



# Effective Lubrication of Pneumatic Actuators by Master Pneumatic

## ***Micro-Lubrication Specialists***

This brochure is to demonstrate that there is a better way to lubricate cylinders and other actuator products with M/P's injection lubrication product line. When our **Serv-Oil** products are properly applied, the customer will realize:

- Longer cylinder life
- Less repair costs
- A reduction in unscheduled maintenance
- Product RELIABILITY

The **Serv-Oil** products shown have been proven effective for both LUBE FREE actuators and actuators requiring lubrication.

M/P introduced **Serv-Oil** INJECTION LUBRICATION in the late 1960's. We manufacture numerous products, in many configurations and sizes, to cost effectively lubricate actuators all over the world.

It is undisputed in our industry that a pneumatic product that receives a small amount of lubricant, CONSISTENLY, will perform better-last longer-and cost less to maintain.

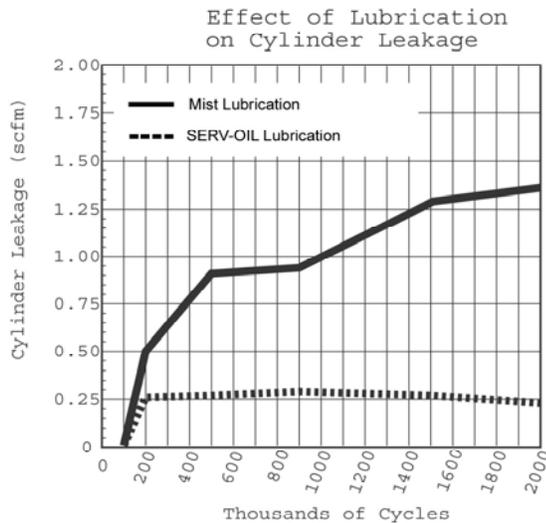
**SPECIFY SERV-OIL !**

# Cylinder Lubrication: Mist vs. SERV-OIL

**A test was conducted for a major automotive plant to compare the effectiveness of mist type and Serv-Oil injection type lubricators.** The test used special dual lip piston weld cylinders, and was conducted over a period of three and a half months. Cylinders were run for approximately 14 hours at a time. Both types of lubricators were adjusted to dispense the equivalent of one-tenth drop of oil for each 10 cylinder cycles.

Triple-filtered air was used in this test, and when the cylinders were disassembled at the end of the test, no visible foreign particles were found in the cylinders. Filtration was at the 0.3- $\mu\text{m}$  level, and this is much finer than is found in most air cylinder operations where only 40- $\mu\text{m}$  filtration is common.

At the end of each daily test run, an air flow meter was attached to each cylinder to measure rod end leakage while the cylinders were still warm. The findings are found in the graph below.



The cylinder leakage graph above displays the results at intervals up to 2 million cycles, the cycle count for the entire test. Air bypass around the piston can be seen to be significantly greater with mist type lubrication. This bypass is a failure that directly affects the force and speed of a cylinder.

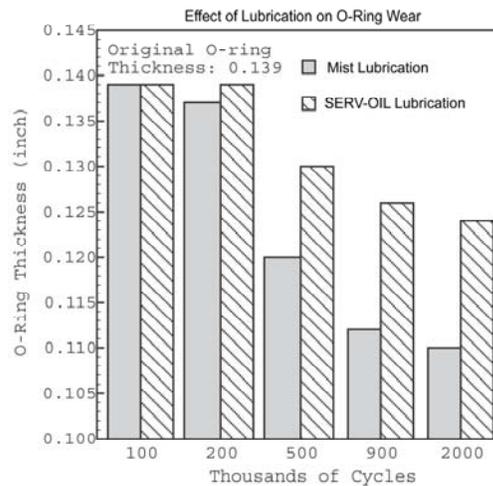
With Serv-Oil lubrication bypass loss is small, and essentially constant after establishing a low initial loss level.

If the cylinders had been of conventional construction, and had air filtration been at the more common plant level (40- $\mu\text{m}$ ), cylinder wear could be expected to be much greater than that recorded in this test.

With the use of Serv-Oil injection lubrication, it is guaranteed that lubricant is reaching the cylinder at the rod end. Oil is carried from the Serv-Oil injector to the lubrication point by 1/8th inch nylon tubing inside the air line. The rod, therefore, is well lubricated and as a result, due to the pistons extended resting period (usually directly under the retract air supply port), the piston also receives a beneficial delivery of lubricant.

The longer and more torturous the air pathway from control valve to cylinder, the less effective the mist lubricator becomes. Oil tends to coalesce on the air line walls and puddle in low points. Much of the oil can also be blown into the atmosphere from the valve's exhaust port, so that it serves no purpose in lubricating the cylinder, but does create a health hazard.

Wear in the cylinder during this test is exemplified by the O-ring wear shown in the graph below.

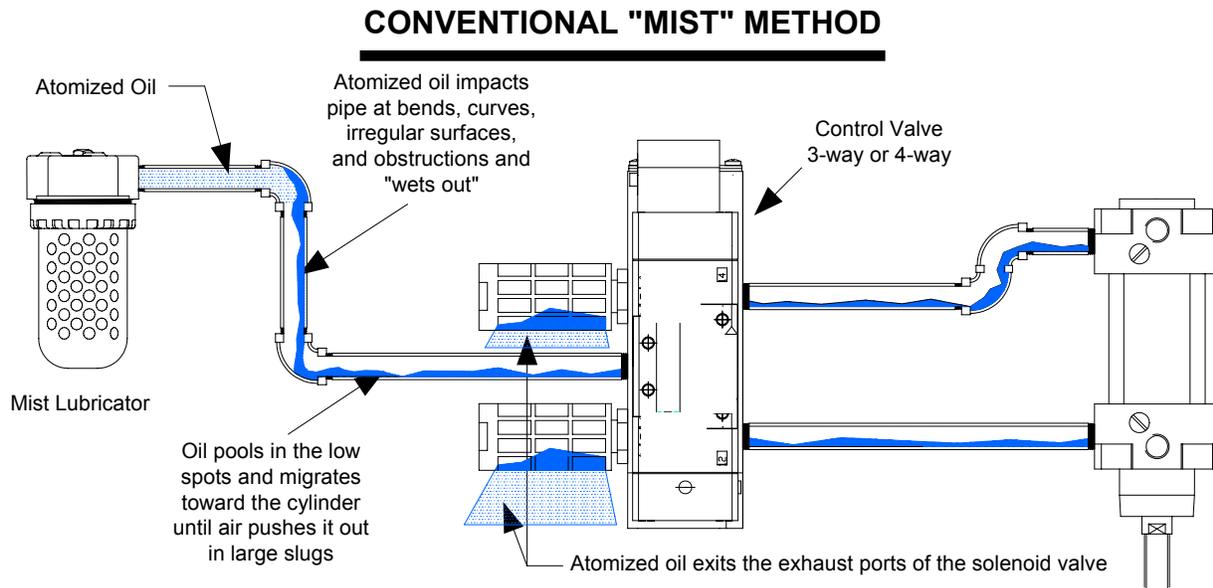


As shown in this graph, an initial O-ring thickness of 0.139 inch was reduced by little more than 10% after two million cycles using Serv-Oil lubrication.

With mist lubrication, the O-ring wear was nearly twice as great.

# CYLINDER LUBRICATION

Extend cylinder life and decrease downtime.



In conventional valve/cylinder circuits, MIST lubricators have been used for decades. M/P makes this type of lubricator as well. Mist lubricators are manufactured in a couple of similar designs. The most common has a tube extending from the sump, or reservoir, to the head. There is usually a metering valve in the head for adjusting the oil volume that is to be introduced into the outlet of the lubricator. Different manufacturers have varying methods of accomplishing this, but ALL have similar success in lubricating the cylinder. **NOT GOOD ENOUGH.**

The problems are numerous. Regulating the volume of oil in the head is extremely difficult and unreliable. When the atomized oil exits the lubricator, it **"wets out"** at bends in the piping, low spots, and in any device between it and the cylinder to be lubricated. Many applications are low flow. Small bore and short stroke cylinders will rarely receive the lubrication required. Most of the oil will end up exiting the system through the valve silencers to atmosphere and end up on the products being made, the people making them and/or the plant floor. **EVERYWHERE BUT WHERE YOU WANTED IT!**

Master Pneumatic makes two different styles of injection lubricators.

**Downstream**– Installed in the air line with an internal oil capillary tube.

**MPL**– Multi Point Lubricator stack installed with an external oil line.

# Downstream Injection Lubricator

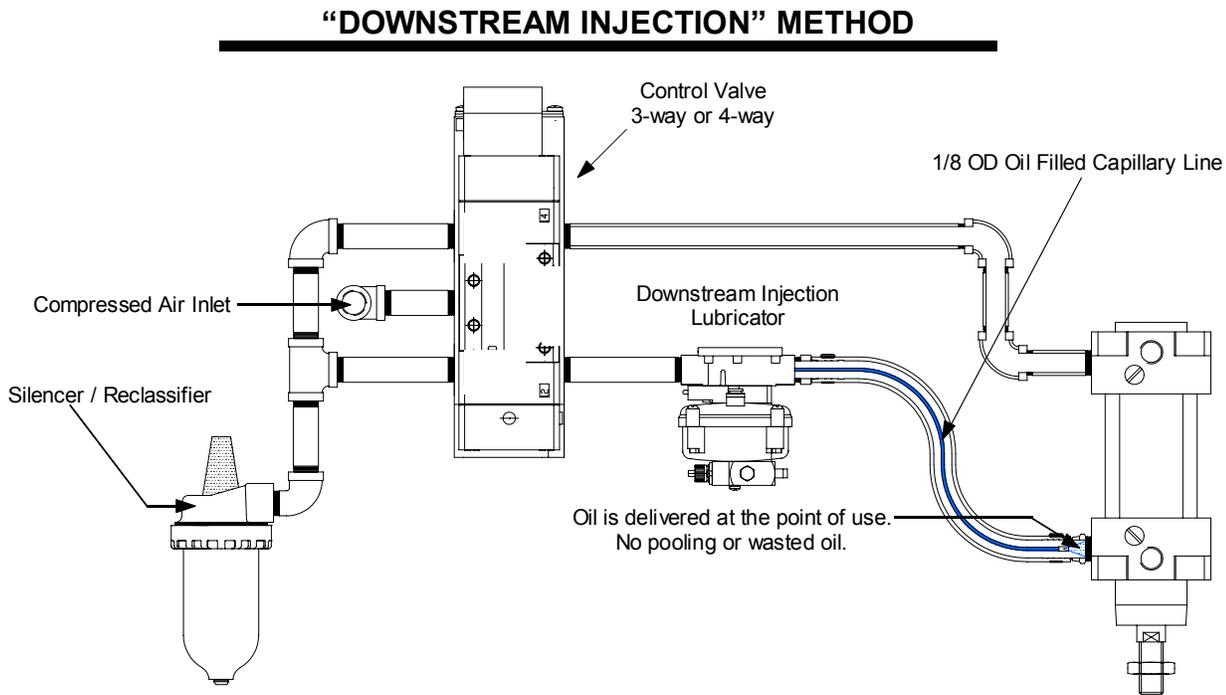
## Installed in the piping

This style of injection lubricator is piped into the air supply “downstream” of the directional valve that is controlling the actuator. Typically, it would be in the piping supply to the rod end of the cylinder. This end of the cylinder is usually where the most damage occurs as a result of under lubrication. The rod gland is cut, or in some way damaged, due to lack of lubrication. Other damage, and sticktion, occurs when lubricant doesn't reach the piston seals.

This lubricator is made in numerous configurations. It can have an integral nylon reservoir or external oil supply. End ports are either 1/2" or 3/4" NPTF or BSPP. The internal oil capillary tube terminates inches before the cylinder port and must include a check valve on the end. This capillary tube can be installed in pipe or flexible hose/tubing. The capillary tube can be manually attached to the Downstream Lubricator or attached using our Coaxial Fittings which allow you to simultaneously attach the air and oil with a threaded fitting or with a quick connect/disconnect.

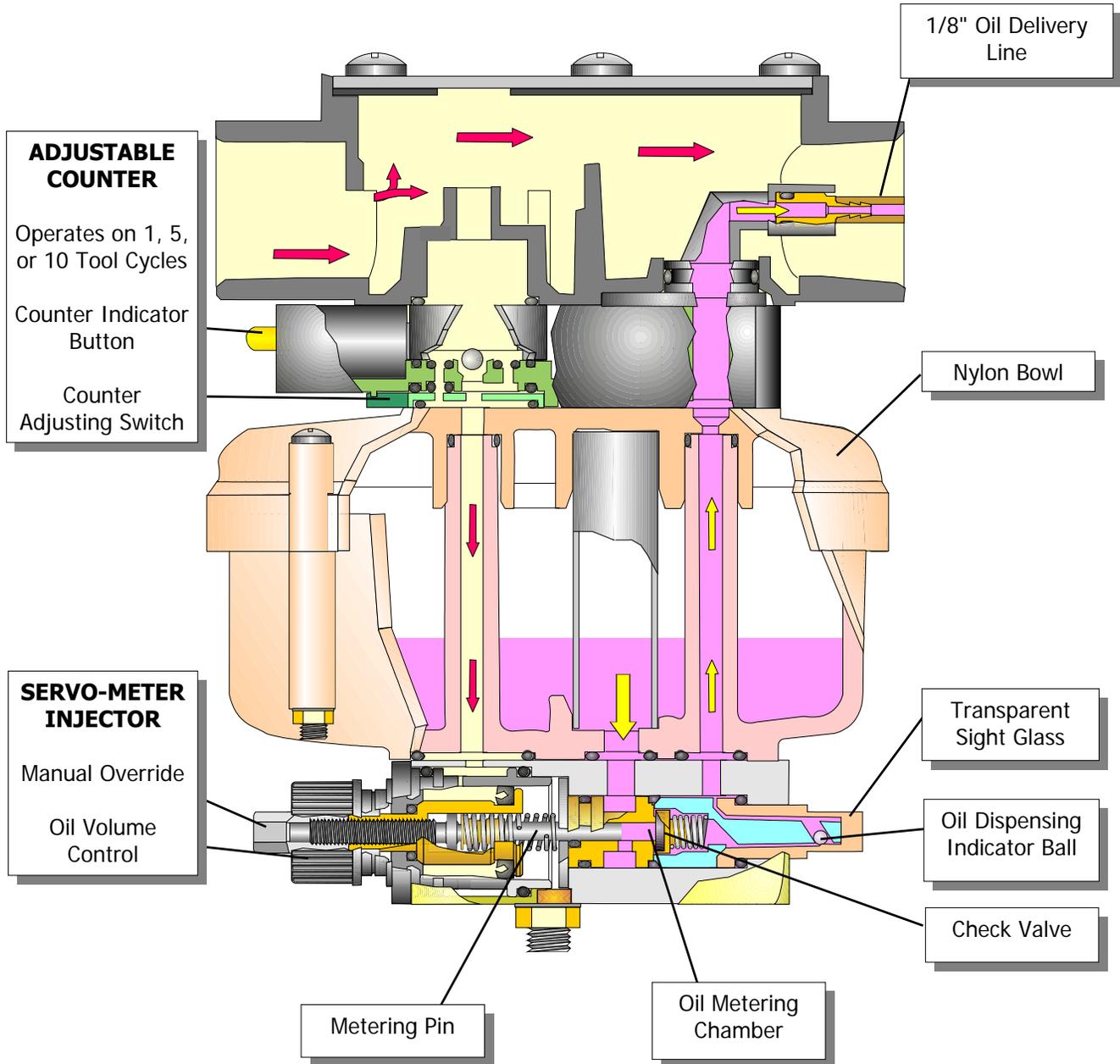
Downstream Lubricators are equipped with adjustable injectors with full stroke volume of 1/2 (.015ml), 1 (.030ml), or 2 drops (.060ml) per cycle. Also included is our pulse counter which allows you to have the volume of oil you have selected dispensed every 1, 5, or 10 cycles of the cylinder. **Flexibility and Consistency!**

If you are retrofitting an existing system, our **Silencer Reclassifier** could be installed to clean up the excess oil left behind from the Mist Lubricator.



# SERV-OIL DOWNSTREAM LUBRICATOR

## WORKING MODE - INJECTING OIL



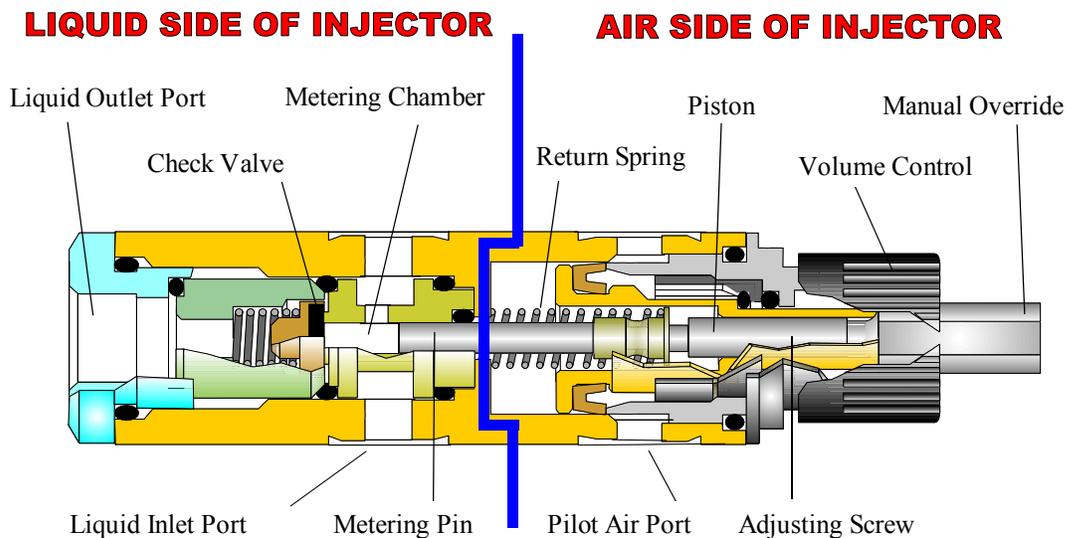
PRODUCT	PIPE PORT SIZE	DROP SIZE	DESCRIPTION	PRODUCT	PIPE PORT SIZE	DROP SIZE	DESCRIPTION
D60045	1/2-NPTF	1/2	Single Point Downstream Lubricator, less Bowl	D64045	1/2-NPTF	1/2	Single Point Downstream Lubricator, WITH Bowl
D60041	1/2-NPTF	1	Single Downstream Point Lubricator, less Bowl	D64041	1/2-NPTF	1	Single Downstream Point Lubricator, WITH Bowl
D60042	1/2-NPTF	2	Single Downstream Point Lubricator, less Bowl	D64042	1/2-NPTF	2	Single Downstream Point Lubricator, WITH Bowl
D60065	3/4-NPTF	1/2	Single Downstream Point Lubricator, less Bowl	D64065	3/4-NPTF	1/2	Single Downstream Point Lubricator, WITH Bowl
D60061	3/4-NPTF	1	Single Downstream Point Lubricator, less Bowl	D64061	3/4-NPTF	1	Single Downstream Point Lubricator, WITH Bowl
D60062	3/4-NPTF	2	Single Point Downstream Lubricator, less Bowl	D64062	3/4-NPTF	2	Single Point Downstream Lubricator, WITH Bowl

# MPL

## Multi Point Lubricator

Master Pneumatic's Multi Point Lubricators (MPL's) were invented in the mid 1960's and have been in service all over the world. First, let's cover some basic terminology.

The heart of the system are small positive displacement pumps called INJECTORS, or *Servo-Meters*. You have three choices of maximum output but various methods of adjusting this output are offered. Full stroke volumes available are 1/2 drop (.015ml), 1 drop (.030ml), and 2 drop (.060ml). Our standard Servo-Meters can be adjusted down to 10% of maximum volume by an external adjustment knob. We also offer Servo-Meters that can be shut off entirely.



The MPL assembly can have 1 Servo-Meter or as many as 10 Servo-Meters. These assemblies can have an assortment of Servo-Meters with maximum output of 1/2, 1, or 2 drops. When an air signal is sent, the piston assembly extends the metering pin and displaces the volume of lubricant which you have dialed in by the volume control knob. That volume of lubricant is dispensed from the metering chamber, past the check valve to the outlet port. When the air signal is removed, the return spring resets the piston for the next lubrication event. In a valve/cylinder circuit, the air pilot signal is usually tapped from the directional valve controlling cylinder action (shown on the page 7). Lubrication can be delivered in either the rod or cap end of the cylinder, or both. Typically, the rod end is the port used to prevent excess wear to the rod gland.

In addition to adjusting oil volume with the Servo-Meter, we offer other methods of delivering the correct amount of oil, consistently.

# MPL

## Multi Point Lubricator (Cont'd)

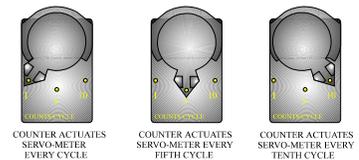
### Integrated Controllers

Flexibility! Users can choose how often the adjusted volume of oil is delivered. There are a number of ways to accomplish this.

- **Pulse Counter**
- **Frequency Generator**
- **Interposed Solenoid Valve**
- **External Solenoid Valve**

#### Pulse Counter

This option allows the user to select when the volume of lubrication is delivered. Each pulse counter can be field adjusted to allow the Servo-Meter(s) to dispense every 1, 5, or 10 cycles of the pneumatic device. If two pulse counters are installed, this frequency can be extended to every 25, 50, or 100 cycles.

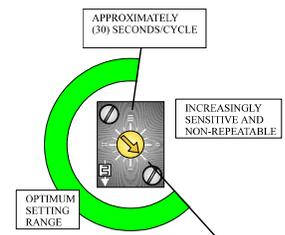


#### Frequency Generator



This is a pneumatic counter. It is generally used in applications where the user wants the Servo-Meter to dispense lubrication multiple times in the cycle. Since the Servo-Meters only operate when given an air signal, lubrication is only dispensed once in a cycle. By including the Frequency Generator, the user can adjust the MPL to deliver lubrication within a range of every 1-30 seconds per cycle. If the Pulse Counter and Frequency Generator were both used,

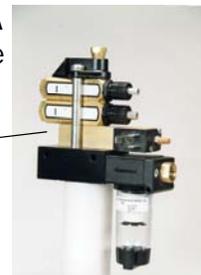
the range could be extended from 1 second to 5 minutes.



#### Interposed Solenoid Valve

Here we install a solenoid operated valve between the base of the MPL and the Servo-Meters. The valve is actuated by an electronic signal when lubrication is to be dispensed. A PLC can be used to adjust frequency of lubrication with infinite adjustability. Some users have tied this option into a proximity switch to automate their process. (Several Voltages are available)

Solenoid Valve

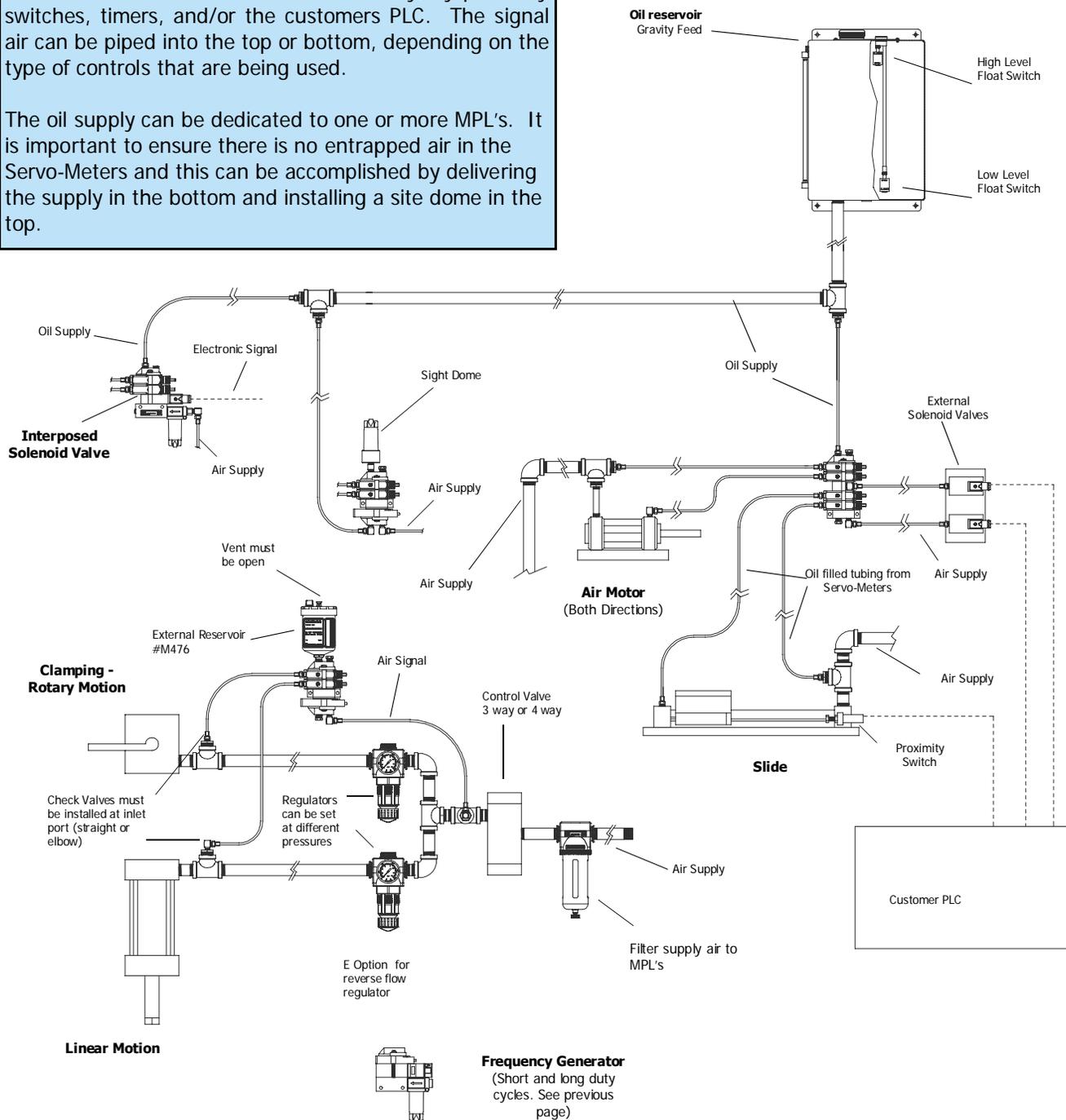


#### External Pilot Valve

Typically, external or remote valves are used for controlling Servo-Meters in MPL's where the injectors are operated at differing times, independently. An example is shown on the next page.

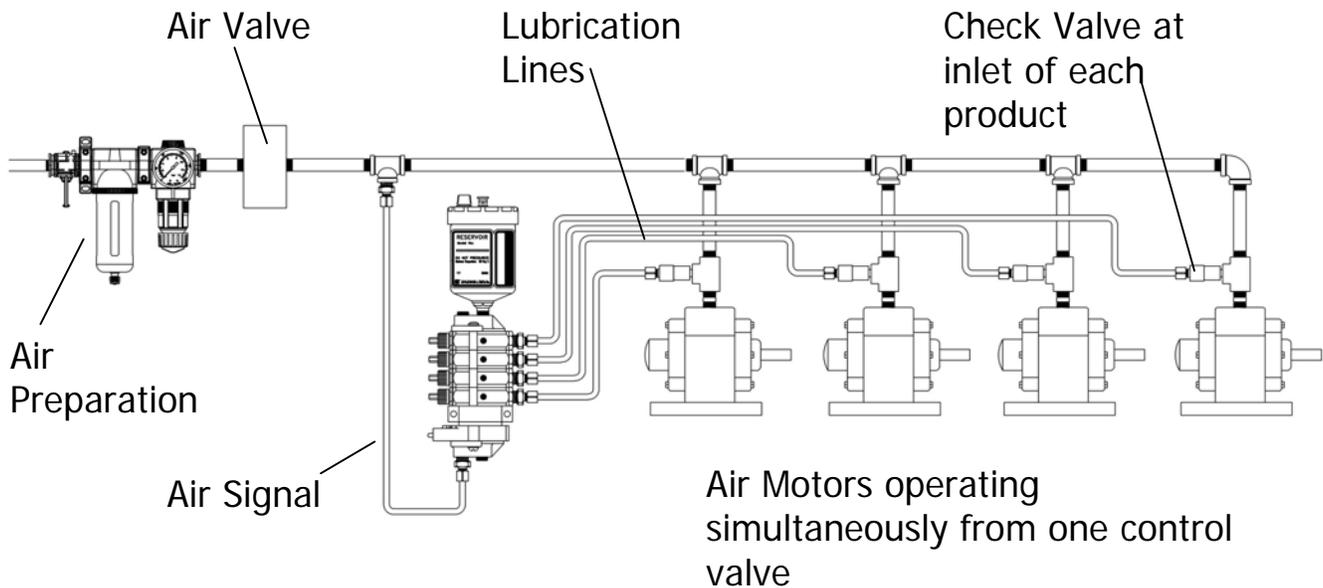
MPL's can be controlled in many ways. Signal air can be supplied by external and interposed valves as shown below. The valves can be actuated manually, by proximity switches, timers, and/or the customer's PLC. The signal air can be piped into the top or bottom, depending on the type of controls that are being used.

The oil supply can be dedicated to one or more MPL's. It is important to ensure there is no entrapped air in the Servo-Meters and this can be accomplished by delivering the supply in the bottom and installing a site dome in the top.



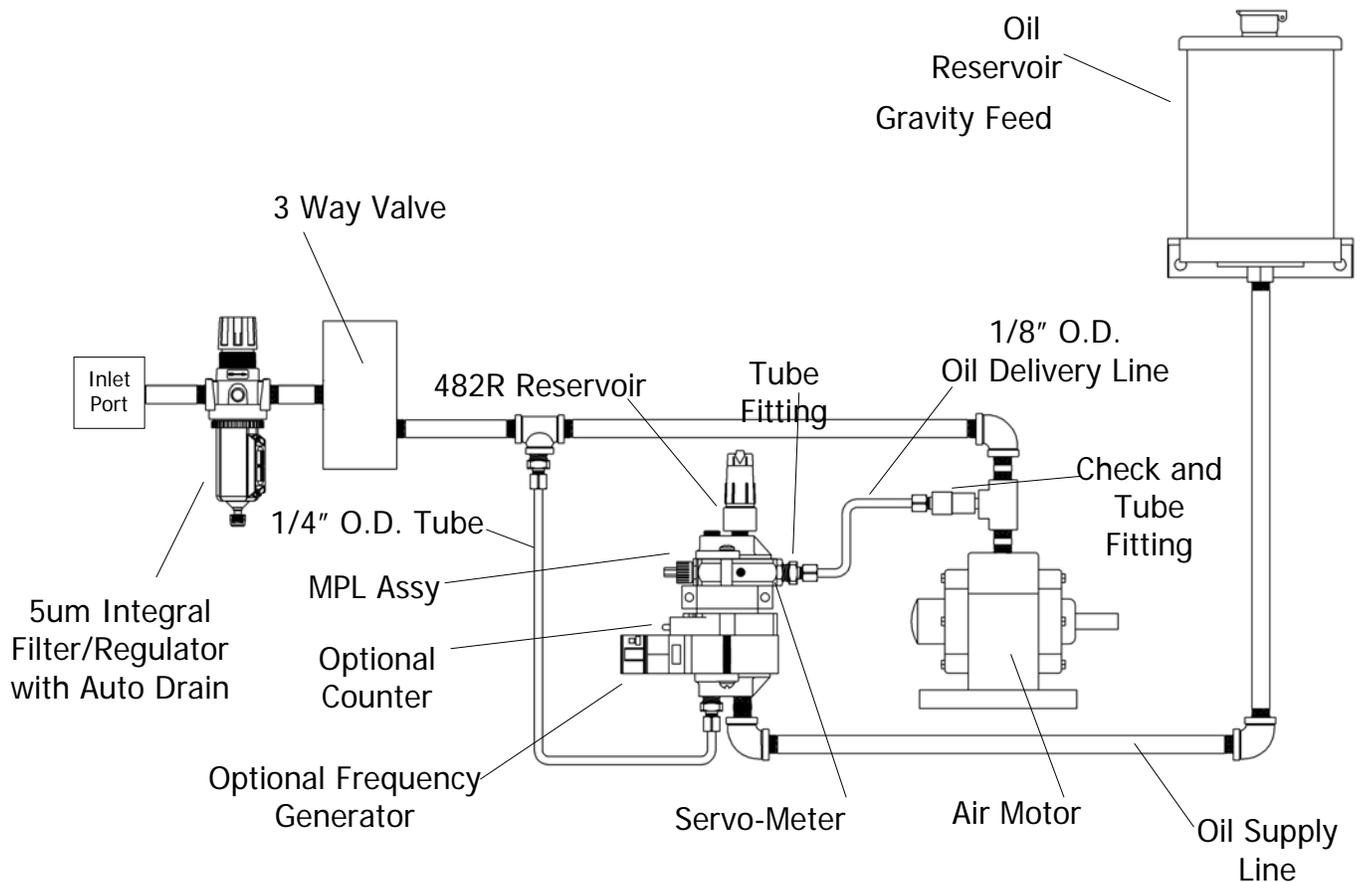
The graphics above are meant to illustrate "some" of the ways MPL's are applied. The applications for, and solutions to lubrication problems, are limited by your imagination.

# MPL Lubricating 4 Air Motors



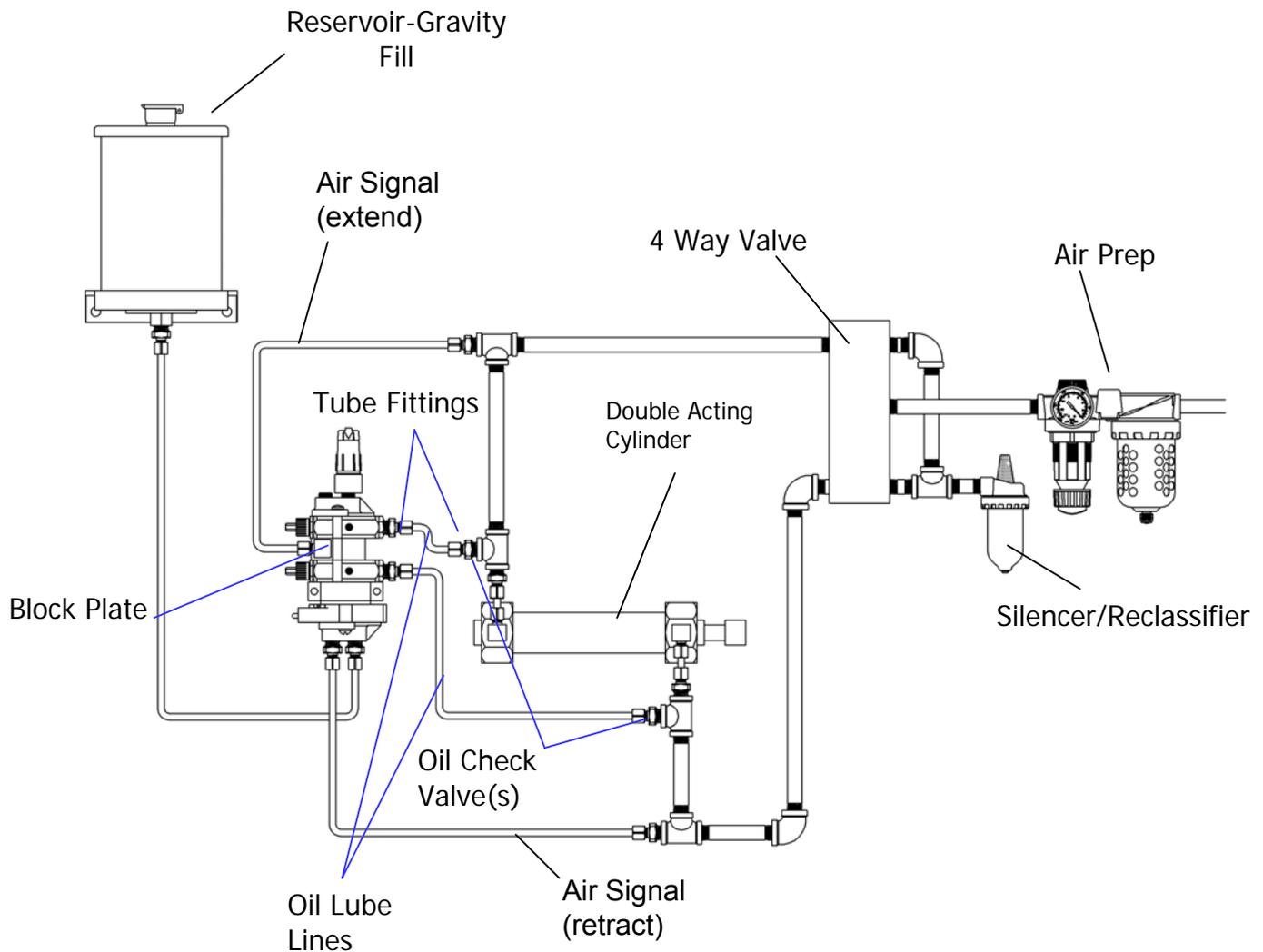
When the Air Valve shifts to passing, we branch off the supply air to signal the MPL to operate. The Servo-Meters are actuated and a precise volume of oil is dispensed through a check valve into the in-rushing air operating the air motors.

# Serv-Oil to Air Motor Applications



Master Pneumatic Serv-Oil system to lubricate an air motor. An optional frequency generator can be added to the assembly if more than one injection of lubricant is required. Duty cycle dictates if this is required.

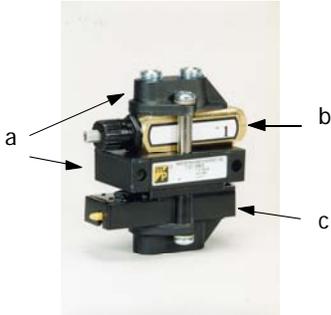
# Cylinder Application



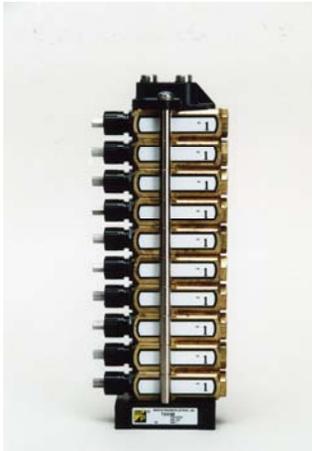
This is an example of the use of Serv-Oil MPL in an air cylinder application. A double acting cylinder installed in the horizontal or vertical position could require two lube points. Above shows a lube point and an optional second lube point.

# Some examples of Multi Point Lubricators ( MPL's )

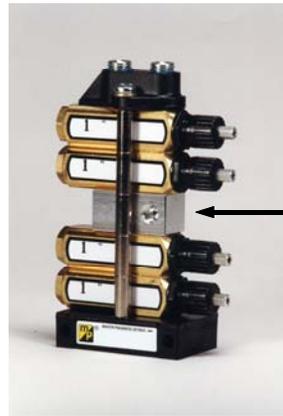
Our basic unit consists of mounting hardware (a) and Servo-Meters (b). Most MPL's are ordered with our optional pulse counter (c).



The picture to the right shows a 5 injector MPL with heavy duty mounting hardware. This provides a means to secure the product at the top & bottom.



MPL's can include up to 10 devices. This can be a combination of Servo-Meters and block plates (shown right). **In the MPL shown to the left, ALL Servo-Meters are actuated at the same time.** It is important to remember this when specifying which product to use. When the control valve delivers the air signal, ALL Servo-Meters deliver the volume of oil that you have adjusted them to dispense. **Servo-Meters of different maximum output can be mixed to suit your needs.**



Block Plate supplies air signal to Servo-Meters above. Servo-Meters below the Block Plate would get their air signal from bottom of the stack.

**\*\* See NEW Integral Port on page 13.**



Frequency Generators (Pneumatic Timers) can be included to operate Servo-Meters more than once per duty cycle. (Shown Left)

Interposed (Shown Right) or remote directional valves control when the duty cycle begins.



Automation Pacs are self-contained lubricators that include a 1/2 gallon reservoir, up to 20 Servo-Meters and various options including pulse counters, hi-lo level switches, air filters, and more.



## "New" Multi Point Lubricators ( MPL's )

In 2006, we introduced

### Aluminum Servo-Meters

There are a number of reasons for this product change including:

- **Lighter weight**
- **Lower cost**
- **Anodize in Custom Color of your choice (optional)**
- **RoHS Compliant**



MP Servo-Meters require an air signal to dispense fluid. If there are multiple Servo-Meters in a MPL stack, all would operate at the same time unless you included our Block Plate option (shown left). This option enabled the user to provide a separate, independent signal to the Servo-Meters ABOVE it.

Our MPL stacks are restricted to a combination of (10) Servo-Meters and Block Plates which limited the user to being able to independently operate only 5 Servo-Meters in a stack.

Our new **INTEGRAL PORT** option provides a number of benefits to the user. In the picture below we have shown three Servo-Meters. The top Servo-Meter is aluminum and has the integral port plugged. The middle Servo-Meter has a 90° tube fitting and the bottom Servo-Meter has a straight tube fitting installed in the Integral Port. (MP will not be offering the tube fittings). The integral port is tapped M5 and plugged.



Some of the benefits realized:

- **Up to 10 Servo-Meters independently controlled per MPL stack**
- **Lower profile**
- **Improved aesthetics**
- **Lower cost**

## "New" Multi Point Lubricators ( MPL's )

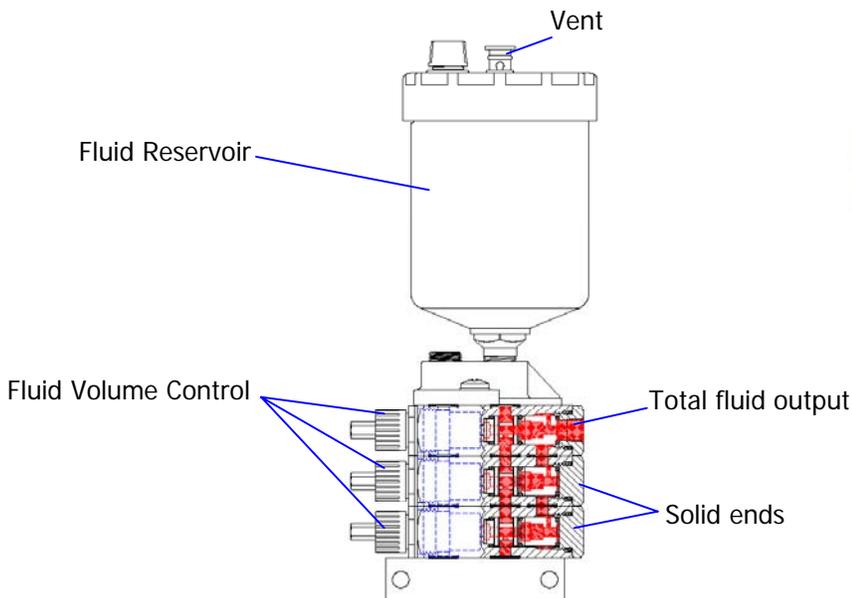
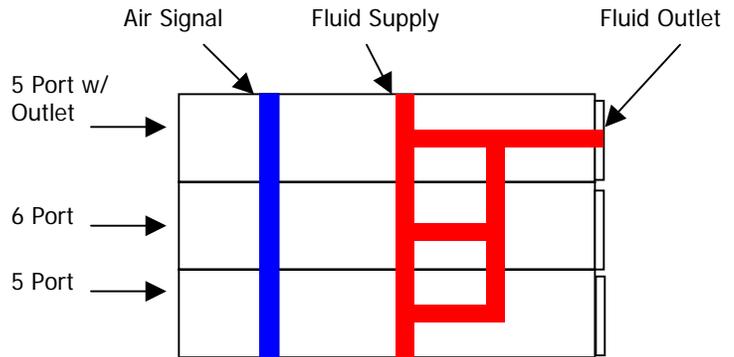
For applications that require **more than 2 drops** (.060 ml) of fluid, Master Pneumatic makes MPL's for higher volume output.

MP manufactures 4 ported Servo-Meters (aluminum version shown right) for a single point of fluid delivery. There is a port on the top and bottom for the air signal, and a top and bottom port for fluid delivery. The fluid is delivered out the threaded end.



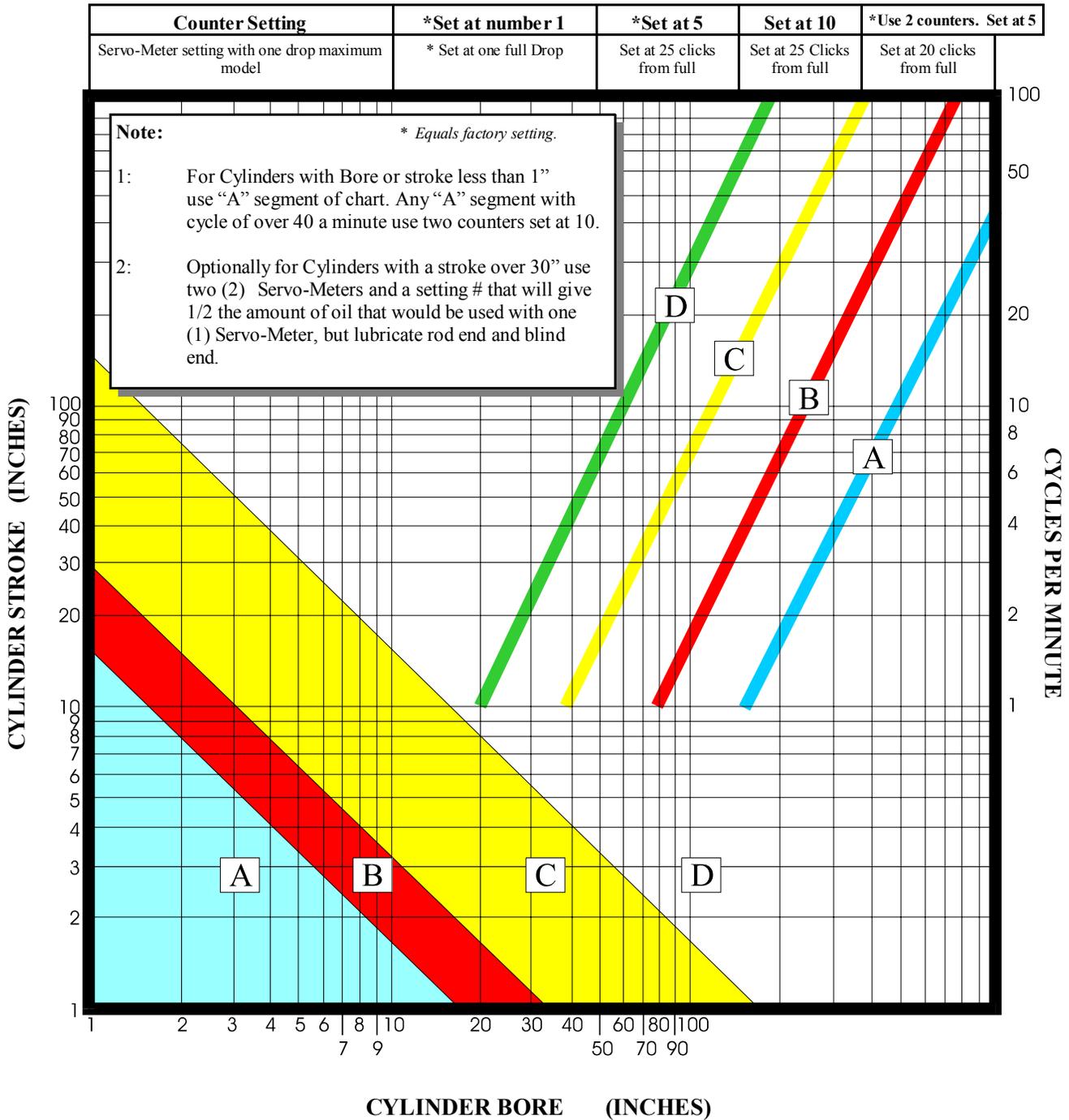
MP also offers **5 & 6 ported versions** for higher volume output applications. We can stack these and dispense the combined volumes out a single point. In the diagram below, the total fluid output of the injectors is dispensed out of the (top) 5 ported Servo-Meter.

If the application called for 6 drops (.18ml) of fluid, for example, three 2 drop Servo-Meters would be used and the total output of the three would be dispensed out the top Servo-Meter. Eight drops (.24ml) required, add one more 6 Port Servo-meter.





# Determining Lubrication Rates



First identify where the bore and stroke intersect on the lower chart. With the appropriate letter use the cycles of the cylinder per minute and draw a line to intersect the A, B, C or D line on the upper chart. Draw a line vertically from there to the appropriate setting of the counter and Servo-Meter.

**Example:** Cylinder with 4" bore and 5" stroke falls into the "B" segment of the selection chart. If the operating rate of the cylinders is 15 per minute, the counter setting should be at 10 and the injector (*Servo-Meter*) knob turned counter - clockwise 25 clicks.

MASTER PNEUMATIC - DETROIT, INC. SERV-OIL ACTUATOR SELECTION CHART.



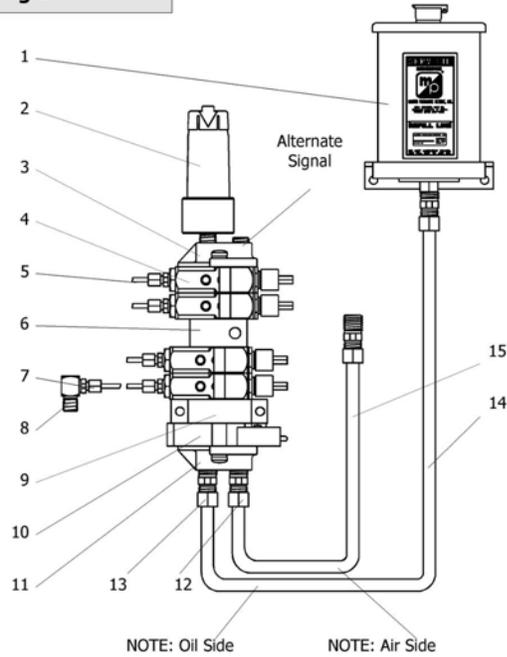
# SERV-OIL Multiple Point Lubricator (MPL)

MASTER PNEUMATIC - DETROIT, INC.

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JM/FS 2-28-00  
Rev: 12-09-04

Fig 1



The **SERV-OIL** remote mount Multiple Point Lubricator is a modular system which can consist of up to 10 Servo-Meters (*recommended maximum*) capable of lubricating one point each. An assembly of four is shown in fig.1. Lubricant supply may be fed in from top or bottom 1/4" ports, (*the bottom port is preferred to allow venting air from oil*). When an air pulse is received from the control valve the Servo-Meters actuate and inject oil. The oil is delivered through 1/8" nylon tubing to the device being lubricated. For a pulsing air source, tee in downstream of an air control valve that operates on a regular sequence with the pneumatic circuit or machine; for example, a valve that operates once every time a part is made. **SERV-OIL** check valves should be installed in pipe tees immediately before the devices being lubricated, or directly in line, as close to point of service as possible to insure a solid column of oil is being maintained.

- 1 Oil reservoir. See **SERV-OIL** catalog for selections.
- 2 Sight dome for manually venting air when you use a remote reservoir and to give visual confirmation of oil in Servo-Meters. Part 482R.
- 3 Mounting clamp. 474-13M
- 4 Servo-Meter 7001# #4B-@ available in 1, 2 or 1/2 drop. For sizes see **SERV-OIL** catalog.
- 5 1/8" oil delivery line. 00942M order by meter.
- 6 Optional block plate. See **SERV-OIL** catalog.
- 7 Tube connector. 00142W
- 8 Ball check valve. See **SERV-OIL** catalog for types and pipe threads.
- 9 Mounting plate. 474-10M.
- 10 Pneumatic pulse counter. A418-04M.
- 11 Mounting clamp. 474-13M.
- 12 Tube connector. 00184W (*air*).
- 13 Tube connector. 001124W (*liquid*).
- 14 3/8" nylon liquid supply line. 009126-M order by meter.
- 15 1/4" Air signal line 00984M, order by meter.

## Installation and Start-Up Procedures

Fig 2

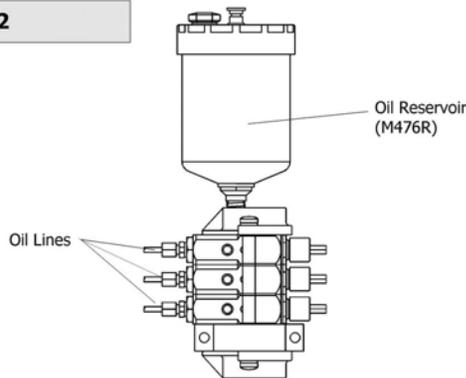
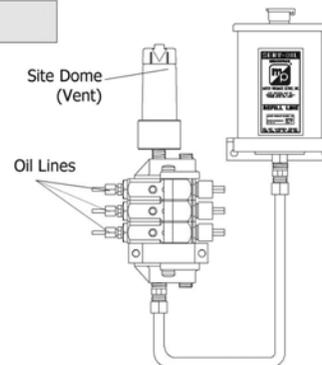


Fig 3



1. If a gravity feed reservoir is used, (*gravity feed is recommended*), install reservoir higher than Multiple Point Lubricators (FIG. 1). If using a pressurized system do not exceed a pressure of 30 P.S.I..
2. Multiple Point Lubricators are easily mounted to a plate or machine with two 1/4" bolts.
3. Connect OIL supply to top or bottom (1/4-18 NPTF) port in the mounting block. Bottom port is normally recommended.
4. Connect AIR signal line to the bottom (1/4-18 NPTF) port in the mounting block when using a pneumatic counter. When not using a pneumatic counter, the AIR signal can be supplied from top or bottom. The air signal should be from the normally unpressurized side of a control, valve.
5. Install oil introduction tees immediately ahead of each device to be lubricated. Oil should be introduced at both ends of horizontally mounted cylinders and rod end of vertically mounted cylinders. Cylinders mounted vertically with the rod facing down, apply oil at blank (*back*) end. Oil is normally introduced at both cylinder ports if stroke exceeds 11 inches.



# SERV-OIL Multiple Point Lubricator (MPL)

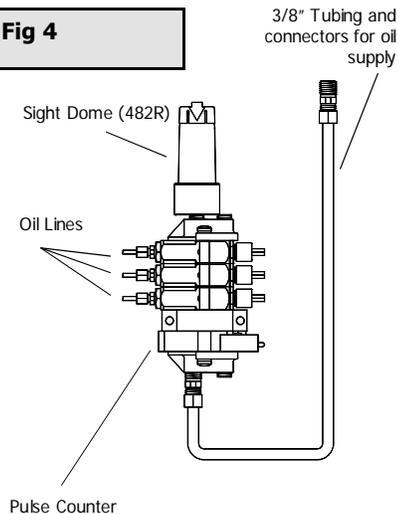
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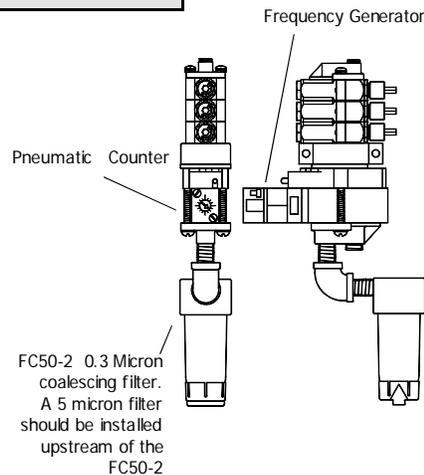
## Installation and Start—Up Procedures

**Fig 4**



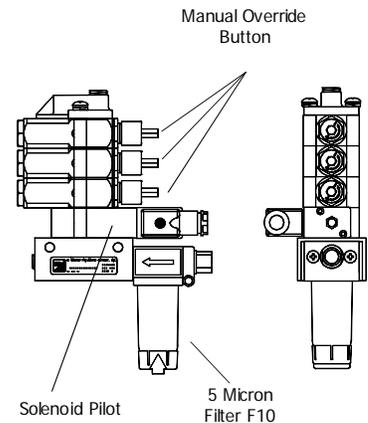
**MODEL # 71003104B-C**  
With 482R sight dome.

**Fig 5**



**MODEL # 71003104B-F**  
With frequency Control

**Fig 6**



**MODEL # 7A003104B2160**  
With electrical connection Solenoid Actuated

6. Fill the reservoir with oil (or connect into the central oil supply).
7. Install the check valves at the oil introduction pipe tees and attach to prefilled oil delivery lines.
8. Using compression fittings, attach the oil delivery lines to the Servo-Meters. Tighten compression fittings at the Servo-Meters and at the check valves. NOTE: The **SERV-OIL** system is a hydraulic system and all fittings must be absolutely free of leaks.
9. Air venting is strongly recommended for convenience at start-up and also to eliminate air entrapment if a reservoir is allowed to run dry. Air venting is achieved by installing manually vented sight dome (Fig 4). When venting with sight dome, after installation is complete and oil is added, push down on black cap until liquid is visible.
10. With the adjustment knob in the full clockwise position (maximum output), operate the equipment being lubricated, or push the manual override button, until oil appears at the outlet of the Servo-Meters. This is to ensure elimination of any remaining air in the Servo-Meter oil metering chamber. Normally 25 to 50 operations will be required. If oil does not appear at the outlet of the Servo-Meters, bleed the oil supply again as described in instruction 9 above.
11. Operate the machine or equipment being lubricated. Manual override buttons should actuate every time the control valve is being used as an air signal source is operated. If a pneumatic counter is used in the circuit, manual override buttons actuate once every 1, 5, or 10 cycles of the air signal valve, depending upon the setting on the pneumatic counter.
12. A precise amount of oil can be delivered to most components. Servo-Meters should be adjusted to provide the maximum amount of oil that can be used without contamination or operator objections. Most valves and cylinders are well lubricated with a 10 to 30 counterclockwise click setting of the adjusting knob. Small cylinders and those operating at a rate of 50 cycles per minute or more, require less oil per injection. Valves and cylinders operating infrequently may require a full drop of oil per cycle. Normal adjustment setting for multiple spindle air tools is 30 to 40 counterclockwise clicks. Shut-off occurs between 46 and 50 counterclockwise clicks (on shut off models only). These numbers are based on the use of a one drop SERVO-METER. The inclusion of an inexpensive pulse counter provides 5 to 10 times the adjustment.
13. If a control valve or an on / off air signal is not available, a frequency generator can be used (Fig 5) to provide needed signal. A frequency generator converts a constant air supply into an on and off signal. Frequency generators will be assembled and tested complete with filter at Master Pneumatic as part of a purchased Serv-Oil system.
14. Master Pneumatic has recently introduced an electronic version (7A0 series) of the Multiple Point Lubrication system. This version can easily be interfaced with your machine, the solenoid unit can be actuated by a PLC output. The 7A0 series is assembled and factory tested complete with a 5 micron filter. (FIG 6)
15. Additional Serv-O-Meter kits can be ordered to add or replace in modular Multiple Point Lubricator assemblies. (FIG 7)
16. Mounting block assemblies can also be ordered along with Serv-O-Meter kits to construct Multiple Point Lubricator assemblies. (FIG 8)



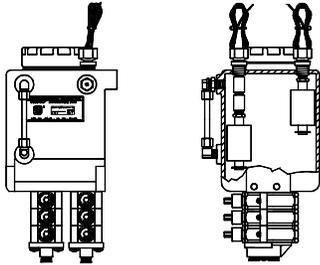
# SERV-OIL Automation Pac

JM/FS 2-28-00

MASTER PNEUMATIC - DETROIT, INC.

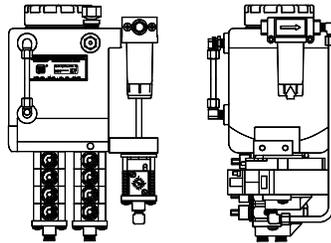
6701 -18 Mile Rd. | Sterling Heights, MI 48314 | Phone: (586) 254-1000 | Fax: (586) 254-6055 | Email: mp@masterpneumatic.com

Fig 9



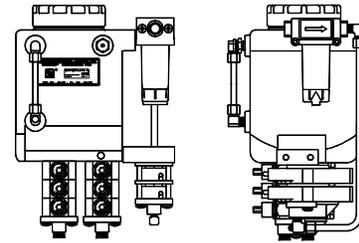
MODEL # 73006104B-GG

Fig 10



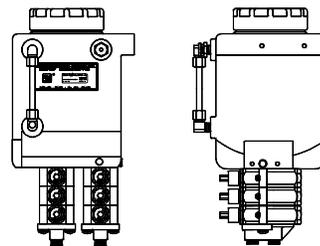
MODEL # 73008104B-F

Fig 11



MODEL # 73006104B-CC

Fig 12



MODEL # 73006104B

Model 730###\*\*4B-@ (Fig 12)

**SERV-OIL** Automation Pac is a self-contained, heavy duty; lubrication system designed to supply a precise amount of lubrication to an exact area. The Automation Pac has a built in, half-gallon reservoir and a vented fill cover with filter screen. The Auto Pac will provide precise lubrication for valves, cylinders, fixtures, automation equipment, machine tools and most any wear points. Up to 20 Servo-Meters can be operated with one pneumatic signal. Servo-Meters can be ordered with a maximum oil delivery of 1/2, 1 or 2 drops, each Servo-Meter can be adjusted to deliver 1/10<sup>th</sup> of it's maximum output, or optionally with suffix "A" to zero.

Model 730###\*\*4B-CC (Fig 11)

Model with "CC" suffix comes factory equipped with two pneumatic pulse counters and a .3 micron coalescing filter. The addition of the two pneumatic counters allows the user to program the frequency of the Servo-meters. The Servo-meters can be programmed to inject every 1, 5, 10, 25, 50 or 100 cycles.

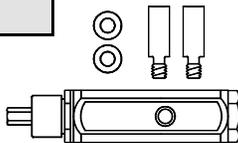
Model 730###\*\*4B-F (Fig 10)

Model with the "F" suffix comes equipped with a frequency generator, one pulse counter and a .3 micron coalescing filter. The frequency generator is used when an on off air signal is not available, the frequency generator takes a constant air supply and converts it to an on/off air signal, the frequency generator, when used with pneumatic pulse counter, can be adjusted to actuate the Servo-meters from once every second to once every five minutes.

Model 730###\*\*4B-G (Fig 9)

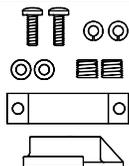
Model with "G" suffix is available with all above options and the addition of a low-level switch, the "GG" suffix indicates a high-low level switch. For example part number 73004104B-CCGG would include, 4 one drop Servo-Meters, two pulse counters and a high low level switch.

Fig 7



SERVO-METER KIT

Fig 8



MOUNTING KIT

## Installation and Start—Up Procedures

### Installing: Model 730###@@4B

1. Bolt the entire assembly to a mounting plate, using 7/16-14 threaded mounting holes on 4-1/8" centers on rear of reservoir.
2. Select a control valve for signaling that operates in a consistent sequence with the Pneumatic circuit or equipment being lubricated. Install a **filtered** air line, from the control valve to the Auto Pac supply port. Signal pressure must be 60 P.S.I. minimum to 150 P.S.I. maximum.
3. Install compression fittings, pre-filled capillary tube, and ball checks where required.
4. It is recommended that before you connect compression fittings to ball checks that oil lines are completely purged and free of air. This can best be accomplished by adjusting each Servo-Meter to full volume, (turn clockwise to increase volume), and cycling system until air is no longer present. Next attach compression fittings to ball checks and adjust each Servo-Meter to desired output.

For lubrication or fluid delivery solutions not addressed in this brochure, contact Master Pneumatic at:

586-254-1000 (Phone)

Or

[www.masterpneumatic.com](http://www.masterpneumatic.com)

Request Tech Support on ***Serv-Oil***



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