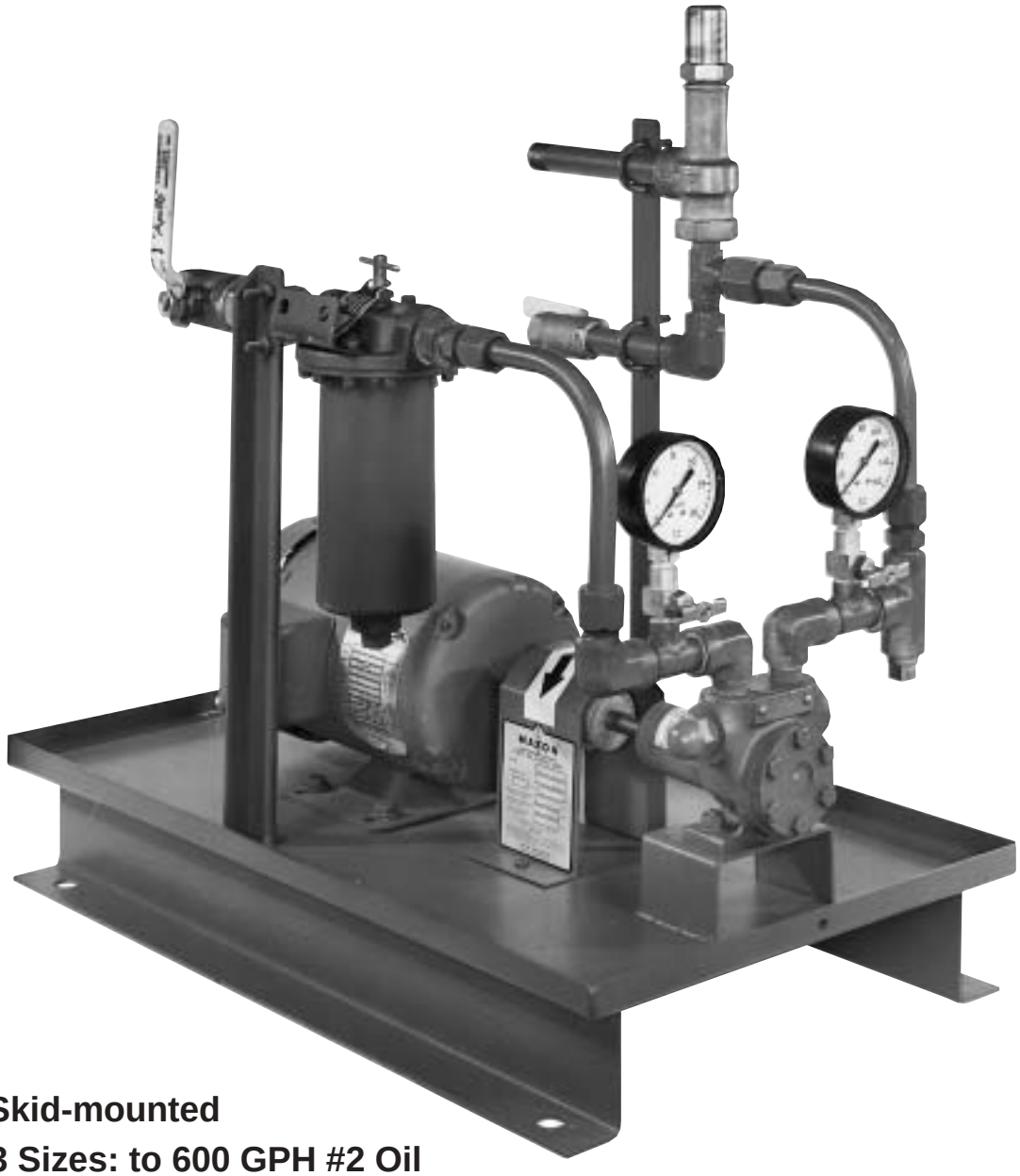
Model "LO" LIGHT OIL

SUPPLY UNITS

★ **Prepiped, Pretested and Compact**



★ **Skid-mounted**
★ **3 Sizes: to 600 GPH #2 Oil**
★ **Discharge Pressures to 130 PSIG**
★ **For any Distillate Oil of 32 – 100 SSU Viscosity**

These are packaged skid-mounted light oil handling systems ready for field wiring and connection to suction and discharge piping, and designed to supply oil to one or more burner systems at desired pressure.

Design Details

Model “LO” LIGHT OIL SUPPLY UNITS include, in compact skid-mounted prepiped form, the system components necessary to deliver filtered distillate oil from a supply tank to one or more burner systems.

They include a UL-listed self-priming gear-within-a-gear direct driven positive displacement pump [4] complete with mechanical shaft seal and integral safety relief valve.

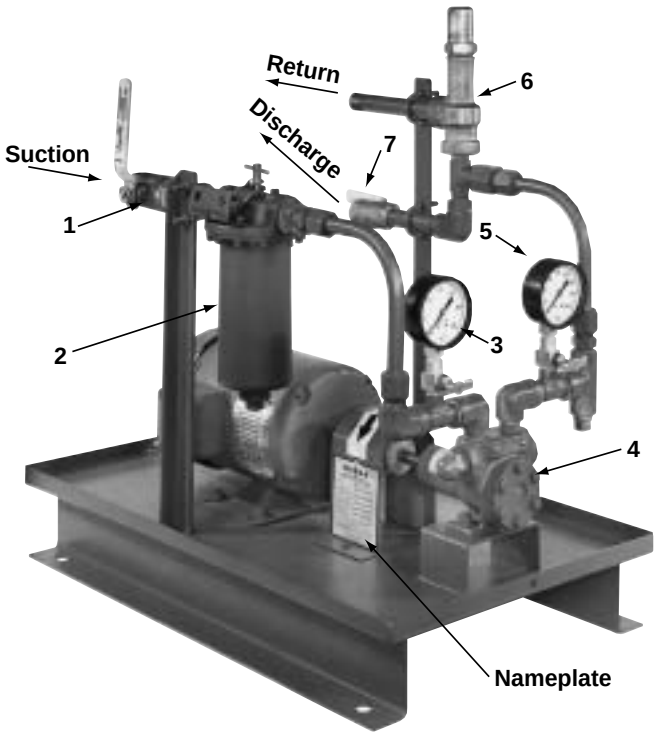
An edgeplate suction filter [2] (70-mesh equivalent) protects the pump while providing for on-line cleaning at the turn of a handle.

Control against chattering or fluctuating discharge pressure is provided by a UL-listed piston type Back Pressure Regulating Valve [6].

LIGHT OIL SUPPLY UNITS include pump suction [3] and discharge [5] pressure gauges for at-a-glance evaluation of performance.

All piping consists of UL-listed flareless steel tube and fittings, securely and compactly mounted on a steel pan with support channels, and pressure-tested prior to shipment.

Components are described in greater detail in the table below. LO-90 and LO-180 units are rated for a maximum of 150 PSIG at 100 SSU viscosity or lower. LO-600 unit is rated at 100 PSIG for viscosities of 38 SSU or less, 150 PSIG for oil viscosities of 38 to 100 SSU.



Components

Item	Description		LO-90	LO-180	LO-600
1	Suction Valve (Ball-Type)	Size	1/2"	3/4"	1-1/4"
		C_v	9.8	18	40
2	Suction Filter (Cuno Edgeplate) 70-mesh equivalent	Size	3/8"	3/4"	1-1/4"
		Type	DS	G	EG
		Spacing	.008"	.008"	.008"
3	Suction Gauge	Range	+30 PSIG to -30" Hg (14.7 PSIG)		
4	Pump and Motor	Viking Number	F432-X	FH432-X	GG195-F
		Gallons/minute	1.5	3	10
		Maximum PSIG	150	150	150
		Port Size	3/8"	1/2"	1"
		Horsepower	1/3	1/2	1
		Frame Number	56	56	56
		Pump/Motor RPM	1800	1800	1800
5	Discharge Gauge	Range	0 - 160 PSIG		
6	Back Pressure Regulating Valve	Size	3/8"	1/2"	1"
		Fulflo Number	SVB-25X1	SVB-35X1	SVB-55X1
7	Discharge Valve (Ball-Type)	Size	3/8"	1/2"	1"
		C_v	5.3	9.8	32

Capacity/Selection Data

Performance date for each of the three available Light Oil Supply Unit sizes is shown in Table 1 below. As reflected in the data provided, general usage calls for a pump set capable of delivering twice the maximum rated burner capacity being supplied. This allows for some recirculation and permits BPRV (back pressure relief valve) to do its job of maintaining supply system pressure. It also allows for some future system expansion.

Operation on 50HZ power will result in approximately a 20% drop in flow.

Discharge loop data indicates a range of back pressure relief valve settings over which the normal capacity can be supplied by the pump set. Higher flows are possible at anything less than maximum listed pressure.

"Head" data indicates the maximum pressure obtainable expressed as equivalent feet of oil. The maximum pressure available at a combustion systems is always reduced by the difference in elevation between burner and pump.

Pressure drop data shown in based on an allowance for partial clogging of the suction filter. With proper maintenance, actual drop will be somewhat less. All table data is based on performance with 50 SSU #2 oil of .845 specific gravity.

Table 1: Performance Data (60 Hz operation)

Model No.		LO-90	LO-180	LO-600
Nominal Burner Capacity (Max)	gal/min	.75	1.20	5.00
	gal/hr	45	90	300
	kBTU/hr	6300	12,600	42,000
Discharge Loop	Psig	25-130	45-130	60-130
	Head	350	350	350
ΔP Suction Valve to Pump	Psig	1	1.5	1.5
	Ft of Oil	2.5	4	4.5
Average Velocity (ft/sec) at Connections	Suction	1.6	1.8	2.1
	Discharge	2.5	3.2	3.7
	Return	2.5	3.2	3.7

Pressure drops for various pipe sizes at maximum suggested burner capacity for each Light Oil Supply Unit are shown in Table 2. Data is given in Psi/100 ft run and is based on .845 sp.gr. oil of the viscosity shown.

Table 2: Pipe Sizing Guide (Psi/100 ft)

Max. Capacity (gpm)	Pipe Size (")	Viscosity (SSU)		
		32	50	100
1-1/2	3/8	2.8	4.3	11.9
	1/2	1.1	1.7	4.7
	3/4	0.3	0.6	1.5
3	1/2	3.8	6.3	8.1
	3/4	0.9	0.9	2.8
	1	0.3	0.4	1.0
10	1	2.6	3.8	4.0
	1-1/4	0.7	1.1	1.4
	1-1/2	0.3	0.5	0.7

Conversion factors between various measurement units (based on sea level equivalent of 14.7 psig = 29.92" Hg = 33.9 ft water = 39.89 ft of .845 sp.gr. oil) are given in Table 3. To use, multiply "known" quantity (from left of table) by the factor shown under "desired" units.

Table 3: Conversion Factors

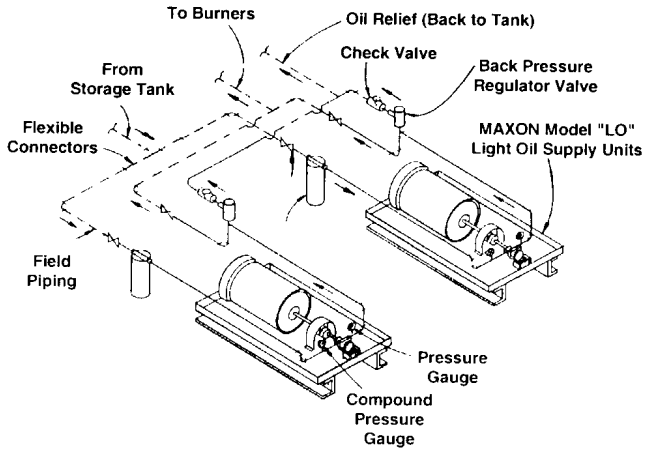
TO / FROM	PSIG	" Hg	Ft. H_2O	FT. OIL
One Psig =	1	2.04	2.31	2.71
One " Hg =	0.49	1	1.13	1.33
One Ft. H_20 =	0.43	0.88	1	1.18
One Ft. Oil =	0.37	0.75	0.85	1

Duplex Arrangement

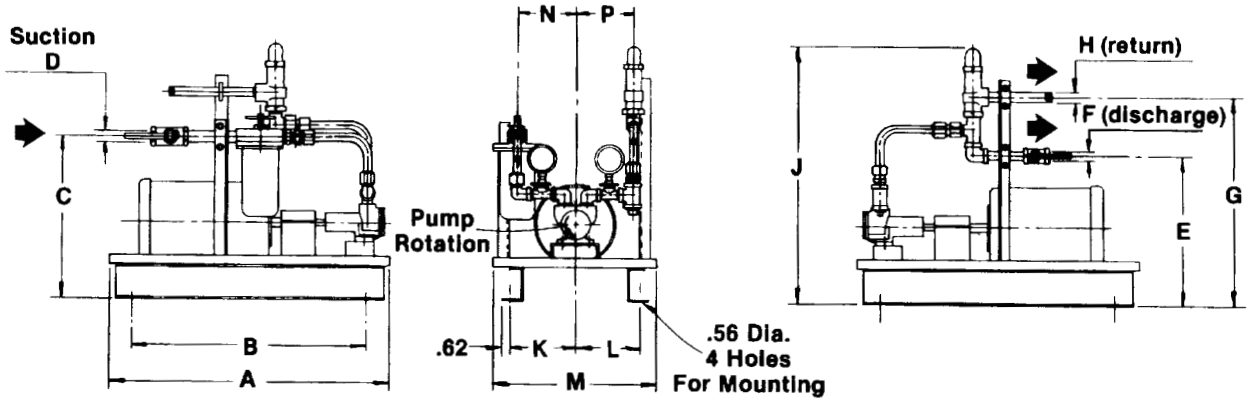
For the ultimate in system dependability, or where shutdown due to pump failure would be serious, two Model "LO" Light Oil Supply Units may be installed in the duplex arrangement shown at right. *Dotted lines indicate field piping.*

Only one supply unit should be in operation at any given time. Changeover may be as simple as manual closing of inlet and discharge ball valves on damaged set, and opening of those valves on the "standby" unit, or the system can be adapted for automatic changeover.

We do recommend that units be used alternatively as main and standby, with the changeover occurring monthly, if not more often.



Dimensions (in inches +- .25)



SIZE	A	S	C	D (size)	E	F (size)	G	H (size)	J	K	L	M	N	P
LO-90	24.00	20.00	16.00	1/2	15.00	3/8	19.00	3/8	23.00	6.38	6.38	14.00	5.00	5.00
LO-180	24.00	20.00	15.38	3/4	13.94	1/2	18.94	1/2	23.44	6.38	6.38	14.00	5.00	5.00
LO-600	29.00	22.75	25.25	1-1/4	15.44	1	22.19	1	28.12	7.88	7.88	20.00	6.25	6.25

Installation Instructions

Pipe sizing should be selected on the basis of maximum pump capacity, not projected usage rate. While suction and discharge connections are sized to give velocities within "standard practice" limits, long pipe runs to or from the supply unit may necessitate larger field piping.

Piping should be sized in accordance with Maxon recommendations on page 9403 and a union installed at each of the three piping connections to the Light Oil Supply Unit.

Return piping should be run back to the storage tank, not just to pump inlet. Do not install valves or any other restriction in the return line. Pressure losses should not be permitted to exceed 5 to 10% of desired system pressure as determined by back pressure regulator valve. Remember that losses include any elevation difference between the supply unit and oil source.

Suction piping must be air tight. Since this run is under negative pressure, oil will not leak out, but air could leak in and become a continual source of operating difficulty and even hazardous conditions. A Check Valve is recommended just above tank connections if the pump is located *above* supply.

Suction lift (plus pressure drop) should not exceed 10-15 feet for oil at 70°F or less. This is not due to pump design but is a function of oil vapor pressure and frictional losses in the suction line. Where practical, the pump should be located *below* supply oil level. Under ideal conditions, as much as a 19-foot suction lift is possible, but *extreme* care should be taken in designing to this limit.

The **circulating loop** should include a return from the most remote point of the burner distribution for steadiest supply pressure and easier purge and control of air problems in the oil piping.

The **Back Pressure Reducing Valve** (BPRV) furnished as part of each Model LO Light Oil Supply Unit does not give the ideal circulating loop as shipped, and in all but the simpliest systems should be relocated to a point beyond the furthest burner take-off, a suitable cap or plug installed in the opening left by its removal, and return loop run from that point back to the supply tank.

Slope piping wherever possible so that BPRV is located at the highest point of the supply leg, since oil, like water, always has some air entrapped or dissolved in it that is released whenever pressure is reduced and/or temperature is raised.

Oil heating may be necessary to prevent congealing in supply, return and distribution piping if those are exposed to sub-freezing temperatures. Critical combustion applications in particular benefit from the consistant viscosity supplied by controlled heating.

Overall installation must comply with any applicable codes and standards including, but not limited to, NFPA 30 (flammable and combustible liquids code), NFPA 31 (oil-burning equipment) and the National Electrical Code. Your local fire marshal and oil supplier can often help.

Supply Unit location should be cool, clean, dry and readily accessable for maintenace. As outlined in the suction lift section above, it should, wherever possible, be lower than the lowest normal oil supply level.

Burner system take-off should usually be from the bottom of oil supply line to avoid air trapping and the operating difficulties it can cause.

Check valves are required on duplex pump systems, but are normally not required on single pump systems except where priming becomes a problem.

Protect oil piping from possible physical damage from either humans or mechanical equipment.

Optional items which may be desirable in your system include the following:

- *Low oil pressure limit switch* (manual reset) to interlock with signaling device and/or pump motor to break motor circuitry whenever discharge pressure falls below a predetermined setting. Must be wired to allow override during system start-up.
- *High oil pressure limit switch* which may back up or take over before the operation of the pump's integral safety relief valve.
- *Remote Stop push buttons* to permit stopping the pump from other desirable locations.
- *Accumulators* to reduce piping stresses due to expansion of trapped oil.

Start-up Instructions

Read and understand the following thoroughly before beginning start-up, then:

1. Manually rotate pump shaft to provide a simple mechanical check against pump damage.
2. Open suction valve and, if Back Pressure Reducing Valve (BPRV) has been relocated downstream of the supply unit's discharge valve, open that discharge valve to provide a flow path to the BPRV.
3. If suction lift is high, break tubing connection just downstream of suction filter and pour about 1/2 pint of lubricating oil into the pump body, then replace fittings and tighten firmly.
4. Open small valves in gauge supply lines. (They should normally be closed to protect gauges from prolonged exposure to the continuous pressure pulses which can greatly shorten operating life.)
5. Start pump motor and watch for discharge pressure gauge to rise to BPRV setpoint as air is bled off through BPRV and oil is drawn through the pump. If this does not occur within one minute, shut off pump and allow a short cooling-off period before trying again. If repeated attempts do not result in suitable discharge pressures, see pump set instructions for troubleshooting.
6. Refine BPRV adjustment to give the desired supply loop pressure. Do not exceed the pump's rated maximum.
7. Allow unit to operate for 5 to 10 minutes without attempting operation of any burner system, then begin systematic purging of all dead end piping such as individual burner system supply lines.
8. Proceed with individual burner system start-up as outlined in appropriate instructions.