ENERGY EXCHANGE
MODEL PV

APPLICATIONS:

Circulating pump for gas glycol dehydrators
Circulating pump for gas amine desulphurizers

FEATURES:

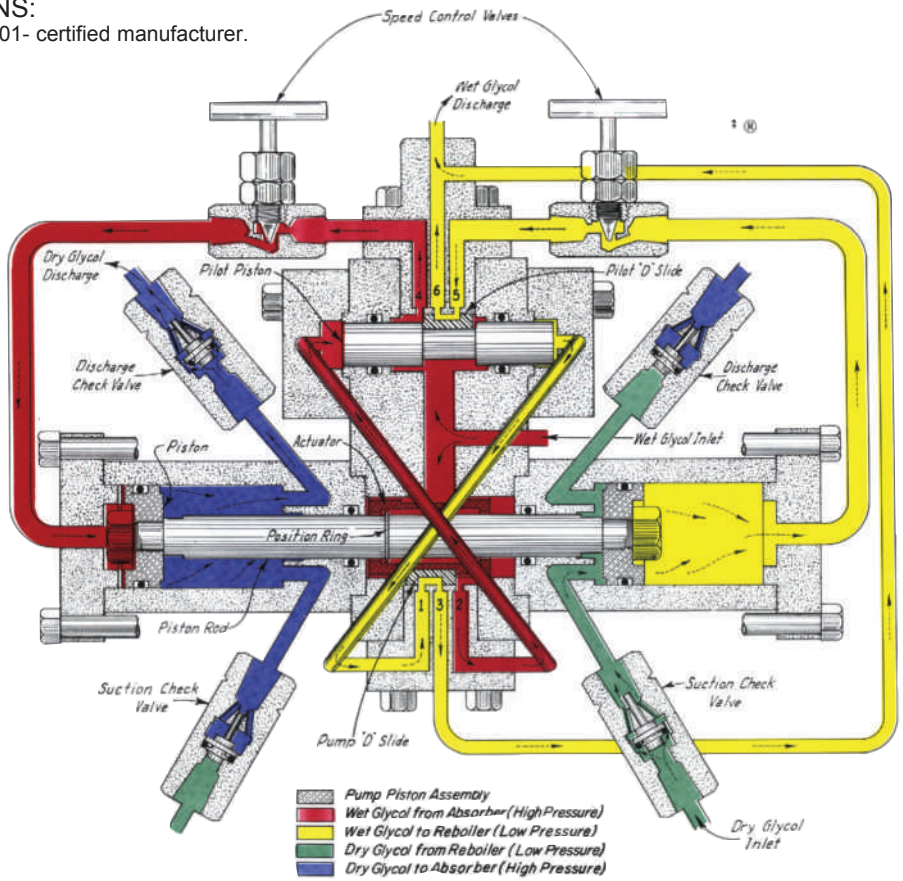
Eliminates absorber liquid level controls
No auxiliary power supply required
Low gas consumption
Completely sealed system prevents loss of glycol
No springs or toggles, only two moving assemblies
Hydraulic "cushioned" check valves with removable seats of hardened stainless steel

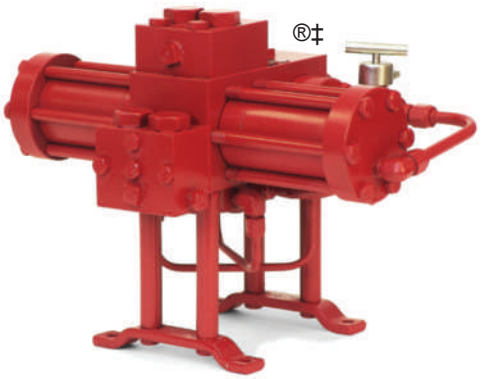
CERTIFICATIONS:

Kimray is an ISO 9001- certified manufacturer.

INTRODUCTION:

The Glycol Energy Exchange Pump, "Pressure Volume" or "PV-Series" Pump was developed in 1957. The initial consideration was a pump that would utilize the energy of the wet glycol at absorber pressure as a source of power. Within the confines of a system, energy can neither be created nor destroyed. Energy can, however, be stored, transferred, or changed from one form to another. The PV Series Pump transfers the energy available from the wet glycol, at absorber pressure, to an "equivalent" volume of dry glycol at reboiler pressure. In order to circulate the glycol, additional energy is needed to overcome friction losses within the pump and connecting piping. This additional energy is supplied by gas at absorber pressure.





Standard Configuration Code †	Order Code	Gallons per hour Minimum	Gallons per hour Maximum ††	Operating Pressure Minimum	Operating Pressure Maximum
GPV040S	GABHSN	12	40	300	2000
GPV090S	GAFHSN	27	90		
GPV210S	GAHHSN	66	210	400	
GPV450S	GAJHSN	166	450		
GPV020S	GACHSN	8	20	100	500
GPV050S	GAGHSN	12	50		
GPV100S	GAIHSN	22	100		
GPV200S	GAKHSN	60	200		

NOTES:

For standard & optional seals, metals, material specifications & dimensions see technical data on pages 10:I - 10: VI
† For code builder see page 10:00.2
†† Maximum output is affected by system pressure drops. See system operation parameter for maximum output curves.

KIMRAY INC.®

ENERGY EXCHANGE
MODEL PV

PRINCIPLE OF OPERATION:

Actions of each of the two basic parts of the pump are completely dependent upon the other. The pilot D-slide actuated by the Pilot Piston alternately feeds and exhausts absorber pressure to the power cylinders at opposite ends of the Piston-Rod Assembly. Likewise, the Pump D-slide actuated by the Piston-Rod Assembly alternately feeds and exhausts absorber pressure to opposite ends of the Pilot Piston.

The force to circulate glycol within the dehydration system is supplied by absorber pressure acting on the area of the Piston Rod at its O-ring seals. The area of the Piston Rod is approximately 20 percent of that of the Piston. Neglecting pump friction and line losses, the resultant force is sufficient to produce a theoretical discharge pressure 25 percent greater than absorber pressure. The theoretical discharge pressure, for example, at 1500 psig absorber pressure would be 1875 psig. This theoretical “over-pressure” would develop against a blocked discharge line but is not sufficient to cause damage or create a hazard.

Approximately 25 to 30 psig pressure is required to overcome pump friction leaving the additional “over pressure” for line losses and circulation. It is recommended that these losses be held to approximately 10 percent of the absorber pressure or as noted in catalog.

Two Speed Control Valves are provided to regulate the flow of wet glycol and gas to and from the power cylinders. Reversing the direction of flow through the Speed Control Valves provides a flushing action which cleans the valve orifices.

If the wet glycol returning to the pump from the absorber were to completely fill the cylinder, no additional gas would be needed. However, the wet glycol will only occupy approximately 65 percent of the total volume of the cylinder and connecting tubing leaving 35 percent to be filled by gas from the absorber. This gas volume amounts to 1.7S.C.F. per gallon of dry glycol at 300 psig absorber pressure and 8.3S.C.F. at 1500 psig and may be considered as continuing power cost for pump operation. This gas can be utilized in the regeneration process of the dehydrator for “rolling” and or “stripping” purposes. It may also be recovered in a low pressure glycol gas separator and used to fire the reboiler pressure glycol gas separator and used to fire the reboiler.

By supplying some absorber gas to the cylinders, the wet glycol level is maintained at the wet glycol outlet connection on the absorber and eliminates the need of a liquid level controller and its attendant problems. Excess liquids such as hydrocarbons are removed from the absorber at approximately 55 percent of the pump rate, reducing the hazard of dumping a large volume of hydrocarbons into the reboiler as would be the case with a liquid level controller.

HEAT EXCHANGERS:

Sufficient heat exchange is necessary to reduce dry glycol suction temperature to at least 200°F, preferably to 150°F.

SYSTEM PRESSURE DROPS:

The Kimray Glycol Pumps are designed to operate by using the energy from the wet glycol and some additional energy in the form of gas at absorber pressure. Excessive pressure drops in the lines connecting the pump to the system can cause the pump to run erratically or stall. The following conditions should be designed into the system to assure proper pump performance:

DRY GLYCOL SUCTION LINE: Size the suction line, low pressure filter and heat exchanger such that the pump will have a positive pressure at the suction inlet when running at the maximum rated speed. This line may need to be larger than the pipe fitting on the suction check valve block. (See pipe connection sizes on page 10.28.)

WET GLYCOL POWER LINE: Recommended line size is the same as the size of the pipe connection for the given pump. (Page 10.28) The pressure drop across the high pressure filter is a factor in considering the total system pressure drop.

DRY GLYCOL DISCHARGE LINE: Recommended line size is the same as the size of the pipe connection for the given pump and the absorber should be full opening to the recommended line size.

WET GLYCOL DISCHARGE LINE: Recommended line size is the same as the size of the pipe connection for the given pump. If a glycol gas separator is used, the pressure maintained on the separator must be considered in the total system pressure drop. Also, heat exchanger coils in accumulator tanks also add to this pressure drop.

ISOLATING VALVES: All plug, gate, or blocking valves should be full opening to the recommended line size of the given pump.

If a positive feed is supplied to the pump at the dry suction inlet, the total system pressure drop will be the sum of the following pressure drops:

1. The pressure drop between the absorber and the pump in the wet glycol line.
2. The pressure drop between the pump and the absorber in the dry glycol discharge, line including any pressure required to open and establish full flow in any check valves.
3. The pressure drop between the pump and the reboiler (at atmospheric pressure) in the wet glycol discharge line. This includes the liquid head to the reboiler, heat exchanger coil, and/or the pressure maintained on a glycol seperator.

The sum of these pressure drops gives the total “system pressure drop”. Exceeding the total allowable system pressure drop will cause the pump to run erratically or to stall.

To determine if a problem exists in an operating dehydration system, slowly open the speed control valves on the pump until it runs at the maximum recommended pump speed. If the Pump cavitates before reaching the maximum pump speed, the suction line is restricted. If the pump will not run at the maximum rated speed, then there are probably restrictions in one or more of the other three connecting lines.

FILTERS:

Filters should be used on every dehydrator for protection of both the pump and reboiler. Many pumps are severely damaged in the first minutes or days of operation from flow line and vessel debris. Reboilers have been known to be filled with sand which had to first pass through the pump.

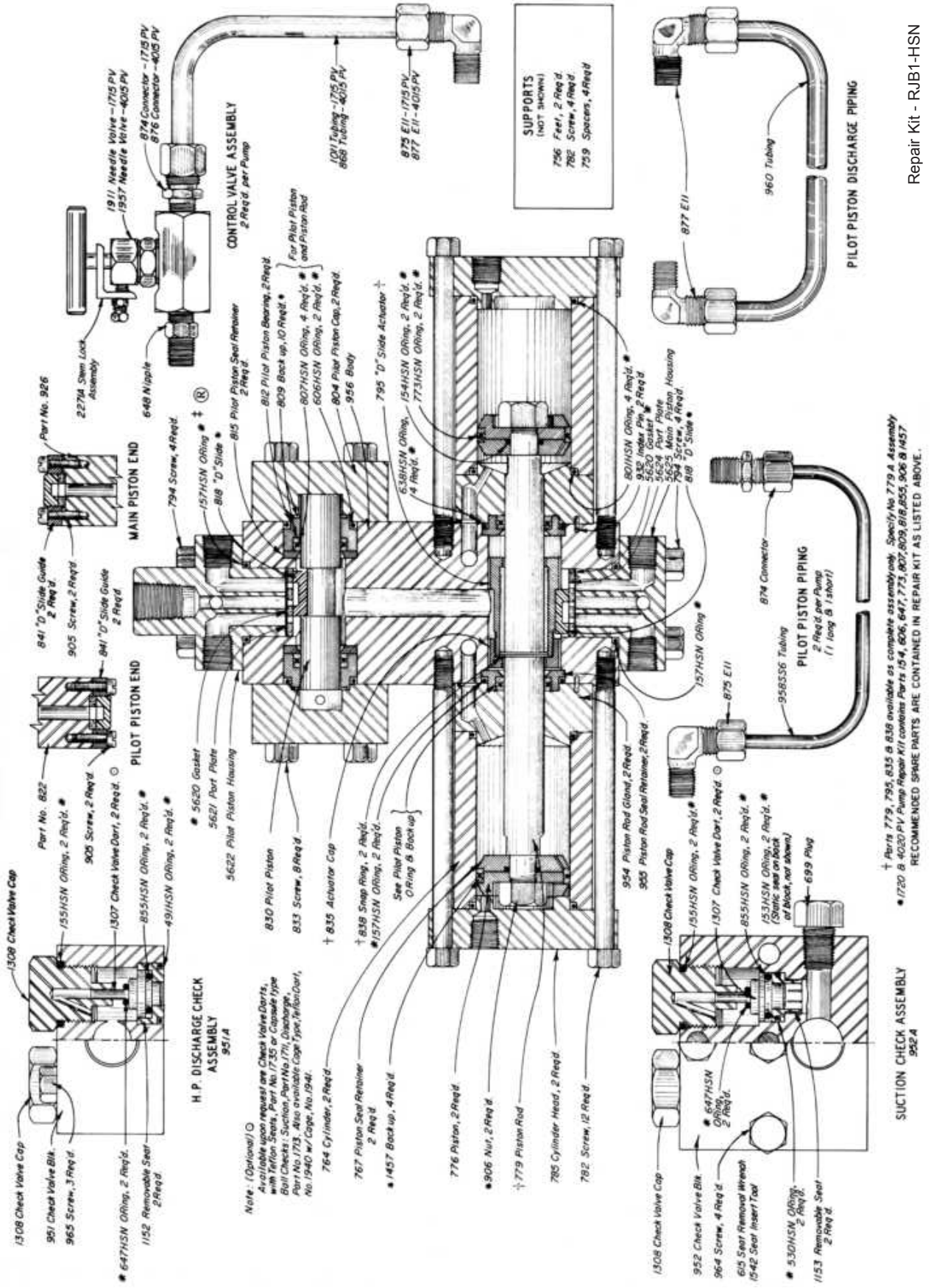
Filters should give protection from 25 to 150 micron particle sizes depending on the specific condition. The disc type, micron type, and sock type have all proven very satisfactory if they are properly maintained. Some metal filters are equipped with a cleaning device which should be operated daily or at least every few days as experience may dictate. Sock filters must be replaced at regular intervals.

A spring loaded by-pass on the filter is not recommended. It is better for the pump to stall due to lack of power than be exposed to dirt and grit from an open by-pass. Always install a high pressure filter between the absorber and the pump. A filter on the wet glycol discharge of the pump will protect the reboiler but does nothing for the pump. A low pressure filter on the pump suction line protects against metallic particles from a new reboiler and its connecting piping. Filters will also keep the glycol free of heavy tars and residue from evaporated hydrocarbons and resinous compounds caused by polymerization of the glycol. Sock type filters are probably best for this type of filtration but should be changed rather frequently.

In addition to using filters it is often necessary to take a chemical analysis of the glycol, not only for pump protection but for better dehydration. Organic acids in glycol are produced from oxidation, thermal decomposition, and acid gases from the gas stream. These acids cause corrosion in the system, and dissolve the plating on pump parts in a short time. Glycol acidity should be maintained between a pH of 7 to 9. Alkaline amines are usually recommended to control the pH value because they will neutralize any acid gases present and are easily regenerated.

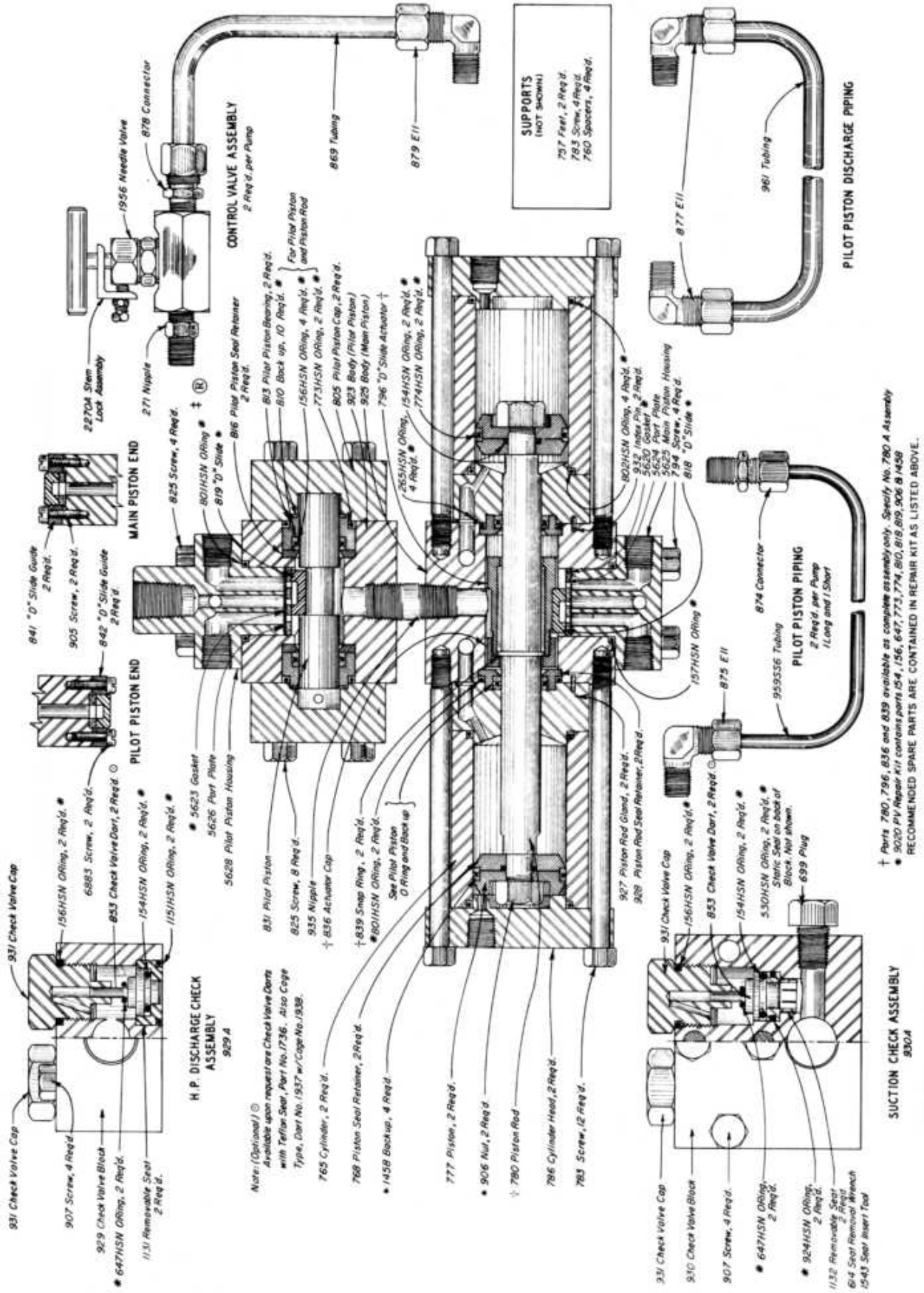
ENERGY EXCHANGE
MODEL PV - 040 CAPACITY

Repair Kit - RJB1-HSN



All Pictures shown are for illustration purpose only. Actual product may vary due to product enhancement.
‡ Configuration of Glycol Pump is a trademark of Kimray, Inc.

ENERGY EXCHANGE
MODEL PV - 090 CAPACITY



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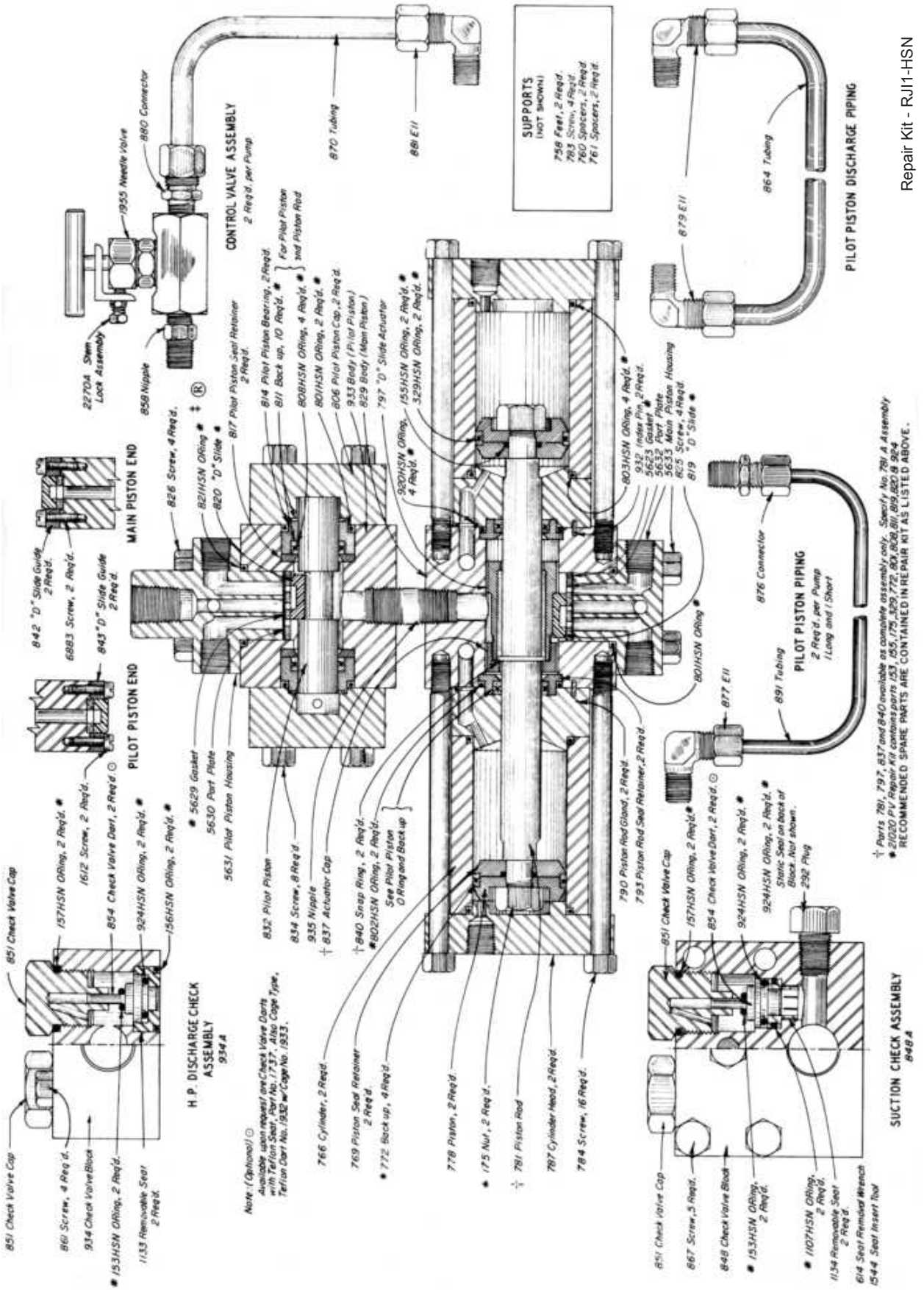
‡ Configuration of Glycol Pump is a trademark of Kimray, Inc.



Repair Kit - RJI1-HSN

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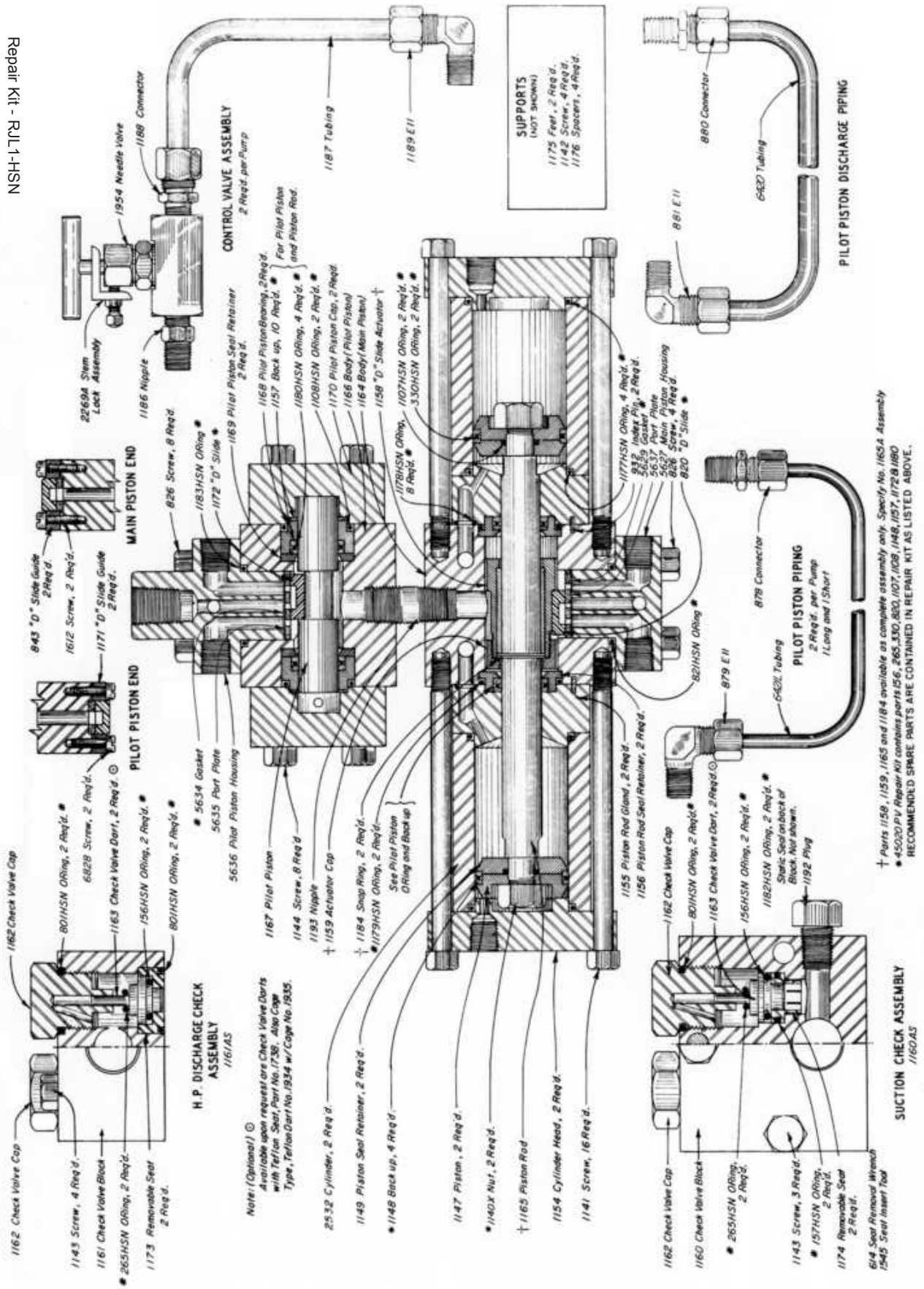
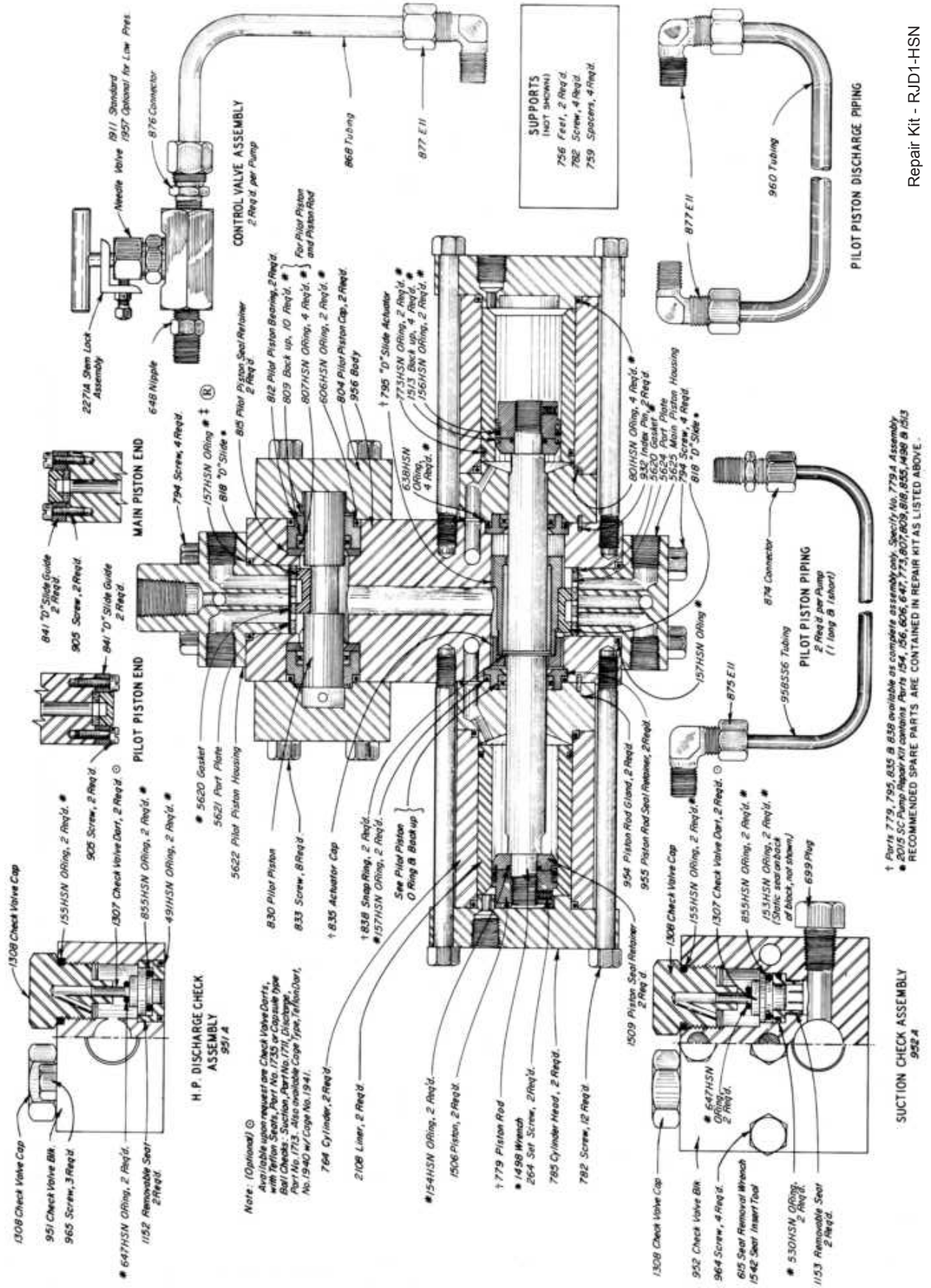
ENERGY EXCHANGE
MODEL PV - 450 CAPACITY

Repair Kit - RJL1-HSN





Repair Kit - RJD1-HSN

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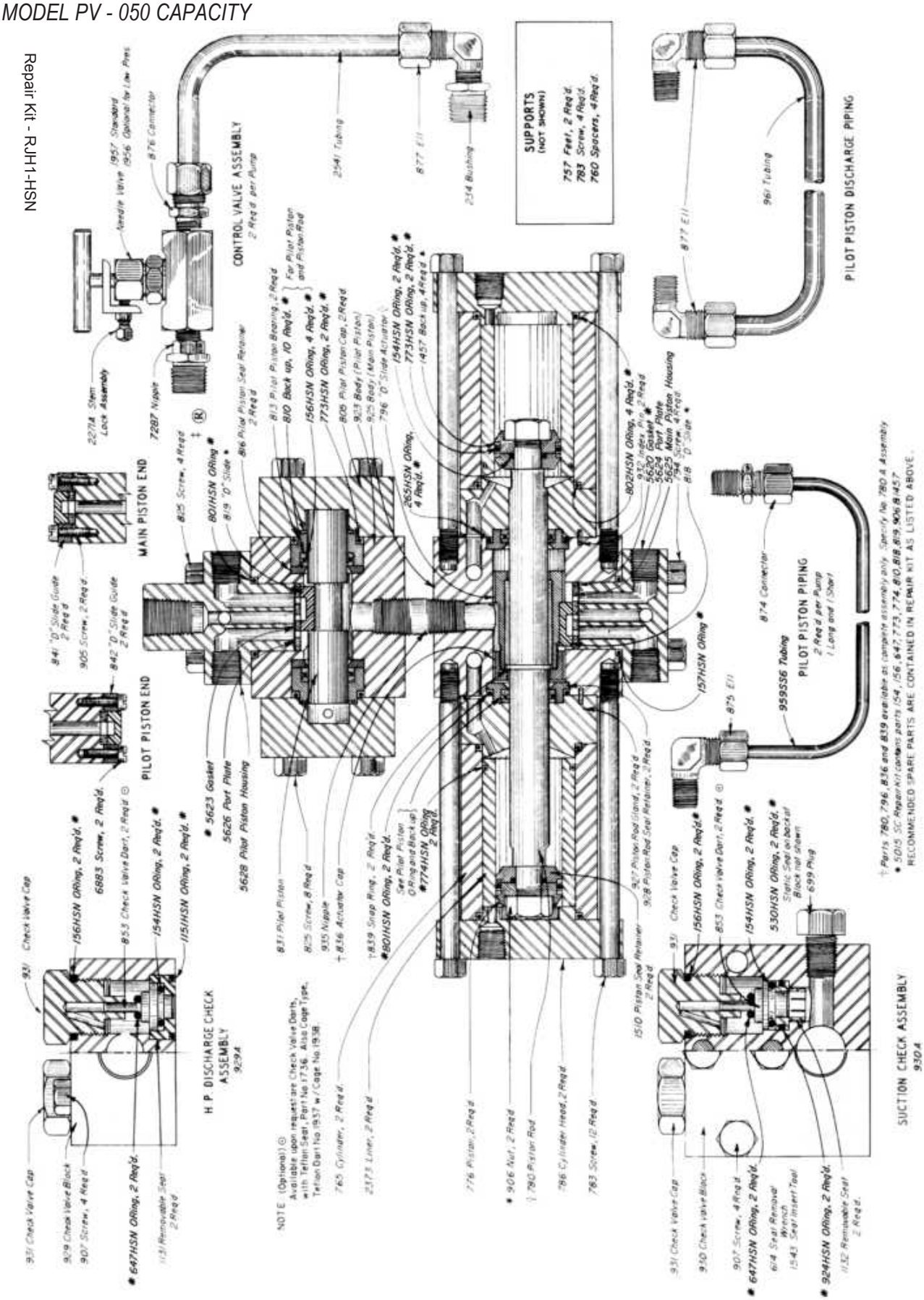
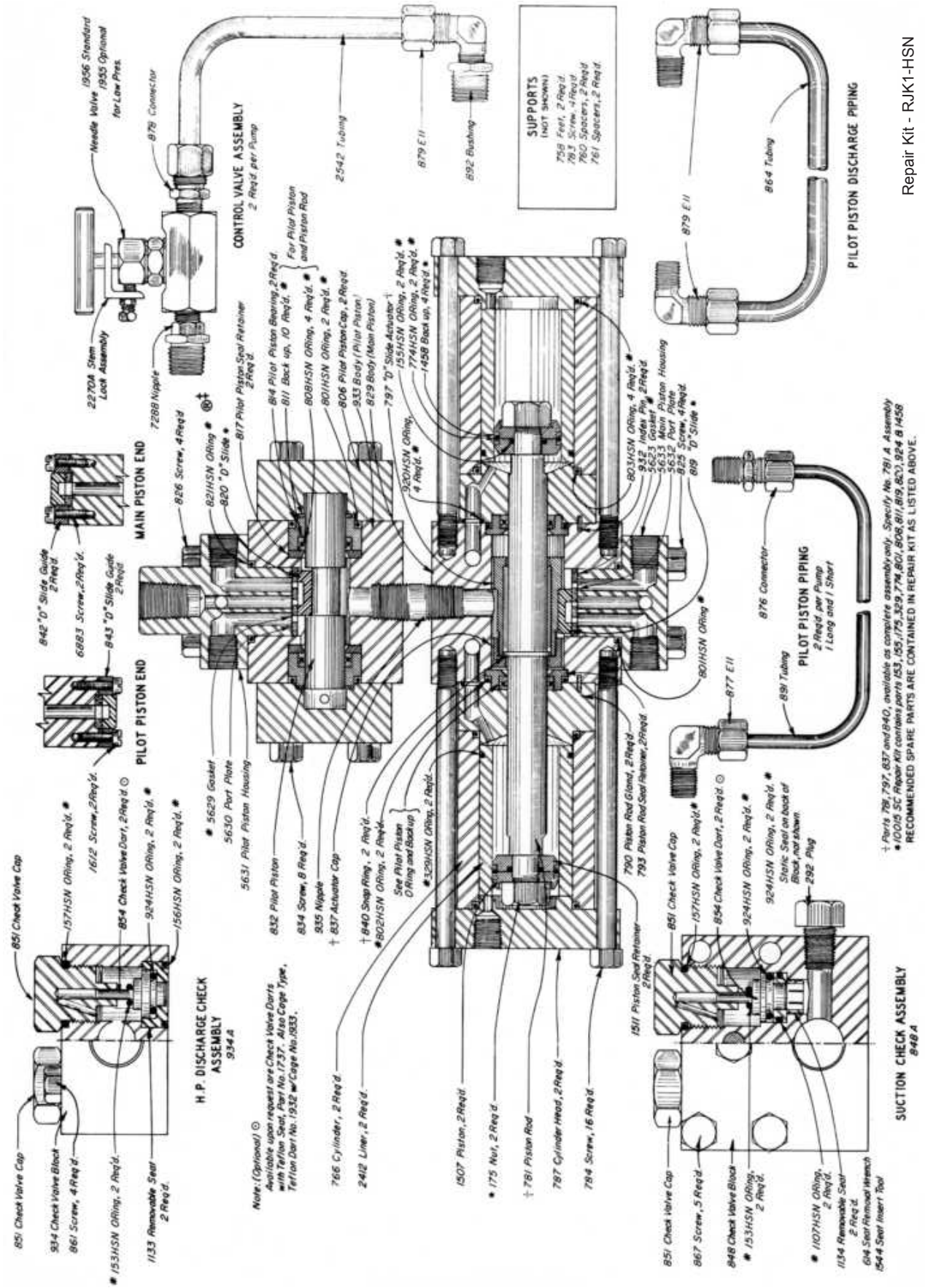
ENERGY EXCHANGE
MODEL PV - 050 CAPACITY

Repair Kit - RJH1-HSN



ENERGY EXCHANGE
MODEL PV - 100 CAPACITY

Repair Kit - RJK1-HSN



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‡ Configuration of Glycol Pump is a trademark of Kimray, Inc.

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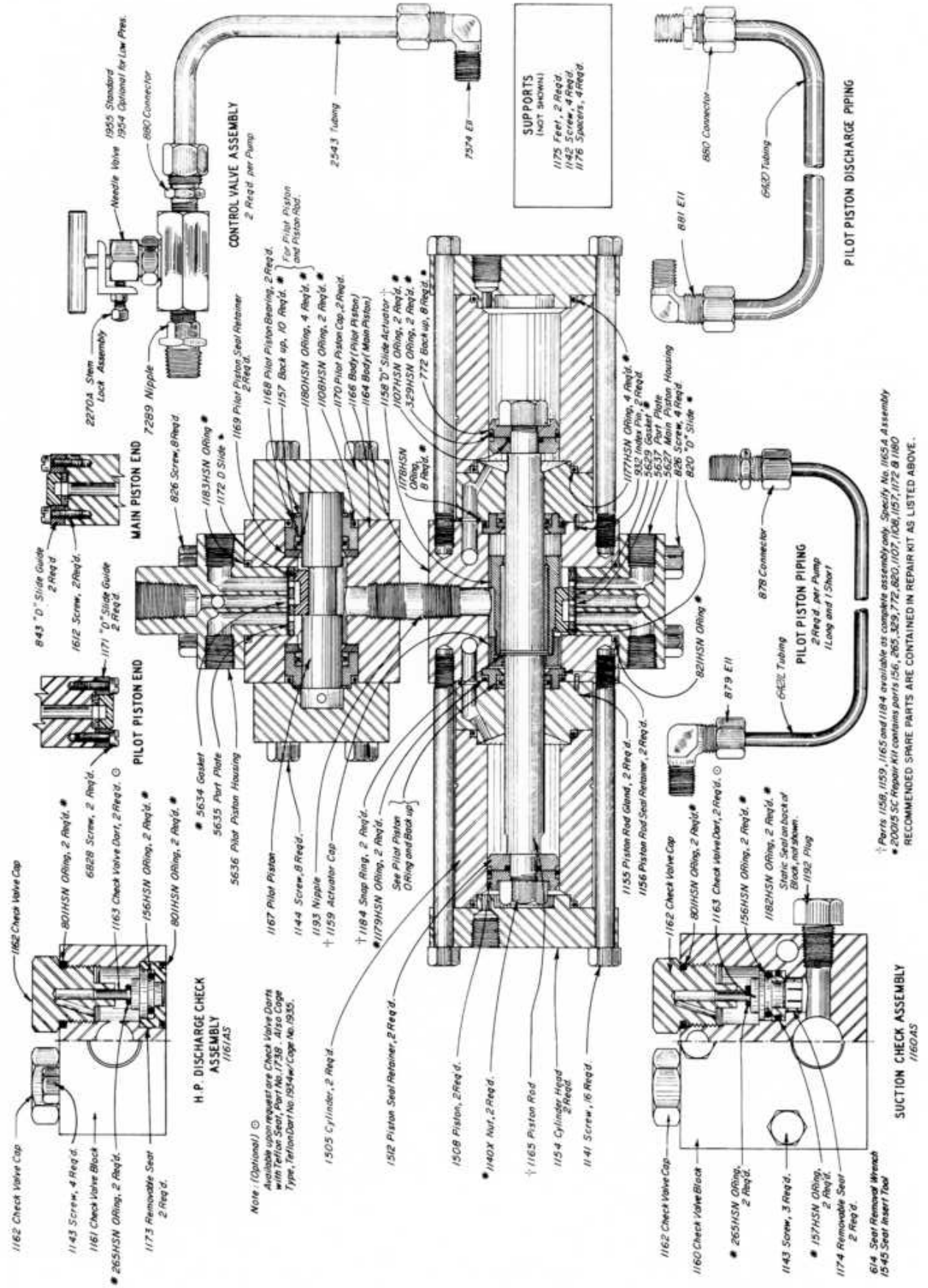
ENERGY EXCHANGE
MODEL PV - 200 CAPACITY



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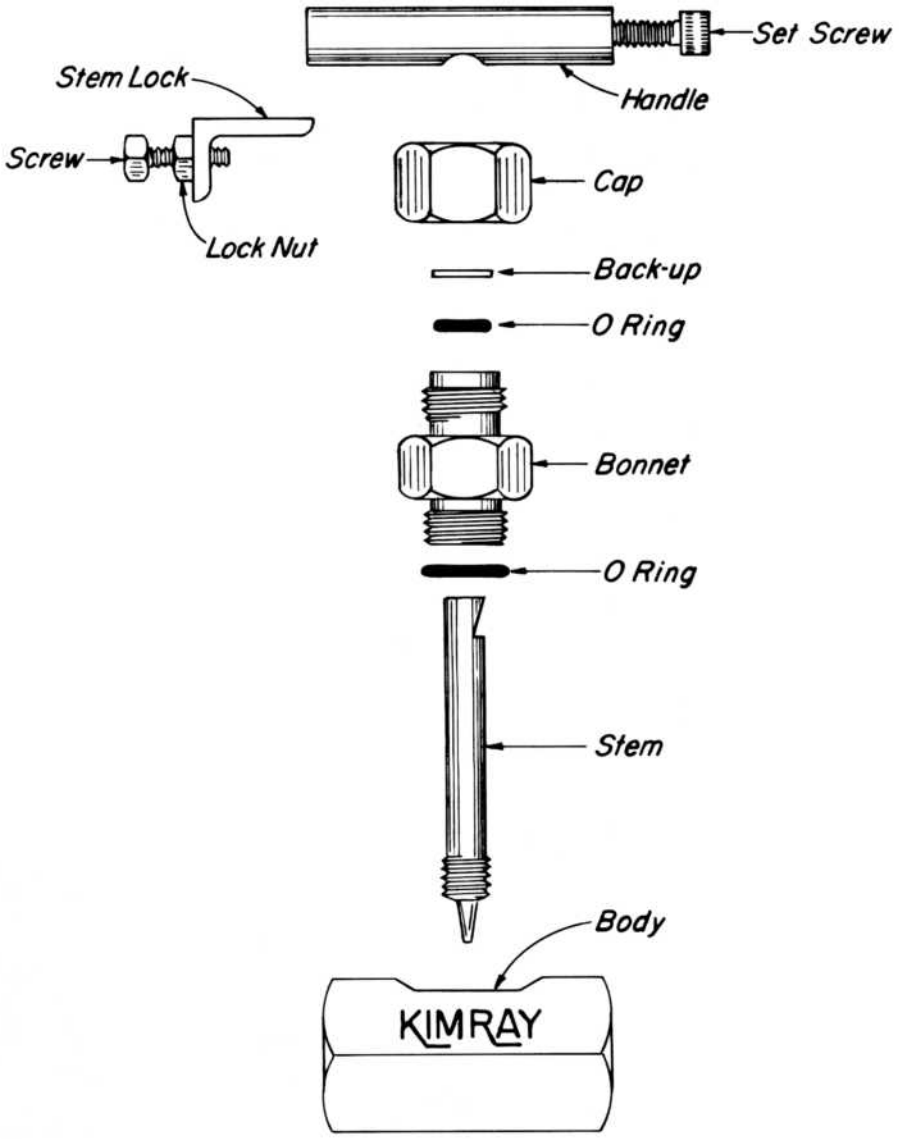


N.P.T. SIZE	VALVE NO.	ORIFICE SIZE	PUMP SIZE	BODY	BONNET	CAP	STEM	HANDLE	SET SCREW	BACK-UP	O-RING	O-RING	STEM LOCK	SCREW	LOCK NUT
TYPE 303 STAINLESS STEEL STANDARD ON ALL PUMPS EXCEPT 45020 PV PUMP															
1/4"	1911	1/16"	1720	1911A	1603D	1603F	1957A	1603B	1964	1978	638HSN	265HSN	6746	6731	6732
1/4"	1957	1/8"	4020	1957C	1603D	1603F	1957A	1603B	1964	1978	638HSN	265HSN	6746	6731	6732
3/8"	1956	3/16"	9020	1956C	1955D	1955F	1956A	1955B	1963	1979	153HSN	2631HSN	6747	6731	6732
1/2"	1955	9/32"	21020	1955C	1955D	1955F	1955A	1955B	1963	1979	153HSN	2631HSN	6747	6731	6732
CARBON STEEL STANDARD ON 45020 PV PUMP ONLY															
3/4"	1954	13/32"	45020	1954C	1954D	1954F	1954A	1954B	1962	1980	154HSN	2131HSN	6748	6731	6732

ENERGY EXCHANGE
SPLIT DISCHARGE CHECK VALVE BLOCKS

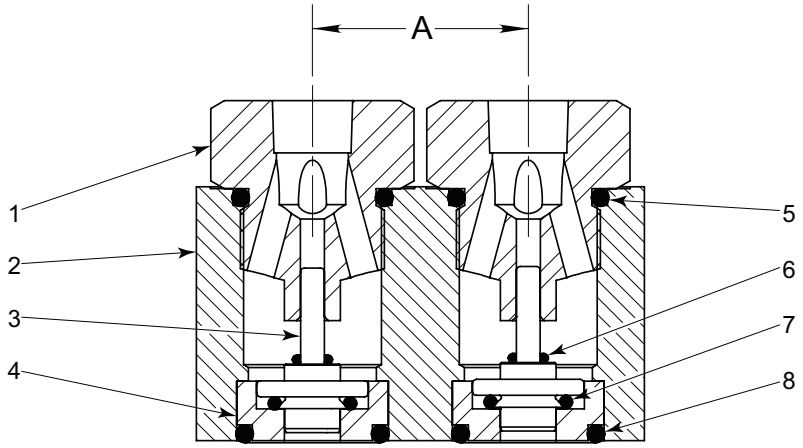
Kimray Glycol Pumps are available with check valve blocks for split discharge to serve two absorbers on a dehydration unit. On an original pump purchase there is no extra charge for this check block.

An accurately divided flow is assured since each absorber is served by one cylinder of the double acting pump.

For an installation of this type only one suction line is necessary. Also the high pressure wet glycol return may be manifolded through one filter or strainer to the pump.

When ordering any Kimray pump for this service, specify the pump number and service. For example: 4020 PV for “split discharge”.

To order Check Valve Blocks for Split Discharge Assemblies add an “A” to the Check Valve Body number. Example: 1194A to order the assemblies with viton O-Rings add a “V” to Check Valve Assemblies number; Example: 1194AV



PART NUMBERS FOR INDICATED PUMPS							
ITEM NUMBER	PART NAME	QTY REQ’D	1720 PV	4020 PV and 2020 SC	9020 PV and 5020 SC	21020 PV and 10020 SC	45020 PV and 20020 SC
1	CHECK VALVE CAP	2	1327	1327	1114	1199	1198
2	CHECK VALVE BODY	1	1194	1194	1195	1196	1197
3	DART	2	1307	1307	853	854	1163
4	REMOVABLE SEAT	2	1152	1152	1131	1133	1173
5	“O” RING, CAP	2	155HSN	155HSN	156HSN	157HSN	801HSN
6	"O" RING, SNUBBER	2	647HSN	647HSN	647HSN	153HSN	265HSN
7	“O” RING, DART	2	855HSN	855HSN	154HSN	924HSN	156HSN
8	“O” RING, SEAT	2	491HSN	491HSN	1151HSN	156HSN	801HSN
TAPPED HOLE SIZE		NPT	1/4	1/4	3/8	1/2	3/4
DIMENSION “A”		Inches	1 1/2	1 1/2	1 11/16	2 5/16	3
ASSEMBLY			1194A		1195A	1196A	1197A

All Pictures shown are for illustration purpose only. Actual product may vary due to product enhancement.

ENERGY EXCHANGE
SMALL CYLINDER CONVERSION

The small cylinder glycol pump was designed to extend the lower operating pressure of the pump downward from 300 psig to 100 psig. Due to increased gas consumption it is recommended to use the full cylinder pumps at pressures greater than 400 psig.

Any Kimray glycol pump can be field converted to a small cylinder pump of comparable size (see comparative table below). Likewise, small cylinder pumps can be converted to full cylinder pumps. The parts required for these conversions are stocked in kit form. To order conversion kits specify; (existing pump model) conversion kit to (converted pump model).

COMPARATIVE TABLE	
FULL CYLINDER	SMALL CYLINDER
GPV040S	GPV020S
GPV090S	GPV050S
GPV0210S	GPV0100S
GPV0450S	GPV0200S

REQUIRED CONVERSION PARTS					
PART DESCRIPTION	QTY	CAPACITY			
		040 TO 020	090 TO 050	210 TO 100	450 TO 200
Cylinder Liner	2	2108	2373	2412	1505
Piston	2	1506	776	1507	1508
Piston Seal Retainer	2	1509	1510	1511	1512
O-Ring	2	156HSN	773HSN	774HSN	329HSN
Back-up Ring	4	1513	1457	1458	772
O-Ring	2	154HSN	154HSN	155HSN	1107HSN
Lock Nut (Piston)	2	----	906	175	1140
Cylinder O-Ring	2	773	774	329	----

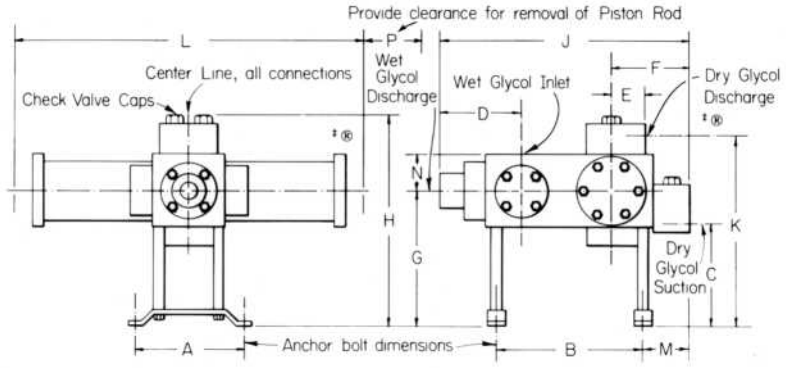
*The piston is the nut for this model and is furnished with a socket head set screw.
‡Full cylinder only.
‡Model 20020 SC only, requires 8, No. 772 Back-up rings.

KIMRAY INC.®

ENERGY EXCHANGE
CAPACITIES & DIMENSIONS

Model Number	Oper. Pressure		Gal. / Minute		Gal. / Hour		Strokes Minute		Glycol Output		GPH per Stroke / Minute
	Min.	Max.	Min.	Max.	Min	Max	Min	Max	Strokes/Gal.	Gal./Strokes	
GPV040S	300	2000	0.20	0.67	12	40	12	40	59	0.017	1.00
GPV090S	300	2000	0.45	1.50	27	90	12	40	26.3	0.038	2.25
GPV210S	400	2000	1.10	3.50	66	210	10	32	9	0.111	6.56
GPV450S	400	2000	2.77	7.50	166	450	10	28	3.5	0.283	16.07
GPV020S	100	500	0.13	0.33	8	20	5	55	147	0.0068	0.36
GPV050S	100	500	0.20	0.83	12	50	10	50	52	0.019	1.00
GPV100S	100	500	0.37	1.67	22	100	10	48	25	0.040	2.08
GPV200S	100	500	1.00	3.33	60	200	10	40	8.8	0.114	5.00

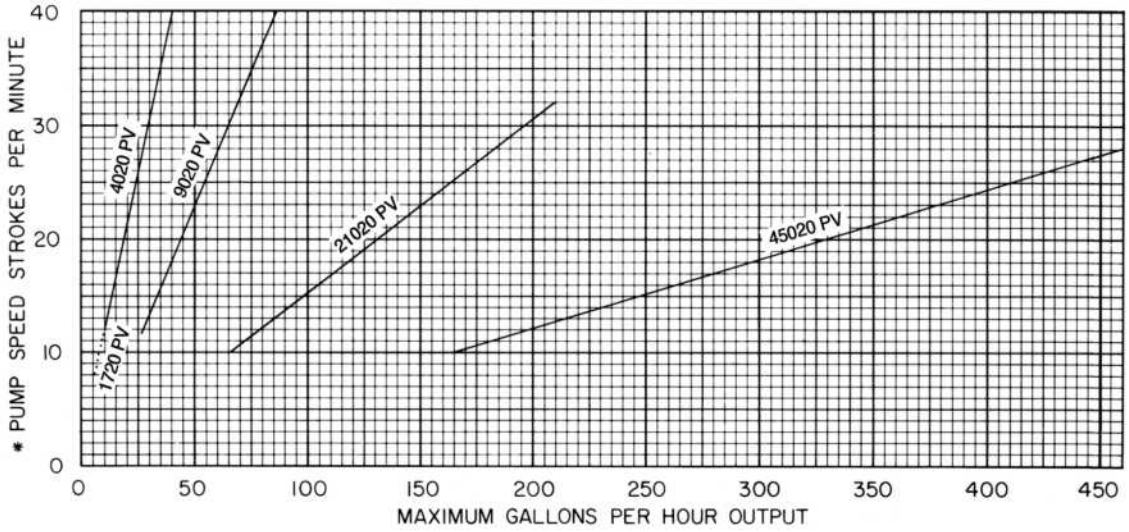
Model Number	Bore	Rod Diameter	Size of Pipe Connections	Mounting Bolts	Approx. Weight	Stroke
GPV040S	1.75"	0.75"	1/2" N.P.T.	3/8" Dia.	66 Lbs.	2.00"
GPV090S	2.25"	1.00"	3/4" N.P.T.	1/2" Dia.	119 Lbs.	2.75"
GPV210S	3.25"	1.38"	1" N.P.T.	1/2" Dia.	215 Lbs.	3.75"
GPV450S	4.50"	2.00"	1 1/2" N.P.T.	3/4" Dia.	500 Lbs.	5.13"
GPV020S	1.25"	0.75"	1/2" N.P.T.	3/8" Dia.	66 Lbs.	2.00"
GPV050S	1.75"	1.00"	3/4" N.P.T.	1/2" Dia.	119 Lbs.	2.75"
GPV100S	2.25"	1.38"	1" N.P.T.	1/2" Dia.	215 Lbs.	3.75"
GPV200S	3.25"	2.00"	1 1/2" N.P.T.	3/4" Dia.	500 Lbs.	5.13"



Model Number	Dimensions, Inches													
	A	B	C	D	E	F	G	H	J	K	L	M	N	P
GPV040S GPV020S	5 1/4	5 11/16	5 3/4	3 7/16	1 1/2	3 1/2	7 1/4	10 7/8	10 3/16	9 5/8	15	2 1/8	1 3/4	3
GPV090S GPV050S	6 1/4	8 1/4	6 3/8	5	1 3/4	4 1/4	8 3/4	13 1/4	13 7/8	11 3/4	20	2 1/2	2	3
GPV210S GPV100S	7 5/8	10 1/8	7	5 3/8	2 1/4	5 3/4	9 1/4	14 3/4	16 5/8	13	24	3 3/16	2 1/2	4
GPV450S GPV200S	10 3/4	14	9	6 5/8	2 5/8	6 1/2	11 3/8	19	21 1/8	16 3/8	34	3 3/4	3 1/2	6

GAS CONSUMPTION FULL CYLINDER																		
Operating Pressure --p.s.i.g.	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000
Cu. Ft./Gallon @ 14.4 & 60°F.	1.7	2.3	2.8	3.4	3.9	4.5	5.0	5.6	6.1	6.7	7.2	7.9	8.3	8.7	9.3	9.8	10.4	10.9

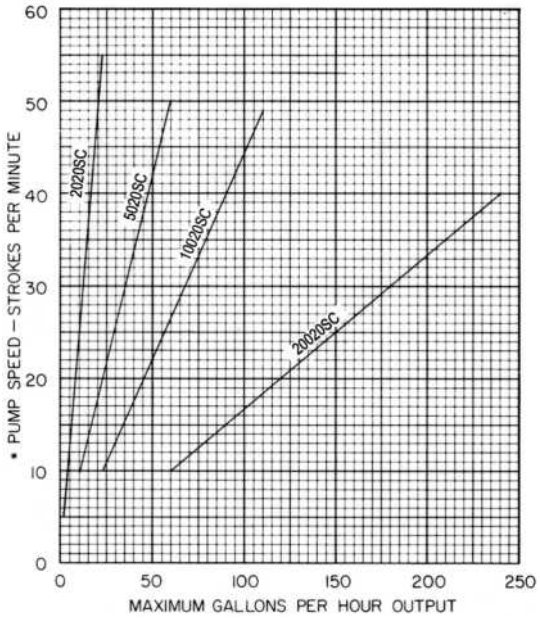
CIRCULATION RATE GRAPH FULL CYLINDER



* It is not recommended to attempt to run pumps at speeds less or greater than those indicated in the above graph.

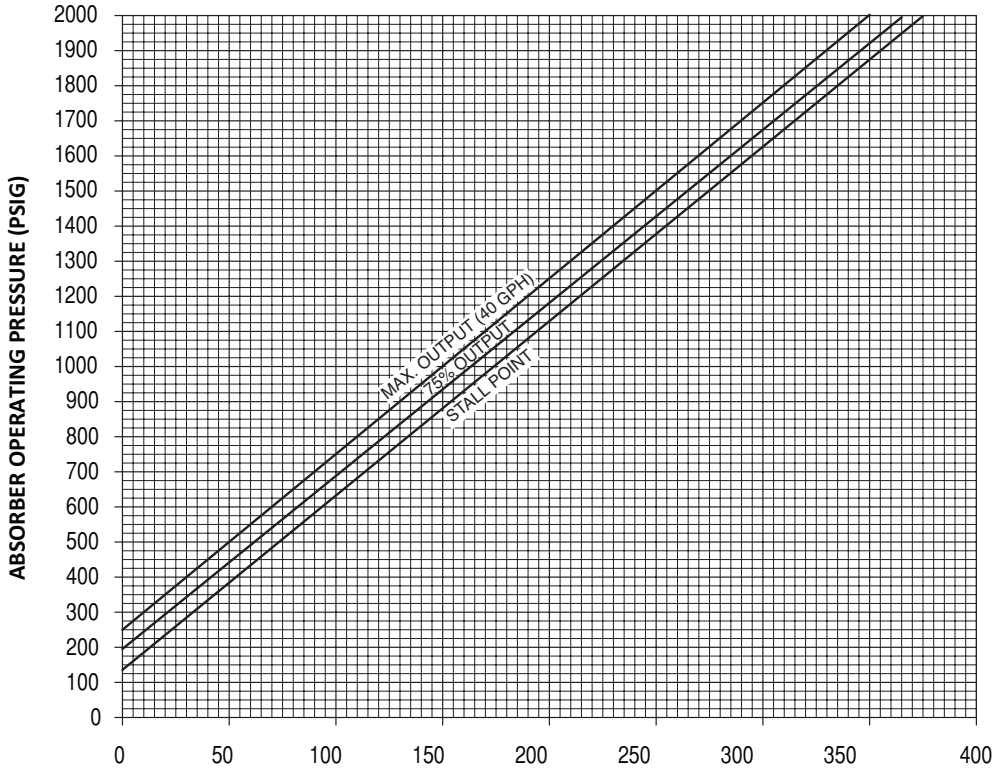
GAS CONSUMPTION SMALL CYLINDER				
Operating Pressure --p.s.i.g.	100	200	300	400
Cu. Ft./Gallon @ 14.4 & 60°F.	1.0	1.9	2.8	3.7

CIRCULATION RATE GRAPH SMALL CYLINDER

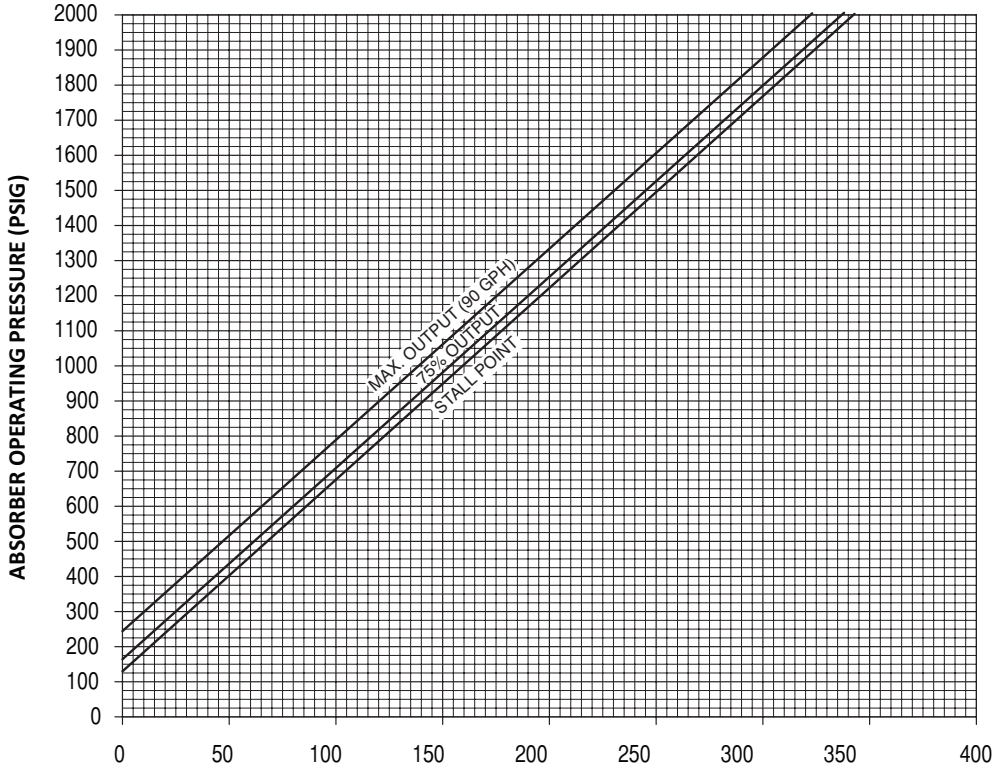


* It is not recommended to attempt to run pumps at speeds less or greater than those indicated in the above graph.

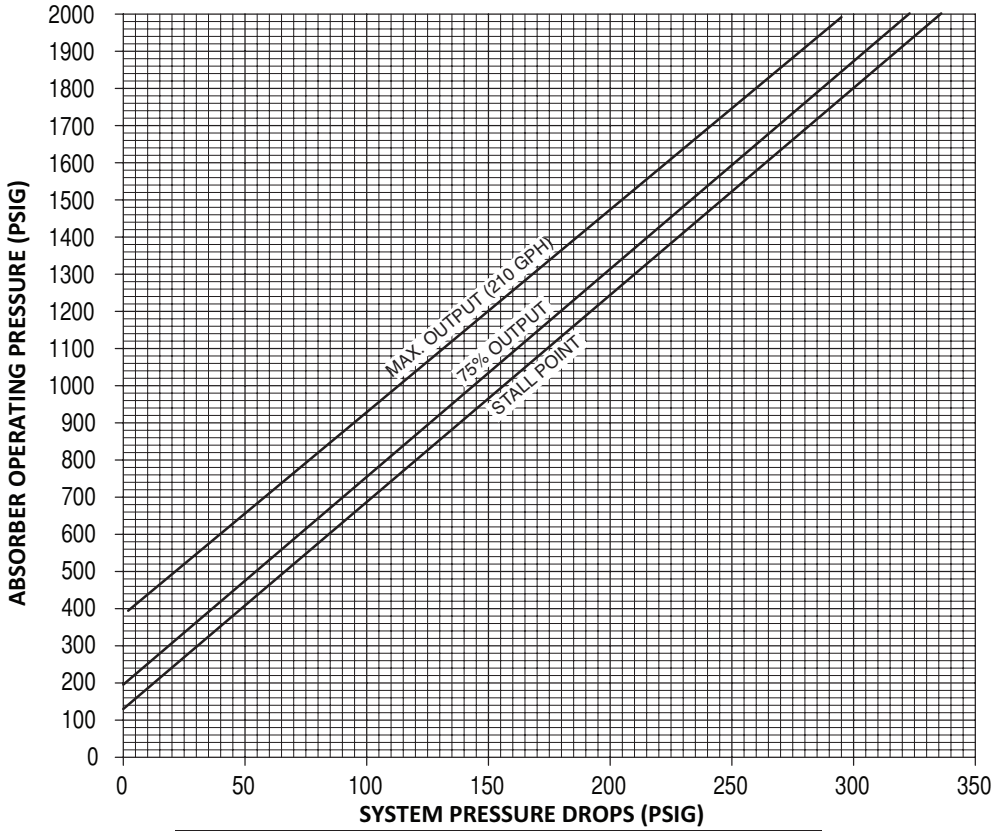
ENERGY EXCHANGE
OPERATING PARAMETERS



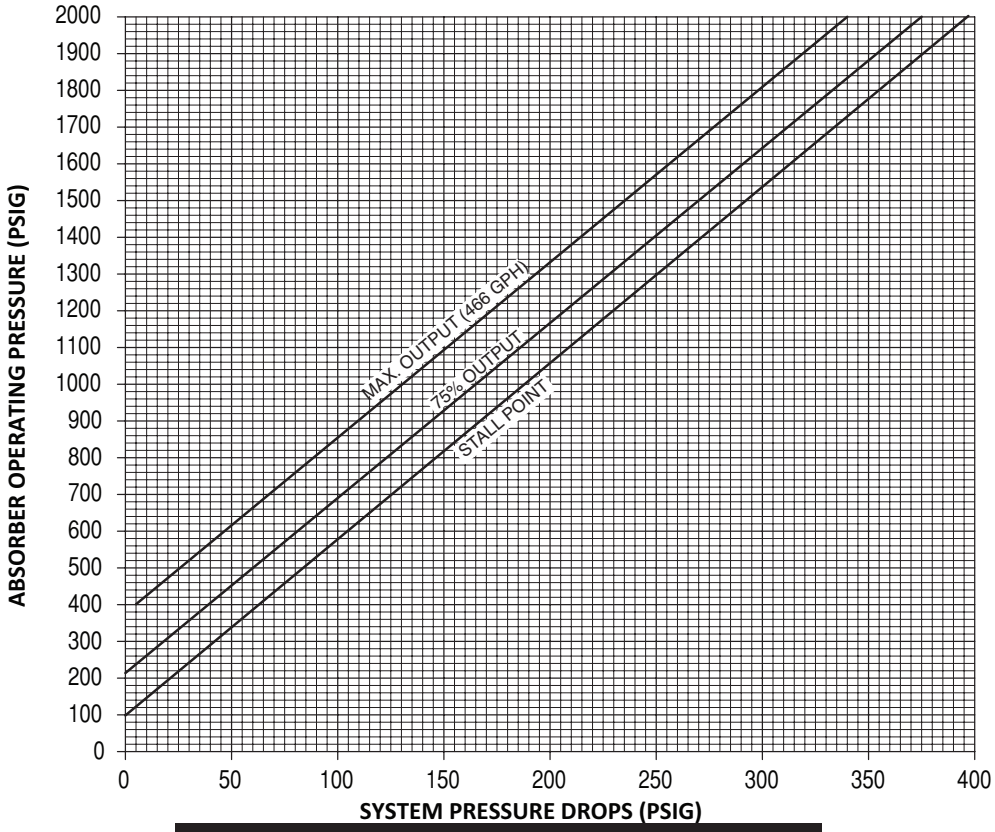
4020 PV Strokes/Minute Range 12-40



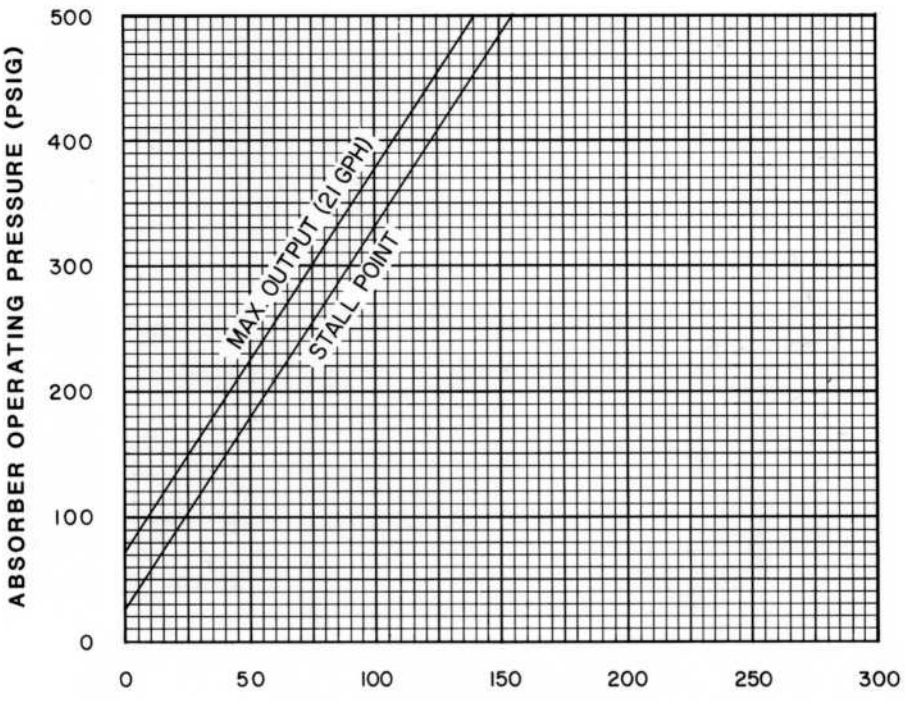
9020 PV Strokes/Minute Range 12-40



21020 PV Strokes/Minute Range 10-32

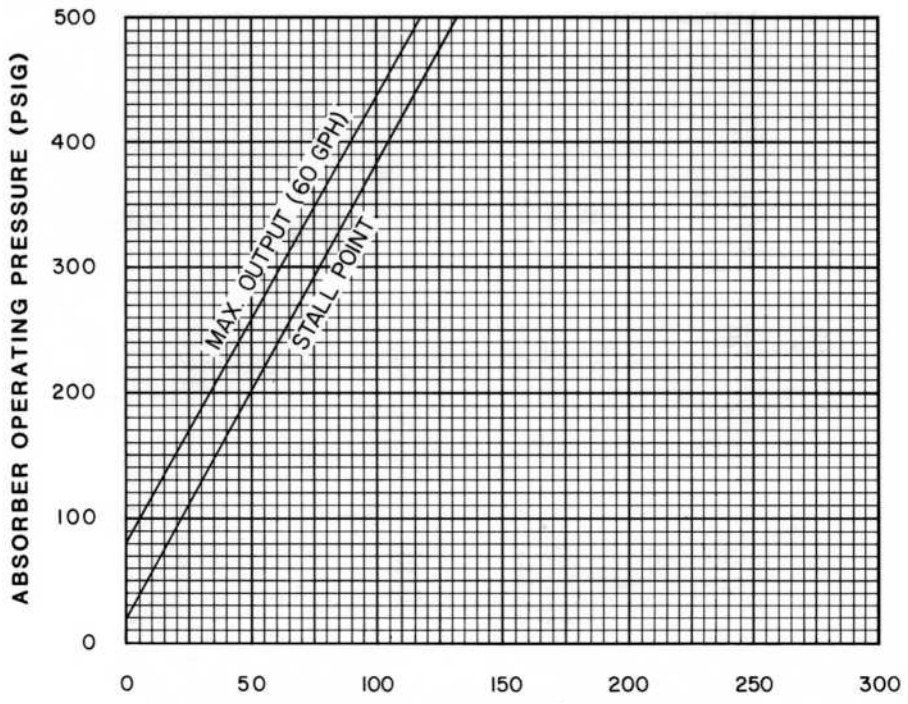


45020 PV Strokes/Minute Range 10-28



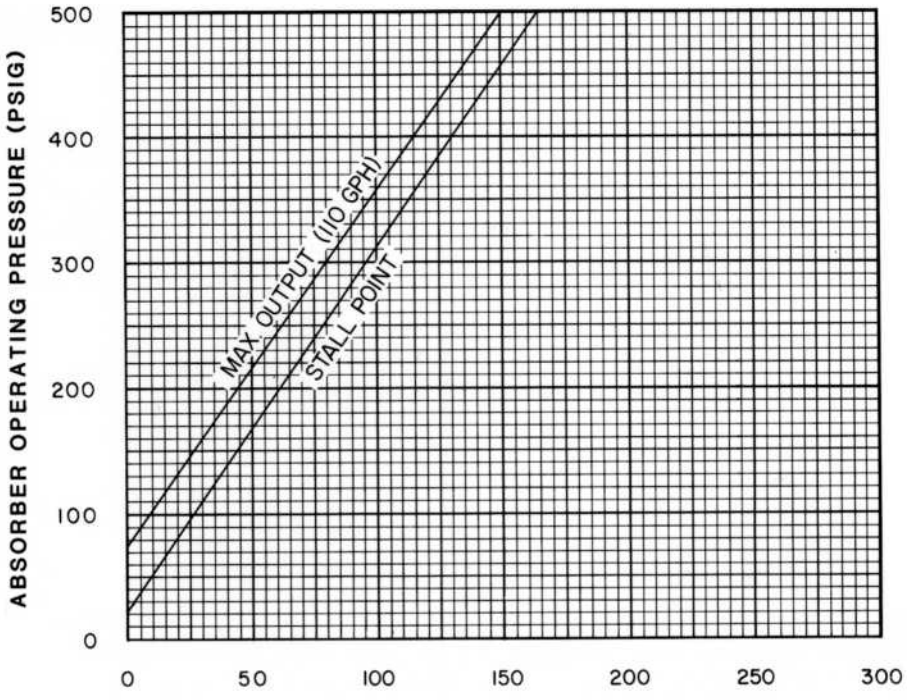
SYSTEM PRESSURE DROPS (PSIG)

2020 SC Strokes/Minute Range 5-55



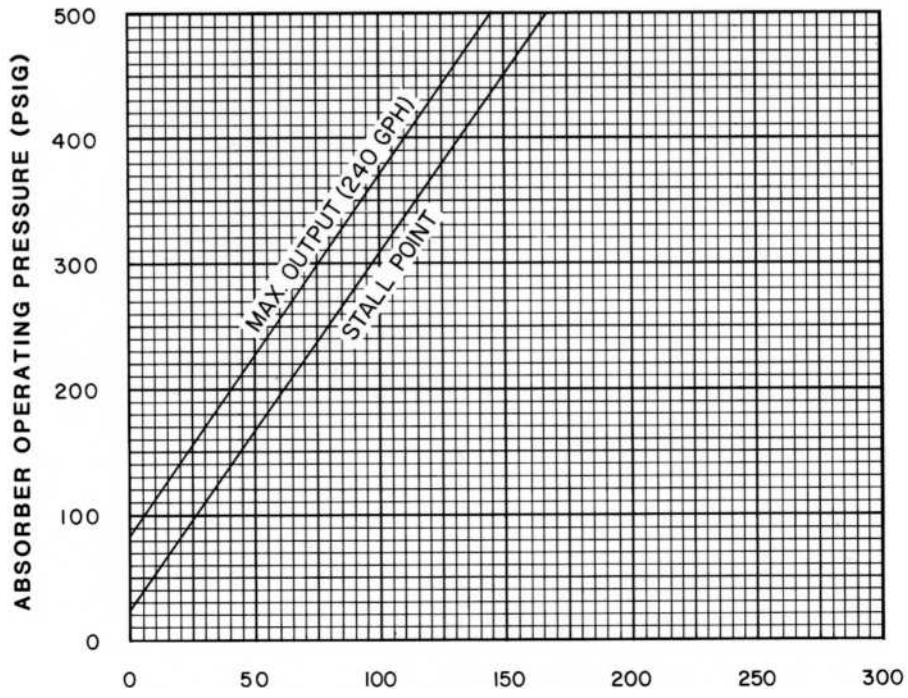
SYSTEM PRESSURE DROPS (PSIG)

5020 SC Strokes/Minute Range 10-50



SYSTEM PRESSURE DROPS (PSIG)

10020 SC Strokes/Minute Range 10-48



SYSTEM PRESSURE DROPS (PSIG)

20020 SC Strokes/Minute Range 10-40

Table 1 - Seal Options		
Part	**Standard Material**	**Optional Material**
O-rings	HSN	FKM, Aflas®
Backups	Glass Filled Teflon	-----

Table 2 - Seal Specifications				
		HIGHLY SATURATED NITRILE	**FKM**	**AFLAS®**
	Kimray Suffix	HSN	V	AF
Resistance	**Abrasion**	G-E	G	G
	Acid	G-E	G-E	E
	Chemical	F	E	E
	Cold	G	P	P
	Flame	P	E	E
	Heat	E	E	E
	Oil	E	E	E
	Ozone	G	G-E	E
	Set	G	G-E	P
	Tear	F	F	P
	Water/Steam	E	P	G
	Weather	G	E	E
	CO2	G	G	G
	H2S	F	P	E
	Methanol	E	P	P
Properties	**Dynamic**	G	G	G
	Electrical	F	F	G-E
	Impermeability	G	G	G
	Tensile Strength	G-E	G	F
	Temp. Range	-20° to +250°F	-15° to +400°F	+15° to +450°F
		-29° to +121°C	-26° to +204°C	-9° to +232°C
RATINGS: P-POOR, F-FAIR, G-GOOD, E-EXCELLENT				

Table 3 - Material Options		
Component	**Standard Material**	**Optional Material**
Body	Ductile (ASTM A395)	N/A
Suction Block	Ductile (ASTM A395)	N/A
Discharge Block	Ductile (ASTM A395)	N/A
Main Valve Housing	Ductile (ASTM A395)	N/A
Pilot Valve Housing	Ductile (ASTM A395)	N/A
Port Plates	Stellite No 6	N/A
Cylinder Heads	Ductile (ASTM A395)	N/A
Pilot Piston Caps	Ductile (ASTM A395)	N/A
Cylinders	17-4PH (ASTM A564)	N/A
Pistons	Alloy Steel (ASTM A108)	N/A
Pilot Pistons	17-4PH (ASTM A564)	N/A
Piston Rod	17-4PH (ASTM A564)	N/A
Piston Rod Glands	Ductile (ASTM A395)	N/A
Fittings	Steel (ASTM A108)	316SS (ASTM A479)
Tubing	304SS (ASTM A249)	N/A

Table 4 - Material Specification					
	Body		**Inner Parts**		
	CAST STEEL	**CAST DUCTILE**	**303 STAINLESS STEEL**	**316 STAINLESS STEEL**	**6061-T6 ALUMINUM**
KIMRAY SUFFIX	LCB	C6	S3	S6	AL
ASTM GROUP	ASTM A-352	ASTM A-351	ASTM A-582	ASTM A-479	ASTM B-221
GRADE	LCB	CF8M	303	316	6061-T6
UNS	J02505	J92900	S30300	S31600	A96061
NACE Compliant	Yes	Yes	No	No	No

CODE BUILDER
G SERIES

Series:

G = Glycol Pump

Model:

PV = Energy Exchange

Capacity

	Flow Rate (gph)	Operating Pressure (psi)
040	12-40	300 - 2000
090	27-90	
210	66-210	400 - 2000
450	166-450	
020	8-20	100 - 500
050	12-50	
100	22-100	
200	60-200	

Service Type:

S = Standard

G	PV	040	S	

Options: Additional cost and lead times will apply

If multiple options required input in sequential order

Leave blank if no options required

A = AFLAS Elastomers

V = FKM Elastomers

X = Export

Not all selections available on all products listed.
See product pages 10:10.1 - 10:10.10 for available options