

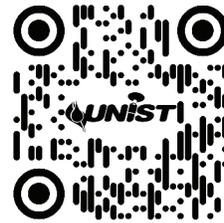
# Serv-O-Spray™

## Operation Manual





[unist.com/sosman](http://unist.com/sosman)



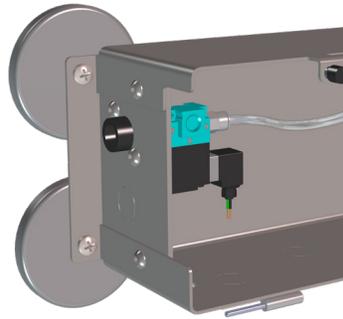
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Serv-O-Spray™ Operation Manual  
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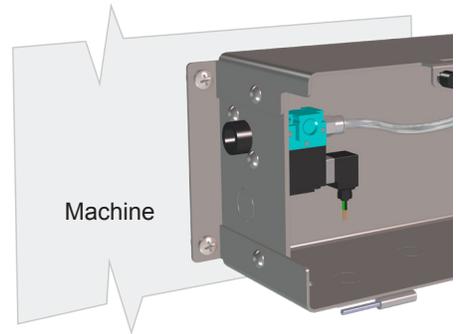
# Serv-O-Spray™ Quick Start Guide

## 1. Mount (Pg. 10)



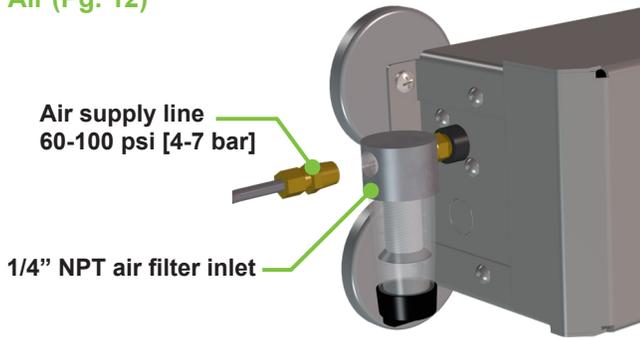
Magnet mount

or



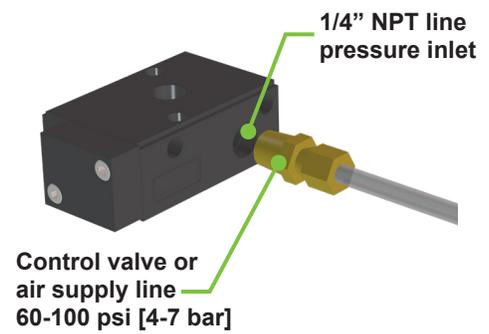
Direct mount

## 2. Air (Pg. 12)



Air supply to filter

or

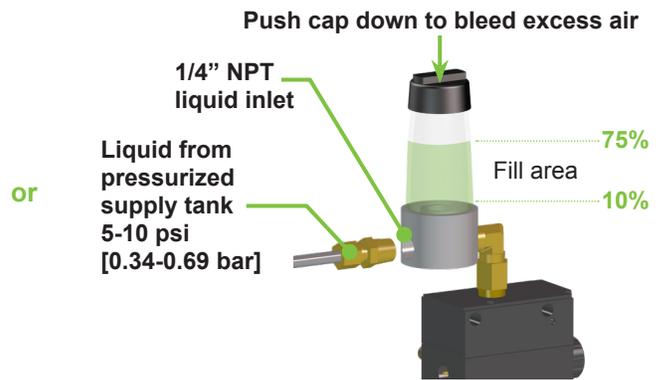


Air supply to manifold

## 3. Fluid (Pg. 12)



Fill reservoir



Bleed trapped air

## 4. Prime (Pg. 14)



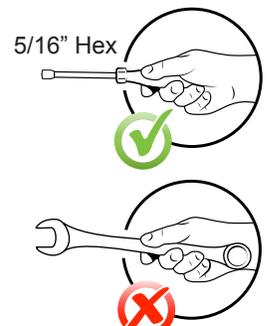
A. 2X Loosen



B. Drip



C. 2X Tighten



## Important Operator Information



Consult this documentation in all cases where this caution symbol appears. This symbol is used to inform you of any potential HAZARD or actions that require your attention.

Use of this equipment in a manner other than that specified by Unist, Incorporated may compromise design integrity and become unsafe.

**WARNING:** This equipment is not intended for use in explosive environments.

**ADVERTENCIA:** Este equipo no está diseñado para uso en atmósferas explosivas.

**AVVERTIMENTO:** Questa apparecchiatura non è inteso per l'uso in ambienti esplosivi.

**WARNUNG:** Das Ausrüstung darf in einer explosiven Umgebung NICHT verwendet werden.

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**Identifying Symbols**



**Caution - ISO 7000-0434B**

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# Introduction

## Thank You

Thank you for your purchase of the Unist Serv-O-Spray™. Please take the time to read this operation manual to take full advantage of your new Serv-O-Spray™.

The Unist Serv-O-Spray™ uses a positive-displacement pump to deliver precise and repeatable shots of lubricant. The system offers flexibility while maintaining simplicity and can be operated using only compressed air.



Figure 1: Serv-O-Spray™ system

## System Introduction

The Serv-O-Spray™ gives simple, precise lubrication. The system is typically configured to give one shot of lubrication per input signal. In the case where additional fluid is required the Serv-O-Spray™ can be paired with a Pulse R™ for multiple shots. Two types of pumps are available: atomizing pumps that provide an air and oil mix, and oil-only pumps. These adjustable positive-displacement pumps are proven with a track record of consistency and reliability. Their modular design allows multiple pumps to be stacked together when more than one output is required, so each system can be tailored specifically for the application. Each pump in the stack includes a stroke adjustment for the pump output.

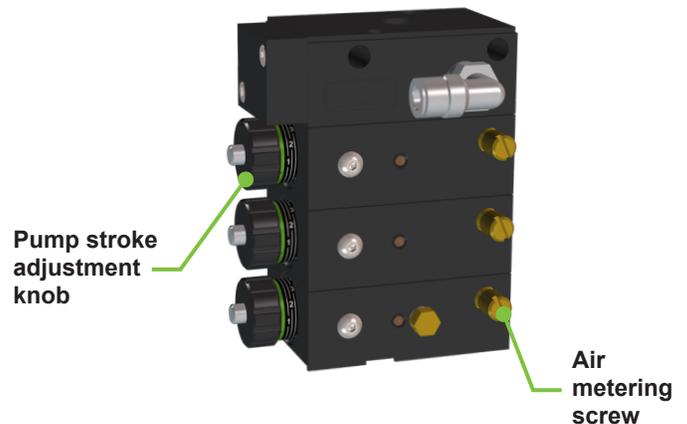


Figure 2: Pump stack

Atomizing pumps also have an air metering screw to regulate the output air flow. The combination of these adjustments gives complete control of the spray output.

It is not only the adjustability and precision of the Unist Serv-O-Spray™ that keeps our customers satisfied, but also our unrivaled quality. Unist products are built to provide years of service in tough, industrial environments. We take pride in the quality of our equipment and each Unist system is thoroughly tested in our shop before making its way to yours.

# Introduction

## Common Configurations

The Serv-O-Spray's™ modularity gives each customer the flexibility to configure a unit exactly as needed. Because of this, there are thousands of Serv-O-Spray™ configurations. They may look different because of the presence or absence of an enclosure or the size of the reservoir, but regardless of the look, all Serv-O-Sprays™ have the same key components which use the same simple adjustments. The examples provided below illustrate some of these different looks.

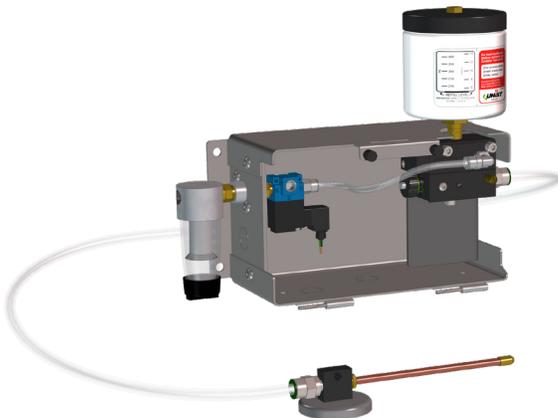


Figure 3: Single pump output system with an enclosure



Figure 4: Multiple pump output system with Pulse R™ and an enclosure



Figure 5: Single pump output system without an enclosure

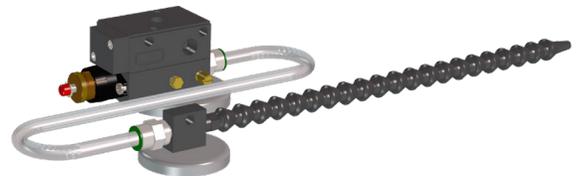


Figure 6: Single pump output system without an enclosure & reservoir

Unist systems perform best with our Coolube® line of lubricants. Coolube's® 100% natural, non-toxic, renewable plant oil-based composition makes it an ideal choice for manufacturers who care about their environmental impact. Coolube® contains no petroleum products, is 100% chlorine and silicone free, and produces no harmful VOC's. Coolube® is completely biodegradable, yet still has a long shelf life. An added benefit is your system's pump is guaranteed for life when used exclusively with Unist Coolube® lubricant.



Figure 7: Coolube® lubricant

# Introduction

## Key Components

### The Pump

In most cases, the Serv-O-Spray™ provides an atomized oil and air mixture that is delivered to the work interface. For some applications, it can be configured with an oil-only pump, so only fluid is delivered. The oil is metered using a pneumatically actuated positive-displacement pump and the output per stroke is adjusted with the pump stroke adjustment knob. If additional fluid is required the system can be equipped with a Pulse-R to adjusted the number of shots from 1-99.

There are many variations of pumps used in the Serv-O-Spray™ system based on the viscosity of the fluid being used, the output rate required, if it is an air atomizing or an oil-only pump, and where the pump is located in the pump stack. The charts on pages 4 and 5 will help identify which style of pumps is/are in your system.

On an atomizing pump, the air flow is controlled with an air-metering screw. The volume of oil supplied with each pump stroke is controlled by the pump stroke adjustment knob. The density and distance of the spray is determined by these two adjustments.

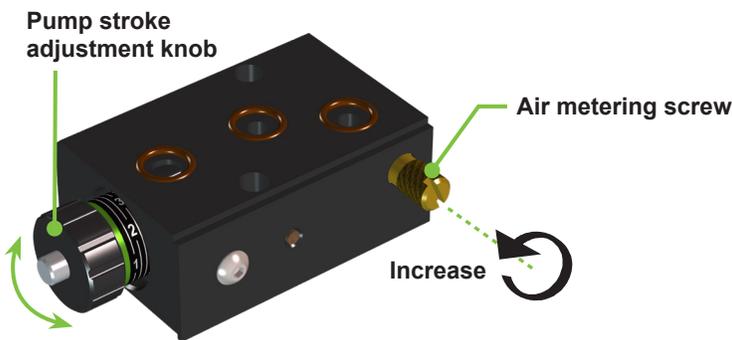


Figure 8: Air metering screw & pump stroke adjustment

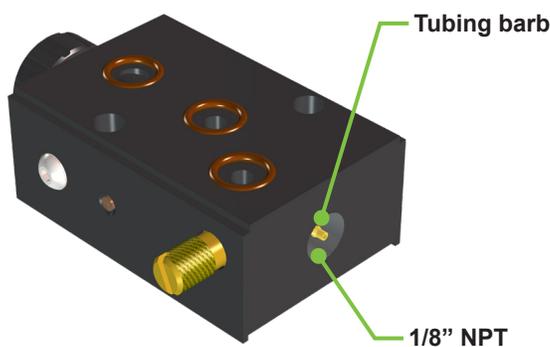


Figure 9: Outlet port

### Intermittent Fluid Output

For systems without the Pulse R™ every time a compressed air signal is supplied from an actuation valve, the pump will deliver one quick shot of fluid out the nozzle tip along with a controlled amount of air.

For systems with a Pulse R™ the number of shots can be adjusted from 1-99. Every time the system receives compressed air and an electrical signal from the actuation valve the pump will deliver the number of shots set by the user at the desired cycle rate along with a controlled amount of air. Air continues to flow from the nozzle tip until the air actuation valve is closed. The pump will not deliver another shot(s) until the actuation valve is closed and then reopened. The pumps can be cycled as often as needed, up to 200 times per minute (not recommended for continuous operation). The actuation valve should be on for at least 100 milliseconds and off for at least 100 milliseconds. Reference Appendix H: Pulse R Operating Modes for more information.



Figure 10: Pulse R™ controller

### Output

If the Serv-O-Spray™ is designed to deliver an air and oil spray, keeping the fluid and air separate until the point of application is the key to delivering consistent spray output. Unist's coaxial outputs excel at this by combining the fluid and air directly at the nozzle tip. The "jacket of air" surrounding the fluid outlet evenly atomizes the fluid and delivers it to the target in a balanced spray pattern. In the oil-only case, the output from the Serv-O-Spray™ can be connected directly to the point(s) of application.

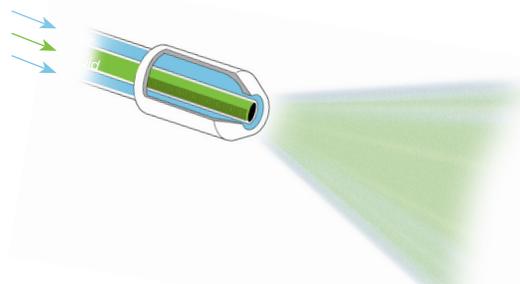
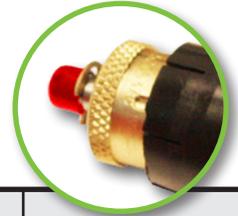


Figure 11: Air & oil spray

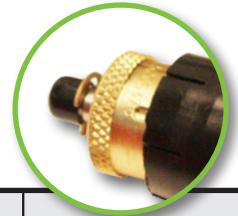
# Standard Pump Identification Charts

## 1-Drop Standard Pump (Red Cap) (Knurled brass adjustment knob with black body)



Features	Air metering screw	Air metering screw & drain plug	None	Drain plug
Pump				
Part #	94-6811	94-6821	94-6811-1	94-6821-1
Location	intermediate	bottom	intermediate oil-only	bottom oil-only

## 3-Drop Standard Pump (Black Cap) (Knurled brass adjustment knob with black body)



Features	Air metering screw	Air metering screw & drain plug	None	Drain plug
Pump				
Part #	94-6813	94-6823	94-6813-1	94-6823-1
Location	intermediate	bottom	intermediate oil-only	bottom oil-only

Figure 12: Standard pump identification charts

# MV Pump Identification Charts

## 1-Drop MV Pump (Green Band)

(Anodized aluminum adjustment knob with black body)



Features	Air metering screw	Air metering screw & drain plug	None	Drain plug
Pump				
Part #	302098	302099	302416	302417
Location	intermediate	bottom	intermediate oil-only	bottom oil-only

## 2-Drop MV Pump (Red Band)

(Anodized aluminum adjustment knob with black body)



Features	Air metering screw	Air metering screw & drain plug	None	Drain plug
Pump				
Part #	302100	302101	302418	302419
Location	intermediate	bottom	intermediate oil-only	bottom oil-only

Figure 13: MV pump identification charts

# System Layout

**A. Air filter**

Standard on every system with enclosure

**B. Control valve**

Options include solenoid valve (shown), air pilot valve, manual valve, or foot valve

**C. Positive-displacement metering pump**

Precise and reliable with full stroke outputs of 0.033 mL, 0.100 mL, or 0.045 mL

**D. Air metering screw**

Controls nozzle air flow (not present on oil-only pumps)

**E. Pump stroke adjustment knob**

Controls volume of fluid delivered per stroke

**F. 16 oz [473 mL] fluid reservoir**

Additional sizes and styles available

**G. Rugged steel enclosure**

Removable cover for easy adjustment or maintenance (optional keyed lock)

**H. Drain plug**

Use to empty fluid from pump stack, reservoir, and to bleed trapped air

**I. Outlet port**

Connection port for coaxial or oil-only outputs

**J. Electronic pump controller (optional)**

Pulse R™, controls pump shot counts



Figure 14: Typical system layout

# System Specifications

<b>Supply air pressure</b>	Clean, dry compressed air, 60-100 psi [4-7 bar]				
<b>Pumps</b>		<b>1-drop standard</b>	<b>3-drop standard</b>	<b>1-drop MV</b>	<b>2-drop MV</b>
	<b>Viscosity</b>	50-1000 SUS	50-1000 SUS	30-1300 SUS	30-500 SUS
	<b>Output at full stroke</b>	0.033 mL	0.100 mL	0.045 mL	0.100 mL
	<b>Max output rate</b>	0-396 mL/hr	0-1200 mL/hr	0-540 mL/hr	0-1200 mL/hr
<b>Air flow rate</b>	1-4 SCFM [28-113 LPM] typical for each air and oil output. 7 SCFM [198 LPM] max.				
<b>Operating temperature storage</b>	32°-122°F [0°-50°C]				
<b>Storage temperature range</b>	4°-158°F [-16°-70°C]				
<b>Fluid reservoir capacity</b>	Reservoir dependent, 16-64 oz [473-1893 mL] Fluid supplied through air trap: clean, filtered fluid, 10 psi [0.69 bar] max				
<b>Cycles per minute</b>	Recommended: 5-50 pulses/min Maximum: 200 pulses/min (not recommended for continuous operation)				

Figure 15: System specifications

# System Installation

## Mounting Dimensions

### Systems With Enclosures

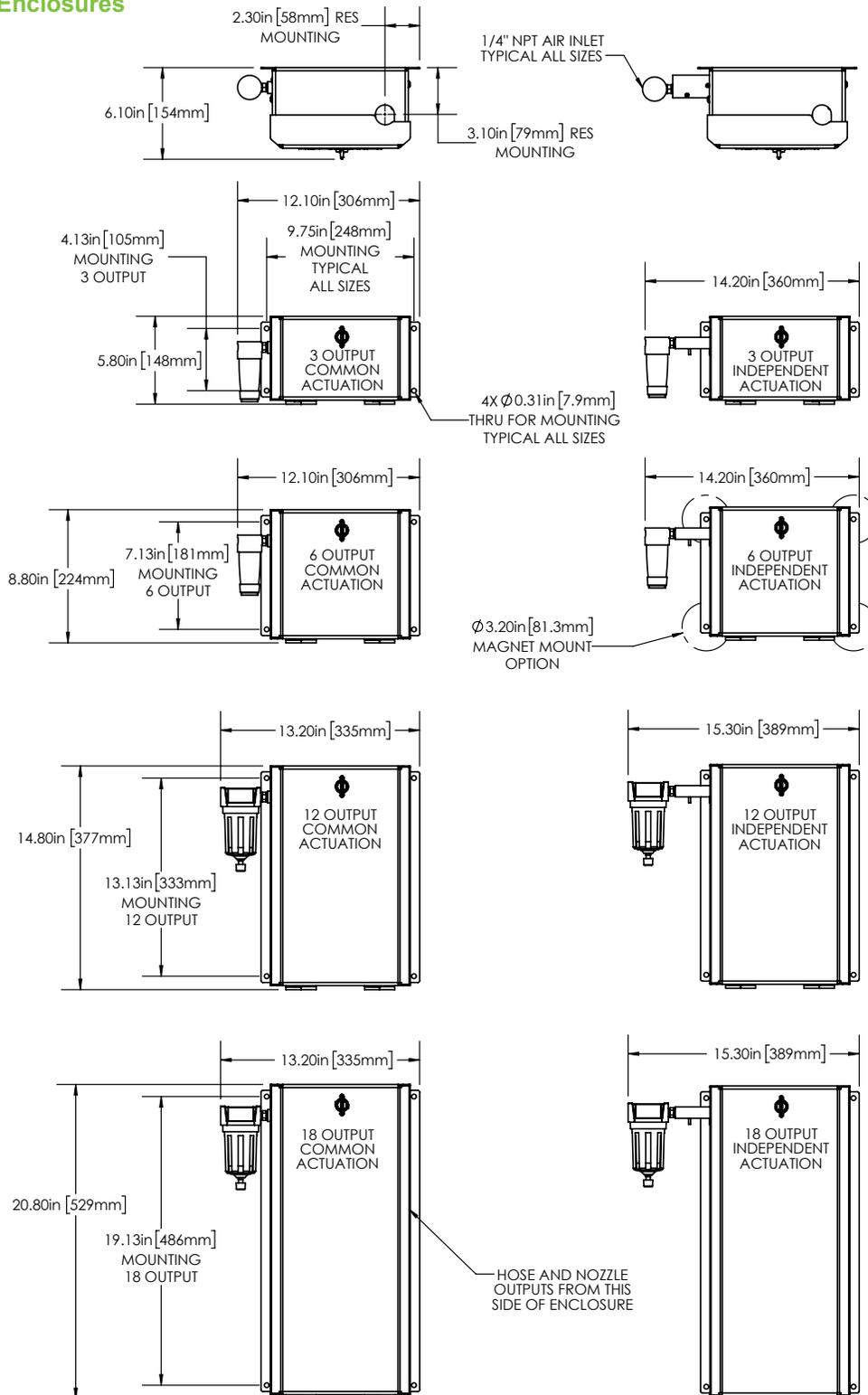


Figure 16: Systems with enclosures

# System Installation

## Systems Without Enclosures

Each pump is 1" [25.4 mm] tall, so you can determine the height of a system's pump stack (in inches) using this formula:

$$\text{Height} = (\text{number of pumps}) + 1.05$$

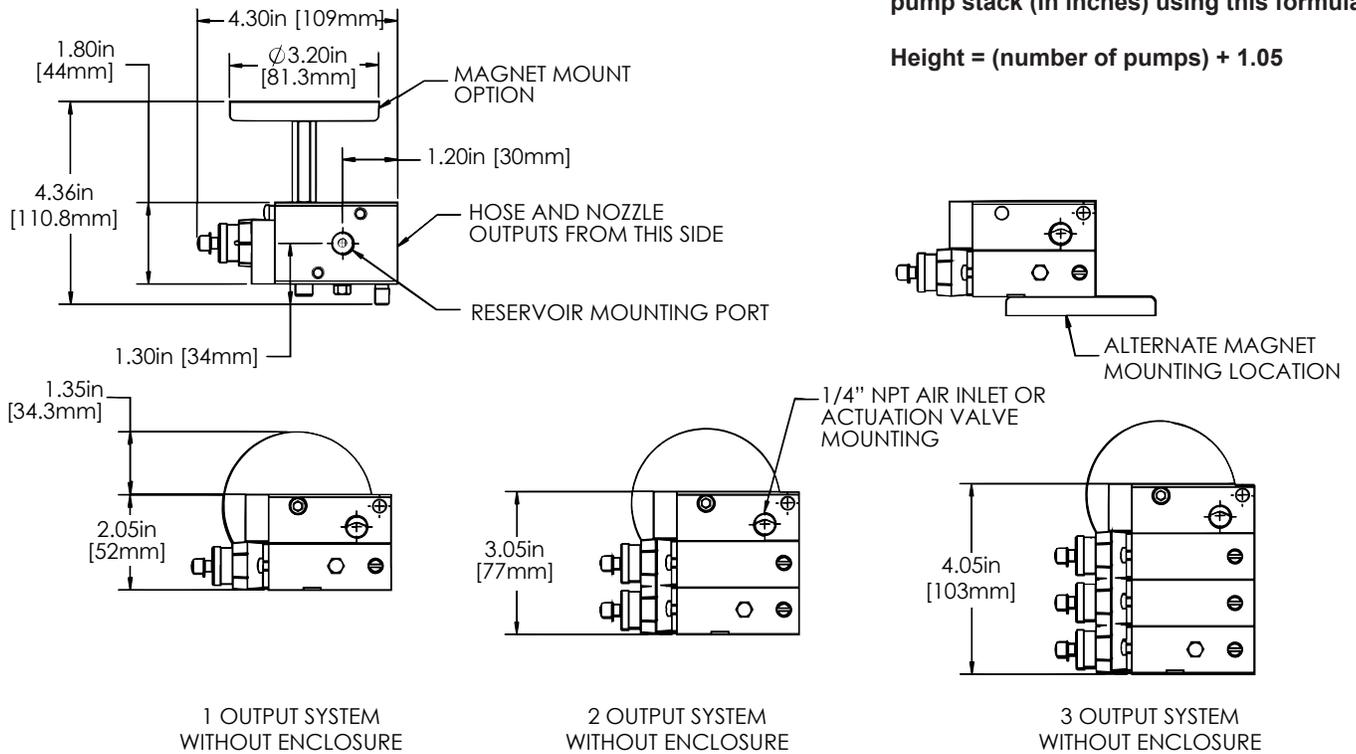


Figure 17: Systems without enclosures

## Reservoirs

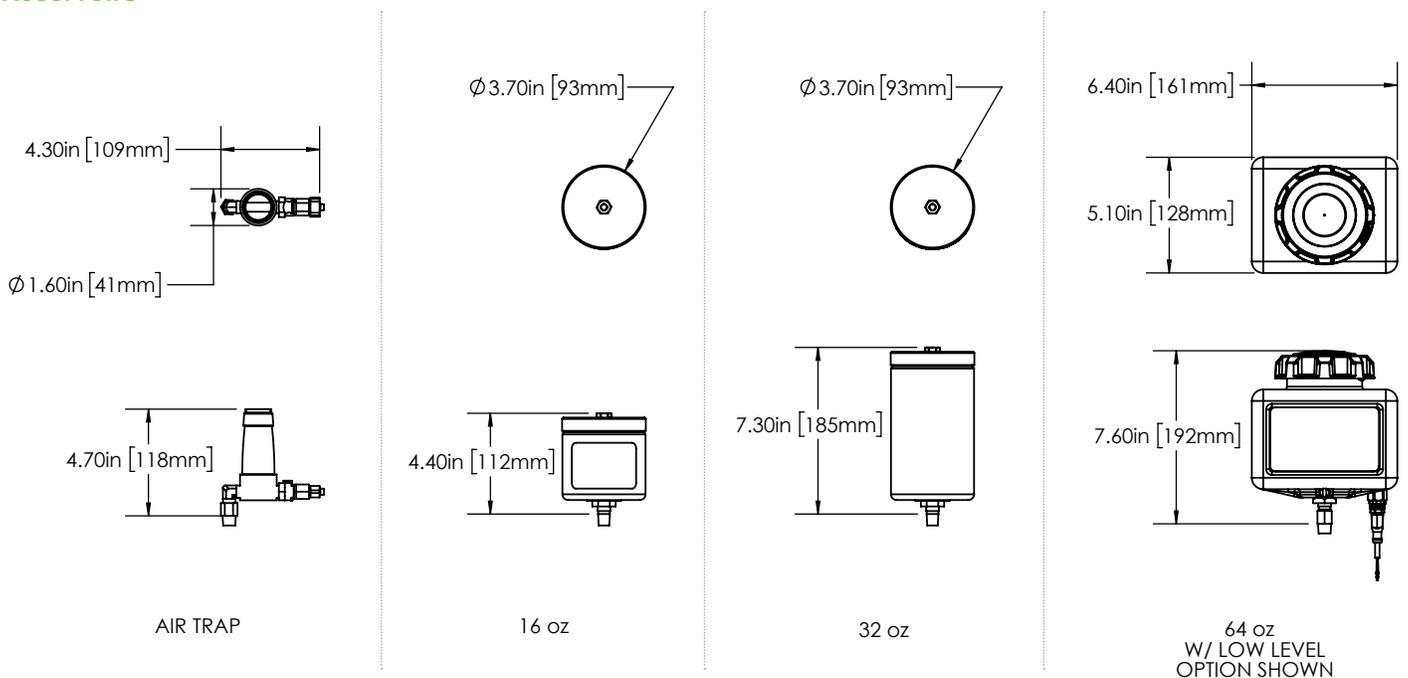


Figure 18: Reservoirs

# System Installation

## Installation

### Position & Mount System

Mount the system in close proximity to the machine, where it is convenient to access and where there are no obstructions that may pinch or kink output or air feed lines. The unit may be mounted directly to the machine, or with optional magnets, and must be mounted so the reservoir is up and the unit is level.

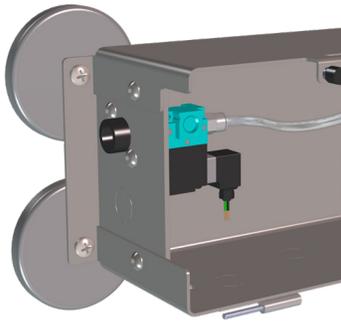


Figure 19: Magnet mount



**Attention:** The Serv-O-Spray™ must be securely mounted to a suitable mounting surface for safe operation. Use appropriate fasteners in all four mounting positions. Failure to do so could lead to unsafe operation and personal injury.

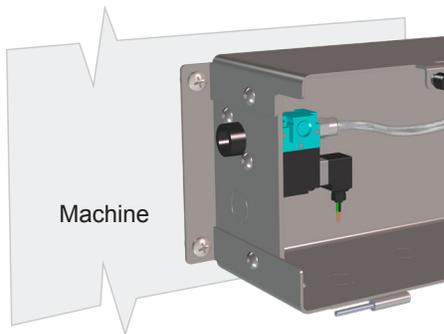


Figure 20: Direct mount



**Attention:** Always use two people while securing the Serv-O-Spray™ to its mounting surface. Failure to do so could cause personal injury.

### Connect Control Valve

The pneumatic circuit on the Serv-O-Spray™ can be controlled with a solenoid valve or an air pilot valve. If the Serv-O-Spray™ is to be turned on whenever the machine is operated, the solenoid valve is wired to the operation circuit on the machine. If independent operation is needed, the solenoid is wired to a separate switch. The voltage, current, and wiring diagrams for the Unist supplied solenoid valves are shown below.

Serv-O-Spray™ Control Valves					
Unist part #	Pipe size	Voltage	Power	Figure	DIN connector size
68-1040-18-12VD	1/8" NPT	12VDC	1.8 W	B	9.4 mm
68-1040-18-24VD	1/8" NPT	24VDC	5.4 W	B	9.4 mm
68-1040-18-24VD w/Pulse R	1/8" NPT	24VDC	17.4 W	B	9.4 mm
68-1040-18-24	1/8" NPT	24V 60/50Hz	5.7/7.4 W	A	9.4 mm
68-1040-18-110	1/8" NPT	110V-50Hz 120V/60Hz	5.4 W	A	9.4 mm
68-1040-18-220	1/8" NPT	220V/50Hz 240V/60Hz	5.9 W	A	9.4 mm
68-1040-110	1/4" NPT	110V/50Hz 120V/60Hz 24VDC	15 W 14 W 6 W	A A B	18 mm
68-1040-110 w/Pulse R	1/4" NPT	24VDC	18 W	B	18 mm
68-1040-24VAC	1/4" NPT	24V/60Hz	14 W	B	18 mm
68-1041-18-110	1/8" NPT	110V/50Hz 120V/60Hz	5.4 W	A	9.4 mm
68-1041-1824VAC	1/8" NPT	24V 60/50Hz	5.7/7.4 W	A	9.4 mm
68-1041-1824VDC	1/8" NPT	24VDC	5.4 W	B	9.4 mm
68-1041-1824VDC w/Pulse R	1/8" NPT	24VDC	17.4 W	B	9.4 mm

Note: Systems come supplied with 2 meter long DIN connector

**FIGURE A AC VOLTAGE**

**FIGURE B DC VOLTAGE**

Figure 21: Serv-O-Spray™ control valves

# System Installation

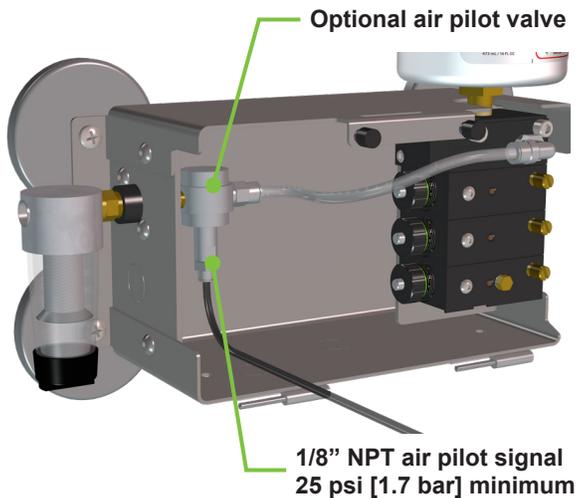


**Attention:** Use caution when making electrical connections. Only qualified individuals should attempt to connect input power and control signals to the Serv-O-Spray™. Failure to do so safely could cause damage to property and personal injury.



**Attention:** Ensure that power is not applied to the Serv-O-Spray™ while connecting solenoid inputs as this could cause personal injury or property damage.

If the system is controlled with a pneumatic air pilot valve, the air pilot signal is connected as shown below.



**Figure 22: Pneumatic air pilot valve**



**Attention:** Ensure air pressure is not present when connecting the air pilot signal to the Serv-O-Spray™ air pilot valve as this could cause personal injury or property damage.

## Connect Low Level Switch (If Applicable)

A low level switch indicates that fluid needs to be added to the system. There are two different styles of switches. One is used in a reservoir and the other in a remote tank. The low level switch can be connected to an input on the machine, an external annunciator, or other device that indicates the fluid level is low. The wiring for each type of switch is shown in Figure 23.

### FOR RESERVOIRS

### 200000 Level Switch

- Minimum media specific gravity: 0.55
- Temperature range: -40–230°F [-40–110°C] oil, 180°F [82°C] max water
- SPST switch, normally closed (NC) contact standard (closed when low). Contact can be changed to normally open (open when low) by inverting float on stem
- Max pressure: 150 psi [10 bar]
- Contact rating: 10 watts, 200 VDC max
- Switching current: 0.5 A

Maximum Resistive Load	
Voltage	Current
0-50VDC	0.2 A
120VAC	0.8 A
240VAC	0.04 A

**Caution:** Do not directly connect switch to inductive or other high current devices

STANDARD NORMALLY CLOSED CONTACT (CLOSED WHEN LOW)

ALTERNATE NORMALLY OPEN CONTACT (OPEN WHEN LOW)

---

### FOR REMOTE TANKS

### 69-5521 Level Switch

- Minimum media specific gravity: 0.55
- Temperature range: -40–230°F [-40–110°C] oil, 180°F [82°C] max water
- SPST switch, normally closed (NC) contact standard (closed when low). Contact can be changed to normally open (open when low) by inverting float on stem
- Max pressure: 150 psi [10 bar]
- Contact rating: 20 watts

Maximum Resistive Load	
Voltage	Current
0-50VDC	0.4 A
120VAC	0.16 A
240VAC	0.08 A

**Caution:** Do not directly connect switch to inductive or other high current devices

STANDARD NORMALLY CLOSED CONTACT (CLOSED WHEN LOW)

ALTERNATE NORMALLY OPEN CONTACT (OPEN WHEN LOW)

**Figure 23: Low level switch**

The float is installed at the factory so that the switch is open when the reservoir is full, and closes when the fluid level is low. This works well for turning on alarms and lights. However, if broken wire detection is desired in the circuit logic, this can be changed by inverting the float on the stem so the switch is closed when the reservoir is full and open when it is low.

11

# System Installation

## Attach Air Supply

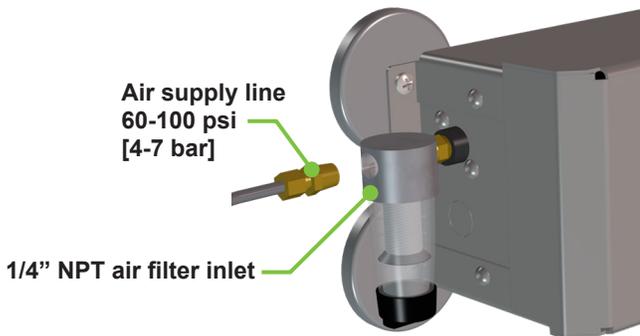


Figure 24: Air supply to filter

Attach air supply line to 1/4" NPT inlet. On units with a steel enclosure the inlet is located on the supplied air filter.

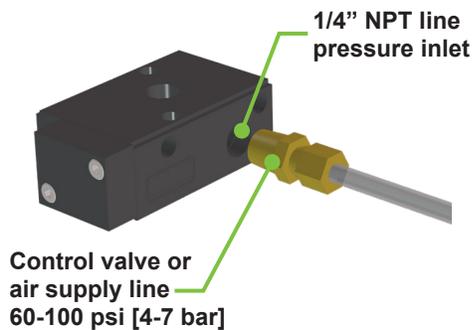


Figure 25: Air supply to manifold

For units without an enclosure, the air supply attaches directly to the control valve, or the top manifold block if no control valve is present. Filtered air should be used for the air supply.



**Attention:** Use caution when connecting the Serv-O-Spray™ to a compressed air source. Only qualified individuals should make this connection. Failure to do so safely could cause damage to property and personal injury.

## Fill Reservoir Or Air Trap

For a system with a gravity feed reservoir, remove the cap, fill the system with the fluid, and replace the cap.



Figure 26: Filling reservoir

If the system is fed pressurized fluid from an external source and is equipped with an air trap, attach the fluid source, set the supply pressure to 5-10 psi [0.34-0.69 bar], and depress the air vent cap until the trap is 75% full. Do this periodically so the air trap does not fill with air.

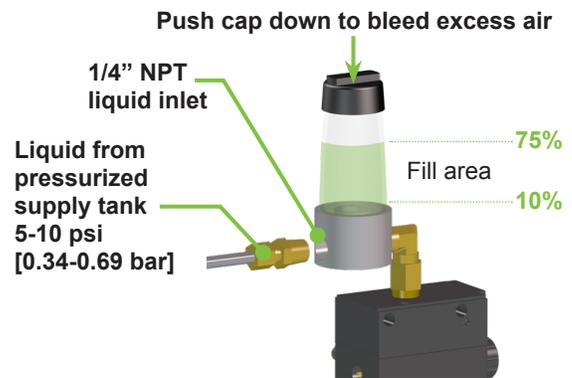


Figure 27: Bleeding air trap



**Attention:** Use caution while connecting to a pressurized fluid source. Fluid leaks could cause hazardous slippery conditions. Only qualified individuals should attempt to make this connection.

## Position & Install Nozzles

Keep the nozzle as close as possible to the cutting edge, ideally within 2" [50.8 mm]. The longer the distance that the nozzle needs to spray, the more airflow is needed to carry aerosol and the higher the likelihood of an unwanted mist being generated.

# System Startup

## Turning The System On & Off

The Serv-O-Spray™ is turned on or off using a solenoid valve or an air pilot valve. Solenoid control will turn on the unit when the correct electrical voltage is applied. Air pilot valve control turns on the unit when the air signal is received.

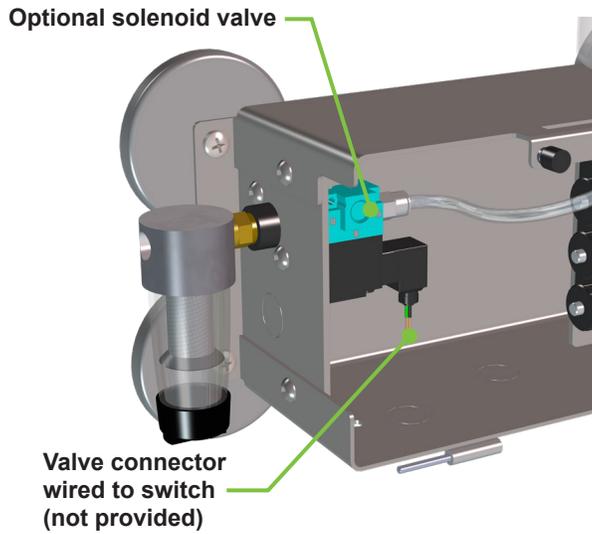


Figure 28: Remote operation

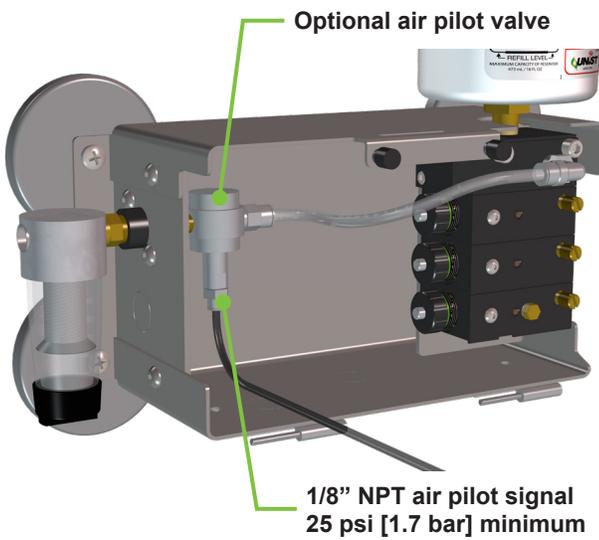


Figure 29: Pneumatic air pilot valve

**Helpful hint:** You can manually stroke a pump by pressing the end of the piston to move the pump's piston. This can be useful in diagnosing system problems.

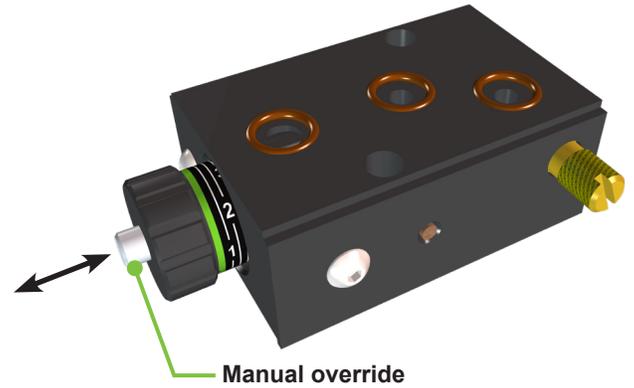
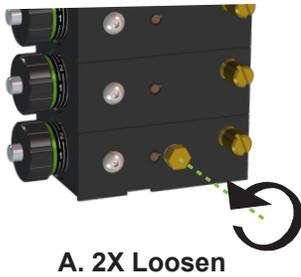


Figure 30: Manual override

# System Startup

## Prime The Pumps

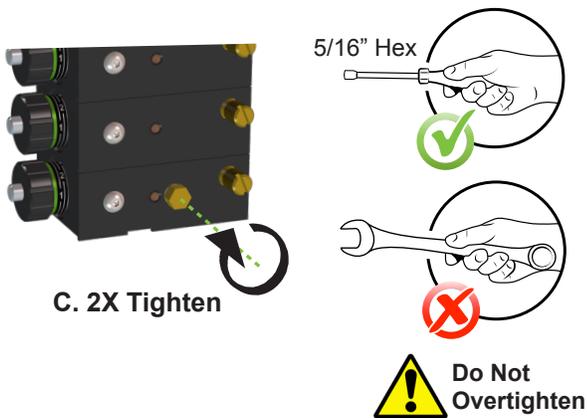
To prime the system, use a 5/16" nut driver to turn the drain plug on the bottom pump two turns counterclockwise to bleed trapped air. Once fluid is present, close the plug; **do not overtighten or you will break the drain plug**. It is recommended a nut driver be used, and not a wrench, to reduce the chance of over tightening. The screw should be snug, tightened just enough so the fluid does not leak from the drain. A rag can be placed below the drain plug to catch the fluid.



A. 2X Loosen



B. Drip



C. 2X Tighten

Figure 31: Priming the pumps

The priming procedure may need to be performed again if there is a lot of air trapped in the fluid path between the reservoir and the bottom pump.



**Attention:** Be careful to not spill any oil during the pump stack bleeding process. Clean up any spilled oil immediately as spilled oil can cause hazardous slippery conditions.

To complete pump priming, adjust the pump(s) to full stroke and then cycle repeatedly until fluid is pumping consistently. When priming is complete, adjust the pump stroke back to the previous setting.



**Attention:** Ensure all people are clear from the area of the system output nozzles when operating the outputs manually. Failure to do so could result in personal injury.

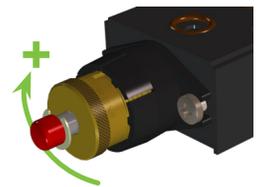
## Set Pump Stroke

Set the pump output to be what is needed for the operation.

**Note:** Adjustment procedure depends on the pump style

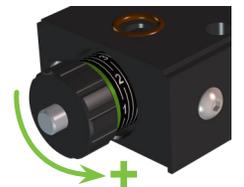
**Standard pumps (pumps with a knurled brass adjustment knob):**

The pump stroke is decreased by turning the knob counterclockwise. Full stroke is when the knob is turned fully clockwise.



**MV pumps (pumps that have a black anodized aluminum adjustment knob):**

The pump stroke is decreased by turning the knob clockwise. Full stroke is when the knob is turned fully counterclockwise.

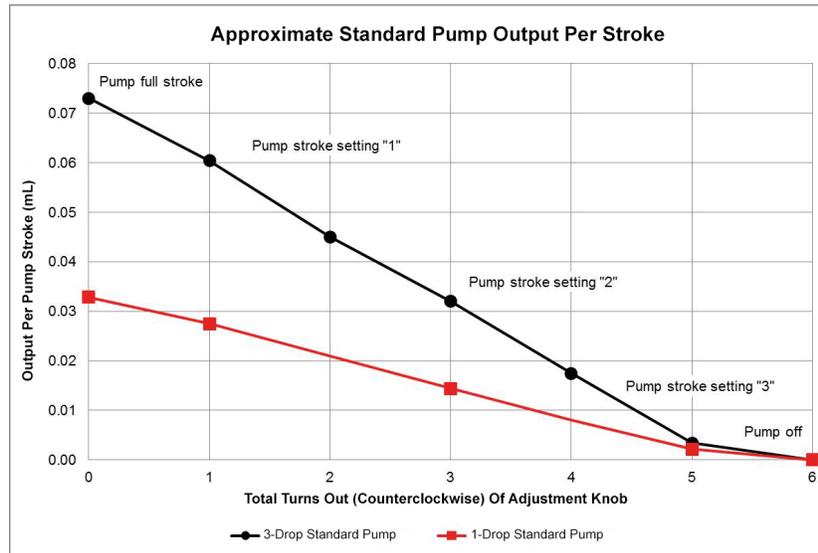


# System Startup

**3-Drop Standard Pump (Black Cap)**



**1-Drop Standard Pump (Red Cap)**

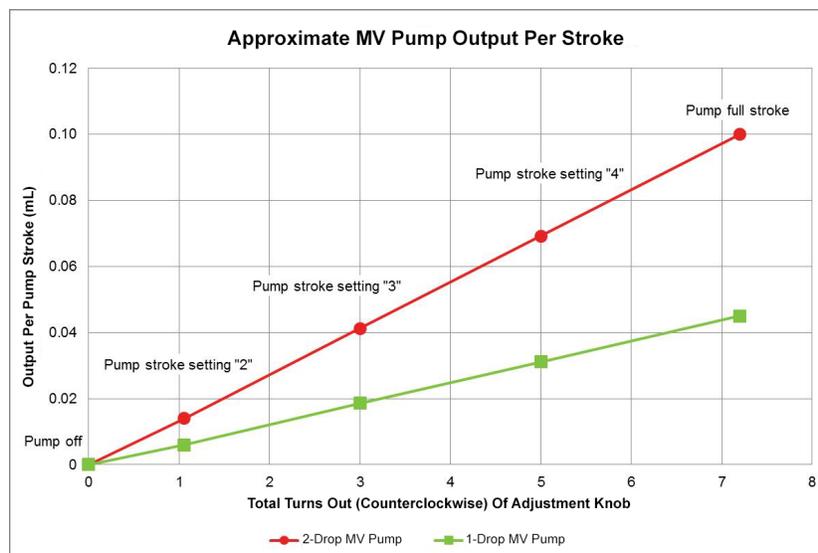


**Figure 32: Approximate standard pump output per stroke**

**2-Drop MV Pump (Red Band)**



**1-Drop MV Pump (Green Band)**



**Figure 33: Approximate MV pump output per stroke**

# System Startup

## Adjust Airflow

On atomizing pumps, the air metering screw will adjust how fine a spray is generated. Too little air will result in a pulsating and spitting spray. Too much air will create a fog of very fine mist. Adjust the air metering screw to the desired degree of atomization for the application.

The recommended initial setting for the air metering screw is found by rotating the air metering screw clockwise until it is fully seated, then backing it off 3/4 of a turn (270 degrees).

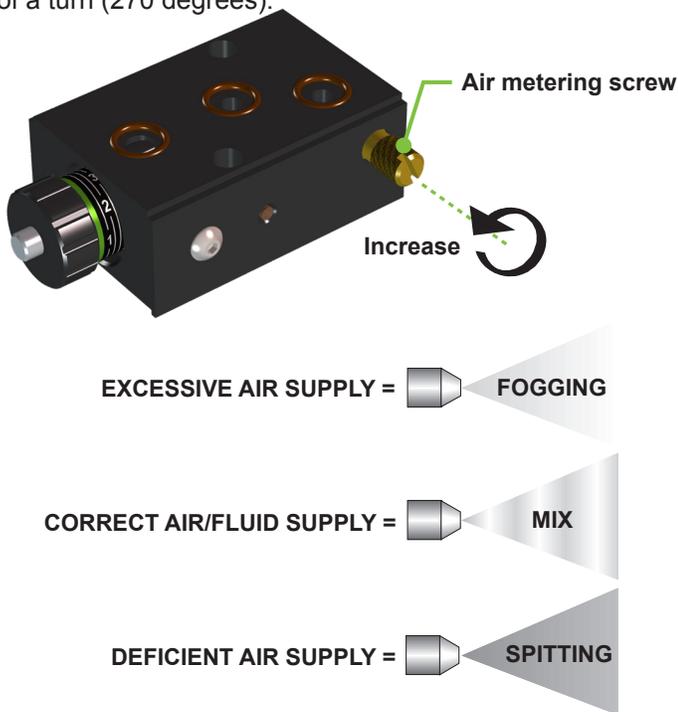


Figure 34: Adjusting airflow

**Note:** Use the minimum amount of air necessary to deliver the fluid to the point of application. Excess air flow will cause undesirable fogging!

## Adjust Pulse R™

If system is equipped with a Pulse R™ a flashing "S" is shown as the first digit, followed by the number of shots the system will deliver upon power up. The cycle rate will be set to 100 cycles per minute by default. The user can use the up and down arrows to adjust the number of shots. If the cycle rate needs to be increased or decreased the user must go into the mode selection.

**Note:** The Pulse R™ is configured for the desired operating mode at the factory and the mode should only be changed if directed to do so by a Unist representative. Reference Appendix H: Pulse R Operating Modes for more information.



Figure 35: Adjust Pulse R

# System Startup

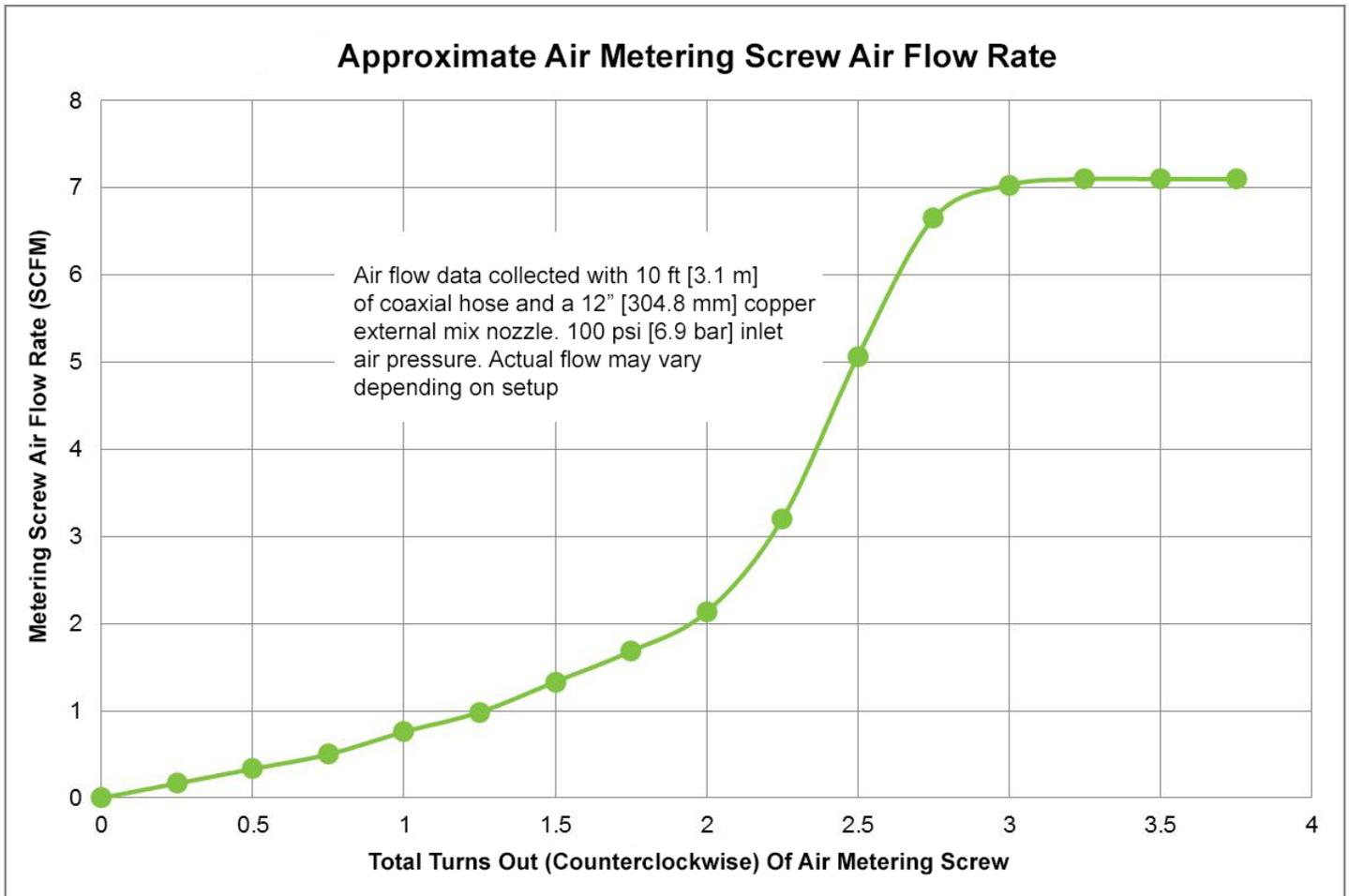


Figure 36: Approximate air metering screw air flow rate

# Nozzles

## Nozzle Styles

### Flexible Plastic

Plastic nozzles are easy to aim to where the spray is needed, and there is no work-hardening on the nozzle if it is repeatedly bent into different shapes. The downside of this style nozzle is if there are things that can hit the nozzle, such as metal chips in cutting operations or an operator cleaning the machine, the nozzle is easily moved out of position. The spray output will have a conical shape with an included angle of approximately 15-20 degrees, depending on the amount of air introduced.

Shown with optional stainless steel tip



Figure 37: Flexible plastic nozzle

### Semi-Rigid Copper

Semi-rigid copper nozzles are our most popular nozzle. They offer a nice balance of flexibility and rigidity. They are easily bent and molded to shape, and they hold that shape well when hit or impacted with moderate force. Repeated bending can cause work-hardening, and eventually the nozzle body will crack. The spray output will have a conical shape with an included angle of approximately 15-20 degrees, depending on the amount of air introduced.



Figure 38: Semi-rigid copper nozzle

### Stainless Steel

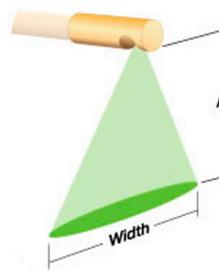
Stainless steel nozzles offer very good rigidity; they are not easily bent into, or out of shape. This makes them the preferred choice when the nozzle will be put in one position, and the force expected to be exerted on the nozzle is more than a copper nozzle can withstand without deforming. The spray output will have a conical shape with an included angle of approximately 15-20 degrees, depending on the amount of air introduced.



Figure 39: Stainless steel nozzle

### Fan Spray

Fan spray nozzles are useful when an elliptical spray pattern fits the application better than a conical pattern. An example of this would be coating an item coming down a conveyer line. The chart below gives approximations of the spray area coverage.



Spray Dimensions				
A	Min	Width	Max	+ / -
1.00" [25.4 mm]	1.60" [40.6 mm]	2.40" [60.9 mm]	3.20" [81.3 mm]	0.80" [20.3 mm]
2.00" [50.8 mm]	2.90" [73.7 mm]	3.80" [96.5 mm]	4.70" [119.4 mm]	0.90" [22.9 mm]
3.00" [76.2 mm]	4.10" [104.1 mm]	5.20" [132.1 mm]	6.30" [160.0 mm]	1.10" [27.9 mm]
4.00" [101.6 mm]	5.30" [134.6 mm]	6.60" [167.6 mm]	7.90" [200.7 mm]	1.30" [33.0 mm]
5.00" [127 mm]	6.50" [165.1 mm]	8.00" [203.2 mm]	9.50" [241.3 mm]	1.50" [38.1 mm]
6.00" [152.4 mm]	7.70" [195.6 mm]	9.40" [238.8 mm]	11.10" [281.9 mm]	1.70" [43.2 mm]

Figure 40: Fan spray nozzle

# Nozzles

## Connecting & Disconnecting Tubing & Nozzles

When ordered as a system, the nozzles, and associated tubing, will come attached to the applicator. To ease the routing of the tubing or make a cleaner installation, the tubing can be disconnected from the nozzle, trimmed to length, and reattached. Knowing the proper technique to attach the coaxial tubing to the unit or the nozzle can make this task much easier. Watching the tutorial video “**Working With The Redesigned Capillary Splicer**” found at [unist.com/splice](http://unist.com/splice) is recommended before disconnecting the tubing.

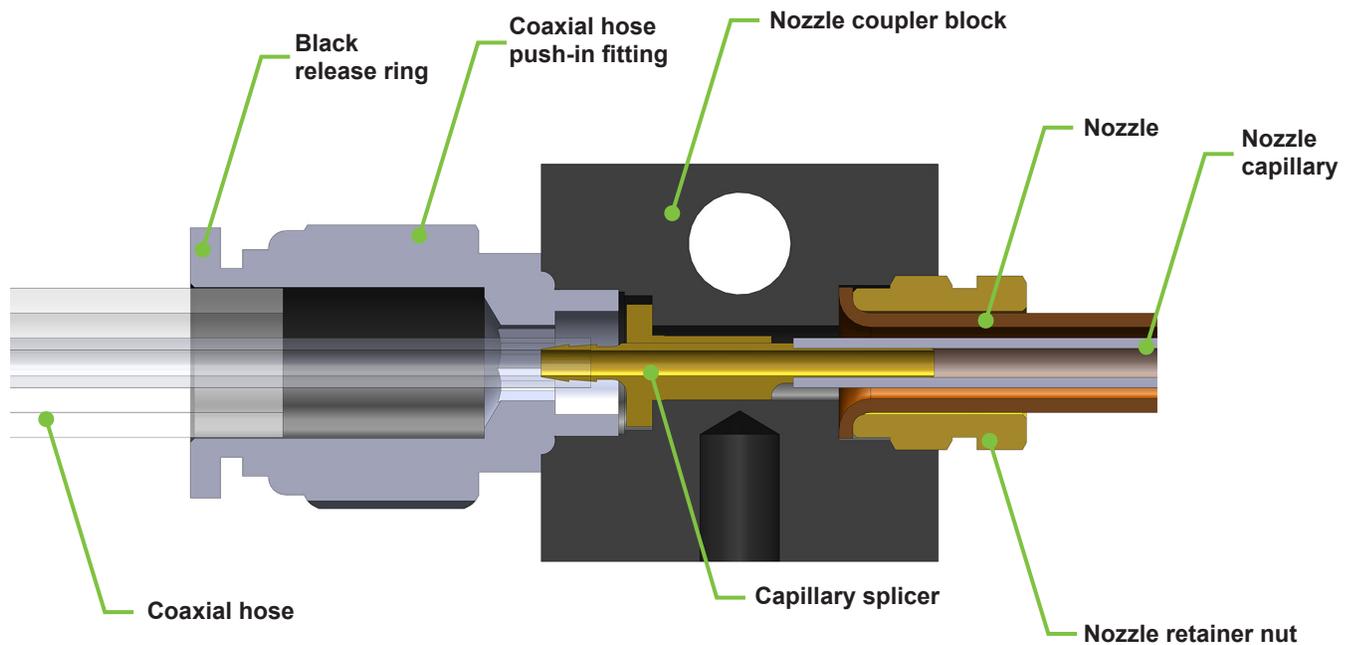


Figure 41: Capillary splicer cross section

# Troubleshooting



**Attention:** While troubleshooting it may be necessary to access the electrical solenoid on the Serv-O-Spray™. Only qualified individuals should perform such work and control power to the Serv-O-Spray™. Should be turned off when accessing this enclosure.

## Pump is not cycling

- Confirm inlet air pressure is between 60-100 psi [4-7 bar].
- Confirm that actuation of the controlling solenoid valve or air pilot valve allows air to flow into the system.

## No fluid output from cycling pump

- Confirm that the fluid reservoir is not empty.
- Confirm that the inlet air pressure is between 60-100 psi [4-7 bar].
- Perform the pump priming procedure, previously described in the section titled **“Prime The Pumps”** on page 14.
- Perform a pump rebuild.  
(Watch the video: [unist.com/rebuild](http://unist.com/rebuild)).

## Reduced fluid output

- Confirm that the fluid reservoir is not empty.
- Confirm that the inlet air pressure is between 60-100 psi [4-7 bar].
- Confirm that the pump stroke adjustment knob is set appropriately.
- Perform the pump priming procedure, previously described in the section titled **“Prime The Pumps”** on page 14.
- Perform a pump rebuild.  
(Watch the video: [unist.com/rebuild](http://unist.com/rebuild)).

## Fluid flows continuously out of a nozzle without pumps cycling

- Perform a pump rebuild to replace outlet check valve seal and spring.

## Air bubbling upward into fluid reservoir when system operating

- Perform a pump rebuild to replace outlet check valve seal and spring.

## Fluid accumulation in outer tubing

- Increase atomizing air flow.
- Position nozzles as shown in the section titled **“Keeping fluid out of the outer tube”** on page 20.

## Keeping fluid out of the outer tube

In some instances the fluid can accumulate in the outer tubing. This is usually caused when too little atomizing air flow is used and/or the fluid line is lower than the nozzle coupling block. The problem can be alleviated by:

1. Increasing the atomizing air flow
2. Raising the fluid line so the fluid flows down into, and eventually out of, the nozzle.
3. Mounting the nozzle coupler block at an angle so fluid flows down into, and eventually out of, the nozzle. See the illustrations below for an example of how to mount the nozzle coupler block.



Figure 42: Correct way to mount the coupler block

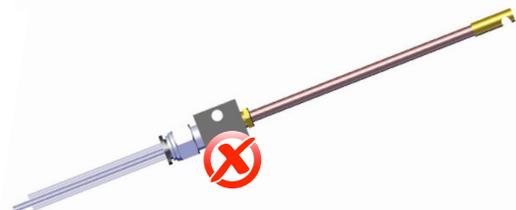


Figure 43: Incorrect way to mount the coupler block

# Troubleshooting

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## Fault Indication

A red light between the buttons indicates that a fault condition is or was present. This will be accompanied with a FXX fault code.

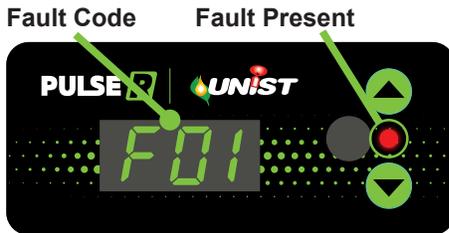


Figure 44: Fault Indication

The system will attempt to operate normally regardless of the fault state. Faults can be cleared when the fault state is no longer active and the user has pressed the up or down button.

### F01 = Output Circuit Error

An F01 error indicates one of three possibilities:

1. An open circuit is detected. Check to ensure that the Pulse R™ is appropriately connected to valve.
2. A short circuit is detected. Check for any shorts in the system on the output side of the Pulse R™.
3. A valve that is not 24VDC is connected to the Pulse R™.

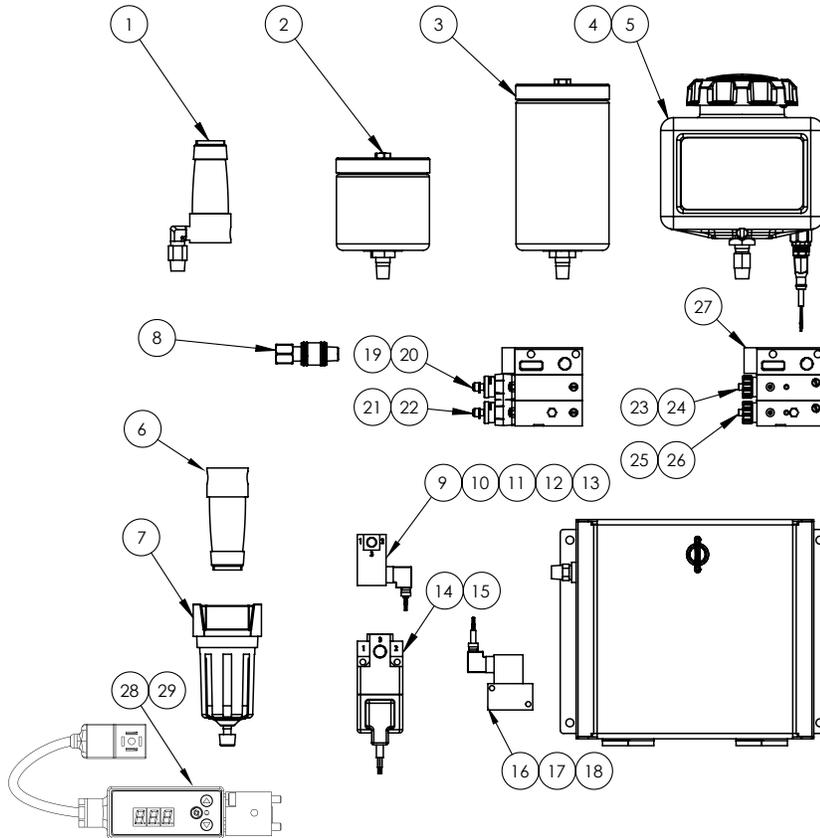
### F02 = Major System Fault

An F02 error indicates that the system has detected an issue within the memory or processor that cannot be resolved. Contact Unist for a replacement system.

### F03 = Incoming Voltage out of range

An F03 error indicates that the incoming voltage is outside of the allowable range. The incoming power must be 24VDC +/- 10%.

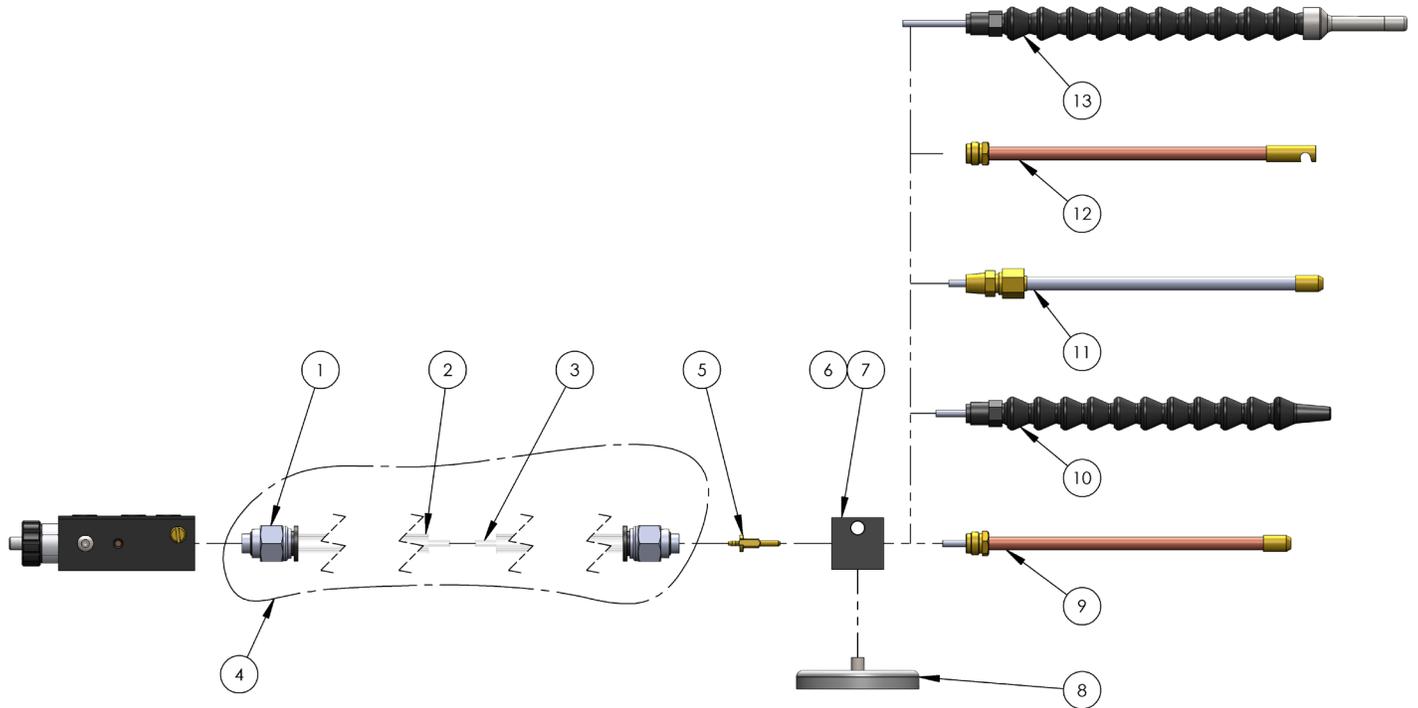
# Appendix A: System Spare Parts



29	PULSE R WITH MANIFOLD MOUNT VALVE, 9.4MM WAFER, SHOT MODE	305310-C3
28	PULSE R WITH MANIFOLD MOUNT VALVE, 18MM WAFER, SHOT MODE	305310-A3
27	ASSEMBLY, OR ELEMENT BLOCK	60-6395
26	PUMP ASSEMBLY, BOTTOM, 1-DROP	302099
25	PUMP ASSEMBLY, BOTTOM, 2-DROP	302101
24	PUMP ASSEMBLY, INTERMEDIATE, 1-DROP	302098
23	PUMP ASSEMBLY, INTERMEDIATE, 2-DROP	302100
22	METERING PUMP, 1-DROP, BOTTOM BLOCK	94-6821
21	METERING PUMP, 3-DROP, BOTTOM BLOCK	94-6823
20	METERING PUMP, 1-DROP, INTERMEDIATE BLOCK	94-6811
19	METERING PUMP, 3-DROP, INTERMEDIATE BLOCK	94-6813
18	SOLENOID VALVE, STACKABLE, 24 VAC, W/2M DIN	68-1041-1824VAD
17	SOLENOID VALVE, STACKABLE, 110 VAC, W/2M DIN	68-1041-18-110D
16	SOLENOID VALVE, STACKABLE, 24 VDC, W/2M DIN	68-1041-1824VDD
15	Solenoid Valve, 1/4", 24 VAC, w/ 2m DIN	68-1040-24VACD
14	Solenoid Valve, 1/4", 110 VAC/24 VDC, w/ 2m DIN	68-1040-110D
13	Solenoid Valve, 1/8", 24 VAC, w/ 2m DIN	68-1040-18-24D
12	Solenoid Valve, 1/8", 12 VDC, w/ 2m DIN	68-1040-1812VDD
11	Solenoid Valve, 1/8", 220 VAC, w/ 2m DIN	68-1040-18-220D
10	Solenoid Valve, 1/8", 110 VAC, w/ 2m DIN	68-1040-18-110D
9	Solenoid Valve, 1/8", 24 VDC, w/ 2m DIN	68-1040-1824VDD
8	MANUAL SLEEVE VALVE, 1/4 NPT	69-5506
7	AIR FILTER, 1/4 NPT	F60-2
6	AIR FILTER, 1/4 NPT	69-459
5	RESERVOIR ASSEMBLY, 64 OZ., UNI-MAX W/LOW LEVEL SENSOR	301313
4	RESERVOIR ASSEMBLY, 64 oz.	301311
3	RESERVOIR, 32 oz, POLYETHYLENE	69-460
2	RESERVOIR, 16 oz, POLYETHYLENE	69-459-PE
1	AIR TRAP, 1/4 NPT	6139
ITEM NO.	DESCRIPTION	PART NUMBER

Figure 45: System spare parts

# Appendix B: Nozzle Spare Parts

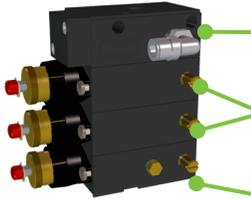


13	X" PLASTIC NOZZLE, EXTERNAL MIX, W/STAINLESS STEEL TIP	6121-P-XP-SS
12	X" COPPER NOZZLE, FAN SPRAY	60-6100-XSR-FS
11	X" STAINLESS STEEL NOZZLE, EXTERNAL MIX, 1/8 NPT	6121PT-P-XSS
10	X" PLASTIC NOZZLE, EXTERNAL MIX	6121-P-XP
9	X" COPPER NOZZLE, EXTERNAL MIX	6121-P-XSR
8	MAGNET, NOZZLE BLOCK	60-6340-22
7	NOZZLE COUPLER BLOCK, 1/8 NPT, 7/16-20	6110
6	NOZZLE COUPLER BLOCK, 1/8 NPT, 1/8 NPT	6110-3
5	SPLICER, CAPILLARY TUBING, W/O HOLE	302116
4	COAX HOSE, W/ FITTINGS, TBD' LG.	6123PT-TBD
3	TUBING, 1/8 OD NYLON CAPILLARY, TBD' LG.	71-2050
2	3/8" OD TUBING, POLYURETHANE, TBD' LG.	6100-TBD
1	PUSH IN FITTING, 3/8" X 1/8" UNIVERSAL PIPE THREAD	301875
ITEM NO.	DESCRIPTION	PART NUMBER

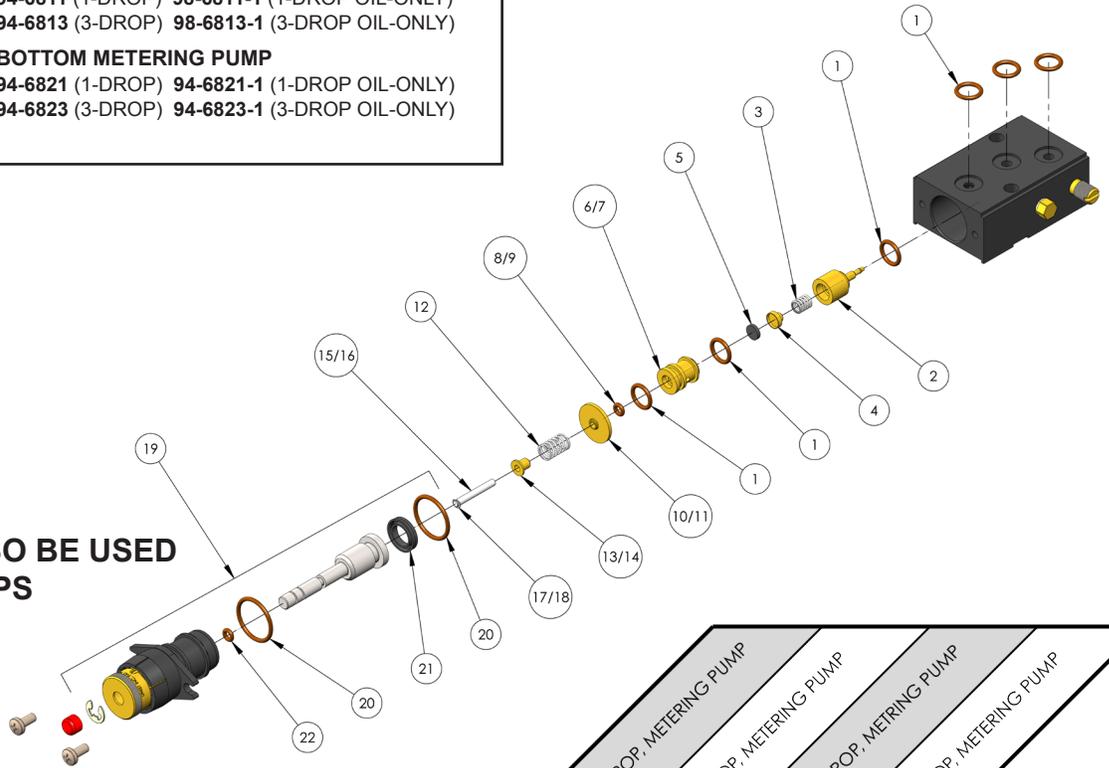
**Figure 46: Nozzle spare parts**

# Appendix C: Standard Pump Components

**STANDARD COMPONENTS**

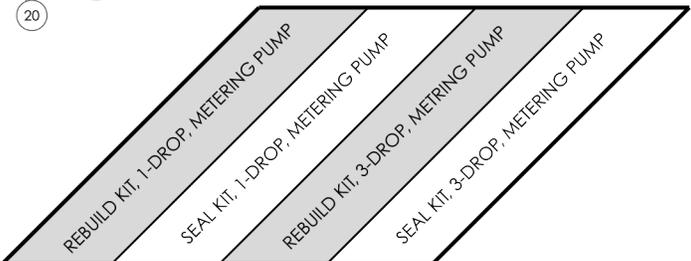


- MANIFOLD**  
94-6900-1
- INTERMEDIATE METERING PUMP(S)**  
94-6811 (1-DROP) 98-6811-1 (1-DROP OIL-ONLY)  
94-6813 (3-DROP) 98-6813-1 (3-DROP OIL-ONLY)
- BOTTOM METERING PUMP**  
94-6821 (1-DROP) 94-6821-1 (1-DROP OIL-ONLY)  
94-6823 (3-DROP) 94-6823-1 (3-DROP OIL-ONLY)



**NOTE: KITS CAN ALSO BE USED WITH OIL-ONLY PUMPS**

**EXPLODED VIEW OF INTERNAL KIT PARTS  
-ORDER BY KIT NUMBER ONLY-**



ITEM NO.	DESCRIPTION	PART NUMBER	94-6831-1 QTY.	94-6831-2 QTY.	94-6833-1 QTY.	94-6833-2 QTY.
1	O-RING, ID .364, CS .070, VITON	2-012-V884-75	6	6	6	6
2	HOUSING, CHECK VALVE, METERING PUMP	89-6900-10	1	-	1	-
3	SPRING, CHECK VALVE, INJECTOR PUMP	9303-108	1	-	1	-
4	BODY, CHECK VALVE, INJECTOR PUMP	9303-107	1	-	1	-
5	CHECK SEAL, CHECK VALVE, VITON, INJECTOR PUMP	9303-112	1	1	1	1
6	INSERT, 1-DROP	94-6808-12	1	-	-	-
7	INSERT, 3-DROP	94-6808-18	-	-	1	-
8	O-RING, ID .114, CS .070, VITON	2-006-V884-75	1	1	-	-
9	O-RING, ID .176, CS .070, VITON	2-008-V358-75	-	-	1	1
10	WASHER, 1-DROP, INJECTOR PUMP	9303-110	1	-	-	-
11	WASHER, 3-DROP, INJECTOR PUMP	95-1001	-	-	1	-
12	SPRING, RETURN, INJECTOR	94-6100-8	1	-	1	-
13	SLEEVE, SPRING RETAINING	94-6812	1	-	-	-
14	WASHER, BRASS, METERING PIN, 3-DROP PUMP	94-6803-2	-	-	1	-
15	METERING PIN, 1-DROP, METERING PUMP	94-6806-12	1	-	-	-
16	METERING PIN, 3-DROP, INJECTOR PUMP	94-6806-18	-	-	1	-
17	RETAINING CLIP, 1-DROP, METERING PIN, INJECTOR PUMP	5103-0012SPPR	1	-	-	-
18	RETAINING CLIP, 3-DROP, METERING PIN, INJECTOR PUMP	5103-0018SPPR	-	-	1	-
19	ASSEMBLY, END CAP, INJECTOR PUMP	94-6801-A	1	-	1	-
20	O-RING, ID .739, CS .070, BUNA	2-018	-	2	-	2
21	U-CUP, BUNA, 1/8" CROSS SEC. x 3/8 ID, 5/8 OD	9303-111	-	1	-	1
22	O-RING, ID .114, CS .070, BUNA	2-006	-	1	-	1

Figure 47: Standard pump components

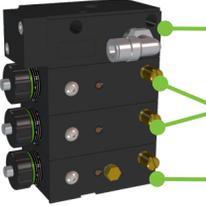
# Appendix D: MV Pump Components

**STANDARD COMPONENTS**

**MANIFOLD**  
94-6900-1

**INTERMEDIATE METERING PUMP(S)**  
302098 (1-DROP) 302410 (1-DROP OIL-ONLY)  
302100 (2-DROP) 302418 (2-DROP OIL-ONLY)

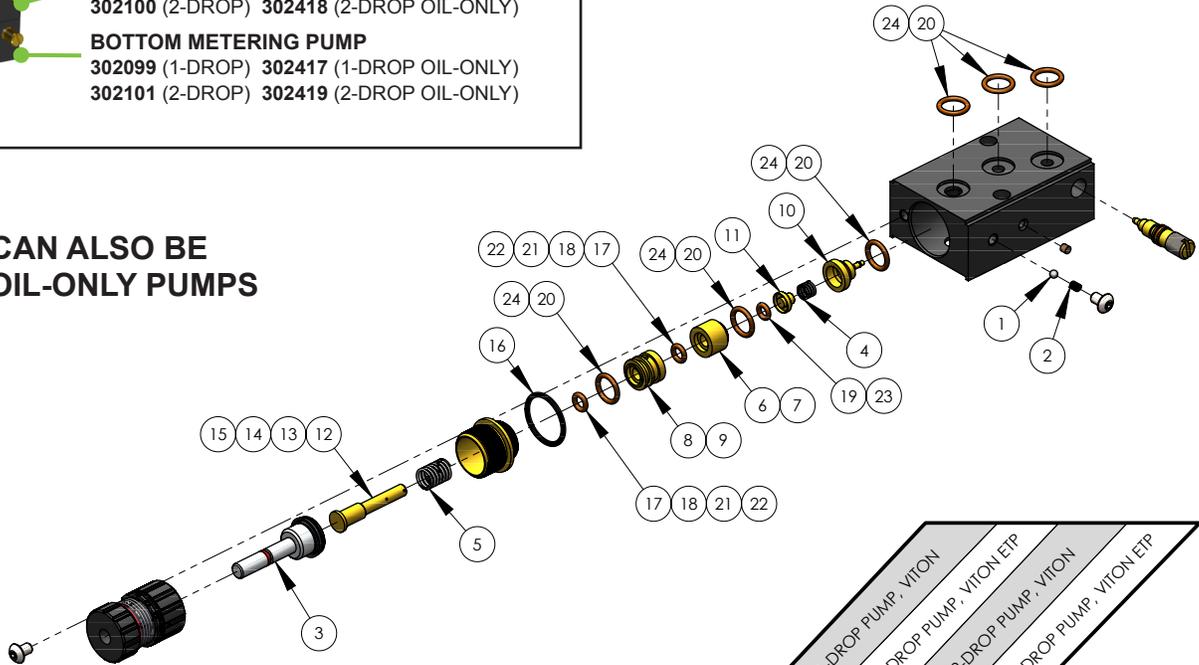
**BOTTOM METERING PUMP**  
302099 (1-DROP) 302417 (1-DROP OIL-ONLY)  
302101 (2-DROP) 302419 (2-DROP OIL-ONLY)



**PULSE R™ ASSEMBLY**  
305310-A3 (18mm WAFER)  
305310-C3 (9.4mm WAFER)



**NOTE: KITS CAN ALSO BE USED WITH OIL-ONLY PUMPS**

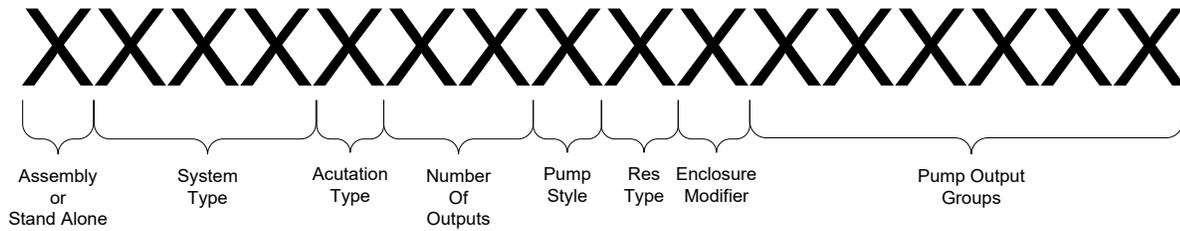


**EXPLODED VIEW OF INTERNAL KIT PARTS  
-ORDER BY KIT NUMBER ONLY-**

ITEM NO.	DESCRIPTION	PART NUMBER	REBUILD KIT, MV 1-DROP PUMP, VITON			
			301877 QTY	303811-ETP QTY	301878 QTY	303812-ETP QTY
1	BALL BEARING, STAINLESS STEEL, 1/8 DIAMETER	71-2031-1	1	1	1	1
2	SPRING, DETENT	301868	1	1	1	1
3	PISTON ASSEMBLY, INJECTOR PUMP	301872	1	1	1	1
4	SPRING, OUTLET CHECK VALVE	301850	1	1	1	1
5	SPRING, PISTON RETURN	301859	1	1	1	1
6	INSERT, METERING PIN, LOWER, 1-DROP	301851	1	1	-	-
7	INSERT, METERING PIN, LOWER, 2-DROP	301852	-	-	1	1
8	INSERT, METERING PIN, UPPER, 1-DROP	301853	1	1	-	-
9	INSERT, METERING PIN, UPPER, 2-DROP	301854	-	-	1	1
10	HOUSING, CHECK VALVE, OUTLET	301848	1	1	1	1
11	BODY, OUTLET CHECK SEAL	301849	1	1	1	1
12	METERING PIN, BALL CHECK VALVE, 1-DROP ASSEMBLY, VITON	301870	1	-	-	-
13	METERING PIN, BALL CHECK VALVE, 1-DROP ASSEMBLY, VITON ETP	304560-ETP	-	1	-	-
14	METERING PIN, BALL CHECK VALVE, 2-DROP ASSEMBLY, VITON	301871	-	-	1	-
15	METERING PIN, BALL CHECK VALVE, 2-DROP ASSEMBLY, VITON ETP	304561-ETP	-	-	-	1
16	O-RING, ID .739, CS .070, BUNA	2-018	2	2	2	2
17	O-RING, ID .114, CS .070, VITON	2-006-V884-75	2	-	-	-
18	O-RING, ID .176, CS .070, VITON	2-008-V358-75	-	-	2	-
19	O-RING, ID .145, CS .070, VITON	2-007-V884-75	1	-	1	-
20	O-RING, ID .364, CS .070, VITON	2-012-V884-75	6	-	6	-
21	O-RING, ID .114, CS .070, VITON ETP	304598-ETP	-	2	-	-
22	O-RING, ID .176, CS .070, VITON ETP	304599-ETP	-	-	-	2
23	O-RING, ID .145, CS .070, VITON ETP	304676-ETP	-	1	-	1
24	O-RING, ID .364, CS .070, VITON ETP	304600-ETP	-	6	-	6

Figure 48: MV pump components

# Appendix E: System Part Numbering Scheme



## 1<sup>st</sup> Character: Assembly or Stand Alone

Designator	Description
A	Assembly - Mated w/ outputs
S	Stand Alone-No output. System only

## 2<sup>nd</sup>, 3<sup>rd</sup> & 4<sup>th</sup> Character: System Type

Designator	Description
200	Serv-O-Spray
210	Serv-O-Spray w/ Pulse R timer

## 5<sup>th</sup> Character: Actuation Type

Designator	Description
A	110VAC Solenoid-Common Actuation
B	24VAC Solenoid-Common Actuation
C	220VAC Solenoid-Common Actuation
M	440VAC Solenoid-Common Actuation
D	24VDC Solenoid-Common Actuation
N	12VDC Solenoid-Common Actuation
Q	24VDC/110VAC Solenoid - Common
F	24VAC Solenoid-Independent Actuation
G	24VDC Solenoid-Independent Actuation
E	110VAC Solenoid-Independent Actuation
P	220VAC Solenoid-Independent Actuation
H	Air Pilot Valve
J	Air Pilot Valve with Foot Pedal
K	Manual Valve
X	No Valve

## 6<sup>th</sup> and 7<sup>th</sup> Character: Number of Outputs

Designator	Description
01-16	1-16 outputs

## 8<sup>th</sup> Character: Pump Style

Designator	Description
A	Standard Viscosity 1 drop
B	Standard Viscosity 3 drop
C	Multi Viscosity 1 drop
D	Multi Viscosity 2 drop
E	Oil Only, SV, 1 drop
F	Oil Only, SV, 3 drop
G	Oil Only, MV, 1 drop
H	Oil Only, MV, 2 drop

## 9<sup>th</sup> Character: Reservoir Type

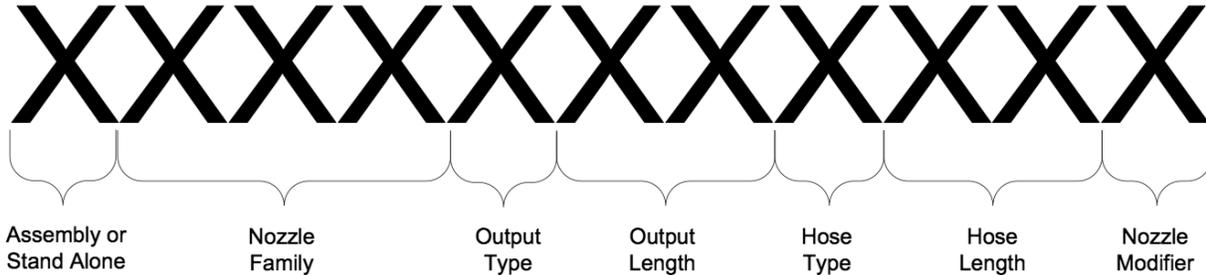
Designator	Description
B	16 oz Gravity Feed
C	32 oz Gravity Feed
D	64 oz Gravity Feed
E	64 oz Gravity Feed w/ LL
F	Air Trap Kit
X	No Reservoir

## 10<sup>th</sup> Character: Enclosure Modifier

Designator	Description
A	Standard Enclosure
B	Standard Enclosure w/ Magnet Mount
C	Standard Enclosure w/ Key Lock
D	Standard Enclosure w/ Magnet Mount and Key Lock
E	No Enclosure and Bottom Magnet Mount
X	No Enclosure

Figure 49: System part numbering scheme

# Appendix F: Nozzle Part Numbering Scheme



### 1st Character: Assembly or Stand Alone

Designator	Description
A	Assembly-Mated w/ system
S	Stand Alone-No system. Outputs only.

### 2nd, 3rd & 4th Character: Nozzle Family

Designator	Description
201	Serv-O-Spray Nozzle

### 5th Character: Output Type

Designator	Description	Use with system type
A	1/4"-Flexible Plastic	100, 200
B	1/4"-Semi-Rigid Copper	100, 200
C	1/4"-Stainless Steel	100, 200
D	1/4"-Flexible Steel	100, 200
P	1/4"-Copper Fan Spray	100, 200
T	1/4"-Plastic w/ Stainless Tip	100, 200

### 6th & 7th Character: Output Length (6" increments)

Designator	Description
06-36	Length (in inches)
XX	Predefined Length Nozzle

Special lengths additional cost

### 8th Character: Hose Type

Designator	Description	Use with system type
A	Polyurethane Coaxial Hose	100, 200
B	Braided Stainless Steel Coaxial Hose	100, 200

### 9th and 10th Characters: Hose Length (5ft increments)

Designator	Description
05-50	Length (in feet)

Special lengths additional cost

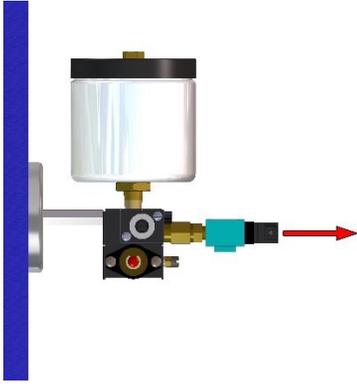
### 11th Character: Nozzle Modifier

Designator	Description
A	Standard (Magnet Only)
B	Articulated Arm Only
C	Magnet & Articulated Arm
X	No Magnet, No Articulated Arm

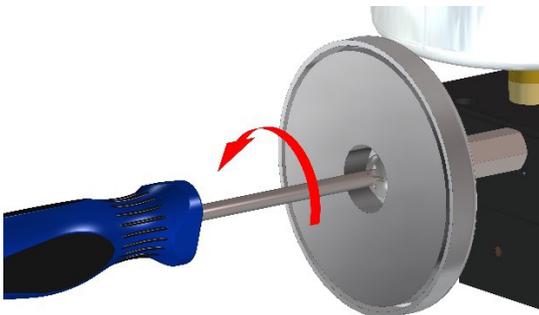
Figure 50: Nozzle part numbering scheme

# Appendix G: Magnet Mount Location Change Instructions

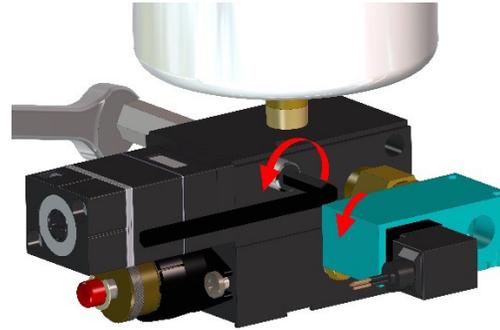
Disconnect air and power from the system, then remove the system from the mounting location.



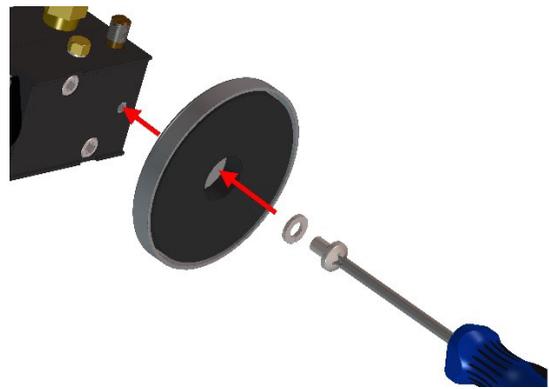
- 1) Using a phillips head screwdriver, loosen and remove the 1/4-20 x 3/8" phillips head screw and 1/4" lock washer securing the magnet to the coupling nut.



- 2) Rotate the solenoid valve (if attached to system) to create space for a 3/16" hex key to access the socket head cap screw. Use a 7/16" wrench to hold the coupling nut. Using the hex key, loosen and remove the 1/4-20 x 2 1/4" socket head cap screw and coupling nut.



- 3) Locate the 1/4-20 tapped hole on the bottom face of the bottom pump. Use the 1/4-20 x 3/8" phillips head screw and 1/4" lock washer to attach the magnet to the bottom pump.



- 4) Mount system to desired location with the magnet now installed on the bottom pump of the system.



# Appendix H: Pulse R Operating Modes

## Changing Operation Modes

The Pulse R™ is configured for the desired operating mode at the factory and should only be changed if directed to do so by a Unist representative.

To change modes, press and hold both the UP and DOWN buttons while turning on power to the Pulse R™. Continue holding buttons for 2 seconds until the mode number with a period before it is displayed.



Figure 51: Mode selection (mode 1 displayed)

Use the UP and DOWN buttons to select the desired mode. To confirm selection, press and hold the UP and DOWN buttons for 2 seconds. After 2 seconds, the display will show the set point for the selected mode. When changing to modes 3 or 4, the system will display the shot delivery rate (in cycles per minute) after pressing and holding the up/down buttons for 2 seconds. The user can then change the shot delivery rate by pressing the up or down buttons. Pressing and holding the up/down buttons for 2 seconds will then save the mode and the desired cycle rate.

## Operating Mode Details

### Mode 1 - Repeat cycle on power up

When powered on, the Pulse R™ output cycles at the rate displayed (indicated in cycles per minute) until power is removed or turned off. The rate can be adjusted from 1 to 200. The duty cycle (on/off time of each cycle) is automatically set by the Pulse R™.

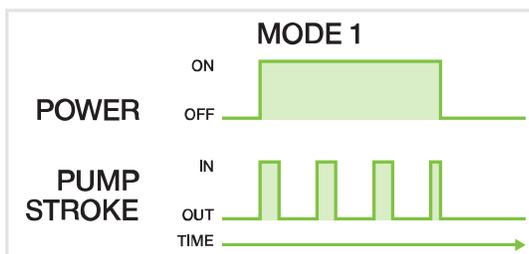


Figure 52: Mode 1 timing diagram

### Mode 2 - Repeat cycle on input signal

When powered on and the input trigger signal is high, the Pulse R™ output cycles at the rate displayed (indicated in cycles per minute) until the input or power is removed. The rate can be adjusted from 1 to 200. The duty cycle is automatically set by the Pulse R™.

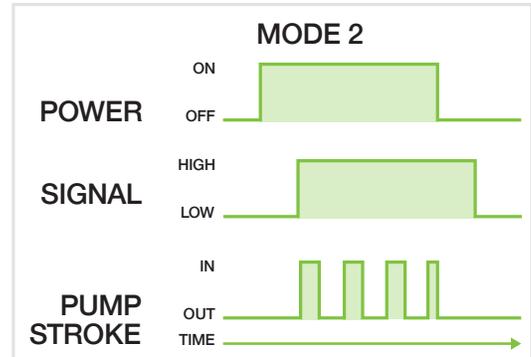


Figure 53: Mode 2 timing diagram

### Mode 3 - Deliver shots on power up

When powered on, the Pulse R™ output rapidly cycles to deliver the selected number of shots. Once power is turned off, repeat function. In mode 3 the first digit on the display will be flashing "S". The value can be adjusted from 1 to 99. The rate of these shots is determined when selecting the mode. See the Changing Operation Modes for more details.

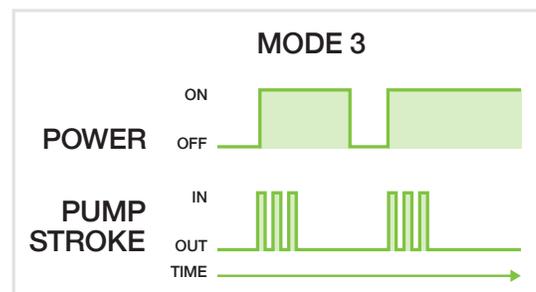


Figure 54: Mode 3 timing diagram

# Appendix H: Pulse R Operating Modes

## Mode 4 - Deliver shots on input signal

When powered on and an input signal is received, the Pulse R™ output rapidly cycles to deliver the selected number of shots. In mode 4 the first digit on the display will be flashing “S”. The value can be adjusted from 1 to 99. The rate of these shots is determined when selecting the mode. See the Changing Operation Modes for more details.

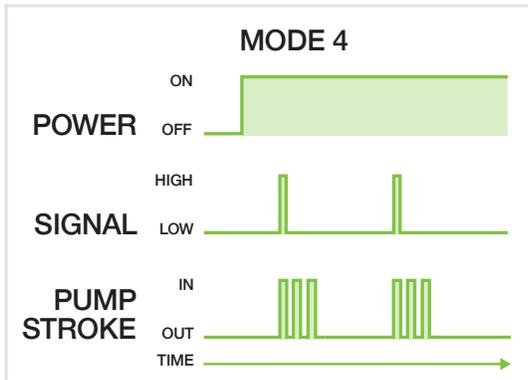


Figure 55: Mode 4 timing diagram

## Locking the Display

To prevent accidental changes to settings, the display can be locked by pressing and holding the up and down button buttons at the same time for 3 seconds. The display will show `L00` for 1 second, and then show the set point for the mode. Anytime a user interacts with the up or down button, the system will display `L00` for 1 second.



Figure 56: Locking the keypad

To unlock, press and hold the up and down buttons for 3 seconds. The display will show `uL0` for 1 second and then show the set point for the mode.



Figure 57: Unlocking the keypad

## Additional Information:



[unist.com/pulseman](http://unist.com/pulseman)







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