

# Pilot Valve and Manifold Manual for Ratio:Feeder<sup>®</sup> Chemical metering pumps.

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## Overview. Pilot Valve.

The Pilot Valve is a remote control large capacity three way valve. This valve is pilot operated, that is, pressure from the inlet port is used to switch the valve. In some designs, an external pressure signal is used to switch the valve. This can be either gas or fluid pressure.

The Pilot Valve is used to control the modular pumpers that inject the chemical additive into the water line. The pumpers are single acting hydraulic (or pneumatic) cylinders. The pressure to power these cylinders is drawn from the water line, an external source such as an air compressor, or a compressed gas storage cylinder. After the pressure is used to inject the chemical, it must be exhausted to a drain or container at zero pressure. Because the pumpers operate very fast at times and because more than one pumper can be used for various reasons, the pilot valve must switch rapidly and have a relatively large flow capacity. The pumpers are single acting so the pilot valve must be a three way type. A three way valve has three ports or connections. A pressure port (inlet), an exhaust port (outlet), and a common (cylinder or pumper) port. The action of the valve alternately connects the inlet to the common or the outlet to the common. When the 'inlet' is connected to the 'common', the

pumper 'pumps' or injects a measured dose of chemical into the water line. When the valve switches and connects the 'outlet' to the 'common', a suction cycle occurs. The fluid or gas used to power the pumping cycle is exhausted or wasted and a new measured dose of chemical is drawn into the pumper to be ready for the next full cycle.

There are two types of pilot valves, two designs, three brands, and three sizes. The first type is non-electric, external signal switching. The second type is electric solenoid operated, internal pressure signal switching. The first design uses a diaphragm operator. The second uses a piston operator. The three brands are; Anderson (type A), Honeywell (type S), and Bürkert (type B). The three sizes are (as determined by the thread size of the input pressure connection); 3/8" NPT, 1/2" NPT, and 3/4" NPT. The model number of the Ratio:Feeder<sup>®</sup> does not identify the valve. You should identify the valve and make a note in your owners manual for use when ordering parts or requesting help with troubleshooting.

The main connections to the three way valves are as follows.

Standard port designations: Inlet; 'P' or '1'. Common; 'A/B' or '2'. Outlet; 'R' or '3' or 'E'.

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## Identifying the valve brand.

The Anderson brand housing is a cube. It has a small threaded connection for a pressure gauge in addition to the main connections.

The Honeywell brand has a forged body and the inlet and outlet connections are side by

side opposite from the common port. The solenoid housing if used, is generally round.

The Bürkert brand has the three main connections on three different faces of the housing. The solenoid if used, is rectangular.

## Pilot Valves & Manifolds

All brands can be either solenoid or external pressure controlled.

The pilot valve requires a minimum pressure to operate properly. The minimum operating pressure for the Ratio:Feeder® is 15 psig. This is greater than that required for the pilot

valve so we will refer to the minimum pressure requirement as 15 psig for the whole system.

Please turn to the section covering the valve you have. The Manifold section follows the pilot valve section.

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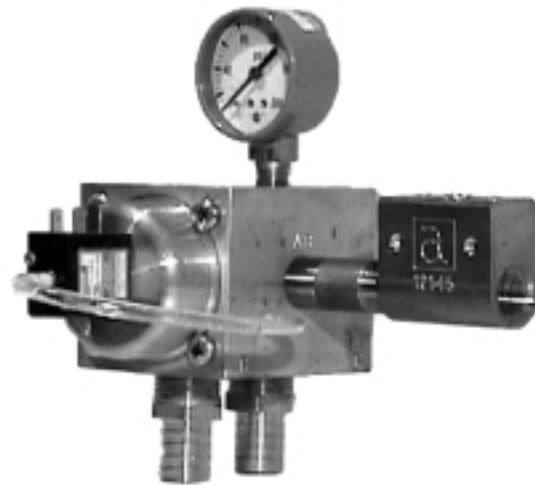
### Type A (Anderson) Valves.

Diaphragm operator, poppet seal, external pressure or solenoid operated.

Solenoid operated valves com with coil coltages of 12 VDC & 24 VAC.

Two sizes; ¾" manifold multiple pumper and ½" single pumper.

Normal operation, fast 'crisp' switching. A small very short discharge is typical when switching to the 'on' or inlet connected to the common port state. A larger more distinct discharge is noted when switching to the 'off' state. The volume of the waste will be proportional to the size and number of pumpers attached to the valve. The waste cycles frequency is determined by the water flow rate in the main line. The valve should never waste continuously.



*Figure 1. Anderson ¾" Pilot Valve with pressure gauge and one multi-adapter for mounting a pumper.*

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### Detail procedures

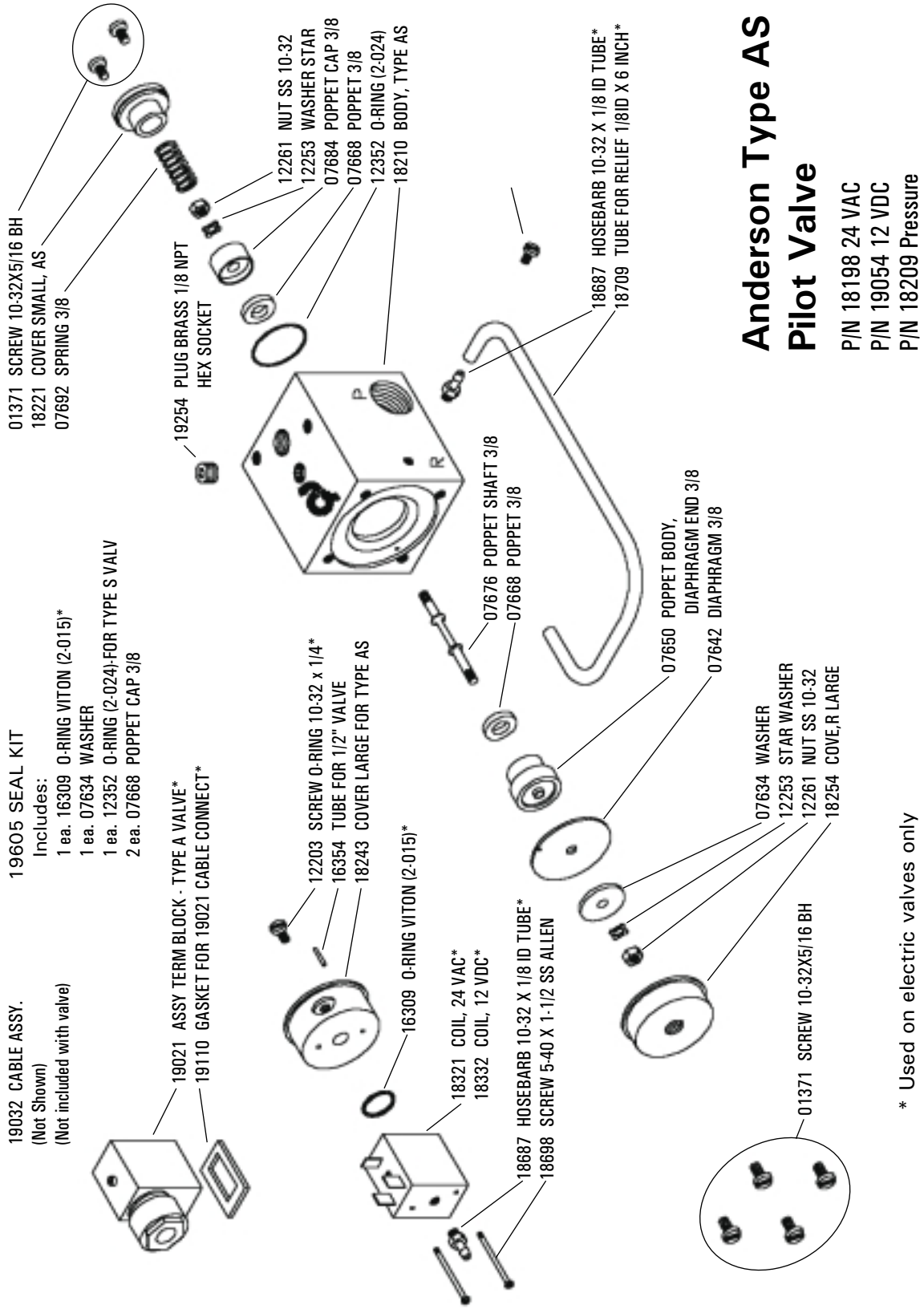
Diaphragm replacement. Remove pressure from valve. Remove the diaphragm cover part 18309 or 18310. Remove opposite cover part 18298. Un-stick diaphragm from valve body. Using suitable tools, remove the nuts (P/N 18498) from each end of the poppet shaft P/N 18343. DO NOT HOLD DIAPHRAGM while removing or tightening nuts. Remove and inspect poppets and diaphragm. Replace if necessary. Install diaphragm first by assembling all parts onto poppet shaft diaphragm end. Tighten nut by holding shaft with locking pliers or placing in vise. Diaphragm is a three piece assembly. The black 'rubber' part with three holes installs away from the nut. As nut is tightened, the

parts may rotate with respect to one another. Observe how far the parts rotate by observing the small hole near the edge of the black diaphragms. Now loosen the nut and pre-position the parts the other way. Tighten the nut and the small holes should be in alignment just as the nut becomes tight. Now place this assembly into the valve body and assemble the remaining parts onto the other end of the poppet shaft. Tighten the nut by holding the opposite nut with a suitable tool (socket). Now position the diaphragm so that the small hole near the edge is in alignment with the hole in the valve body. Replace the cover assembly to seal and hold the diaphragms in the proper position. Replace the opposite end cover. Place the complete valve back in service and test.

**Table 1**  
**Troubleshooting the Type A (Anderson) Pilot Valve**

<b>Condition</b>	<b>Probable Cause</b>	<b>Remedy</b>
Valve does not switch	1. No signal.	1. Not a fault of valve. Fix signal.
	2. Insufficient pressure.	2. Minimum pressure required for system is 15 psig. Also if using pressure from an external source to switch the valve, the pressure should be equal to or preferably greater than the pressure in the water line.
	3. Dirt in valve or pilot circuit.	3. Sluggish or slow operation can be caused by dirt in the pilot circuit. If solenoid is used, remove the small tube from the end of the solenoid to the valve body. Blow compressed air into the small tube. Remove the solenoid. Remove the center parts from the coil by pushing on the tube barb. Clean all parts. Both stainless pieces remove from the plastic carrier. Clean orifices. Replace all parts.
	4. Broken diaphragm operator.	4. Valve follows signal. Be sure signal is correct.
Excessive or continuous waste	5. Insufficient pressure.	5. Minimum system pressure is 15 psig.
	6. Broken diaphragm.	6. Replace diaphragm, see detail repair procedures.
	7. Damaged poppet and/or seat.	7. Remove diaphragm and poppet shaft. Inspect poppets and seat area in valve body. If seat is damaged valve cannot be repaired in the field. Contact factory.
"Groaning" or chattering	8. Valve switching too rapidly.	8. Broken diaphragm. Replace, see detail procedures. Occasionally, low pressure or dirt in the pilot circuit can cause these symptoms. See remedy three above.

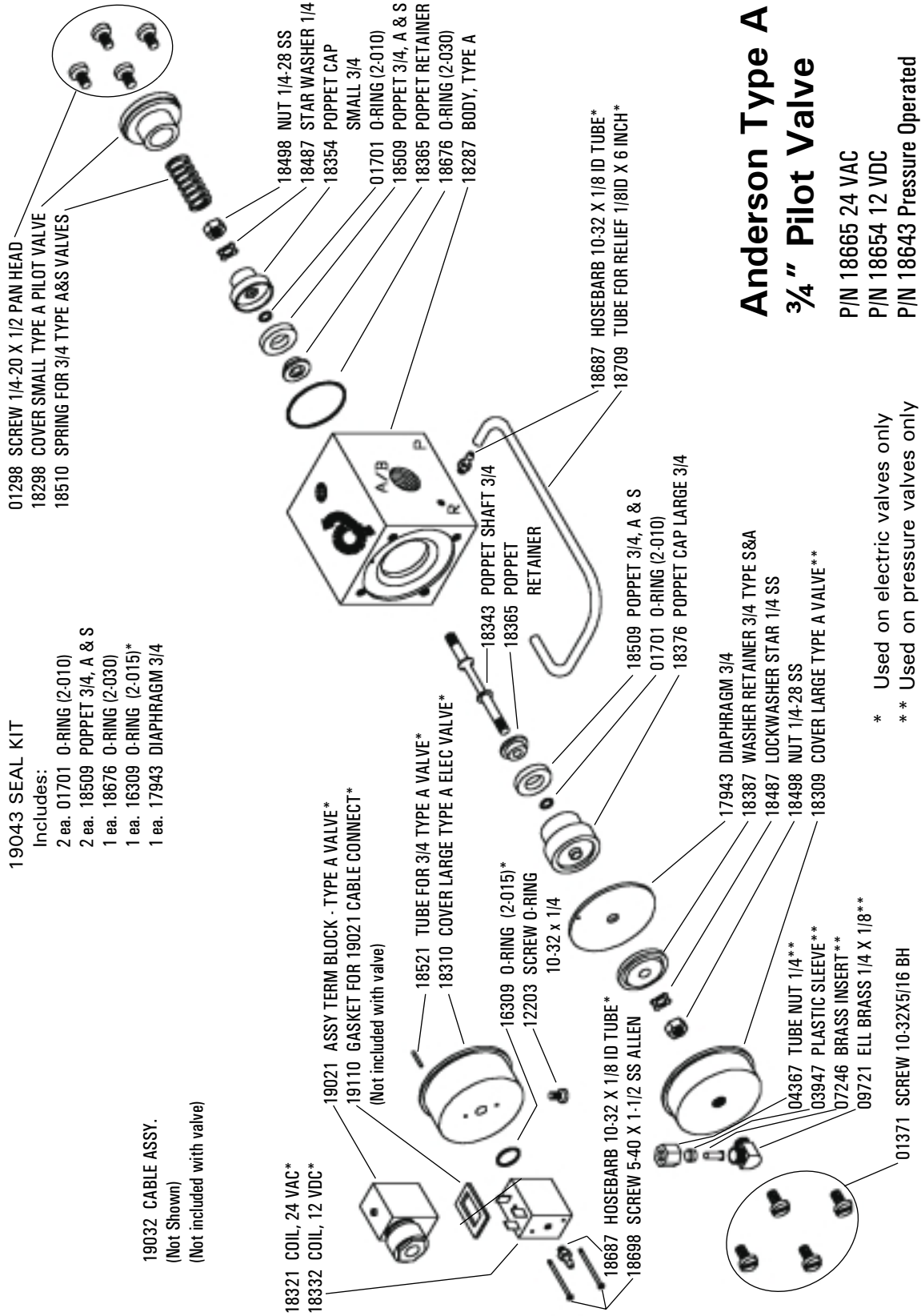
Pilot Valves & Manifolds



**Anderson Type AS  
Pilot Valve**

- P/N 18198 24 VAC
- P/N 19054 12 VDC
- P/N 18209 Pressure

\* Used on electric valves only



# Anderson Type A 3/4" Pilot Valve

- P/N 18665 24 VAC
- P/N 18654 12 VDC
- P/N 18643 Pressure Operated

\* Used on electric valves only  
\*\* Used on pressure valves only

## Pilot Valves & Manifolds

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### Type S (Honeywell)

Diaphragm operator, poppet seal, external pressure and electric solenoid operated.

Coil Voltages; 12 VDC, 24, 120, 240 VAC.

Three sizes; 3/8", 1/2", and 3/4"

Rapid operation switching, no sliding seals.  
Long life and no scheduled maintenance.

Normal operation is indicated by 'crisp' switching, normally silent, and with a small short waste discharge when switching to the 'on' or 'inlet' connected to the 'common' state. If solenoid operated, the solenoid will be energized to produce the 'on' state. The off state, 'outlet' connected to the 'common', will be noticed by a larger discharge of pressure (water or air). The volume of waste discharge will be proportional to the size and number of attached pumps. There should never be a continuous waste.

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### Replacing the Diaphragm.

Remove large and small covers. Separate diaphragm from valve body. Remove nut from center of diaphragm, hold opposite nut, not diaphragm when removing. Install new diaphragm assembly so black diaphragm with three holes is in furthest into body. Tighten nut to hold diaphragm onto poppet shaft so that small holes near outer edge of black diaphragms are aligned. DO NOT HOLD DIAPHRAGMS WHILE TIGHTENING NUTS. DONOT ENGAGE THE SMALL TUBE INTO THE DIAPHRAGMS TO

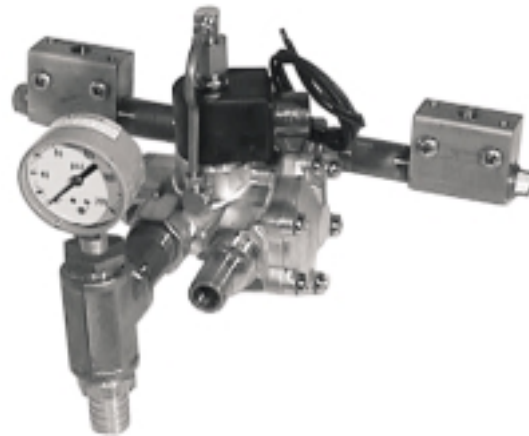


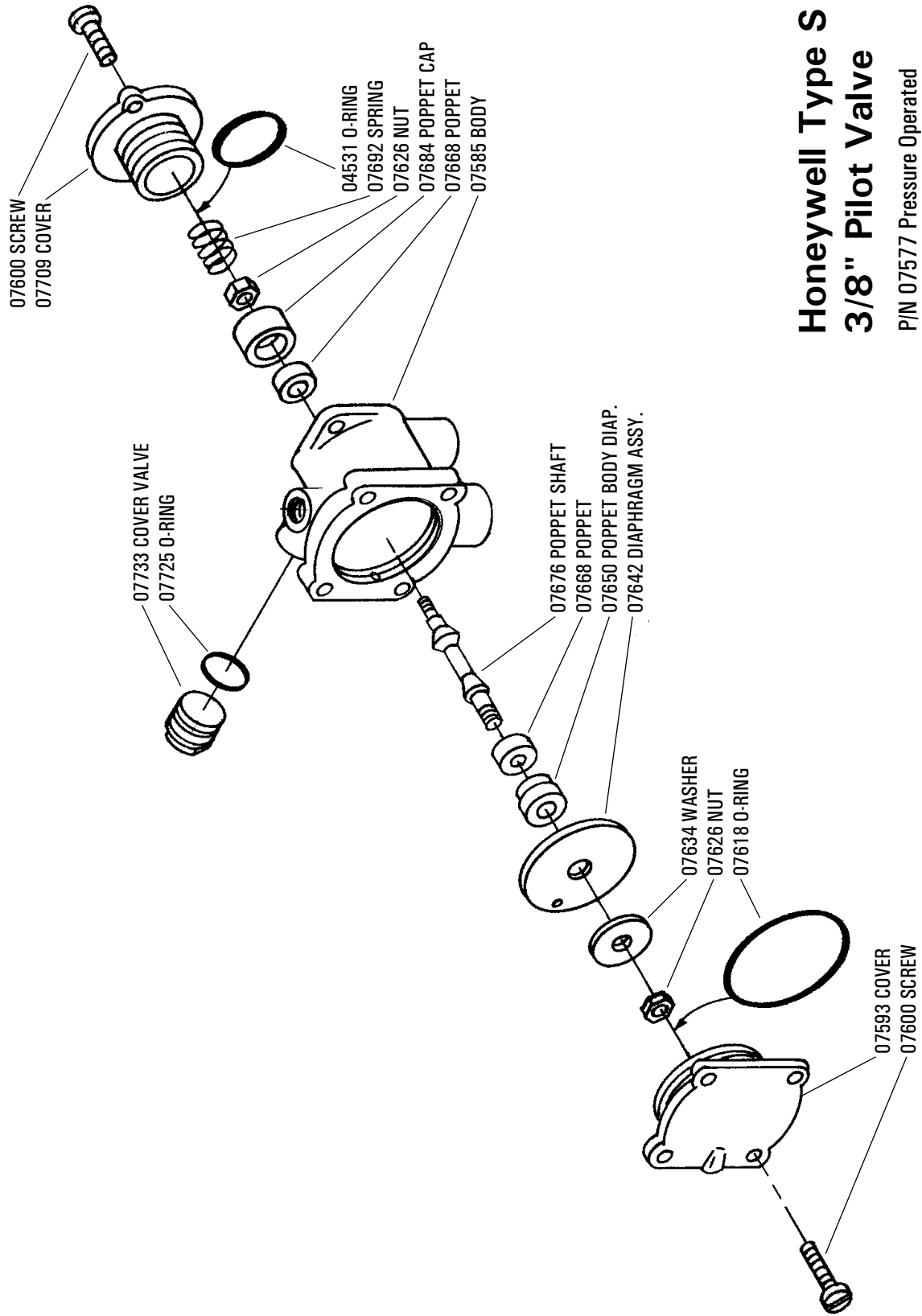
Figure 2. Two pumper manifold using Honeywell type S pilot valve.

KEEP THEM IN ALIGNMENT. Tighten nut, see how far diaphragms moved. Loosen nut, pre-position diaphragms the other way so that as nut is tightened, the diaphragms will be in their correct position as the nut becomes tight. Insert diaphragm poppet shaft ass'y into body. DO NOT ENGAGE TUBE INTO SMALL HOLES YET! Now install other side poppet and nut. After both nuts are tight, engage the diaphragms onto the small tube near the edge. Do not place the diaphragms into any torque stress. Now replace the covers. It helps if the screw threads are coated with an anti-sieze lubricant.

*Parts identification drawings (6) insert here.*

<p align="center"><b>Table 2</b> <b>Troubleshooting the Type S (Honeywell) Pilot Valve</b></p>		
<b>Condition</b>	<b>Probable Cause</b>	<b>Remedy</b>
Valve does not switch	1. No signal either external pressure or solenoid action.	1. Verify proper signal is sent. No signal is not a fault of valve. Solenoid can be clogged by dirt.
	2. Valve clogged by dirt or trash.	2. Remove large cover. Push diaphragm center in about 3/16". It should spring back easily. If not, Remove small cover opposite side and clean area. Be sure spring is not broken.
	3 .Diaphragm operator broken.	3. Replace diaphragm. See Section X.X
Excessive waste	4. Diaphragm broken.	4. Replace diaphragm, see 3 above
	5. Poppet seat damaged. (small continuous waste)	5. Remove poppet/diaphragm ass'y (3 above). Inspect poppets and their seat area in the valve body. Damaged bodies cannot be repaired in the field. Contact factory.
	6 .Insufficient pressure.	6. Increase pressure.
"Groaning" or chattering	7. Insufficient pressure differential	7. On S series Ratio:Feeder@s as unit ages, at small flows there is not enough pressure loss across unit. Increase water flow. Rebuild R:F motor section.
	8. Broken diaphragm	8 .Replace diaphragm, see 3 above.
	9. Clogged or dirty pilot passageways.	9. Remove large cover. Remove external signal connection. If solenoid controlled, the tube from the top of the solenoid to the valve body is the signal line. Blow compressed air from the small tube near the edge of the diaphragms to the signal connection port. This should clear the trash. If not, remove the aluminum cover which screws onto the body. Clear any trash under this cover.

Pilot Valves & Manifolds

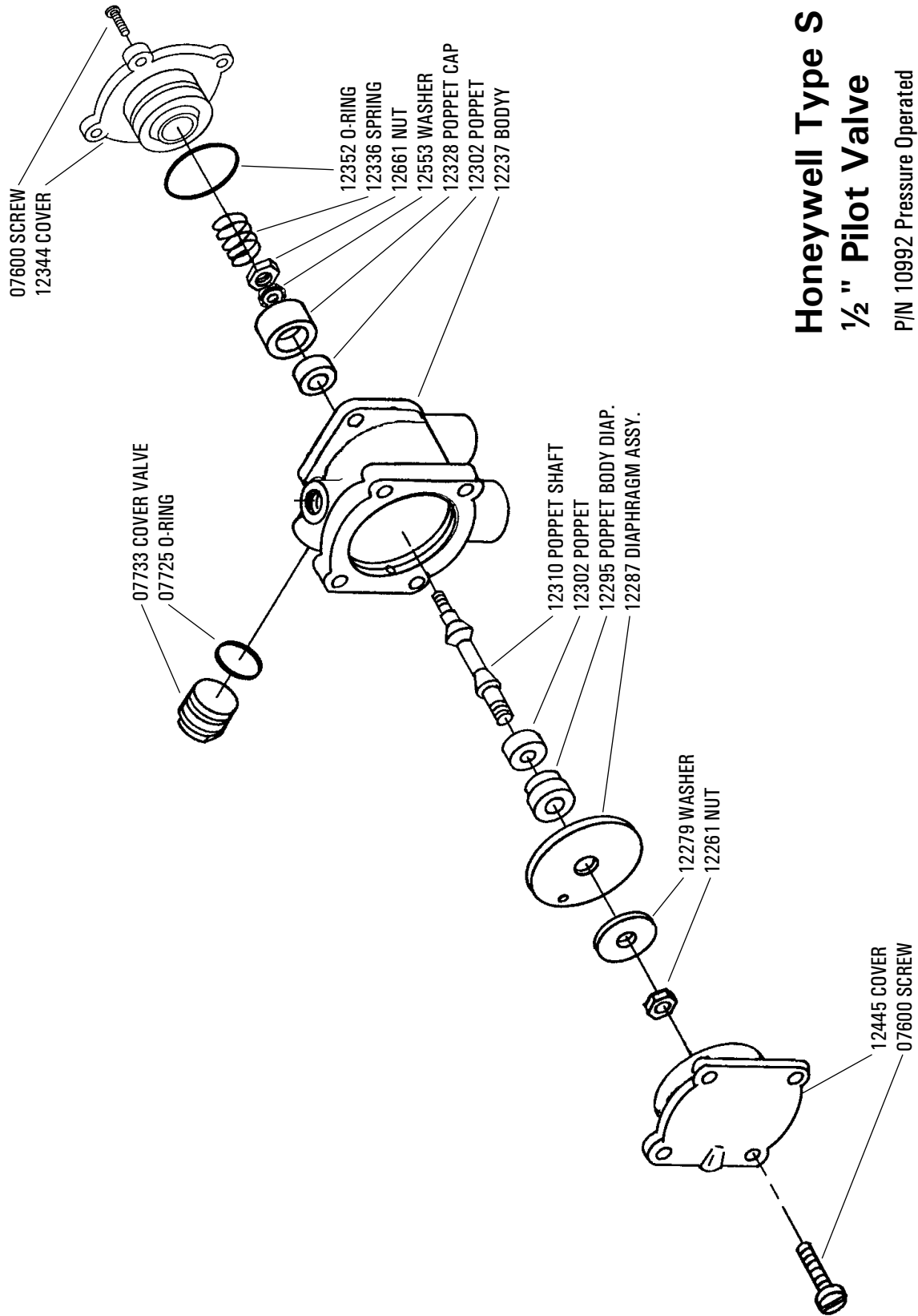


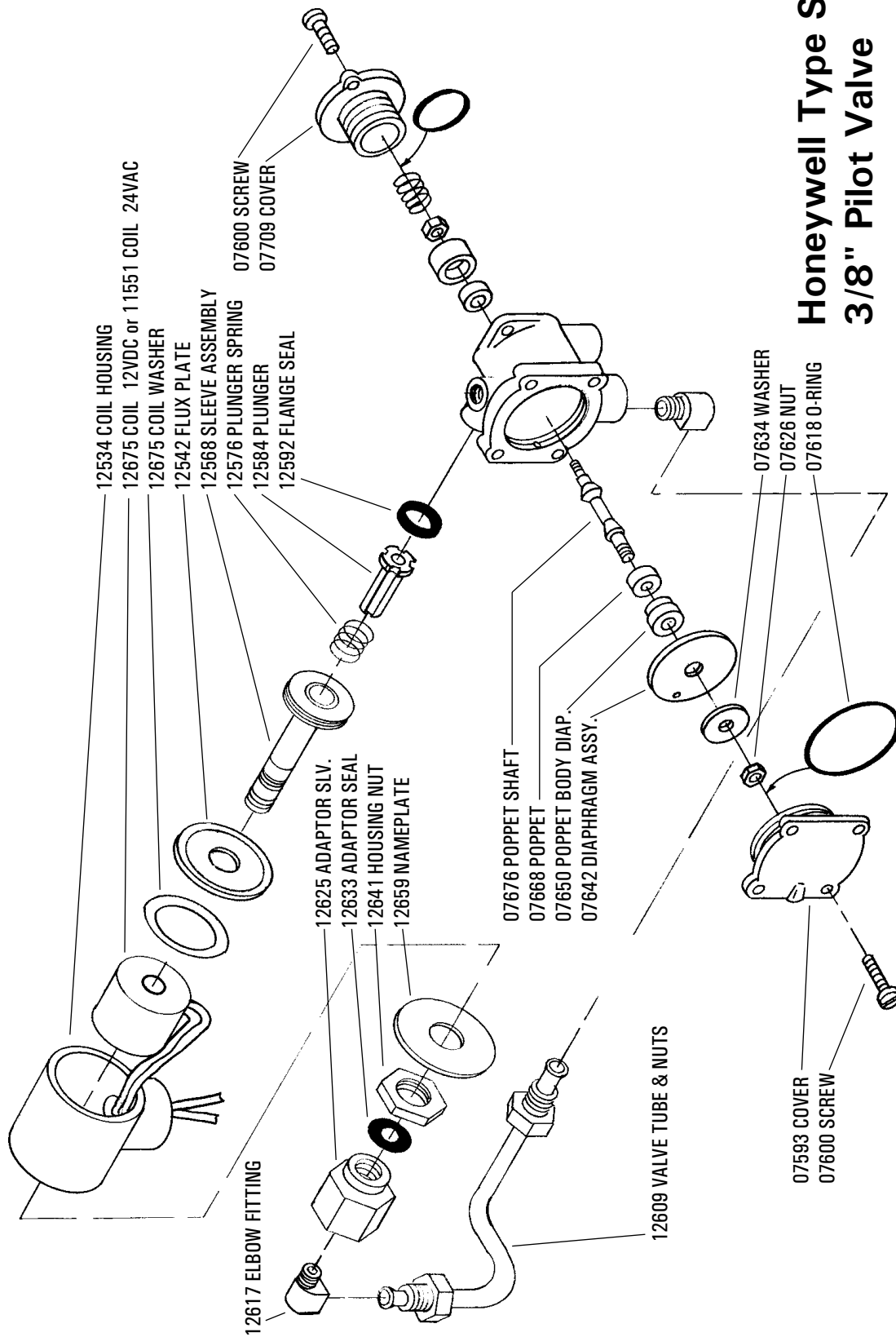
**Honeywell Type S  
3/8" Pilot Valve**

P/N 07577 Pressure Operated

# Honeywell Type S 1/2" Pilot Valve

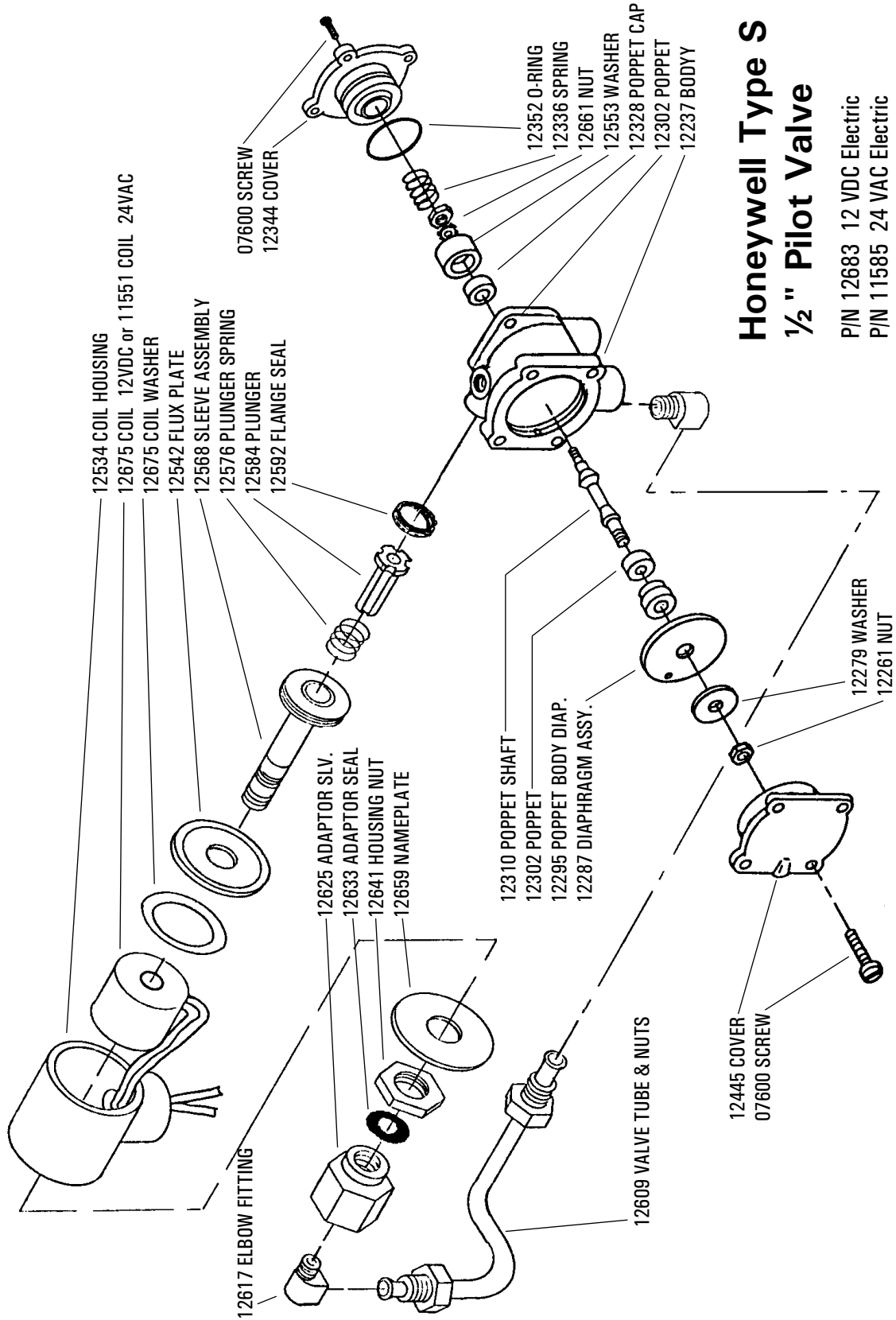
P/N 10992 Pressure Operated





## Honeywell Type S 3/8" Pilot Valve

P/N 10992 12 VDC Electric



## Honeywell Type S 1/2" Pilot Valve

P/N 12683 12 VDC Electric  
P/N 11585 24 VAC Electric

### **Type B (Bürkert) Valves.**

Piston operator, external signal and electric solenoid switched, adjustable orifice, manual operation button. Two sizes; 1/2" and 3/4".

Coil voltages: 12 VDC; 12, 24, 120, and 240 VAC.

Normal operation is a 'crisp' switching to the 'on' state (inlet connected to the common). A slight amount of water or air will be exhausted during the transition from 'off' to 'on'. If water is used, the amount of waste will be about 50 ml for the 1/2" valve and 75ml for the 3/4" valve. There should never be a continuous waste discharge. The normal discharge on the waste cycle will be proportional to the size and number of attached pumpers.

### **Troubleshooting.**

Repair procedures. To remove solenoid armature remove solenoid and turn upside down. Remove actuator seal and backup plate. Note small spring pushing against armature lever. Place cloth over lever to catch spring and move lever slightly towards spring and pull up and out of coil. Find spring in cloth and save. Clean coil and manual operator button with suitable solvent, WD40® can be used if wiped out after cleaning. Insert tool you have fashioned from



*Figure 3. Two pumper manifold using Bürkert type B pilot valve.*

sheet metal or use a metal nail file the same approximate width as lever down into the coil and compress the button spring towards the manual operator button. Now insert the lever between the nail file and the coil housing and slide it into position. As it moves into position, it will compress the spring out of the way. Now remove the nail file and replace the spring near the exposed end of the lever.

Check for proper operation of the lever, depress the manual button and lever should move. Replace the plate and actuator seal and reassemble the coil to the valve.

**Table 3  
Troubleshooting the Type B (Bürkert) Pilot Valve**

<b>Condition</b>	<b>Probable Cause</b>	<b>Remedy</b>
Valve does not switch	1. No pressure signal	1. Not a fault of valve. Fix signal.
	2. No pressure in line.	2. Pilot operated valves do not work unless main line is pressurized.
	3. Manual operator does not produce any action.	3. Check armature in solenoid or external operator pivot arm P/N 05067. If lever is broken, replace. On solenoid types, entire solenoid must be replaced. Orifices may be out of adjustment. "P" side starting adjustment is 2 turns in from flush. "R" side is 1 1/4 turns in from flush. Dirt or trash may be preventing piston operator from moving. Remove solenoid or valve operator. Clean area in and around piston by flushing with water. Move piston and flush again. Re-assemble and test. If valve still does not work, disassemble valve and repair or replace piston ring and seals and sleeve.
Valve leaks	4. Excessive waste from exhaust.	4. Valve not switching completely. Clean as in 3 above. Be sure you have 15 psig minimum pressure. Damaged orifice seat. Cannot be repaired in the field.
	5. Small continuous leak.	5. Damaged orifice seat. Disassemble and inspect. Cannot be repaired in the field.
	6. Leak from or near solenoid.	6. Actuator seal damaged. Replace.
Valve buzzes or solenoid gets hot.	7. Solenoid armature dirty.	7. Remove solenoid and armature see repair procedures and clean.
	8. Electric signal faulty.	8. Repair controller output. Usually output triac has failed.
	9. Insufficient power..	9. Check controller, replace triacs.

**05306 SEAL KIT 1/2**

**Contains:**

1 ea.	05025*	1 ea.	05158
1 ea.	05166	1 ea.	05174
2 ea.	05190	1 ea.	05257
3 ea.	05273	1 ea.	05299

\* Not used with electric valve

**ORIFICE ADJUSTING PROCEDURE**

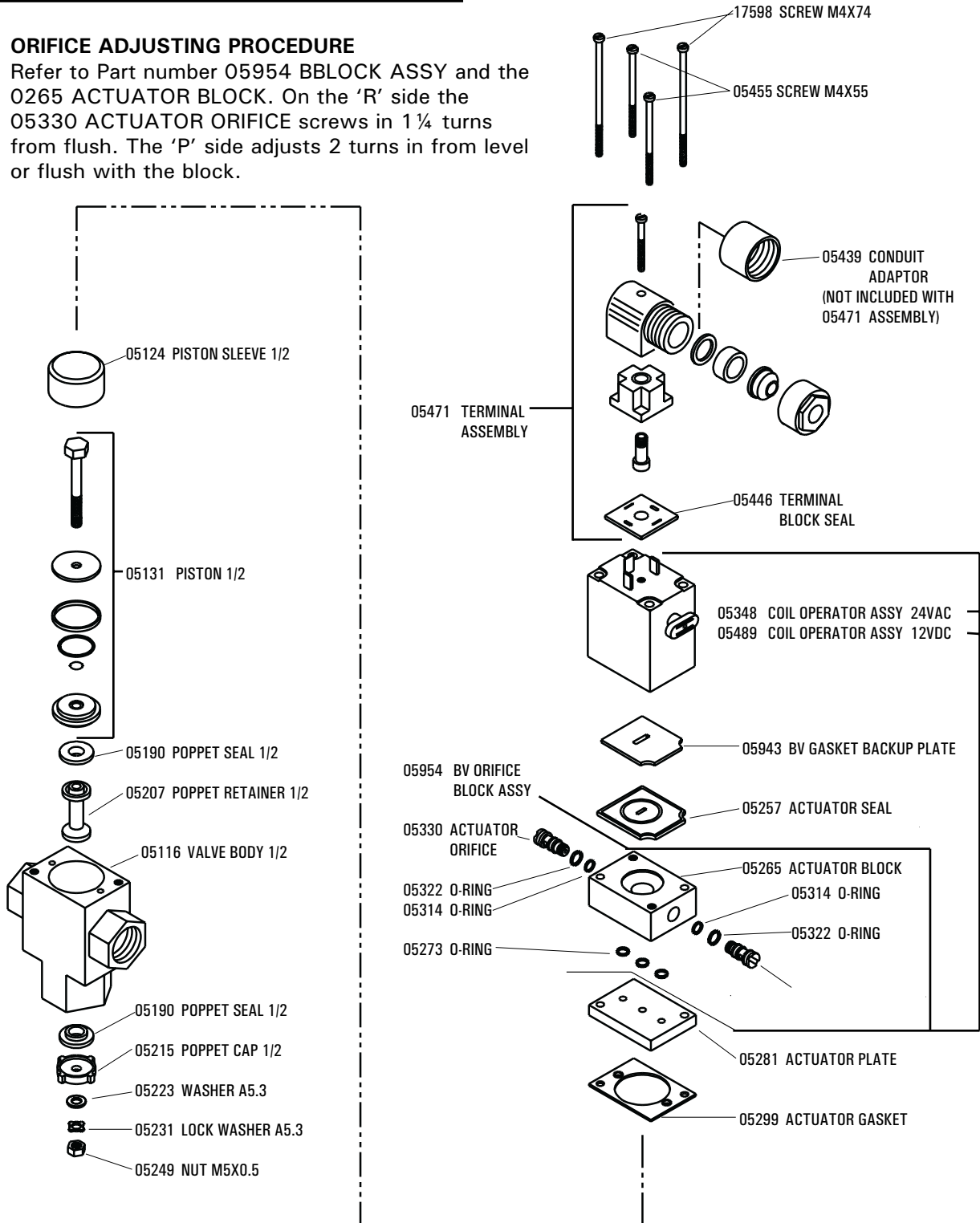
Refer to Part number 05954 BBLOCK ASSY and the 0265 ACTUATOR BLOCK. On the 'R' side the 05330 ACTUATOR ORIFICE screws in 1 ¼ turns from flush. The 'P' side adjusts 2 turns in from level or flush with the block.

**MANIFOLD VALVE PARTS**

For ½" Type B Valve

24 VAC, P/N 06510

12 VDC, P/N 06502



# PRESSURE ACTUATED MANIFOLD VALVE PARTS

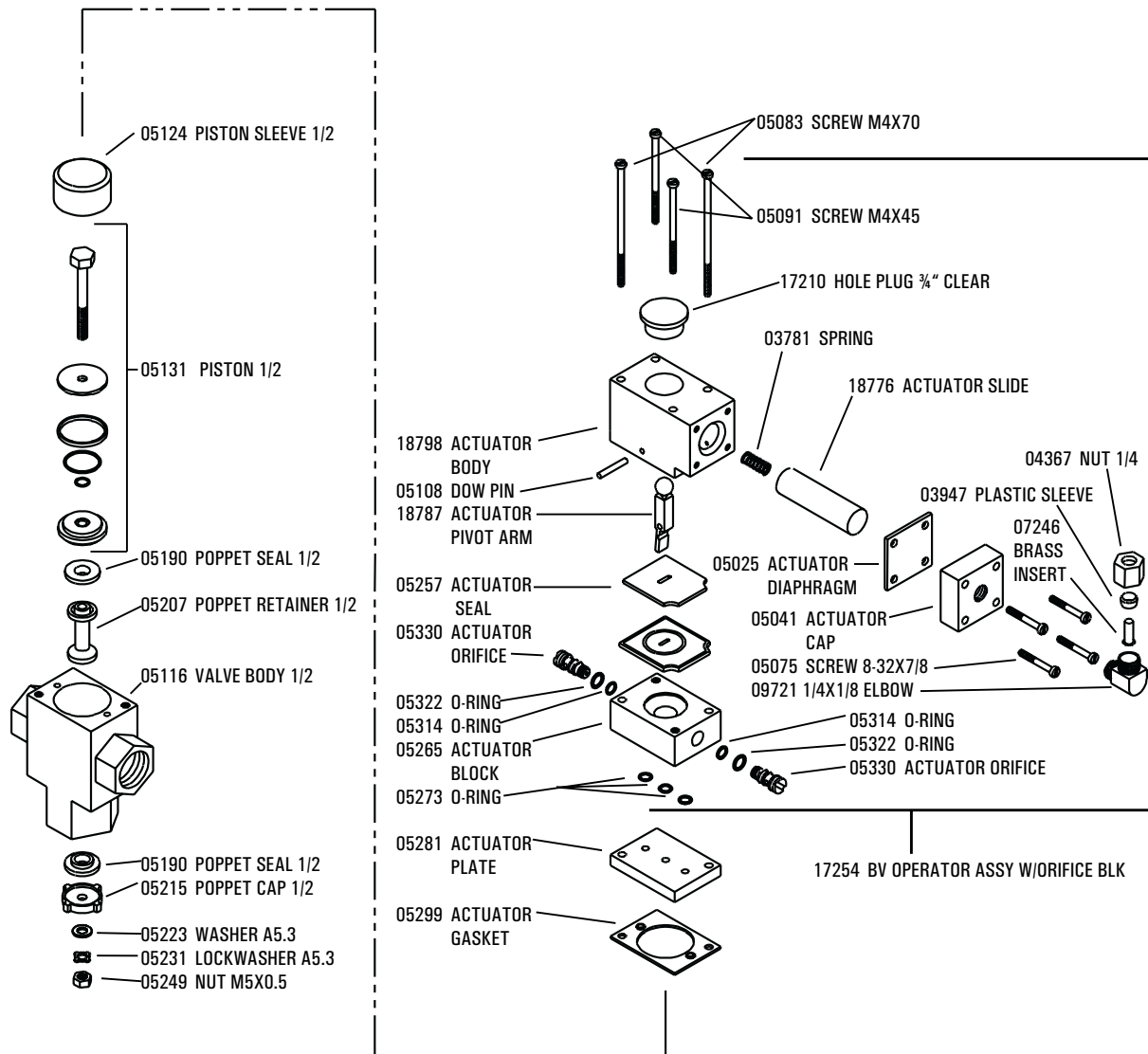
For 1/2" Type B Valve

P/N 06536

## 05306 SEAL KIT 1/2

Contains:

1 ea. 05025	1 ea. 05158
1 ea. 05166	1 ea. 05174
2 ea. 05190	1 ea. 05257
3 ea. 05273	1 ea. 05299



**05703 SEAL KIT 3/4**

Contains:

- |              |             |
|--------------|-------------|
| 1 ea. 05025* | 1 ea. 05688 |
| 1 ea. 05696  | 1 ea. 05703 |
| 2 ea. 05737  | 1 ea. 05257 |
| 3 ea. 05273  | 1 ea. 05894 |

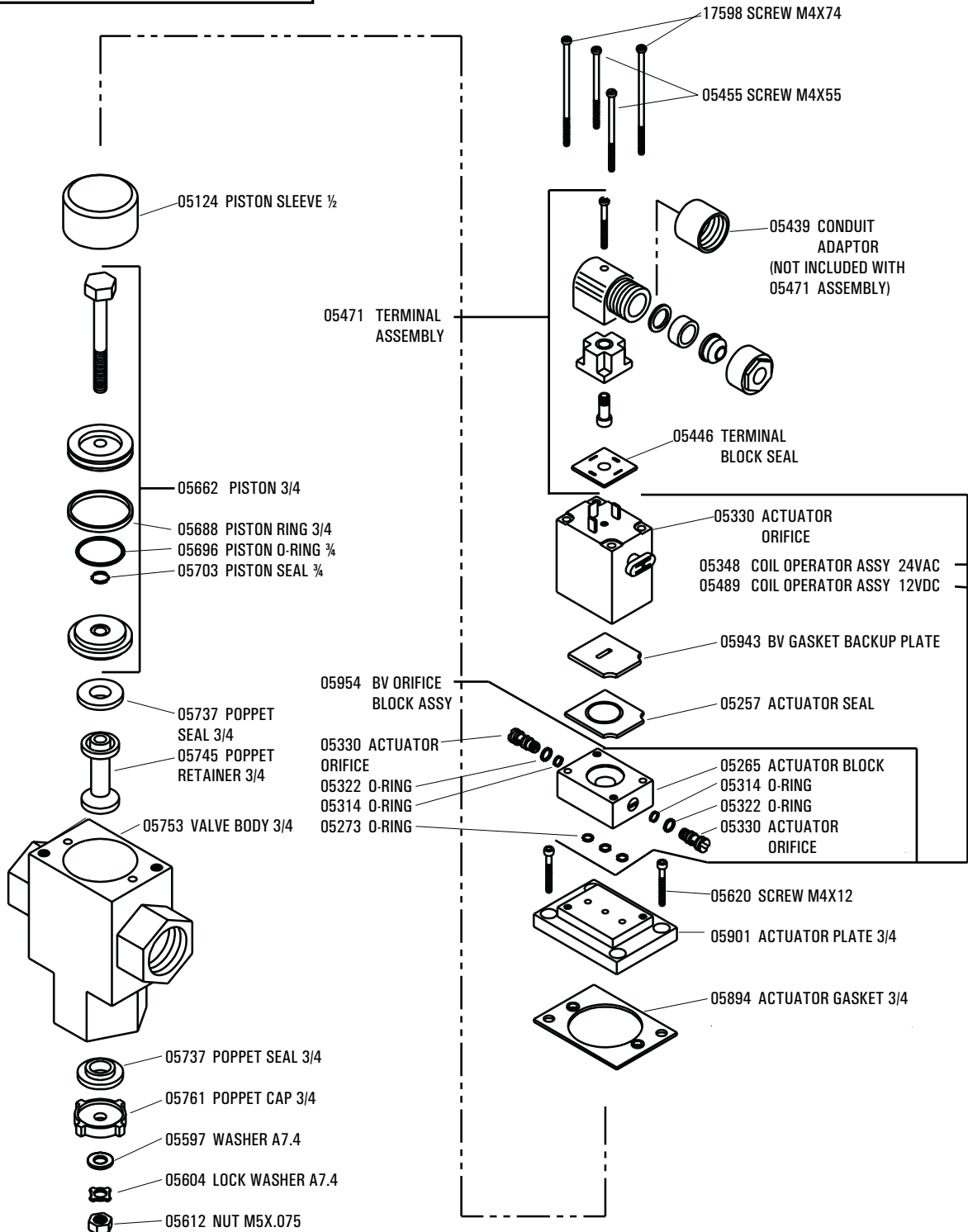
\* Not used with electric valve

**SERIES SMC  
MANIFOLD VALVE PARTS**

For 3/4" Type B Valve

24 VAC, P/N 06528

12 VDC, P/N 07914



# SERIES S MULTI-HEAD MANIFOLD VALVE PARTS

For 3/4" Type B Valve

Pressure Operated, P/N 06544

## 17532 SEAL KIT 3/4

Contains:

1 ea.	05025	1 ea.	05688
1 ea.	05696	1 ea.	05703
2 ea.	05737	1 ea.	05257
3 ea.	05273	1 ea.	05894

