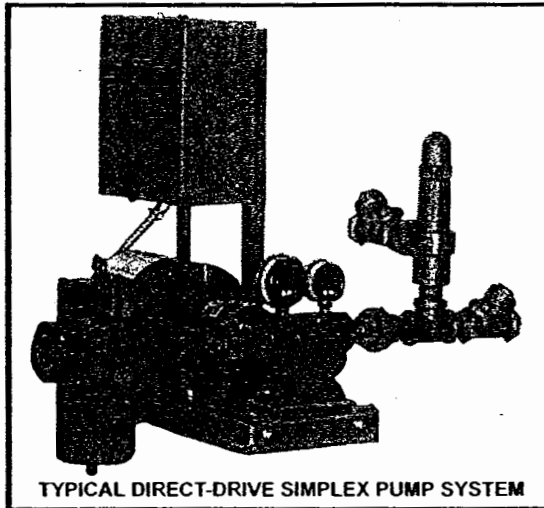


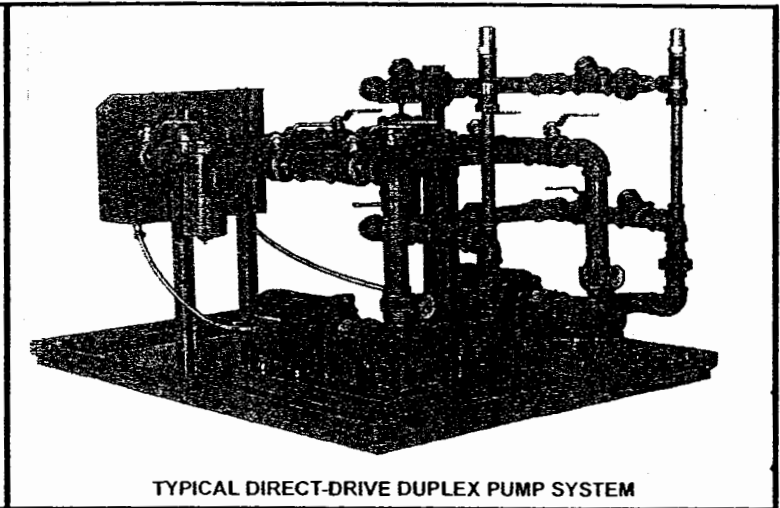
Specification Data OIL CIRCULATING PUMP SYSTEMS

LOW PRESSURE MODELS - LS2D AND LD2D for No. 2 FUEL OIL
INTERMEDIATE PRESSURE MODELS - IS2D AND ID2D for No. 2 FUEL OIL

SIMPLEX OR DUPLEX - DIRECT DRIVE



TYPICAL DIRECT-DRIVE SIMPLEX PUMP SYSTEM



TYPICAL DIRECT-DRIVE DUPLEX PUMP SYSTEM

General Description: Low pressure pump sets (capacities are rated at 15 gph) are suitable for fuel transfer or for supplying a circulating loop to burner pumps. Intermediate pump sets are primarily for the purpose of supplying No. 2 fuel oil to John Zink air atomizing burners (capacities are rated at 100 gph) and are also suitable as fuel transfer units for applications in this pressure range. See charts for spring ranges listed and limitations.

Note that the drawings and components required are the same for the low and intermediate pump sets. The difference lies in capacities of components at different pressures and horsepower required.

Components: The simplex pump set is made up with a standard base mounted electric motor; gear type pump; flexible drive coupling and coupling guard mounted on a heavy gauge steel base.

Accessories include a compound gauge (0-30 psi X 30" Hg.); pressure gauge (0-200 psi) on intermediate pump sets and 0-60 psi on low pressure systems; relief/regulator valve; check and shutoff valve; simplex strainer with removable basket; NEMA-1 cabinet with motor starter(s) mounted and wired. Oil strainer is not mounted on simplex pump sets to prevent damage in shipment.

Duplex pump sets are the same as simplex systems described above except that two each of the components are piped for common supply, discharge and relief return line with necessary shutoff valves and piping to permit transferring from one system to the other. Motor starters are enclosed in a single NEMA-1 control cabinet and wired for single electrical connection. All duplex components are mounted on a liquid tight base pan.

Reference Catalog Sheet (1-gen-10.6) for a more detailed discussion on suction lines and piping in general.

Pump Set Model Numbering System

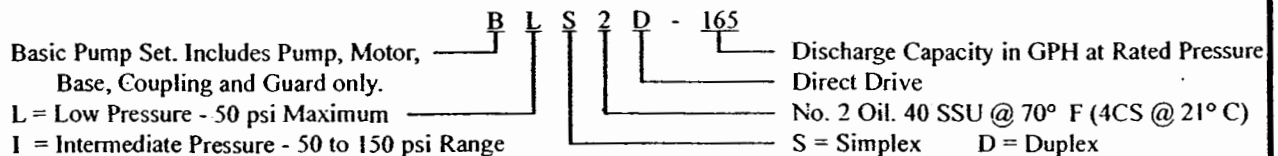


Figure 1

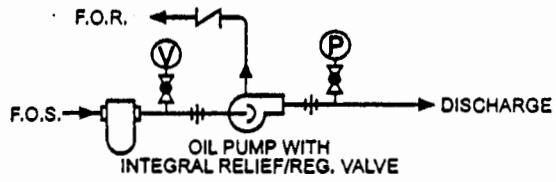


Figure 2

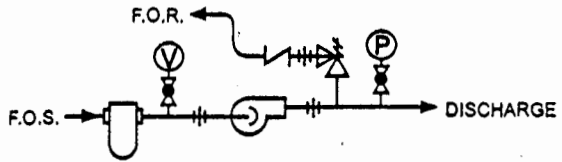
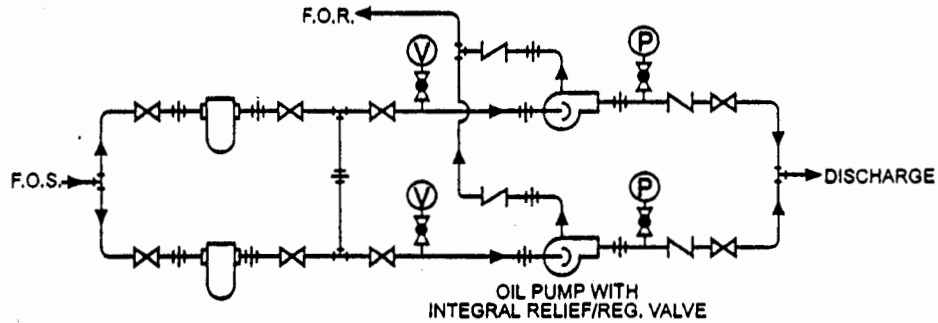
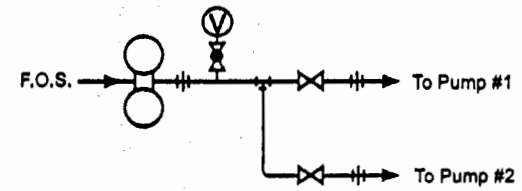


Figure 3

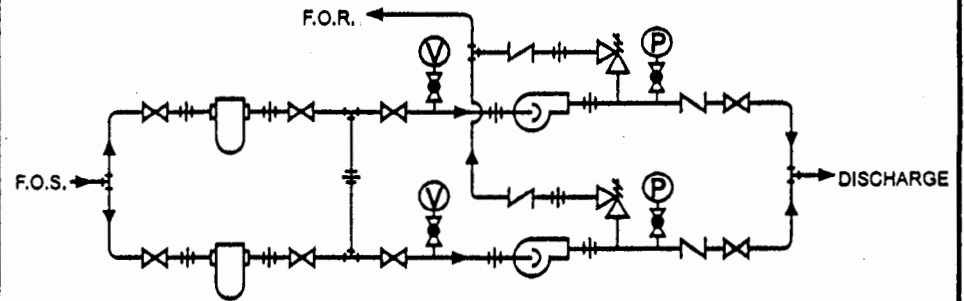


Alternate Piping



Alternate Piping for Duplex Strainer in place of Simplex Strainers on Duplex Pump Sets.

Figure 4



LEGEND (for piping)

- Check Valve.....
- Gate Valve.....
- Globe Valve.....
- Oil Pump.....
- Oil Strainer.....

- Relief/Regulator Valve.....
- Temperature Gauge.....
- Vacuum/Pressure Gauge.....
- Pressure Gauge.....
- Gauge Cock (See Note).....

- Fuel Oil Supply..... F.O.S.
- Fuel Oil Return..... F.O.R.
- Union.....

NOTE: Gauge cock not supplied as standard.

<p>WEBSTER "2R" SERIES INLET CONDITION: - -- 15" HG SUCTION -- 3 PSI POSITIVE INLET PRESSURE (SEE NOTE 4) -- SUCTION CAPACITY DETERMINED AT ATMOSPHERIC INLET TO ATMOSPHERIC DISCHARGE.</p> <p>STANDARD VOLTAGE - 3 PH / 60 HZ (SEE NOTE 1)</p> <p>PIPING SCHEMATIC - SIMPLEX - FIG. 1 - DUPLEX - FIG. 3</p>	<p>PARKER "D" AND "H" SERIES (SEE NOTE 3) INLET CONDITION: - -- 10" HG SUCTION -- 20 PSI POSITIVE INLET PRESSURE (SEE NOTE 4) -- SUCTION CAPACITY DETERMINED AT ATMOSPHERIC INLET TO ATMOSPHERIC DISCHARGE.</p> <p>HORSEPOWER: LOW PRESSURE TO 50 PSI INTERMEDIATE PRESSURE TO 150 PSI</p> <p>STANDARD VOLTAGE - 3 PH / 60 HZ (SEE NOTE 1)</p> <p>PIPING SCHEMATIC - SIMPLEX - FIG. 2 - DUPLEX - FIG. 4</p>	<p>VIKING "432" AND "4195" SERIES INLET CONDITION: - -- 20" HG SUCTION -- 100 PSI POSITIVE INLET PRESSURE (SEE NOTE 4) -- SUCTION CAPACITY DETERMINED AT 15" HG INLET TO ATMOSPHERIC DISCHARGE.</p> <p>HORSEPOWER: LOW PRESSURE TO 50 PSI INTERMEDIATE PRESSURE TO 150 PSI</p> <p>STANDARD VOLTAGE - 3 PH / 60 HZ (SEE NOTE 1)</p> <p>PIPING SCHEMATIC - SIMPLEX - FIG. 2 - DUPLEX - FIG. 4</p>
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DATA FOR LOW PRESSURE SYSTEMS @ 15 PSI						
PUMP MODEL	PUMP CAPACITY (GPH)		RELIEF / REG. VALVE (2)		PUMP RPM (1) @ 60 HZ	MOTOR H.P.
	DISCHARGE	SUCTION	MODEL	SPR. RANGE		
2R233D-5AA4	36	70	INTEGRAL	5-25 PSI	1725	.33
2R636D-5AA4	75	125	INTEGRAL	5-25 PSI	1725	.33
D05AA2A	45	50	RV2103	10-25 PSI	1725	.33
D07AA2A	70	73	RV2103	10-25 PSI	1725	.33
D09AA2A	90	92	RV2103	10-25 PSI	1725	.33
D11AA2A	105	114	RV2103	10-25 PSI	1725	.33
D14AA2A	135	143	RV2103	10-25 PSI	1725	.33
D17AA2A	165	176	RV3003	10-55 PSI	1725	.33
D22AA2A	215	228	RV3003	10-55 PSI	1725	.33
D27AA2A	265	280	RV3003	10-55 PSI	1725	.33
H31AA2A	310	327	RV3003	10-55 PSI	1725	.50
H39AA2A	385	408	RV3003	10-55 PSI	1725	.50
H49AA2A	485	510	RV3003	10-55 PSI	1725	.75
H62AA2A	605	636	VJ-4US	7-35 PSI	1725	.75
H77AA2A	760	798	VJ-4US	7-35 PSI	1725	1.00
H90AA2A	915	963	VJ-5US	7-35 PSI	1725	1.00
C432-PHSFCS	30	35	RV2103	10-25 PSI	1725	.33
F432-PHSFCV	65	72	RV2103	10-25 PSI	1150	.33
F432-PHSFCV	105	114	RV2103	10-25 PSI	1725	.33
FH432-PHSFCV	130	138	RV2103	10-25 PSI	1150	.33
FH432-PHSFCV	200	210	RV3003	10-55 PSI	1725	.33
GG4195-PHSCCV	390	432	RV3003	10-55 PSI	1150	.50
GG4195-PHSCCV	630	672	VJ-4US	7-35 PSI	1725	.75
HJ4195-PHSCCV	840	870	VJ-5US	7-35 PSI	1150	1.00
HJ4195-PHSCCV	1290	1320	VJ-5US	7-35 PSI	1725	1.50
HL4195-PHSCCV	1140	1200	VJ-5US	7-35 PSI	1150	1.50
HL4195-PHSCCV	1800	1860	VJ-6US	7-35 PSI	1725	2.00

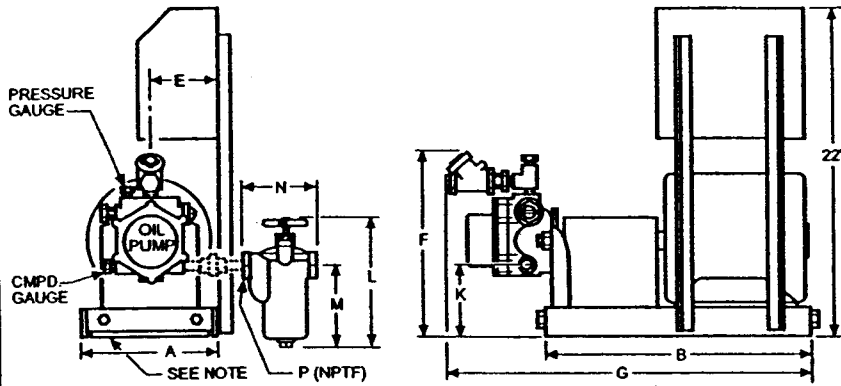
DATA FOR INTERMEDIATE PRESSURE SYSTEMS @ 100 PSI						
PUMP MODEL	PUMP CAPACITY (GPH)		RELIEF / REG. VALVE (2)		PUMP RPM (1) @ 60 HZ	MOTOR H.P.
	DISCHARGE	SUCTION	MODEL	SPR. RANGE		
2R223D-5AA14	30	70	INTEGRAL	70-330 PSI	1725	.33
2R626D-5AA14	60	125	INTEGRAL	70-330 PSI	1725	.50
D05AA2A	35	50	RV2104	80-140 PSI	1725	.33
D07AA2A	65	73	RV2104	80-140 PSI	1725	.33
D09AA2A	85	92	RV2104	80-140 PSI	1725	.33
D11AA2A	100	114	RV2104	80-140 PSI	1725	.33
D14AA2A	125	143	RV2104	80-140 PSI	1725	.50
D17AA2A	155	176	RV2104	80-140 PSI	1725	.50
D22AA2A	205	228	RV2104	80-140 PSI	1725	.75
D27AA2A	250	280	RV2104	80-140 PSI	1725	.75
H31AA2A	295	327	RV2104	80-140 PSI	1725	1.00
H39AA2A	365	408	RV3002	50-220 PSI	1725	1.50
H49AA2A	460	510	RV3002	50-220 PSI	1725	1.50
H62AA2A	570	636	RV3002	50-220 PSI	1725	2.00
H77AA2A	720	798	VJ-5XS	60-175 PSI	1725	3.00
H90AA2A	865	963	VJ-5XS	60-175 PSI	1725	3.00
C432-PHSFCS	25	35	RV2104	80-140 PSI	1725	.33
F432-PHSFCV	45	72	RV2104	80-140 PSI	1150	.33
F432-PHSFCV	80	114	RV2104	80-140 PSI	1725	.33
FH432-PHSFCV	95	138	RV2104	80-140 PSI	1150	.33
FH432-PHSFCV	165	210	RV2104	80-140 PSI	1725	.50
GG4195-PHSCCV	275	432	RV3002	50-220 PSI	1150	1.50
GG4195-PHSCCV	525	672	VJ-5XS	60-175 PSI	1725	2.00
HJ4195-PHSCCV	685	870	VJ-5XS	60-175 PSI	1150	2.00
HJ4195-PHSCCV	1150	1320	VJ-6XS	60-175 PSI	1725	3.00
HL4195-PHSCCV	955	1200	VJ-6XS	60-175 PSI	1150	3.00
HL4195-PHSCCV	1600	1860	VJ-7XS	60-175 PSI	1725	5.00

NOTES

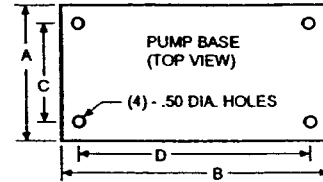
1. If voltage is 50 HZ/1450 RPM ILO 1725 RPM or 950 RPM ILO 1150 RPM, deduct 17% from listed suction and discharge capacities.
2. When Fulflo valves (P/N VJ-XXX) are installed as relief valves; divide the maximum spring range by 1.25 to determine maximum set point.
3. Parker "D" and "H" series pumps are suitable for jet fuel, No. 1 fuel oil and kerosene. Deduct 15% from discharge capacities.
4. NFPA-31 or local codes may limit inlet pressures on some installations.

SIMPLEX PUMP SET DIMENSIONS (Dashed lines are field piping)

Figure 5 - WEBSTER "2R" SERIES



NOTE: Alternate mounting brackets available on request (Qty: 2 per base) for welding to metal support or drip pan. Supplied as standard on duplex pump sets.



CAUTION: Pump and motor shafts are factory aligned to within acceptable tolerances. When mounting the pump base to a surface using the top (4) .5 dia. holes; the base can be pulled into a warped position. This will cause misalignment of the above mentioned shafts producing noise and shorter life of the pump and drive couplings.

Figure 6 - PARKER "D" and "H" SERIES

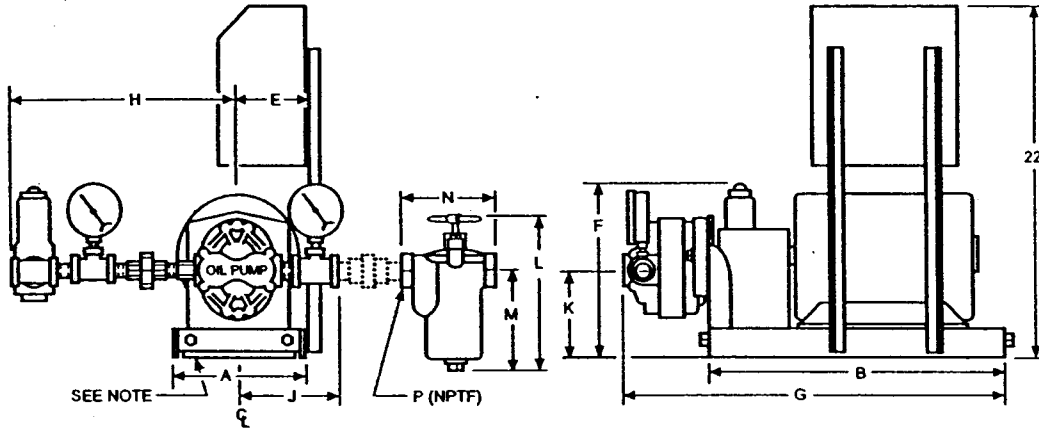


Figure 7 - VIKING "432" SERIES

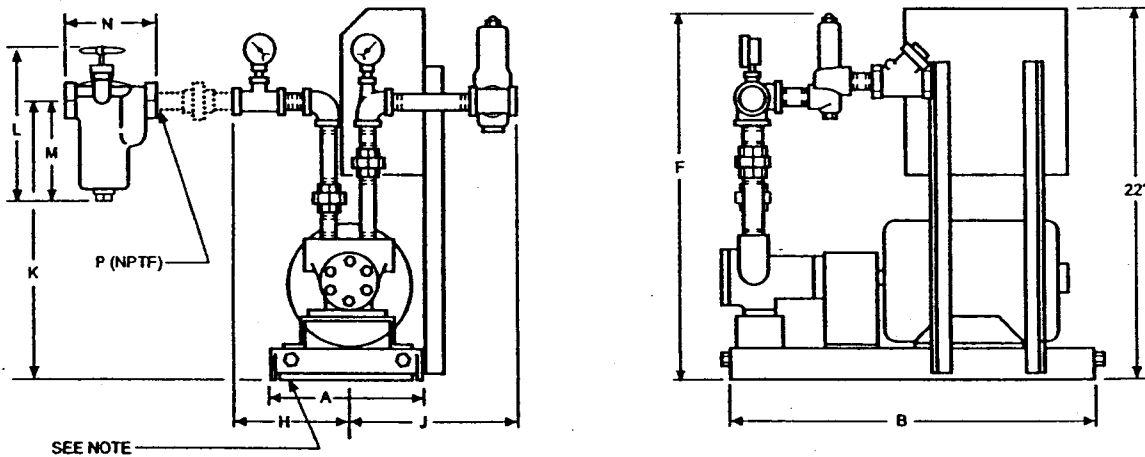
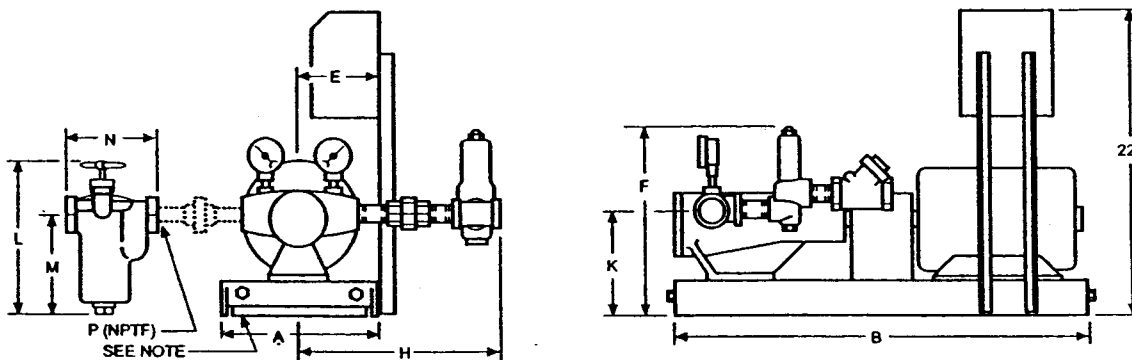


Figure 8 - VIKING "4195" SERIES



SIMPLEX PUMP SET DIMENSIONAL DATA

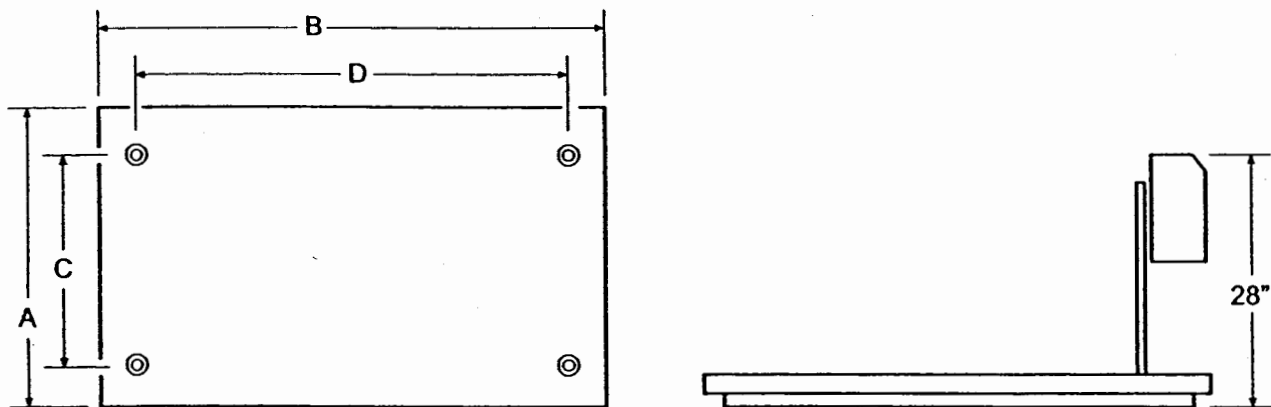
LOW PRESSURE SYSTEMS (15 PSI RANGE)																
PUMP SET MODEL	FIG. NO.	MOTOR FRAME	BASE DIMENSIONS				OVERALL DIMENSIONS						OIL STRAINER DIMENSIONS			
			A	B	C	D	E	F	G	H	J	K	L	M	N	P
LS2D-36-2R233	5	48	7.50	12.50	6.00	11.00	3.75	9.25	17.50	--	--	3.19	7.19	4.56	3.81	.50
LS2D-75-2R636	5	48	7.50	12.50	6.00	11.00	3.75	9.25	17.50	--	--	3.19	7.19	4.56	3.81	.50
LS2D-45-D05	6	48	7.50	12.50	6.00	11.00	3.75	7.00	14.75	8.00	5.00	3.97	7.19	4.56	3.81	.50
LS2D-70-D07	6	48	7.50	12.50	6.00	11.00	3.75	7.00	14.82	8.00	5.00	3.97	7.19	4.56	3.81	.50
LS2D-90-D09	6	48	7.50	12.50	6.00	11.00	3.75	7.00	14.89	8.00	5.00	3.97	7.19	4.56	3.81	.50
LS2D-105-D11	6	48	7.50	12.50	6.00	11.00	3.75	7.00	14.97	8.00	5.00	3.97	7.19	4.56	3.81	.50
LS2D-135-D14	6	48	7.50	12.50	6.00	11.00	3.75	7.00	15.08	8.00	5.00	3.97	7.19	4.56	3.81	.50
LS2D-165-D17	6	48	7.50	12.50	6.00	11.00	3.75	7.91	15.21	8.00	5.00	3.97	9.63	5.69	5.38	.75
LS2D-215-D22	6	48	7.50	12.50	6.00	11.00	3.75	7.91	15.40	8.00	5.00	3.97	9.63	5.69	5.38	.75
LS2D-265-D27	6	48	7.50	12.50	6.00	11.00	3.75	7.91	15.59	8.00	5.00	3.97	9.63	5.69	5.38	.75
LS2D-310-H31	6	56	8.50	15.00	7.00	13.50	4.25	9.12	18.29	8.00	4.75	4.29	9.63	5.69	5.38	.75
LS2D-385-H39	6	56	8.50	15.00	7.00	13.50	4.25	9.12	18.43	8.50	4.75	4.29	9.63	5.69	5.38	.75
LS2D-485-H49	6	56	8.50	15.00	7.00	13.50	4.25	9.12	18.61	8.50	4.75	4.29	9.63	5.69	5.38	1.00
LS2D-605-H62	6	56	8.50	15.00	7.00	13.50	4.25	14.10	18.83	8.50	4.75	4.29	9.63	5.69	5.38	1.00
LS2D-760-H77	6	143T	8.50	15.00	7.00	13.50	4.25	14.10	19.38	8.50	4.75	4.29	9.63	5.69	5.38	1.00
LS2D-915-H90	6	143T	8.50	15.00	7.00	13.50	4.25	15.31	19.67	8.50	4.75	4.29	10.50	5.94	7.00	1.25
LS2D-30-C432	7	48	7.50	15.25	6.00	13.75	3.75	14.75	--	4.50	5.00	11.62	7.19	4.56	3.81	.50
LS2D-65-F432	7	56	8.50	16.00	7.00	14.50	4.25	15.25	--	4.50	5.00	12.12	7.19	4.56	3.81	.50
LS2D-105-F432	7	48	7.50	15.25	6.00	13.75	3.75	14.75	--	4.50	5.00	11.62	7.19	4.56	3.81	.50
LS2D-130-FH432	7	56	8.50	16.00	7.00	14.50	4.25	15.25	--	4.50	5.00	12.12	7.19	4.56	3.81	.50
LS2D-200-FH432	7	48	7.50	15.25	6.00	13.75	3.75	14.75	--	4.50	5.00	11.62	9.63	5.69	5.38	.75
LS2D-390-GG4195	8	56	8.50	21.00	7.00	19.50	4.25	9.75	--	10.50	--	5.52	9.63	5.69	5.38	1.00
LS2D-630-GG4195	8	56	8.50	21.00	7.00	19.50	4.25	15.62	--	10.00	--	5.52	10.50	5.94	7.00	1.25
LS2D-800-HJ4195	8	145T	9.50	23.75	8.00	22.25	4.75	16.87	--	12.50	--	6.24	12.00	7.44	7.00	1.50
LS2D-1290-HJ4195	8	145T	9.50	23.75	8.00	22.25	4.75	16.87	--	12.50	--	6.24	12.00	7.44	7.00	1.50
LS2D-1140-HL4195	8	143T	9.50	23.75	8.00	22.25	4.75	16.87	--	11.25	--	6.24	12.00	7.44	7.00	1.50
LS2D-1800-HL4195	8	145T	9.50	23.75	8.00	22.25	4.75	18.00	--	11.25	--	6.24	13.75	7.81	9.00	2.00

INTERMEDIATE PRESSURE SYSTEMS (100 PSI RANGE)																
PUMP SET MODEL	FIG. NO.	MOTOR FRAME	BASE DIMENSIONS				OVERALL DIMENSIONS						OIL STRAINER DIMENSIONS			
			A	B	C	D	E	F	G	H	J	K	L	M	N	P
IS2D-30-2R223	5	48	7.50	12.50	6.00	11.00	3.75	9.25	17.50	--	--	3.19	7.19	4.56	3.81	.50
IS2D-60-2R626	5	56	8.50	15.00	7.00	13.50	4.25	9.25	17.50	--	--	3.69	7.19	4.56	3.81	.50
IS2D-35-D05	6	48	7.50	12.50	6.00	11.00	3.75	7.00	14.75	8.00	5.00	3.97	7.19	4.56	3.81	.50
IS2D-65-D07	6	48	7.50	12.50	6.00	11.00	3.75	7.00	14.82	8.00	5.00	3.97	7.19	4.56	3.81	.50
IS2D-85-D09	6	48	7.50	12.50	6.00	11.00	3.75	7.00	14.89	8.00	5.00	3.97	7.19	4.56	3.81	.50
IS2D-100-D11	6	48	7.50	12.50	6.00	11.00	3.75	7.00	14.97	8.00	5.00	3.97	7.19	4.56	3.81	.50
IS2D-125-D14	6	56	8.50	15.00	7.00	13.50	4.25	7.50	17.58	8.00	5.00	4.47	7.19	4.56	3.81	.50
IS2D-155-D17	6	56	8.50	15.00	7.00	13.50	4.25	7.50	17.71	8.00	5.00	4.47	9.63	5.69	5.38	.75
IS2D-205-D22	6	56	8.50	15.00	7.00	13.50	4.25	7.50	17.90	8.00	5.00	4.47	9.63	5.69	5.38	.75
IS2D-250-D27	6	56	8.50	15.00	7.00	13.50	4.25	7.50	18.09	8.00	5.00	4.47	9.63	5.69	5.38	.75
IS2D-295-H31	6	143T	8.50	15.00	7.00	13.50	4.25	7.50	18.29	8.00	4.75	4.29	9.63	5.69	5.38	.75
IS2D-365-H39	6	145T	8.50	15.00	7.00	13.50	4.25	8.41	18.43	8.00	4.75	4.29	9.63	5.69	5.38	.75
IS2D-460-H49	6	145T	8.50	15.00	7.00	13.50	4.25	8.41	18.61	8.50	4.75	4.29	9.63	5.69	5.38	1.00
IS2D-570-H62	6	145T	8.50	15.00	7.00	13.50	4.25	8.41	18.83	8.50	4.75	4.29	9.63	5.69	5.38	1.00
IS2D-720-H77	6	182T	9.50	16.00	8.00	14.50	4.75	15.85	20.38	8.50	4.75	5.29	9.63	5.69	5.38	1.00
IS2D-865-H90	6	182T	9.50	16.00	8.00	14.50	4.75	15.85	20.67	8.50	4.75	5.29	10.50	5.94	7.00	1.25
IS2D-25-C432	7	48	7.50	15.25	6.00	13.75	3.75	14.75	--	4.50	5.00	11.62	7.19	4.56	3.81	.50
IS2D-45-F432	7	56	8.50	16.00	7.00	14.50	4.25	15.25	--	4.50	5.00	12.12	7.19	4.56	3.81	.50
IS2D-80-F432	7	48	7.50	15.25	6.00	13.75	3.75	14.75	--	4.50	5.00	11.62	7.19	4.56	3.81	.50
IS2D-95-FH432	7	56	8.50	16.00	7.00	14.50	4.25	15.25	--	4.50	5.00	12.12	7.19	4.56	3.81	.50
IS2D-165-FH432	7	56	8.50	16.00	7.00	14.50	4.25	15.25	--	4.50	5.00	12.12	9.63	5.69	5.38	.75
IS2D-275-GG4195	8	145T	8.50	21.00	7.00	19.50	4.25	9.75	--	10.50	--	5.52	9.63	5.69	5.38	1.00
IS2D-525-GG4195	8	145T	8.50	21.00	7.00	19.50	4.25	16.87	--	10.00	--	5.52	10.50	5.94	7.00	1.25
IS2D-685-HJ4195	8	184T	9.50	23.75	8.00	22.25	4.25	18.12	--	12.50	--	5.87	12.00	7.44	7.00	1.50
IS2D-1150-HJ4195	8	182T	9.50	23.75	8.00	22.25	4.75	19.38	--	11.50	--	5.87	12.00	7.44	7.00	1.50
IS2D-955-HL4195	8	213T	12.00	28.00	10.00	26.00	6.00	21.00	--	11.25	--	8.87	12.00	7.44	7.00	1.50
IS2D-1600-HL4195	8	184T	9.50	23.75	8.00	22.25	4.75	21.38	--	11.25	--	5.87	13.75	7.81	9.00	2.00

DUPLEX PUMP SET DIMENSIONAL DATA

NOTE

Base pans listed below are for standard pump sets as priced. Check with factory when special equipment (eg: larger control cabinet or added components) are required for correct base pan dimensions.



PUMP SET MODEL		BASE PAN DIMENSIONS (inches)			
LOW PRESSURE	INT. PRESSURE	A	B	C	D
LD2D-36	ID2D-30	30.00	36.00	20.88	33.00
LD2D-75	ID2D-60				
LD2D-45	ID2D-35				
LD2D-70	ID2D-65				
LD2D-90	ID2D-85				
LD2D-105	ID2D-100				
LD2D-135	ID2D-125				
LD2D-165	ID2D-155				
LD2D-215	ID2D-205				
LD2D-265	ID2D-250				
LD2D-310	ID2D-295				
LD2D-385	ID2D-365	36.00	45.00	26.88	42.00
LD2D-485	ID2D-460				
LD2D-605	ID2D-570				
LD2D-760	ID2D-720				
LD2D-915	ID2D-865				
LD2D-30	ID2D-25	30.00	36.00	20.88	33.00
LD2D-65	ID2D-45				
LD2D-105	ID2D-80				
LD2D-130	ID2D-95				
LD2D-200	ID2D-165				
LD2D-390	ID2D-275	36.00	45.00	26.88	42.00
LD2D-630	ID2D-525				
LD2D-800	ID2D-685				
LD2D-1290	ID2D-1150				
LD2D-1140					
	ID2D-955	42.00	54.00	37.88	49.88
LD2D-1800	ID2D-1600				

BACK PRESSURE REGULATOR VALVE

Low pressure and intermediate pressure pump sets are used in many different applications and do not always require a back pressure valve; therefore, valves are not included on standard pump set material lists. When required, order separately to be shipped loose with the pump set.

Flow chart is for Cash-Acme Model FR10 with non-metallic diaphragm and a 10% rise in pressure from set point. eg: A valve flowing the full discharge capacity of a pump will have a 10% rise in pressure from set point. For a more sensitive pressure control, select the valve with next pipe size larger. For a less sensitive pressure control, use the 20% or 30% pressure rise capacities.

Valves with metallic diaphragms have approximately 1/2 the capacity shown for non-metallic diaphragms. eg: Multiply the required flow capacity by 2.0 for sizing.

Diaphragm material available:

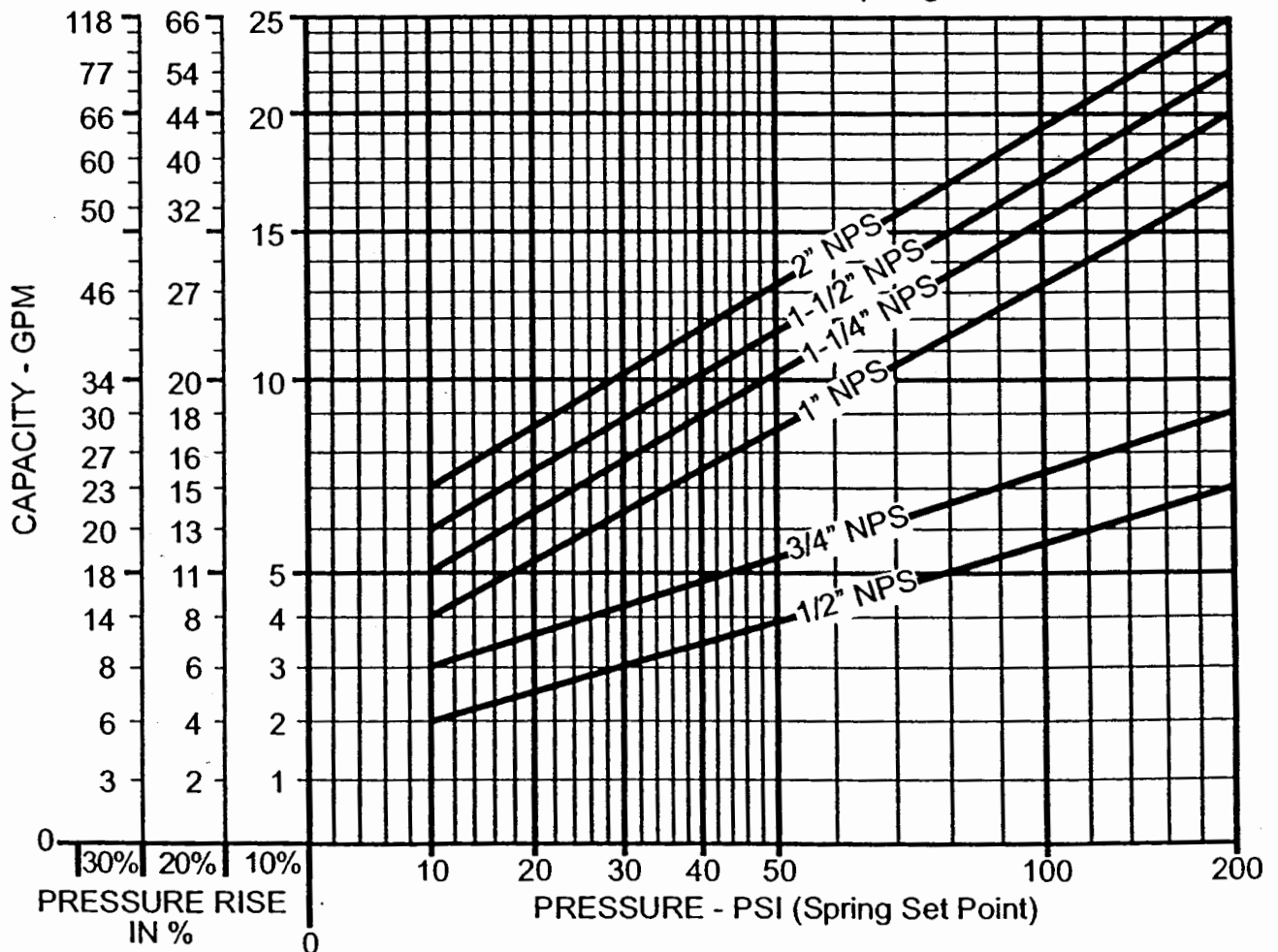
Non-metallic = Viton

Metallic = Monel

SIZE (inches)	RANGE OF ADJUSTMENT IN PSI				
	0-25	5-50	30-100	75-175	100-250
1/2	0-25	5-50	30-100	75-175	100-250
3/4	0-10	10-50	20-110	30-150	100-250
1	0-20	20-90	40-125	50-250	
1-1/4	0-15	20-85	40-125	50-250	
1-1/2, 2	0-10	10-55	30-100	40-200	125-250

BACK PRESSURE REGULATOR FLOW CHART

No. 2 oil Cash-Acme Model FR10
with non-metallic diaphragm

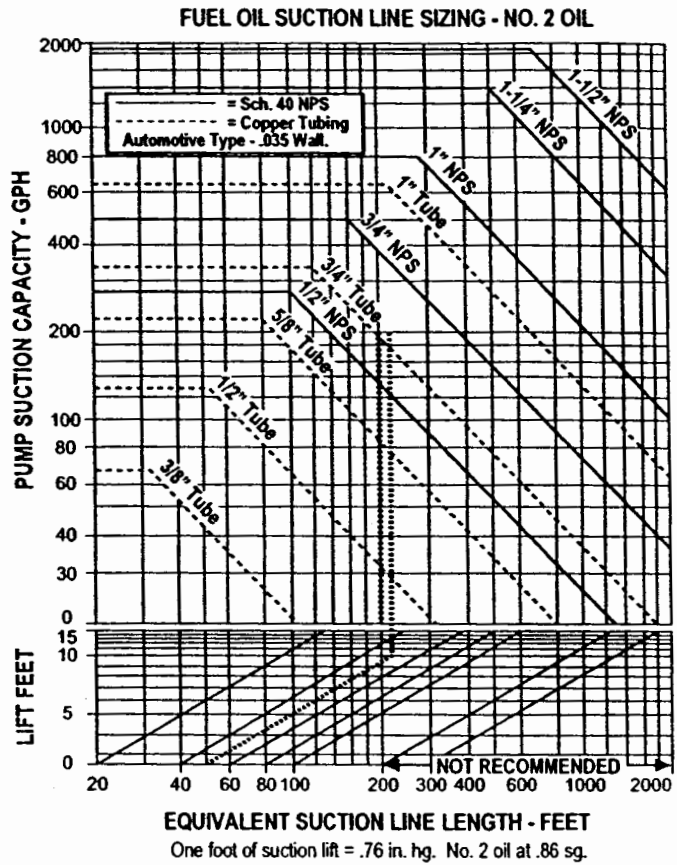


Pump sets that deliver oil to the burner for firing are normally sized 1-1/2 times the boiler requirement. Transfer and circulating pump set selections are often based on different requirements. Suction line sizing is based on the suction capacity of the pump selected.

Equivalent suction line length includes the measured length of the suction line from the point of entry (bottom of tank) to the pump, plus the friction loss equivalent length of valves, fittings, etc. installed in the suction line piping. (See Table)

On installations where suction lift is not required, use the upper portion of the chart. Eg: A 200 ft. suction line flowing 200 GPH will intersect at approximately the 3/4" tubing size. When three points intersect (GPH, suction line length and pipe size), the suction requirement will be approximately 6-7" Hg. Suction requirement can be reduced by selecting the next size larger pipe or tubing if desired. The horizontal line extension for each pipe or tubing size indicates a high velocity range. An increase in GPH above the horizontal line will produce a velocity in excess of 300 FPM.

Use the lower portion of the chart to compensate for suction lift. Eg: Assume an equivalent suction line length of 50 ft., 200 GPH suction capacity and a 10ft. lift. Enter the chart at the 50 ft. line length, move diagonal up at 30 deg. to the 10 ft. lift line. Then vertical to the 200 GPH line. Use the 3/4" NPS or the 1" tubing. An increase in line size at this point on the chart would be of a small value.



Practical design would limit one ft. of suction lift to one in. Hg of the pumps capability. Eg: A pump with 10" Hg suction capability should be limited to 10 ft. of lift. Suction lifts over 15 ft. with any pump using No. 2 oil should be avoided. Suction lines of 200 ft. in length or longer should be avoided and should have no suction lift.

FRICION LOSS IN STANDARD VALVES AND FITTINGS (Table gives equivalent lengths in feet of straight pipe)

PIPE SIZE NPS	TYPE OF FITTING OR VALVE (1)						
	GATE VALVE (OPEN)	GLOBE VALVE (OPEN)	CHECK VALVE (OPEN)	ELL (2) STANDARD 90 DEG.	ELL STANDARD 45 DEG.	TEE SGT. THRU FLOW	TEE (2) RGT. ANGLE FLOW
1/2	0.35	17	4.0	1.5	0.8	1.0	3.2
3/4	0.50	22	5.5	2.2	1.0	1.3	4.5
1	0.60	27	6.0	2.7	1.3	1.7	5.7
1-1/4	0.80	38	9.0	3.6	1.7	2.3	7.5
1-1/2	1.20	44	11.0	4.5	2.0	2.8	9.0
2	1.20	53	14.0	5.2	2.6	3.5	12.0
2-1/2	1.40	68	17.0	6.5	3.0	4.3	14.0
3	1.70	80	20.0	8.0	4.0	5.2	16.0
4	2.30	120	25.0	11.0	5.0	7.0	22.0
5	2.80	140	34.0	14.0	6.2	9.0	27.0
6	3.50	170	40.0	16.0	7.8	11.0	33.0
8	4.50	220	54.0	21.0	11.0	14.0	43.0
10	5.70	280	67.0	26.0	14.0	17.0	53.0

NOTES

1. Preferred anti siphon valves require a minimum of 2" HG to operate.
2. Basket type strainers that are line size have a friction loss similar to a 90° ell. Strainers one line size smaller are similar to a right angle tee.