution. Inspect diaphragms on the back side where the backing plate wears against it. If more than 1/8" is worn off, replace diaphragm.
- g. **Body and Valve Casing Polyester Polymer Parts (PBT):** Inspect parts for cracks, worn surfaces or chemical attack.

Plunger Assembly Instructions

1. Plunger / Connecting Rod Assembly: (Fig. 5)

Skip this step if assembly was left untouched, otherwise assemble stainless steel washer on shoulder bolt and slide ceramic plunger over bolt. Lubricate o-ring, and roll it over the end of the bolt threads until tight against the plunger. Spray Loctite activator on threads and then apply blue Loctite to threads. (Stainless steel requires activator for Loctite to adhere. Thread bolt into connecting rod and tighten with 3/16" Allen wrench, while holding connecting rod with a crescent wrench or in a vise (Fig. 6). Shoulder bolt should be tightened to approximately 100 to 115 in-lbs.



Figure 5

2. Plunger Guide / Vacuum Seal Assembly: (Fig. 7)

Assemble vacuum seal by lubricating o-ring with oil, then slipping Teflon® seal ring inside o-ring. Carefully insert vacuum seal assembly into brass plunger guide retainer at an angle and part way in (Fig. 8). Align carbon plunger guide with the brass retainer cup and start it into retainer. With a constant force, push carbon guide all the way down. This will align and locate the vacuum seal correctly against the bottom. Carbon guide should be even with the top of the brass plunger guide retainer when fully assembled.

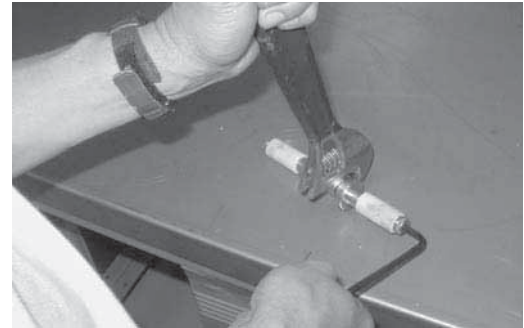


Figure 6

3. U-Cup / Valve Casing Assembly: (Fig. 9)

Lubricate o-ring on valve with oil and push valve in casing as shown in Figure 9. Note: The cage should always be on the upper side of the assembly. Solution enters the valve through the stainless steel metal seat of the valve and exits through the plastic cage. On the plunger side of the casing, insert the U-cup with the open side facing in. This allows the pressure of the liquid to spread the lips of the U-Cup and energize it to seal against the ceramic plunger. Insert metal backup ring and then the o-ring to finish assembly.

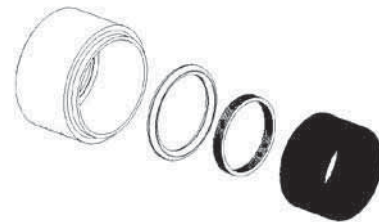


Figure 7

4. Assemble Sub-Assemblies:

Push vacuum seal/plunger guide over ceramic plunger. Groove for o-ring on retainer should be facing outward. Next slip valve/U-cup casing onto plunger and mate it up to the retainer cup. Repeat for other side of plunger. Check orientation: inlet valve side of valve casing (metal seat side of valve) towards the bottom and the blue plastic cage side up. The connecting rod cupped face should be orientated to face the motor pilot of the body half (Fig. 10).



Figure 8

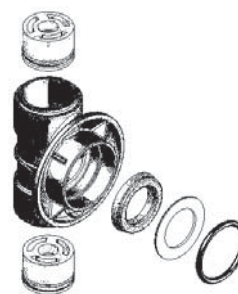


Figure 9

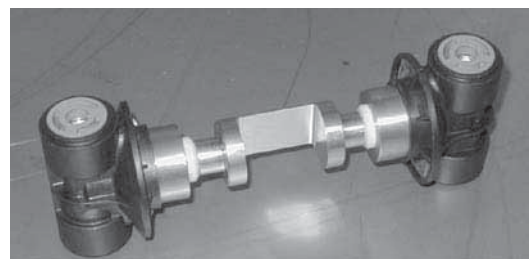


Figure 10

Plunger Assembly Instructions

5. Final Pump Head Assembly:

Lubricate and insert o-ring No. 1720-0076 into the bottom of the pump body's two circular cavities (Fig.11). Use grease or vacuum seal grease to hold o-rings in place. Carefully place sub-assembly into pump body's lower half. Slide or reposition parts to get the assembly to fit into place (Fig. 12). Extra care is usually necessary for positioning of the brass plunger guide. Next, place lubricated o-rings in upper body half and squeeze lower body with sub-assembly into upper body. Some lateral pressure will have to be applied to the two valve casings to get them to feed into the pump body. Once the two identical body halves are together, drop the bolts in so that the flanged nuts are positioned on the bottom (inlet) side. Tighten nuts 35 to 40 in-lbs. Finally, lubricate connecting rod with wheel bearing grease (three pumps of grease gun). Pump head is now ready for assembly onto motor or gas engine.

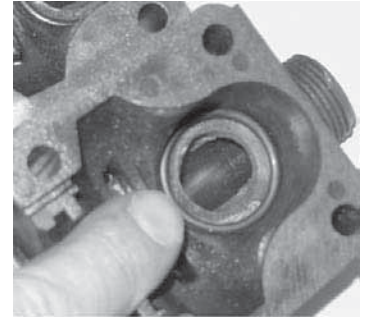


Figure 11

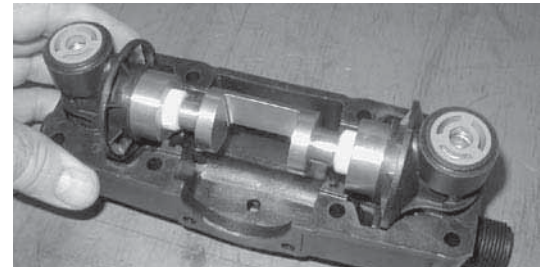


Figure 12

Diaphragm Assembly Instructions

1. Diaphragm / Connecting Rod Assembly: (Fig. 13)

To assemble diaphragm / connecting rod assembly, first slide spacer onto pilot of connecting rod. Then slide bushing onto spacer. Be sure to orientate the bushing properly (smaller diameter faces outward) when assembling this part. Thread shoulder bolt through front diaphragm support, diaphragm, (smooth, flat surface faces inward towards the connecting rod) backing plate, (smooth curved surface against diaphragm) and diaphragm clamp (grooved-side facing diaphragm). Spray Loctite activator on threads, then apply blue Loctite to threads. Finish by inserting bolt into spacer and tightening shoulder screw onto connecting rod with a 3/16" Allen wrench, while holding connecting rod with a crescent wrench or in a vise (Fig 14). Shoulder bolt should be tightened to approximately 100 to 115 in-lbs. Repeat procedure for second half of assembly.

Note: Applying grease between the backing plate and diaphragm will prolong the life of the diaphragms.

2. Diaphragm / Valve Casing Assembly: (Fig. 15)

Lubricate o-ring on valve with oil and push valve in casing as shown to the lower right. Note: The cage should always be on the upper side of the configuration. Solution enters the valve through the stainless steel metal seat and exits through the plastic cage. Note arrow on side of valve casing showing the direction of flow. The valve cage can only assemble into the valve casing from this side.

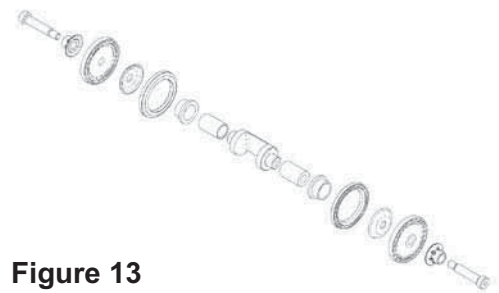


Figure 13

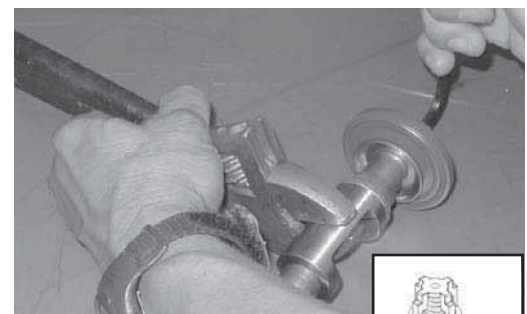


Figure 14

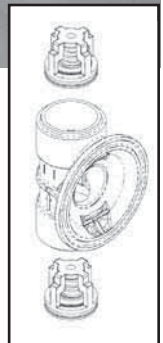


Figure 15

Diaphragm Assembly Instructions

3. Assemble Sub-Assemblies: (Fig. 16)

Place oiled o-rings No. 1720-0076 (2) into pockets at the bottom half of pump body. One o-ring is placed on each side. With both hands, assemble the two valve casing parts to the connecting rod assembly. Orientate valve casing in the correct position relative to the connecting rod, as shown to the right (valve cages facing upward and connecting rod cupped face facing the motor pilot). Set the assembly into the body half.

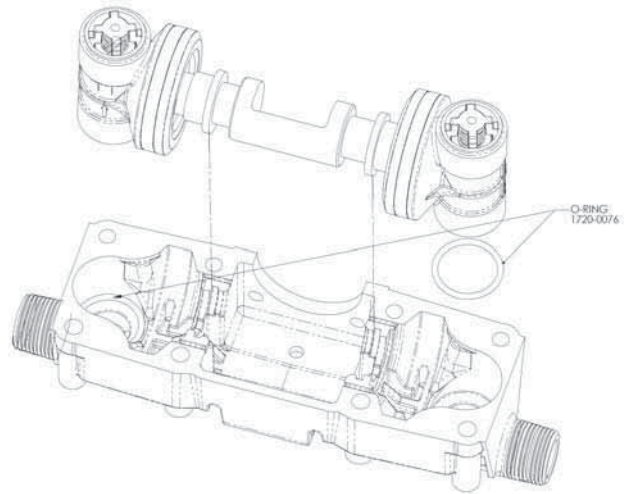


Figure 16

With your index fingers, align the bushing into the groove of the body as indicated (Fig. 17). At this point, make sure the diaphragm is properly mated with the valve casing and diaphragm clamp. You may need to roll or stuff the diaphragm into the groove (Fig. 18).

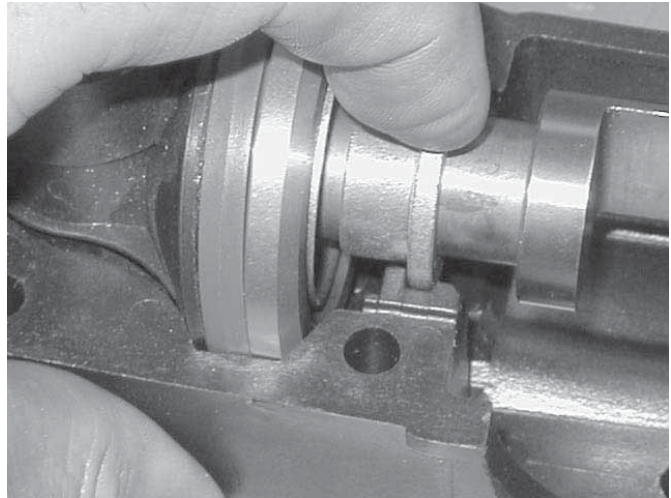


Figure 17

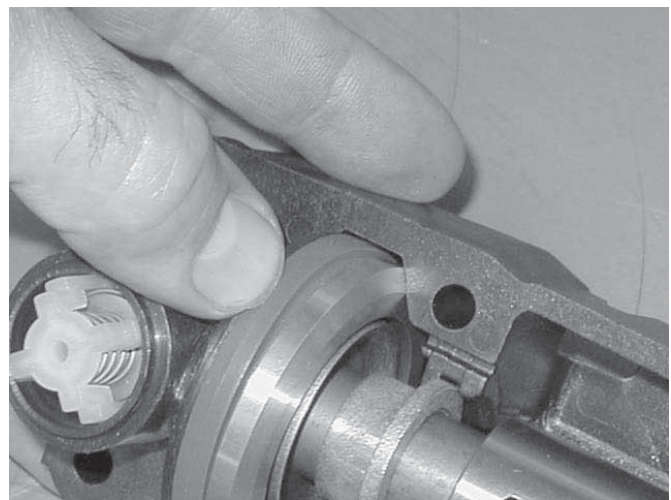


Figure 18

Diaphragm Assembly Instructions

4. Final Pump Head Assembly:

Lubricate and insert o-ring No. 1720-0076 into the bottom of the pump body's two circular cavities (Fig. 11). Use grease or vacuum seal grease to hold o-rings in place. Next, work lower body with sub-assembly into upper body. Some lateral pressure will need to be applied to the two valve casings to compress the diaphragms and allow the valve casing to feed into the upper pump body. A bar clamp is a very helpful aid for this task (Fig. 19).

Once the two identical body halves are together, drop the bolts in so that the flanged nuts are positioned on the bottom (inlet) side. Tighten bolts and nuts 35 to 40 in-lbs. Finally, lubricate connecting rod with wheel bearing grease (three pumps of grease gun). (See Fig. 20.) Pump head is now ready for assembly onto motor or gas engine.

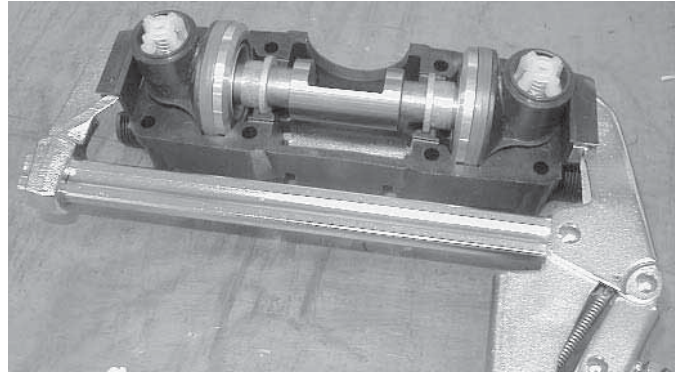


Figure 19

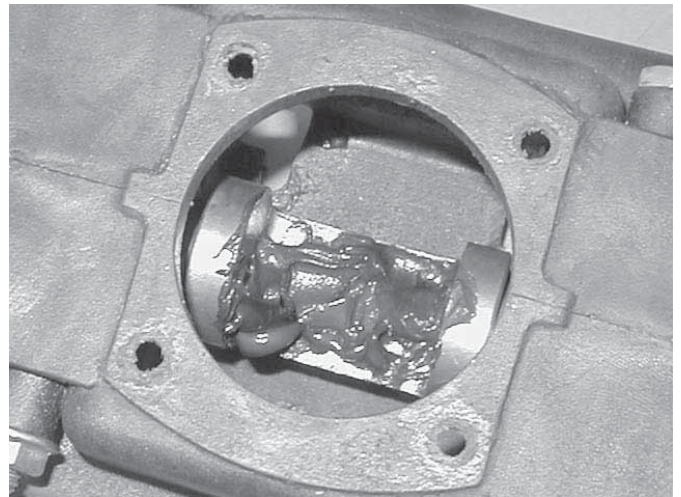


Figure 20

Motor / Pump Assembly

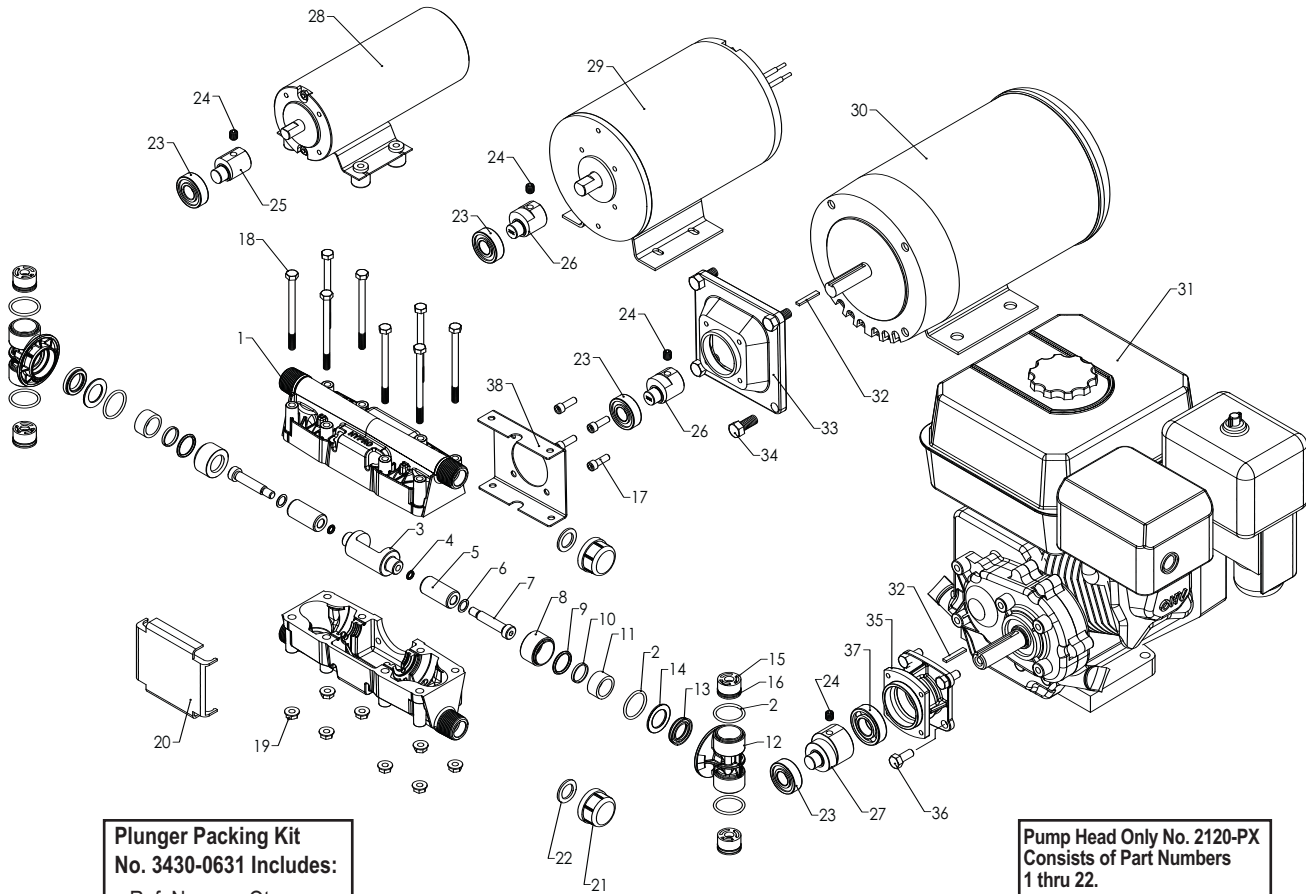
1. Shaft Eccentric and Bearing:

Be sure the correct eccentric is assembled onto your motor. Over-sizing the eccentric may cause damage to the motor. Check with parts breakdown for correct sizing.

Press bearing onto shaft eccentric using an arbor press. Assemble eccentric shaft onto motor shaft with the flat surface aligned with the set screw. Tighten set screw down onto the shaft using 5/32" Allen wrench. Front face of bearing should be no further than 1.34" (1-11/32") distance from the mounting face that the pump mates up with. If the

bearing distance is too great, interference can prevent the motor from turning or decrease bearing life. Next, align pump head with pilot on motor. Check that bearing is not interfering with connecting rod. Adjust eccentric shaft further back if necessary. Using 1/4" hex cap screw (2220-0041) and a long 3/16" Allen wrench, bolt pump head onto motor. Tighten screws to approximately 35 to 40 in-lbs. If your motor has a 56C face on it, you will need to use an adapter flange as well as a 3/32" X 3/16" rectangular key to create the flat for the set screw to lock on.

2120 Plunger Series



**Plunger Packing Kit
No. 3430-0631 Includes:**

Ref. No.	Qty.
2	6
4	2
6	2
9	2
10	2
11	2
13	2

**Plunger Pump Valve Kit
No. 3430-0632 Includes:**

Ref. No.	Qty.
2	4
15	4
16	4

**Engine Flange Mounting
Kit No. 3430-0658 Includes:**

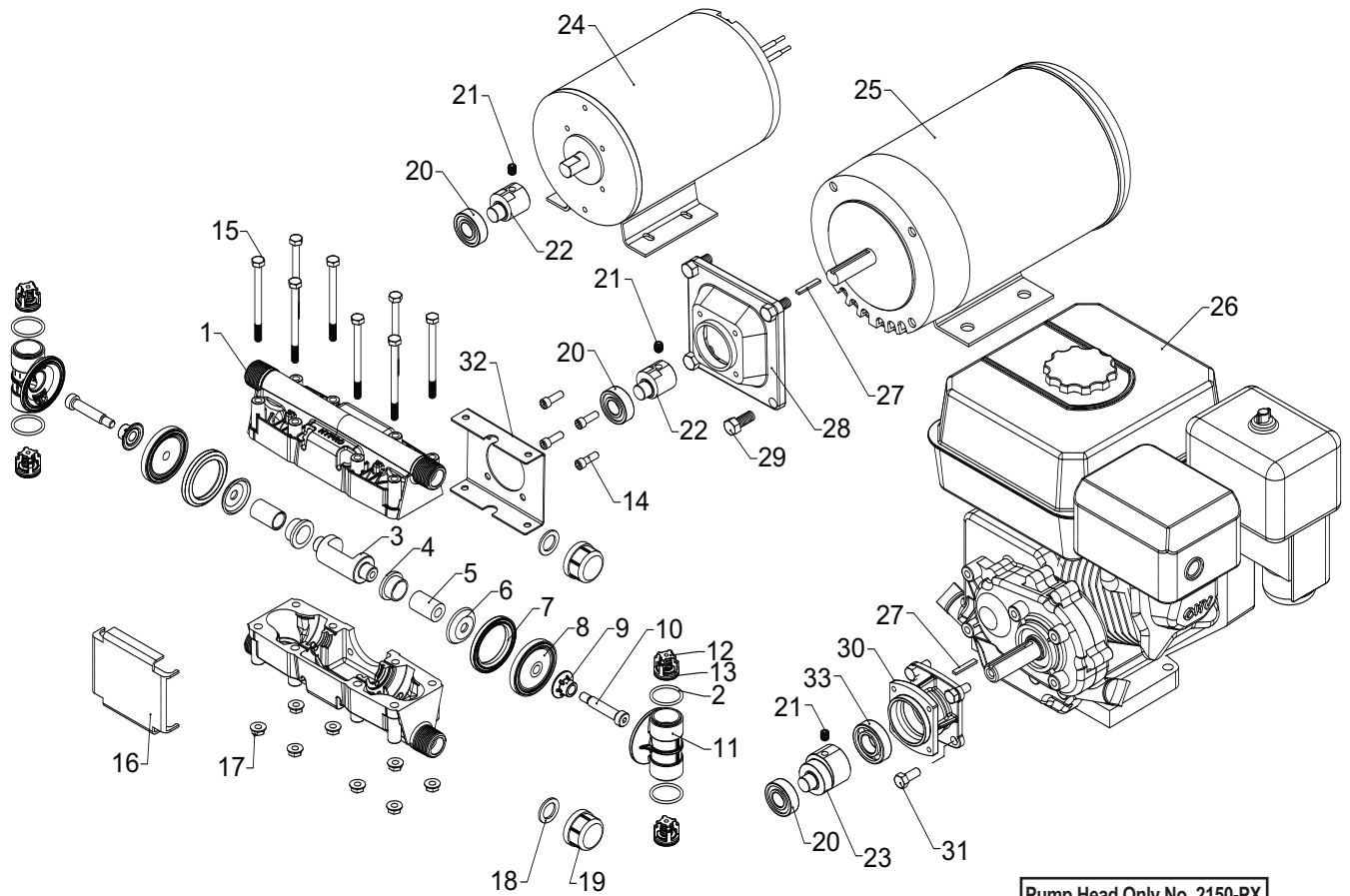
Ref. No.	Qty.
32	1
35	1
36	4
37	1

**Pump Head Only No. 2120-PX
Consists of Part Numbers
1 thru 22.**

Note: When ordering parts, give quantity, part number, description and complete model number. Reference numbers are used ONLY to identify parts in the drawing and NOT to be used as order numbers.

Ref. No.	Qty. Req'd.	Part No.	Description	Ref. No.	Qty. Req'd.	Part No.	Description
1	2	0101-2100P	Pump Body (Polyester PBT)	21	2	2102030	End Cap
2	6	1720-0076	O-ring	22	2	G40013	End Cap Washer
3	1	0500-2100	Connecting Rod	23	1	2000-0015	Bearing
4	2	1720-0033	O-ring	24	1	2230-0003	Set Screw
5	2	3500-0070	Ceramic Plunger (3/4" in. Dia.)	25	1	0550-2145	Shaft Eccentric (2120P-P18DC)
6	2	2270-0015	Seal Washer	26	1	0551-2175	Shaft Eccentric (2120P-P35DC, P50AC)
7	2	2220-0104	Shoulder Screw	27	1	0552-2190	Shaft Eccentric (Gas Engine)
8	2	1830-0171	Guide Retainer	28	1	2570-0025	DC Motor (20 Amp)
9	2	1720-0202	O-ring	29	1	2570-0026	DC Motor (36 Amp)
10	2	1440-0010	Seal Ring	30	1	2560-0013	Motor (1/2 HP, 56C Frame AC, 50 Hz)
11	2	1440-0086	Plunger Guide (Carbon)	30	1	2570-0027	Motor (1/2 HP, 56C Frame DC, 39 Amp)
12	2	0717-2100P	Valve Retainer	30	1	21721	Motor (1/2 HP, 56C Frame AC, 60 Hz)
13	2	2150-0091	U-Cup Seal (Viton)	31	1	2549-0040	Gas Engine (2:1 Gear Reduced)
14	2	2270-0095	U-Cup Backup Ring	32	1	1610-0061	Key
15	4	3400-0088	Valve Assembly	33	1	0706-2100A	Adapter Flange (56C Motor)
16	4	1720-0007	O-ring	34	4	2210-0020	Bolts
17	4	2220-0041	Hex Head Cap Screw	35	1	0708-2100A	Adapter Flange (Gas Engine)
18	8	2210-0137	Bolts	36	4	2210-0146	Bolts
19	8	2250-0077	Flanged Nuts	37	1	2000-0017	Bearing
20	1	2840-0083	Nameplate				

2150 Diaphragm Series



Diaphragm Packing Kit No. 3430-0633 Includes:	
Ref. No.	Qty.
2	4
6	2
7	2
8	2
9	2

Diaphragm Pump Valve Kit No. 3430-0634 Includes:	
Ref. No.	Qty.
2	4
12	4
13	4

Engine Flange Mounting Kit No. 3430-0658 Includes:	
Ref. No.	Qty.
27	1
30	1
31	4
33	1

**Pump Head Only No. 2150-PX
Consists of Part Numbers
1 thru 19.**

Note: When ordering parts, give quantity, part number, description and complete model number. Reference numbers are used ONLY to identify parts in the drawing and NOT to be used as order numbers.

Ref. No.	Qty. Req'd.	Part No.	Description	Ref. No.	Qty. Req'd.	Part No.	Description
1	2	0101-2100P	Pump Body (Polyester PBT)	19	2	2101030	3/4" End Cap
2	4	1720-0076	O-ring	20	1	2000-0015	Bearing
3	1	0500-2100	Connecting Rod	21	1	2230-0003	Set Screw
4	2	1440-0087	Bushing	22	1	0551-2145	Motor Eccentric Bushing (1/2 HP)
5	2	1430-0029	Spacer	23	1	0552-2145	Motor Eccentric Bushing (Gas Engine)
6	2	1410-0113	Backing Plate	24	1	2570-0026	DC Motor (36 Amp)
7	2	1830-0172P	Diaphragm Clamp	25	1	2570-0027	Motor (1/2 HP, 56C Frame DC, 39 Amp)
8	2	2535-0009	Diaphragm	25	1	2560-0013	Motor (1/2 HP, 56C Frame AC, 50 Hz)
9	2	1410-0114P	Front Support Washer	25	1	21721	Motor (1/2 HP, 56C Frame AC, 60 Hz)
10	2	2220-0104	Shoulder Screw	26	1	2549-0040	Gas Engine 5.5 HP (2:1 Gear Reduced)
11	2	0718-2100P	Diaphragm/Valve Casing	27	1	1610-0061	Shaft Key
12	4	3400-0168	Valve Assy. (includes 1720-0007)	28	1	0706-2100A	Adapter Flange (56C Motor)
13	4	1720-0007	O-ring	29	4	2210-0020	Adapter Bolts
14	4	2220-0041	Bolts	30	1	0708-2100A	Adapter Flange (Gas Engine)
15	8	2210-0137	Head Bolts	31	4	2210-0146	Hex Head Cap Screw
16	1	2840-0083	Shield and Nameplate	32	1	1520-0087	Label Bracket
17	8	2250-0077	Flanged Nuts	33	1	2000-0017	Bearing
18	2	G40013	Gasket for End Cap				

Troubleshooting

Symptom	Probable Cause(s)	Corrective Action(s)
No flow or low flow.	Pump not primed.	Refer to Priming in the Operation Section.
	Air leaks in suction line.	Check and reseal inlet fittings.
	Blocked or clogged line strainer.	Inspect strainer and clear any debris from screen.
	Undersize suction line or collapsed hose.	Suction line should be the same diameter as inlet port of pump or larger.
	Nozzle clogged.	Clear nozzle or replace.
	Low voltage at motor.	Increase wire size.
	Unloader or relief valve not functioning properly.	Repair or replace relief valve.
Low pressure.	Pump incorrectly rebuilt.	Dissassemble and rebuild per instructions.
	Debris in valves.	Remove debris. See Repair section.
	Valves worn.	Replace Valves. See Repair section.
	Unloader or relief valve not functioning properly.	Repair or replace relief valve.
Pump leaking.	Pump not primed.	See priming in Operation section.
	Seals worn.	Replace seals. See Repair section.
	Body cracked.	Replace body. See Repair section.

Performance Data

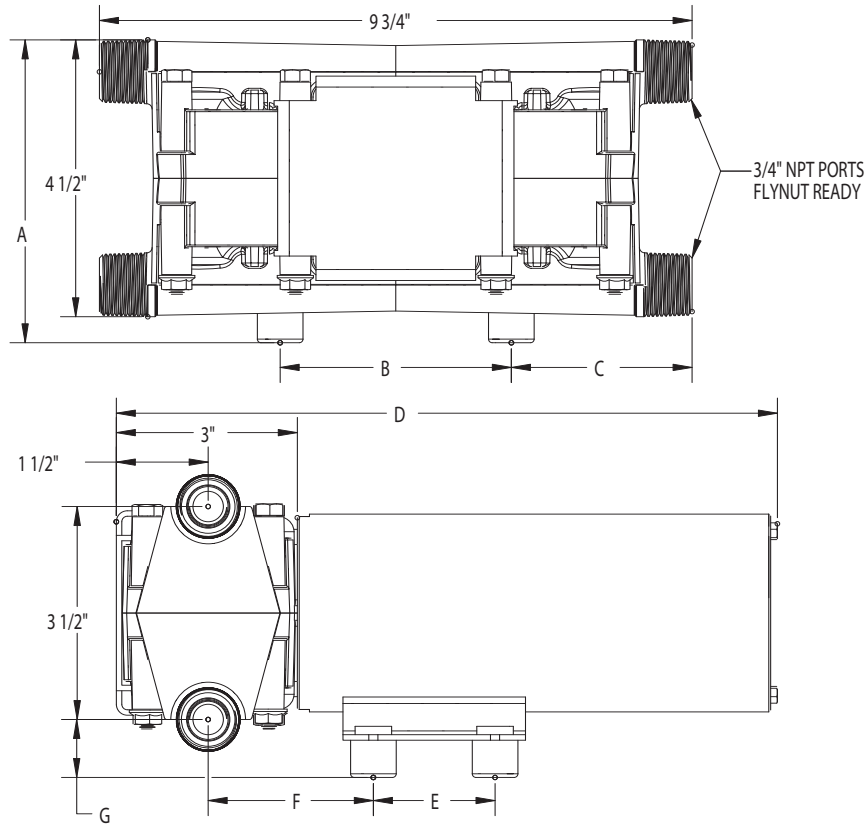
2100 Versa Twin Series Performance Plunger Pumps

2120P-P18DC			2120P-P35DC			2120P-P39DC			2120P-P05AC			2120P-P05EU			2120P-P55GE	
PSI	GPM	AMPS	PSI	GPM	AMPS	PSI	Flow	AMPS	PSI	Flow	AMPS	PSI	Flow	AMPS	PSI	Flow
0	2.7	8.9	0	2.9	9.9	0	2.9	10.7	0	2.5	7.7	0	2.1	6.4	0	2.9
25	2.3	10.5	50	2.4	14.9	50	2.7	14.3	50	2.4	7.8	50	2.0	6.5	50	2.6
50	2.1	12.5	100	2.4	18.9	100	2.6	18.0	100	2.3	7.9	100	1.9	6.6	100	2.5
75	2.1	14.0	150	2.2	22.3	150	2.4	21.7	150	2.2	8.0	150	1.9	6.6	150	2.4
100	2.0	15.7	200	2.2	26.5	200	2.3	25.4	200	2.1	8.0	200	1.8	6.7	200	2.3
125	2.0	17.4	250	2.1	29.8	250	2.2	29.1	250	2.0	8.1	250	1.7	6.8	250	2.3
150	2.0	19.1	300	2.0	33.1	300	2.0	32.8	300	2.0	8.2	300	1.6	6.8	300	2.2

Diaphragm Pumps

2150P-D35DC			2150P-D39DC			2150P-D05AC			2150P-D55GE	
PSI	GPM	AMPS	PSI	Flow	AMPS	PSI	Flow	AMPS	PSI	Flow
0	7.0	12.9	0	8.3	15.7	0	6.7	7.6	0	7.0
20	6.6	17.2	20	7.6	19.7	20	6.4	7.7	20	6.6
40	6.0	22.3	40	6.7	23.8	40	6.0	7.8	40	6.3
60	5.6	26.8	60	6.1	27.8	60	5.7	7.9	60	5.9
80	5.2	31.2	80	5.7	31.9	80	5.3	8.0	80	5.5
100	5.0	35.3	100	5.3	35.9	100	5.0	8.2	100	5.2

2100 Outline Drawing



Dim.	2120P-P18DC	2120P-P35DC 2150P-D35DC	2120P-P39DC 2150P-D39DC	2120P-P05AC 2150P-D05AC	2120P-P55GE 2150P-D55GE
A	5.00	6.25	6.38	8.50	13.00
B	3.75	3.75	5.75	5.50	6.38
C	3.00	3.00	2.00	1.75	3.88
D	11.00	10.50	14.50	13.00	15.13
E	2.00	2.00	3.00	3.00	3.00
F	2.75	3.00	5.13	6.75	6.00
G	1.00	1.75	1.75	1.75	2.50

2100 Eccentric Kits	Description
3430-0651	1/2" Shaft .145" [Ref. 23, 24 & 25] for Model 2120P-P-18DC
3430-0653	5/8" Shaft .145" [Ref. 20, 21, 22 & 27] for Model 2150P-DXXXX Diaphragm Pumps
3430-0654	5/8" Shaft .175" [Ref. 23, 24, 26 & 32] for Model 2120P-PXXXX Plunger Pumps
3430-0655	3/4" Shaft .145" [Ref. 20, 21, 23 & 27] for Model 2150P-D55GE Diaphragm Pumps
3430-0656	3/4" Shaft .190" [Ref. 23, 24, 27 & 32] for Model 2120P-P55GE Plunger Pumps
3430-0657	AC Motor 56C Frame Adapter Flange Kit [Ref. 32, 33 & 34]
3430-0658	Gas Engine Adapter Flange Kit [Ref. 32, 35, 36 & 37]

Pump Head Kits	Description
2120PX	Replacement Plunger Pump Head
2150PX	Replacement Diaphragm Pump Head

Limited Warranty on Hypro Pumps

Hypro warrants to the original purchaser of its products (the "Purchaser") that such products will be free from defects in material and workmanship under normal use for the period of one (1) year for all products except: oil crankcase plunger pumps will be free from defects in material and workmanship under normal use for the period of five (5) years, and accessories will be free from defects in material and workmanship under normal use for the period of ninety (90) days. In addition, Hypro warrants to the purchaser all forged brass pump manifolds will be free from defects in material and workmanship under normal use and from damage resulting from environmental conditions for the life of the pump.

"Normal use" does not include use in excess of recommended maximum speeds, pressures, vacuums and temperatures, or use requiring handling of fluids not compatible with component materials, as noted in Hypro product catalogs, technical literature, and instructions. This warranty does not cover freight damage, freezing damage, normal wear and tear, or damage caused by misapplication, fault, negligence, alterations, or repair that affects the performance or reliability of the product.

THIS WARRANTY IS EXCLUSIVE. HYPRO MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Hypro's obligation under this warranty is, at Hypro's option, to either repair or replace the product upon return of the entire product to the Hypro factory in accordance with the return procedures set forth below. **THIS IS THE EXCLUSIVE REMEDY FOR ANY BREACH OF WARRANTY.**

IN NO EVENT SHALL HYPRO BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND, WHETHER FOR BREACH OF ANY WARRANTY, FOR NEGLIGENCE, ON THE BASIS OF STRICT LIABILITY, OR OTHERWISE.

Return Procedures

All pumps or products *must* be flushed of *any* chemical (ref. OSHA Section 0910.1200 (d)(e)(f)(g)(h) and hazardous chemicals *must* be labeled before being shipped* to Hypro for service or warranty consideration. Hypro reserves the right to request a Material Safety Data sheet from the Purchaser for any pump or product Hypro deems necessary. Hypro reserves the right to "disposition as scrap" pumps or products returned which contain unknown substances, or to charge for any and all costs incurred for chemical testing and proper disposal of components containing unknown substances. Hypro requests this in order to protect the environment and personnel from the hazards of handling unknown substances.

For technical or application assistance, call the **Hypro Technical/Application number: 1-800-445-8360.**

To obtain service or warranty assistance, call the Hypro Service and Warranty number: 1-800-468-3428;

or call the Hypro Service and Warranty FAX: (651) 766-6618.

Be prepared to give Hypro full details of the problem, including the following information:

1. Model number and the date and from whom you purchased your pump.
2. A brief description of the pump problem, including the following:
 - Liquid pumped. State the pH and any non-soluble materials, and give the generic or trade name.
 - Temperature of the liquid and ambient environment.
 - Suction lift or vacuum (measured at the pump).
 - Discharge pressure.
 - Size, type, and mesh of the suction strainer.
 - Drive type (gas engine/electric motor, direct/belt drive, tractor PTO) and rpm of pump.
 - Viscosity (of oil, or other than water weight liquid).
 - Elevation from the pump to the discharge point.
 - Size and material of suction and discharge line.
 - Type of spray gun, orifice size, unloader/relief valve.

Hypro may request additional information, and may require a sketch to illustrate the problem.

Contact the factory to receive a return material authorization before sending the product. All pumps returned for warranty work should be sent shipping charges prepaid to:

HYPRO
Attention: Service Department
375 Fifth Avenue NW
New Brighton, Minnesota 55112

*Carriers, including U.S.P.S., airlines, UPS, ground freight, etc., require specific identification of any hazardous materials being shipped. Failure to do so may result in a substantial fine and/or prison term. Check with your shipping company for specific instructions.



**Pentair Water
SPRAY GROUP**

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