

Single Line & Saw Blade Lube Systems

Operation Manual





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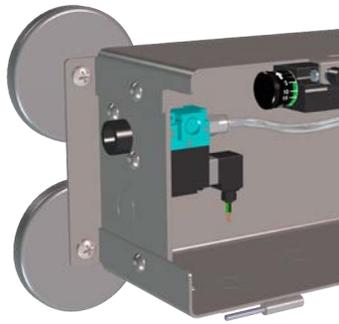
Single Line & Saw Blade Lube Systems Operation Manual

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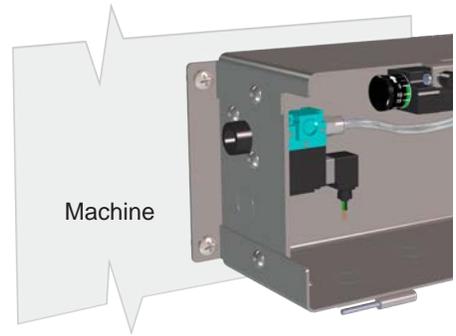
Single Line System Quick Start Guide

1. Mount (Pg. 10)



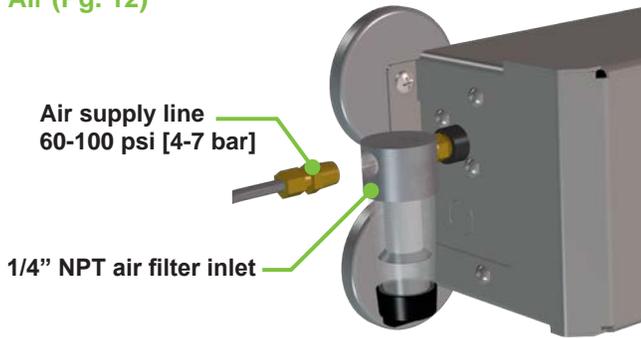
Magnet mount

or



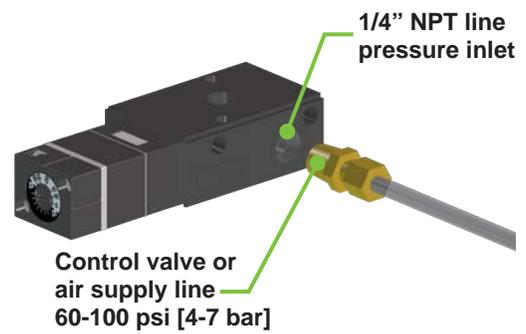
Direct mount

2. Air (Pg. 12)



Air supply to filter

or

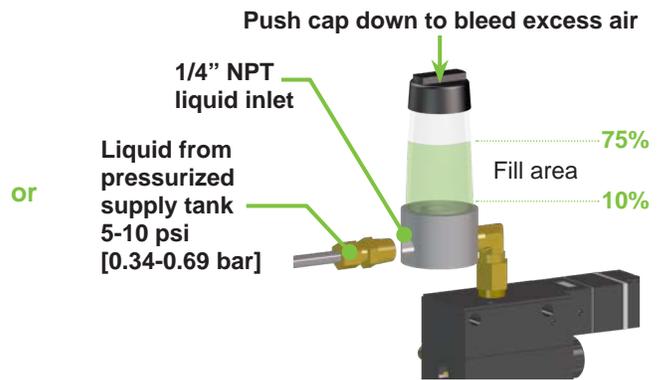


Air supply to manifold

3. Fluid (Pg. 12)

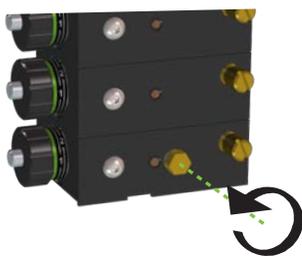


Fill reservoir



Bleed trapped air

4. Prime (Pg. 16)



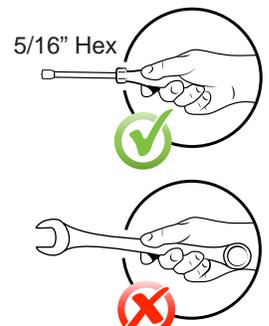
A. 2X Loosen



B. Drip



C. 2X Tighten



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Identifying Symbols



Caution - ISO 7000-0434B

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Table Of Contents

Introduction.....	1-3
Thank You.....	1
System Introduction.....	1
Common Configurations.....	2
The Standard Single Line System.....	2
The Saw Blade Lube System.....	2
The OEM System.....	2
Key Components.....	3
The Pump.....	3
Pulse Timer.....	3
Output.....	3
Standard Pump Identification Charts.....	4
MV Pump Identification Charts.....	5
System Layout.....	6
System Specifications.....	7
System Installation.....	8-14
Mounting Dimensions.....	8-9
Systems With Standard Enclosures.....	8
Systems Without Standard Enclosures.....	9
Reservoirs.....	9
Installation.....	10-12
Position & Mount System.....	10
Connect Control Valve.....	10
Connect Low Level Switch (If Applicable).....	11
Attach Air Supply.....	12
Fill Reservoir Or Air Trap.....	12
Position & Install Nozzles.....	13-14
Single Line Copper Nozzle.....	13
Splitter Nozzle.....	13
Bat Nozzle.....	13
Band Saw Blade Nozzle.....	14
Band Saw Guide Nozzle.....	14
BSB & BSG Mounting Kit.....	14

Table Of Contents

System Startup	15-19
Turning The System On & Off	15
Prime The Pumps.....	16
Setting Pump Stroke.....	16
Approximate Standard Pump Output Per Stroke.....	17
Approximate MV Pump Output Per Stroke.....	17
Adjust Stroke Frequency	18
Pulse R™.....	18
Pulse Generator With Adjustment Knob	18
Pulse Generator Without Adjustment Knob	18
Adjust Airflow	18
Approximate Air Metering Screw Air Flow Rate.....	19
Troubleshooting	20-21
Appendix A: System Spare Parts.....	22
Appendix B: Nozzle Spare Parts	23
Appendix C: Standard Pump Components.....	24
Appendix D: MV Pump Components	25
Appendix E: System Part Numbering Scheme.....	26
Appendix F: Nozzle Part Numbering Scheme.....	27
Appendix G: Magnet Mount Location Change Instructions	28
Appendix H: Pulse R Operating Modes Instructions	29-30
Notes.....	31

Introduction

Thank You

Thank you for your purchase of the Unist Single Line lubricator. Please take the time to read this operation manual to take full advantage of your new unit.

The Unist Single Line lubricator uses a positive-displacement pump to give a continuous spray of fluid at a precise rate. The system offers flexibility while maintaining simplicity and can be operated using only compressed air.



Figure 1: Saw Blade Lube system



Figure 2: Single Line system



Figure 3: OEM system

System Introduction

The Single Line lubricator gives simple, precise lubrication. The adjustable positive-displacement pumps are proven with a track record of consistency and reliability. The modular design allows multiple pumps to be stacked together when more than one output is required, so each unit can be tailored specifically for the application. Each pump stack includes a stroke adjustment for the pump output and a pulse generator to control the cycle rate of the pump.

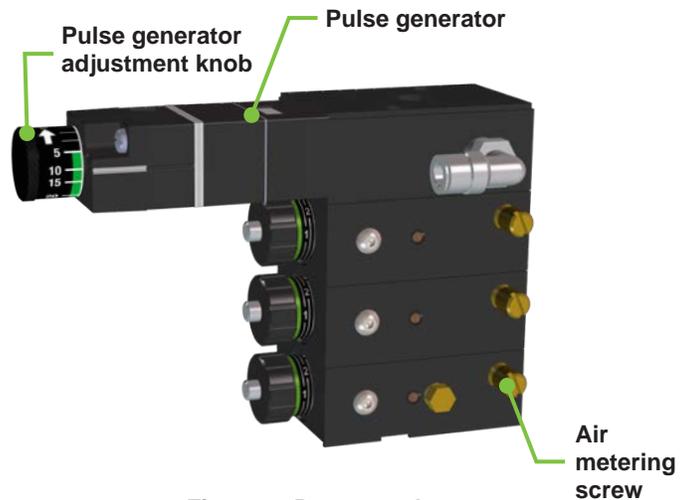


Figure 4: Pump stack

The pump also has 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 Single Line system 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

Because of its modular design, there are thousands of possible configurations for a Single Line lubricator. Units may look different because of the presence or absence of an enclosure, the size of the reservoir, or the type of nozzle attached. However, regardless of the look or nozzle, all Single Line lubricators have the same key components which use the same simple adjustments.

There are three main styles of Single Line systems: The standard Single Line system, the Saw Blade Lube system, and the OEM system.

The Standard Single Line System

The standard Single Line system is a Single Line lubricator with one or more single line copper nozzles.



Figure 5: Standard Single Line system with single line copper nozzle

The Saw Blade Lube System

The Saw Blade Lube system is a Single Line lubricator with one or more saw specific nozzles.



Figure 6: Saw Blade Lube system with band saw nozzles and Pulse R™

The OEM System

The OEM system is a single output Single Line lubricator with a small enclosure and a 16 oz [473 mL] or 32 oz [946 mL] enclosure.



Figure 7: OEM system with Bat Nozzle

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 8: Coolube® lubricant

Introduction

Key Components

The Pump

In most cases, the Single Line system 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.

There are many variations of pumps used in the Single Line 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 pump(s) 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.

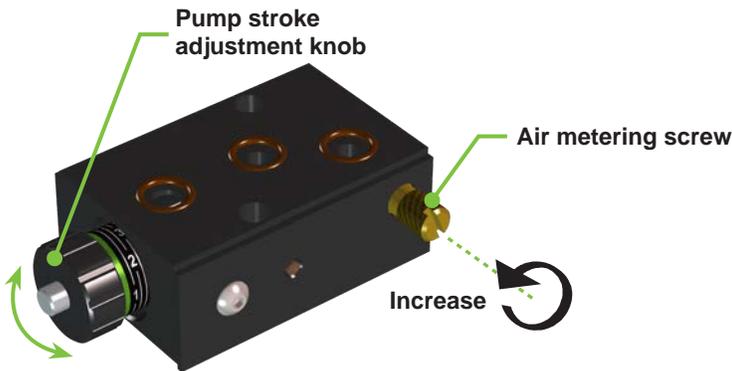


Figure 9: Air metering screw & pump stroke adjustment

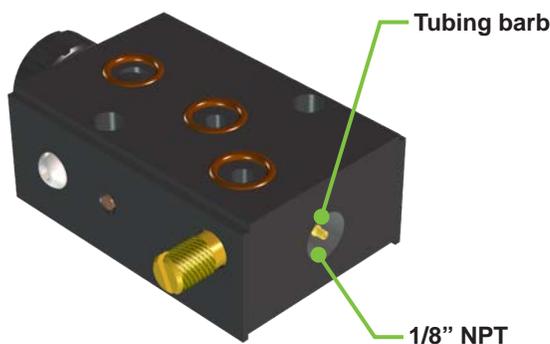


Figure 10: Outlet port

Pump Timer

The pump timer is either an electronic or pneumatic device specifically designed and manufactured by Unist to give consistent control of the pump cycle rate. This feature can be pneumatic or electronic depending on the system configuration. For pneumatic pump timers, known as pulse generators, as long as there is 60-100psi [4-7 bar] of compressed air provided to the system the cycle rate can be adjusted using the knob on the device as seen in figure 11. The Pulse R™ is a Unist designed electronic pump timer requiring 24VDC for power. This can be supplied by a 24VDC air inlet solenoid using the Pulse R™'s wafer connector. With the device powered up, the cycle rate can be adjusted using the up and down arrows on the device to ensure a precise and consistent cycle rate. Reference Appendix H: Pulse R Operating Modes for more information.



Figure 11: Pump timers

Output

The Single Line system is named from tubing that carries the air and oil mixture from the end of the pump to the tip of the nozzle. On Single Line systems, the air and oil are mixed at the pump and a single line carries this mixture to the nozzle. This is in contrast to the Unist Coolubricator™ line, where coaxial tubing carries the air and oil separately. Oil-only pumps deliver straight oil.

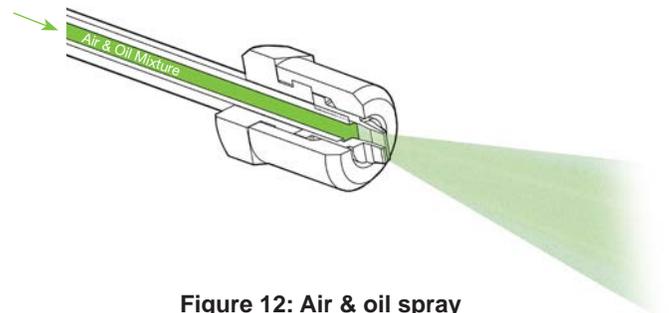
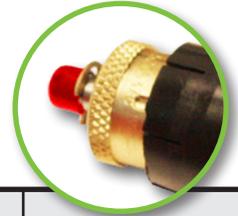


Figure 12: Air & oil spray

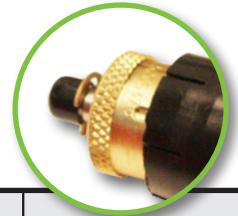
Standard Pump Identification Charts

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 13: 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 14: MV pump identification charts

System Specifications

Supply air pressure	Clean, dry compressed air, 60-100 psi [4-7 bar]				
Pumps		1-drop standard	3-drop standard	1-drop MV	2-drop MV
	Viscosity	50-1000 SUS	50-1000 SUS	30-1300 SUS	30-500 SUS
	Output at full stroke	0.033 mL	0.100 mL	0.045 mL	0.100 mL
	Output rate	0-396 mL/hr	0-1200 mL/hr	0-540 mL/hr	0-1200 mL/hr
Air flow rate	1-2 SCFM [28-56 LPM] typical for each air and oil output. 3 SCFM [85 LPM] max.				
Pump timer frequency	Recommended: 5-50 cycles per minute (Modes 1 & 2 on the Pulse R™) Maximum: 200 cycles/minute (Not recommended for continuous operation)				
Operating temperature storage	32° -122°F [0° -50°C]				
Storage temperature range	4° -158°F [-16° -70°C]				
Fluid reservoir capacity	Reservoir dependent, 16-64 oz [473-1893 mL] Fluid supplied through air trap: clean, filtered fluid, 10 psi [0.69 bar] max				

Figure 16: System specifications

System Installation

Mounting Dimensions

Systems With Standard Enclosures

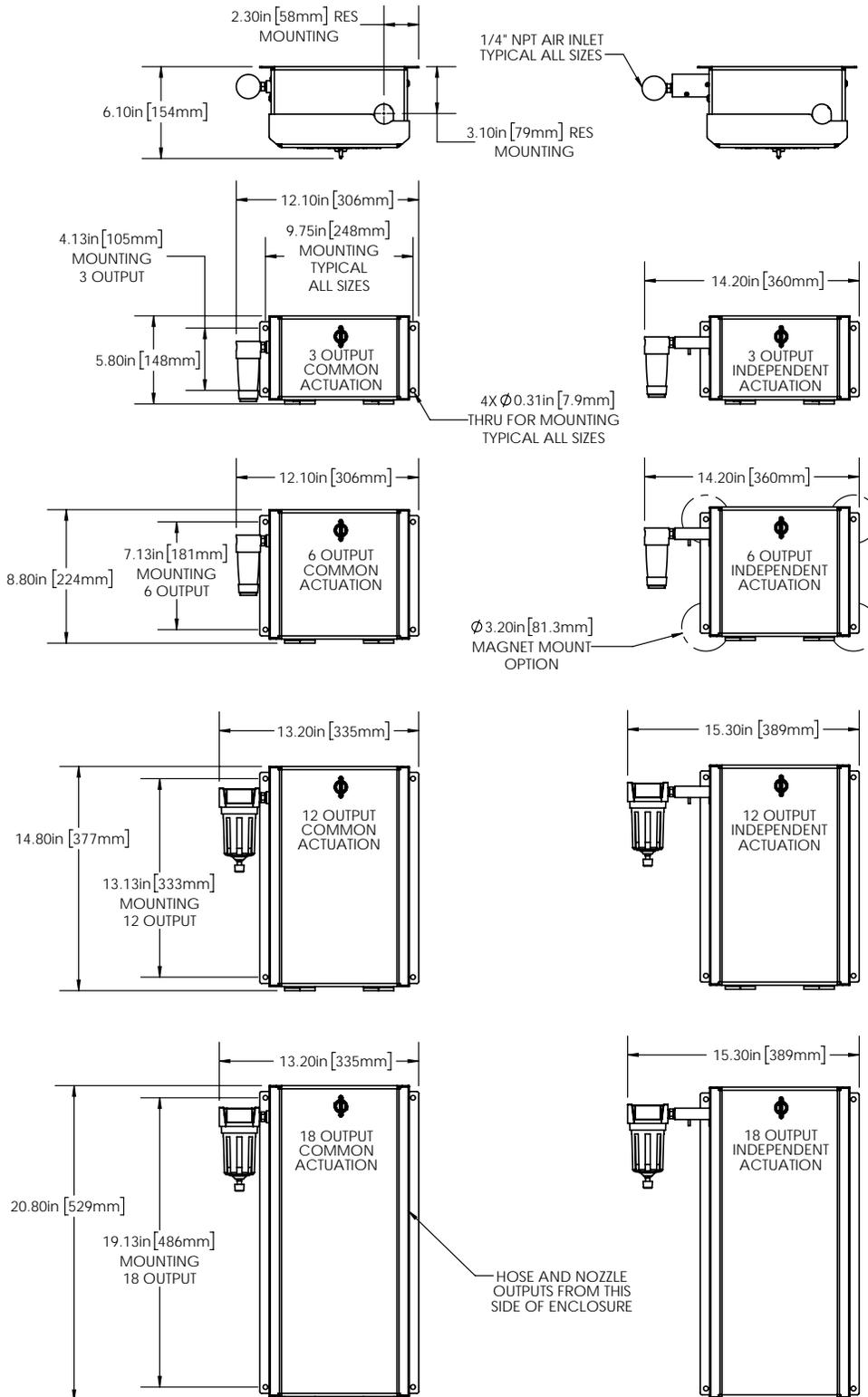


Figure 17: Systems with standard enclosures

System Installation

Systems Without Standard 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: $\text{Height} = (\text{number of pumps}) + 1.05$

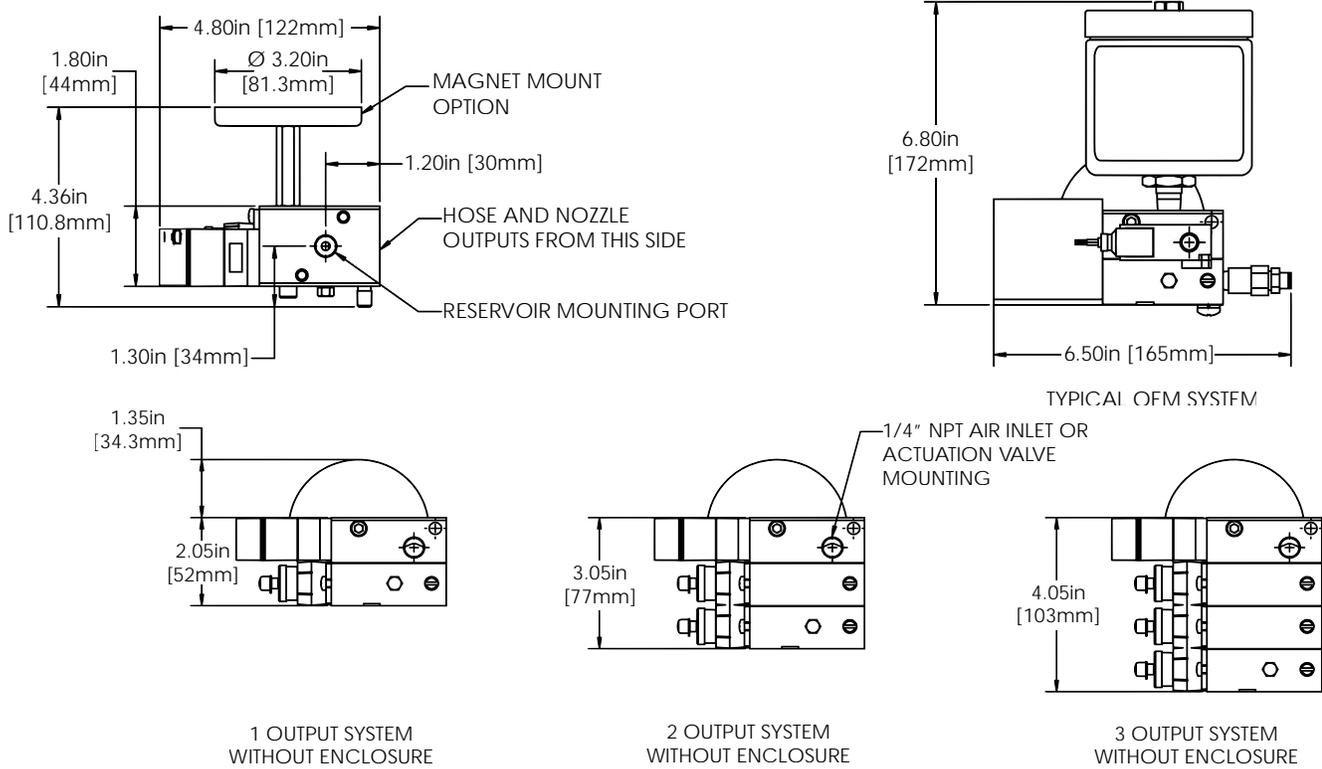


Figure 18: Systems without standard enclosures

Reservoirs

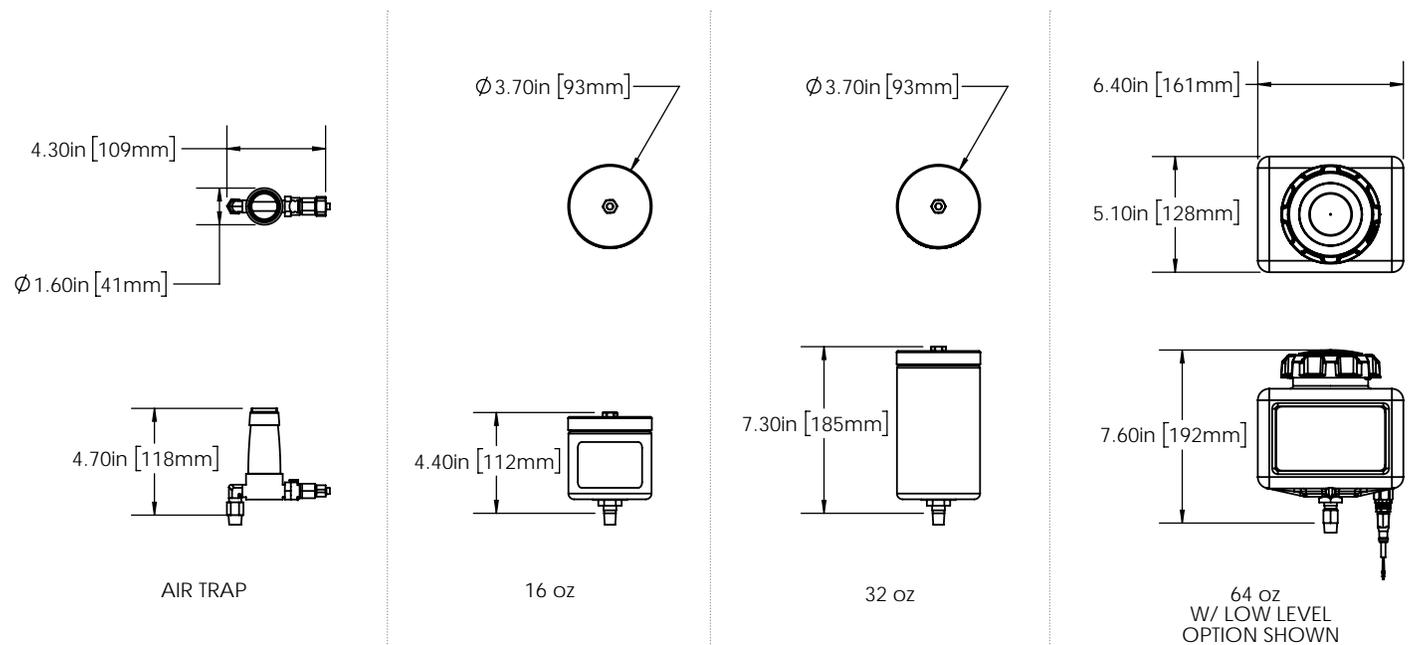


Figure 19: Reservoirs

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.

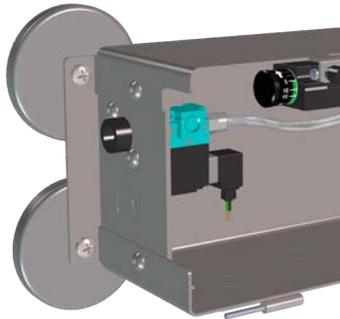


Figure 20: Magnet mount



Attention: The Single Line lubricator 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.

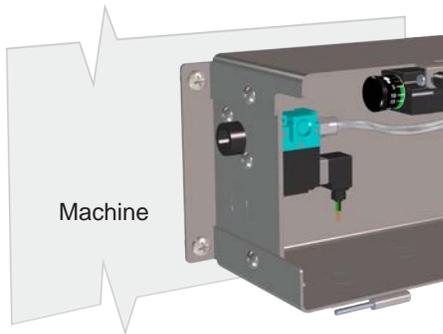


Figure 21: Direct mount



Attention: Always use two people while securing the Single Line lubricator to its mounting surface. Failure to do so could cause personal injury.

Connect Control Valve

The pneumatic circuit on the Single Line lubricator can be controlled with a solenoid valve, a manual slide valve, or an air pilot valve. If the Single Line lubricator 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.

Single Line 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	5.777.4 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	5.777.4 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 22: Single Line 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 Single Line lubricator. Failure to do so safely could cause damage to property and personal injury.



Attention: Ensure that power is not applied to the Single Line lubricator 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.

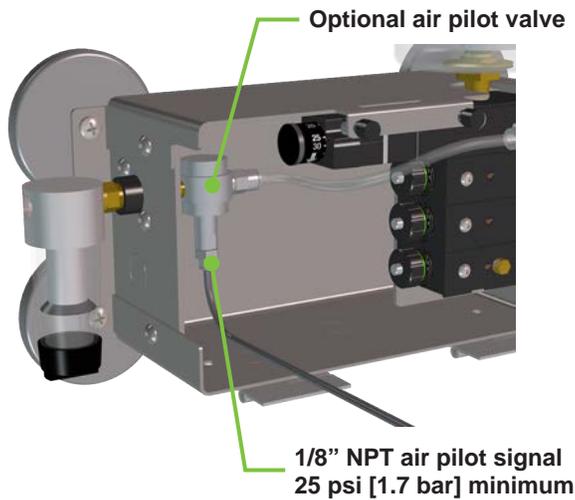


Figure 23: Pneumatic air pilot valve



Attention: Ensure air pressure is not present when connecting the air pilot signal to the Single Line 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 24.

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, 200VDC 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 24: 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

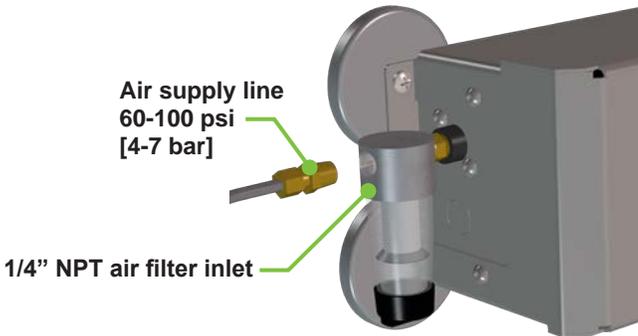


Figure 25: Air supply to filter

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

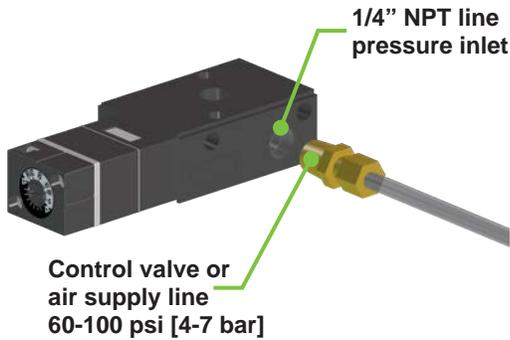


Figure 26: Air supply to manifold

For units without a standard 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 Single Line lubricator 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 27: 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.

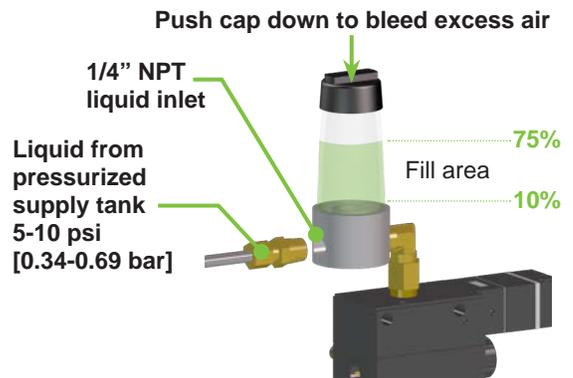


Figure 28: Bleeding air trap



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.

System Installation

Position & Install Nozzles

Single Line Copper Nozzle

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.



Figure 29: Single line copper nozzle

On the vertical plane, the nozzle should be placed so all the tools to be used are adequately covered by the output spray. For longer tools this means the angle from vertical is less than the 60-70 degrees shown.

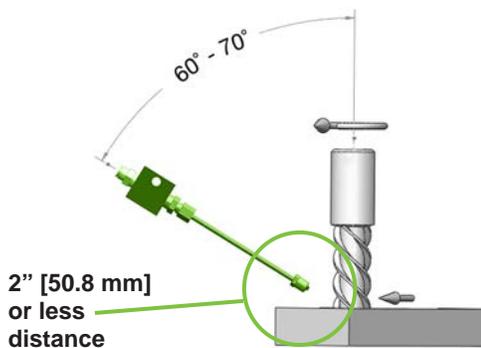


Figure 30: Vertical position of single line copper nozzle

Splitter Nozzle

For sawing applications where a Bat Nozzle or a Band Saw Blade Nozzle will not fit, a splitter nozzle could be the best solution. The nozzles should be aimed to spray the sides of the blade and into the gullet of the teeth.

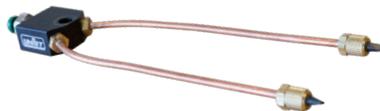


Figure 31: Splitter nozzle

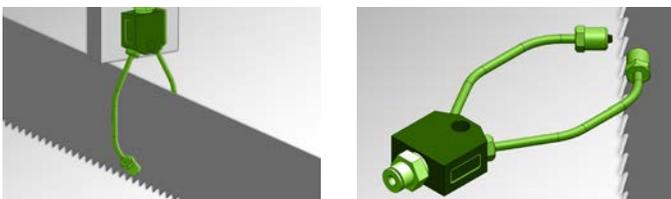


Figure 32: Splitter nozzle on a horizontal or vertical band saw

Bat Nozzle

The Bat Nozzle was designed to easily fit on a wide variety of circular saws, vertical band saws, and horizontal band saws. The nozzle includes a 1.75" [44.5 mm] square mounting flange that can be attached to the blade guard. A 1" [25.4 mm] diameter hole drilled through the guard allows the nozzle to be centered over the blade. The nozzle position can then be adjusted as close to the blade as required with a thumb screw. Two outlets on the sides of the blade and a third outlet spraying directly into the gullet of the teeth assure proper application of lubricant to the saw blade. The Bat Nozzle is available in various lengths to accommodate a broad range of saws.



Figure 33: Bat Nozzle

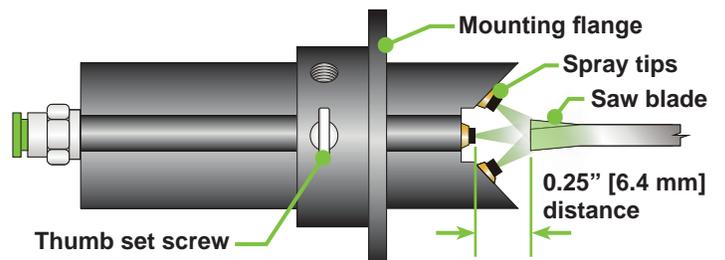


Figure 34: Bat Nozzle components

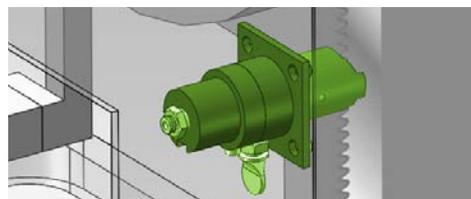
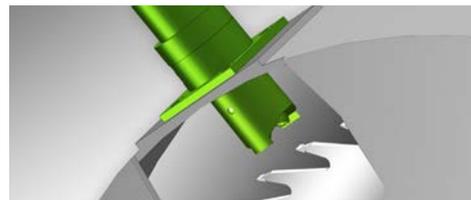


Figure 35: Bat Nozzle on a circular or band saw

System Installation

Band Saw Blade Nozzle

The Band Saw Blade (BSB) Nozzle provides users with alternative mounting options and delivers an ideal spray pattern for horizontal band saw blade lubrication. Its smaller footprint makes for easier mounting and less intrusive installation. When mounted to the blade guide, proper positioning is easy when using the built-in ruler guide. Simply align the top of the blade with the appropriate blade size marking and secure the nozzle in place. The available mounting kit provides additional mounting flexibility. The BSB Nozzle is available in 1" [25.4 mm], 2" [50.8 mm], and 3" [76.2 mm] sizes to accommodate most common band saw blade widths.



Figure 36: Band Saw Blade Nozzle

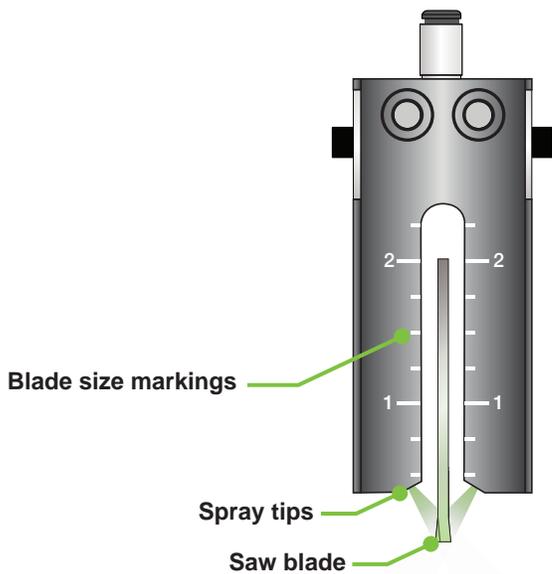


Figure 37: Band Saw Blade Nozzle Components

Band Saw Guide Nozzle

When blade guide lubrication is required, the Band Saw Guide (BSG) Nozzle will lubricate the sides of the blade to help minimize friction. The BSG Nozzle can be mounted directly to a guide block, to the BSB Nozzle, or installed with the Mounting Kit. When paired with a BSB Nozzle, this will provide lubrication for both the cutting edge and the sides of the blade.



Figure 38: Band Saw Guide Nozzle paired with a Band Saw Blade Nozzle

BSB & BSG Mounting Kit

For maximum flexibility, every band saw mounting kit includes two mounting brackets. The block mount allows either a blade or the guide nozzle to be held 90 degrees from the mounting surface. The rail mount allows the vertical height of the BSB or BSG Nozzles to be easily adjusted by sliding the nozzle up or down and tightening the clamps at the sides.

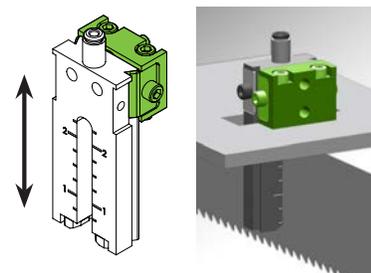


Figure 39: Block mount

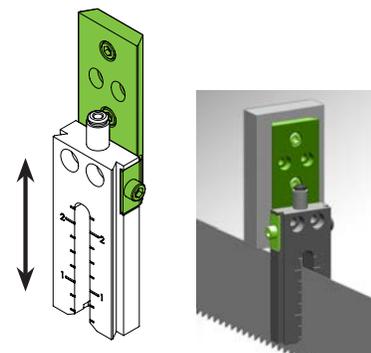


Figure 40: Rail mount

System Startup

Turning The System On & Off

The Single Line system is turned on or off using a manual slide valve, a solenoid valve, or an air pilot valve. If the unit is equipped with a manual slide valve, it is turned on and off by sliding the valve to the desired position. Moving the slide valve barrel toward the air filter will turn air flow to the system on. Moving the slide valve barrel away from the air filter will turn air flow to the system off.

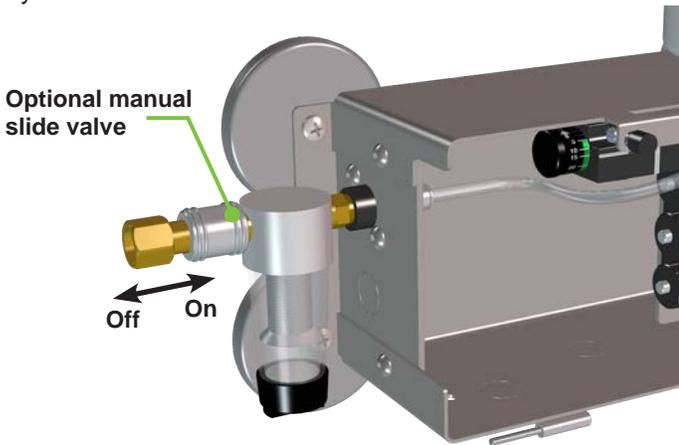


Figure 41: Manual slide valve

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.

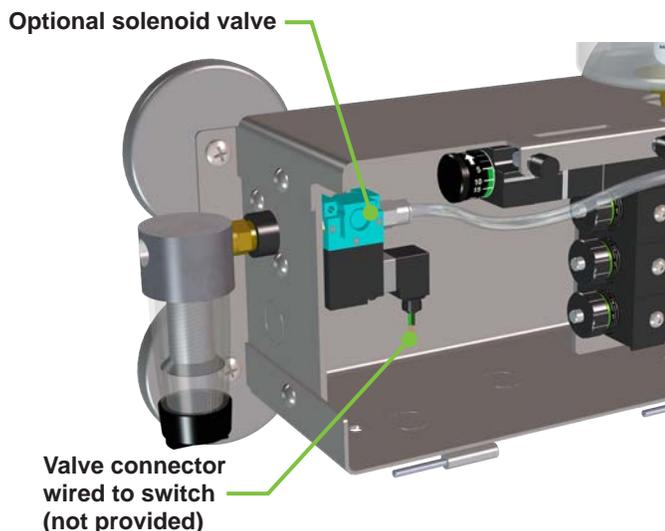


Figure 42: Remote operation

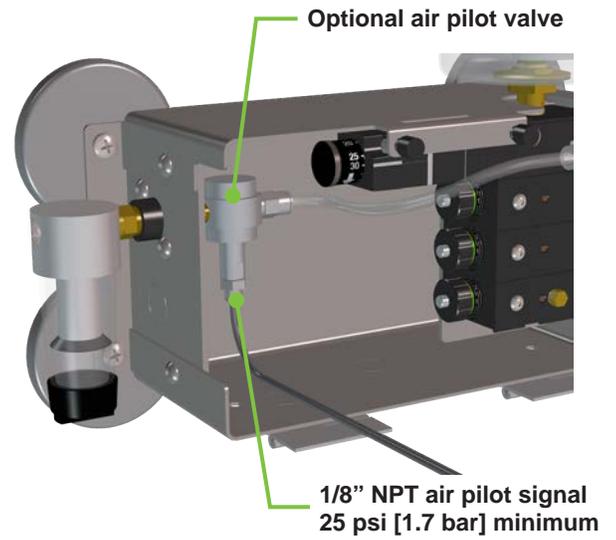


Figure 43: Pneumatic air pilot valve

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.

Warning: Excessive manual cycling of the pump without proper atomizing air may result in fluid backflow into the pneumatic system.

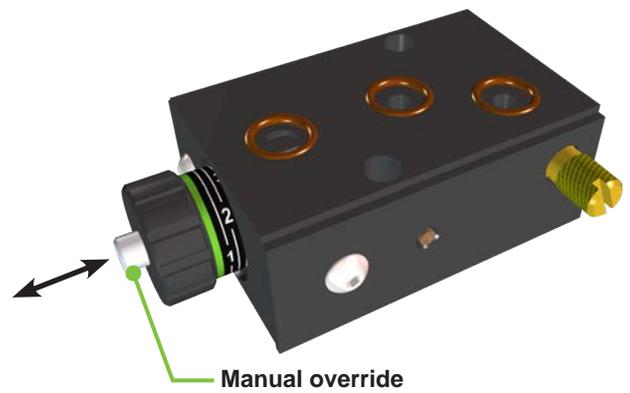


Figure 44: Manual override

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 fluid does not leak from the drain. A rag can be placed below the drain plug to catch the fluid.

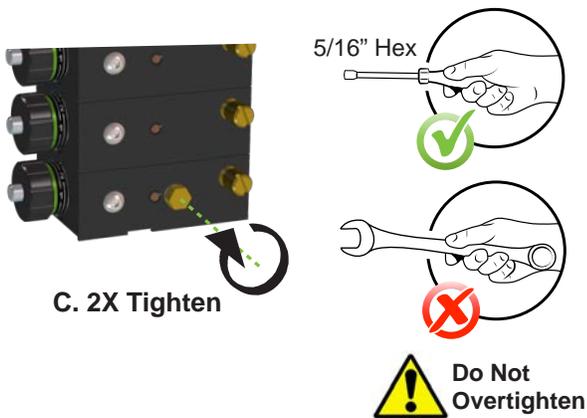
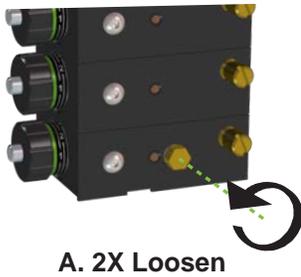


Figure 45: Priming the pumps

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.

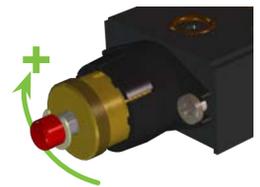
Setting Pump Stroke

It is suggested that the pump be left at full stroke and spray pattern adjustments are made with the pulse generator. However in cases where very low output is needed and a stable spray pattern cannot be maintained when adjusting the pulse generator alone, the pump stroke length can be decreased and the pump cycle rate increased.

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)

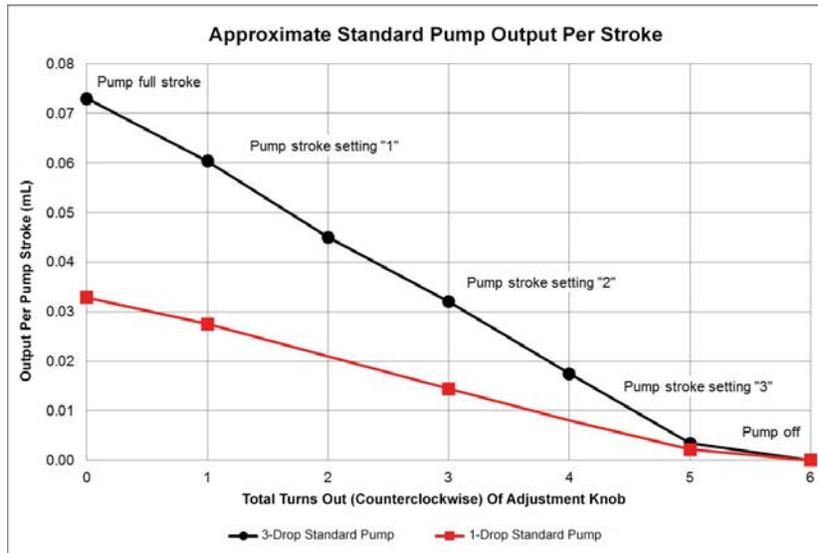


Figure 46: Approximate standard pump output per stroke

2-Drop MV Pump (Red Band)

1-Drop MV Pump (Green Band)

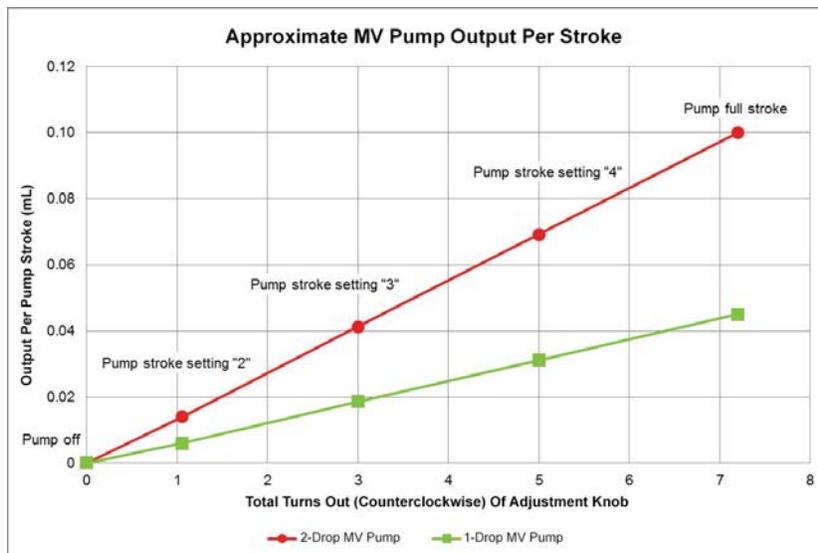


Figure 47: Approximate MV pump output per stroke

System Startup

Adjust Stroke Frequency

Stroke frequency is the best way to adjust the amount of fluid being applied. If less fluid is desired, decrease the cycle rate but ensure there is still a continuous spray with no pulsing. If more fluid is desired, increase the cycle rate. Depending on the system set up, the max cycle rate is 200 cycles per minute.

Pulse R™

If system is equipped with a Pulse R™ upon powering up, the device output cycles at the rate displayed (indicated in cycles per minute). The rate can be adjusted from 1 to 200, using the up and down arrow buttons on the device. The duty cycle is automatically set by the Pulse R to be 50%. Reference Appendix H: Pulse R Operating Modes for more information.



Figure 48: Pulse R™ controller

Pulse Generator With Adjustment Knob

Adjust the pulse generator to 10 pulses per minute by aligning the 10 on the decal with the alignment notch on the mounting block. This should result in a pulse approximately once every 6 seconds. Turning the knob clockwise decreases the frequency, counterclockwise increases it. The numbers on the dial can be used as rough approximations of the pulses per minute.

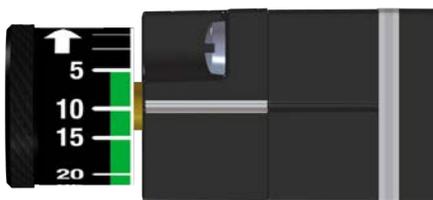


Figure 49: Pulse generator adjustment knob

Pulse Generator Without Adjustment Knob

Adjust the pulse generator to 10 pulses per minute using a screwdriver and a stopwatch. The pump should pulse once every 6 seconds. Turning the screw clockwise decreases the frequency, counterclockwise increases it.

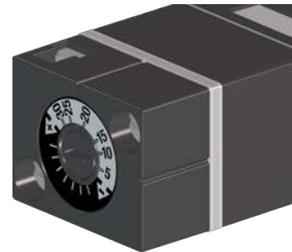


Figure 50: Pulse generator

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).

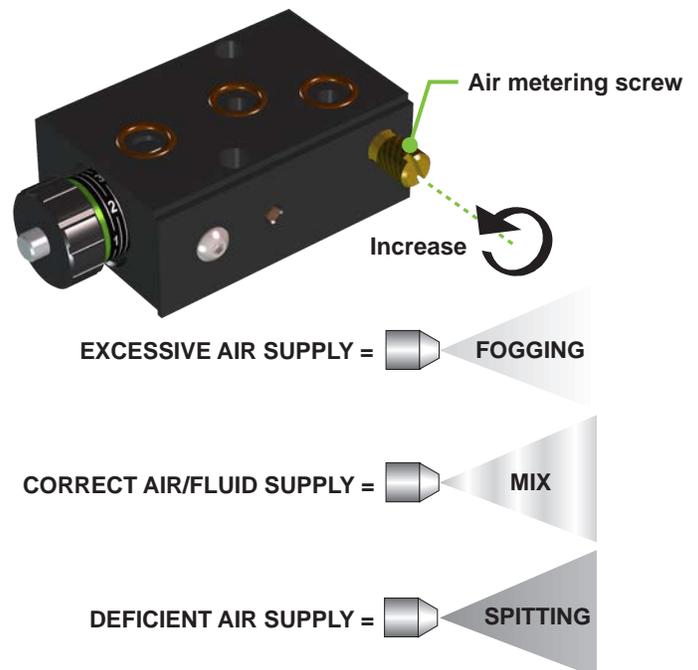


Figure 51: Adjusting airflow

System Startup

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

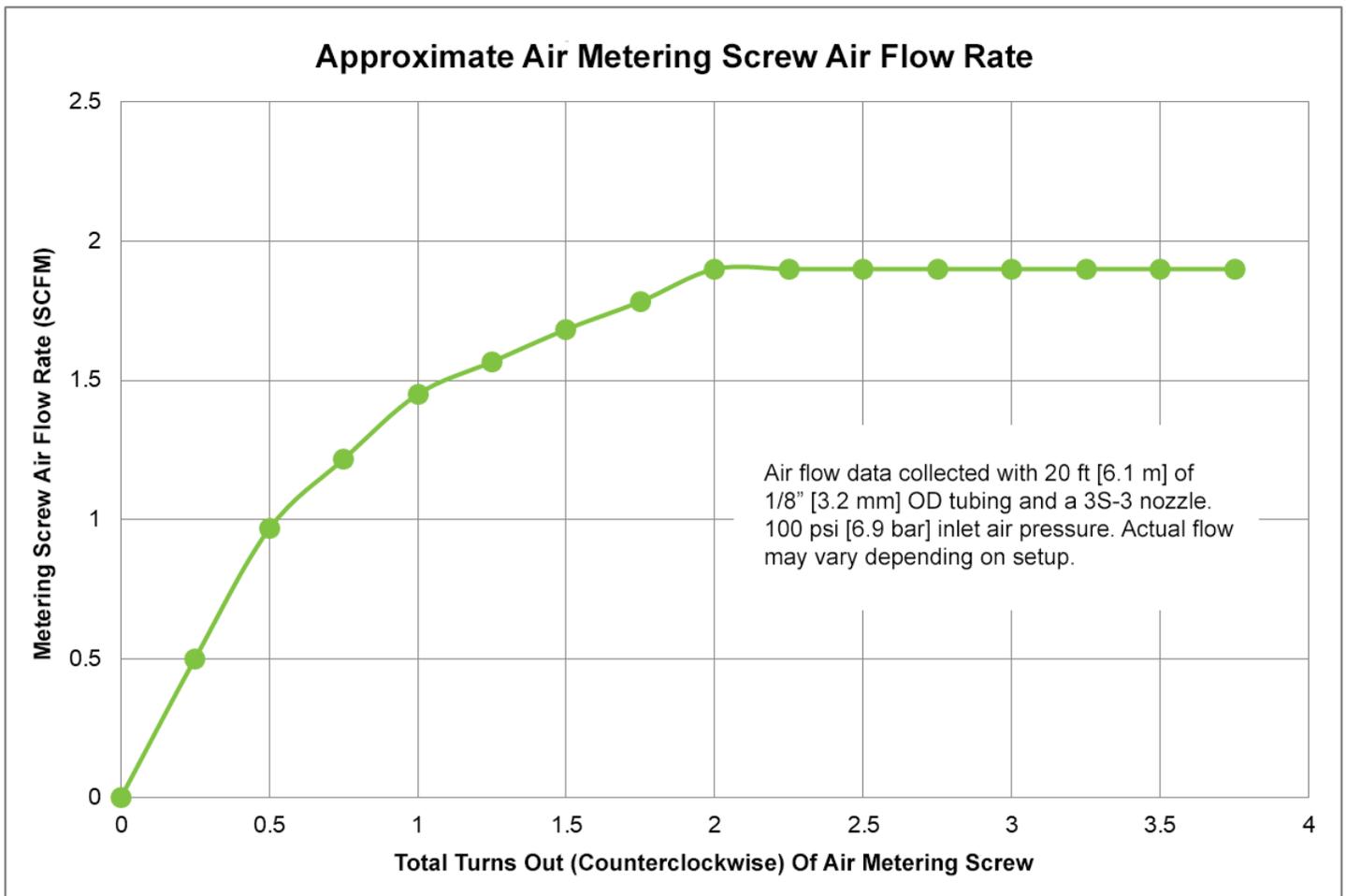


Figure 52: Approximate air metering screw air flow rate

Troubleshooting



Attention: While troubleshooting it may be necessary to access the electrical solenoid on the Single Line Lubricator. Only qualified individuals should perform such work and control power to the Single Line Lubricator. Should be turned off when accessing this enclosure.

Pump is not cycling

- Confirm pump timer is not set to 0.
- Confirm inlet air pressure is between 60-100 psi [4-7 bar].
- Confirm that actuation of the controlling manual valve, solenoid valve, or air pilot valve allows air to flow into the system.
- Inspect the pulse generator inlet screen for debris. (See Figure 52).

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 16.
- Perform a pump rebuild.
(Watch the video: 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.
- Confirm the pump timer is set appropriately.
- Perform the pump priming procedure, previously described in the section titled “**Prime The Pumps**” on page 16.
- Perform a pump rebuild.
(Watch the video: 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.

Inspecting the pulse generator

Remove pulse generator and check air inlet screen for particulate matter. If none found, replace pulse generator. See illustration below for details on the position of the air inlet screen.

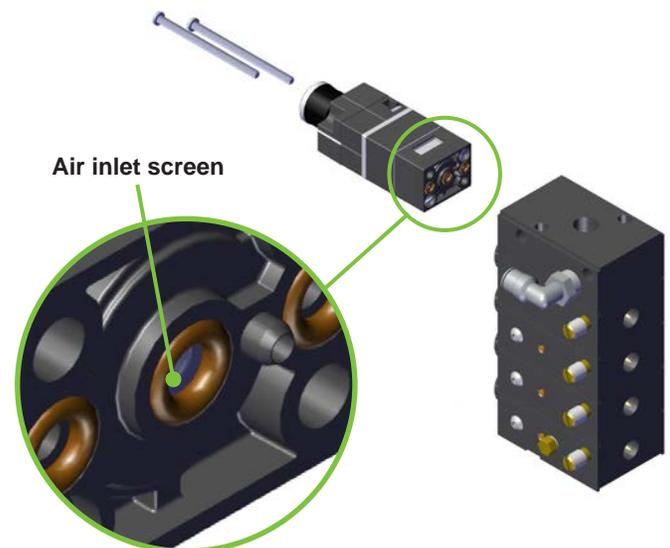


Figure 53: Air inlet screen

Troubleshooting

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 54: 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™.

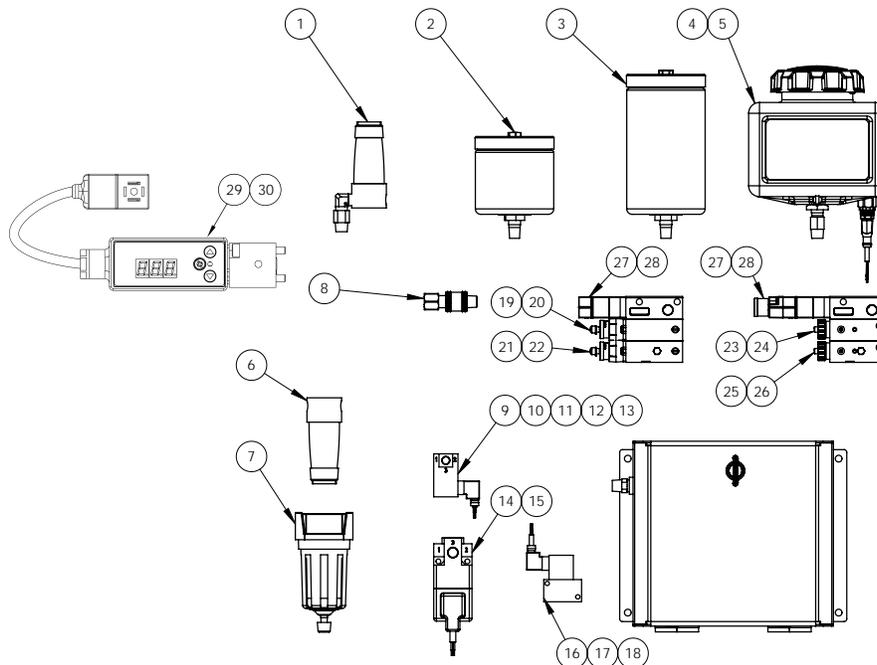
F02 = Major System Fault

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



30	PULSE R WITH MANIFOLD MOUNT VALVE, 9.4MM WAFER, SHOT MODE	305310-C1
29	PULSE R WITH MANIFOLD MOUNT VALVE, 18MM WAFER, SHOT MODE	305310-A1
28	ASSEMBLY, PULSE GENERATOR, WITH ADJUSTMENT KNOB	301930
27	ASSEMBLY, PULSE GENERATOR	60-6393
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, 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 55: System spare parts

Appendix B: Nozzle Spare Parts

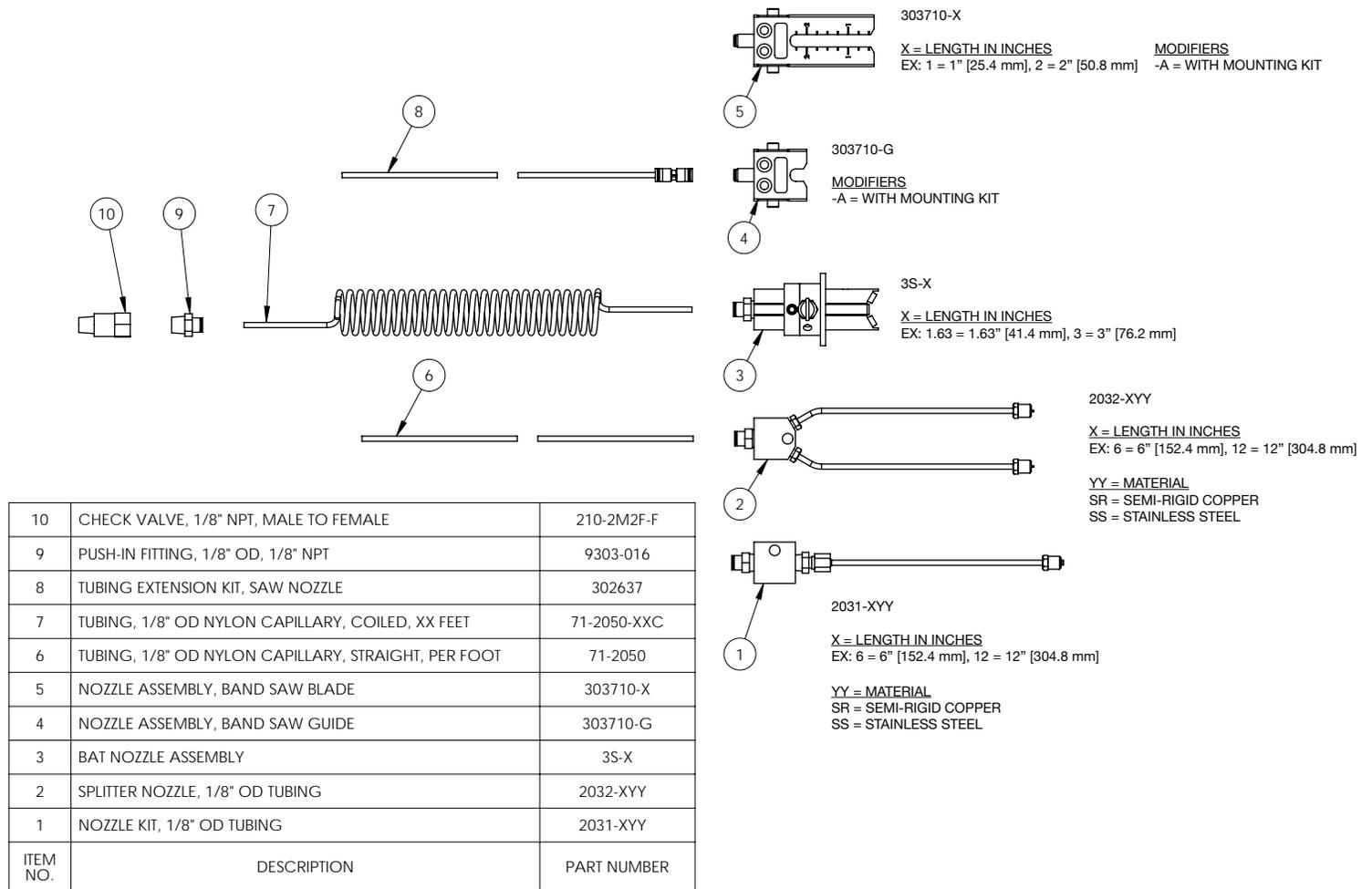


Figure 56: Nozzle spare parts

Appendix C: Standard Pump Components

STANDARD COMPONENTS

ADJUSTMENT KNOB 301929



PULSE GENERATOR WITH ADJUSTMENT KNOB 301930



PULSE GENERATOR 60-6393



MANIFOLD 94-6900-1

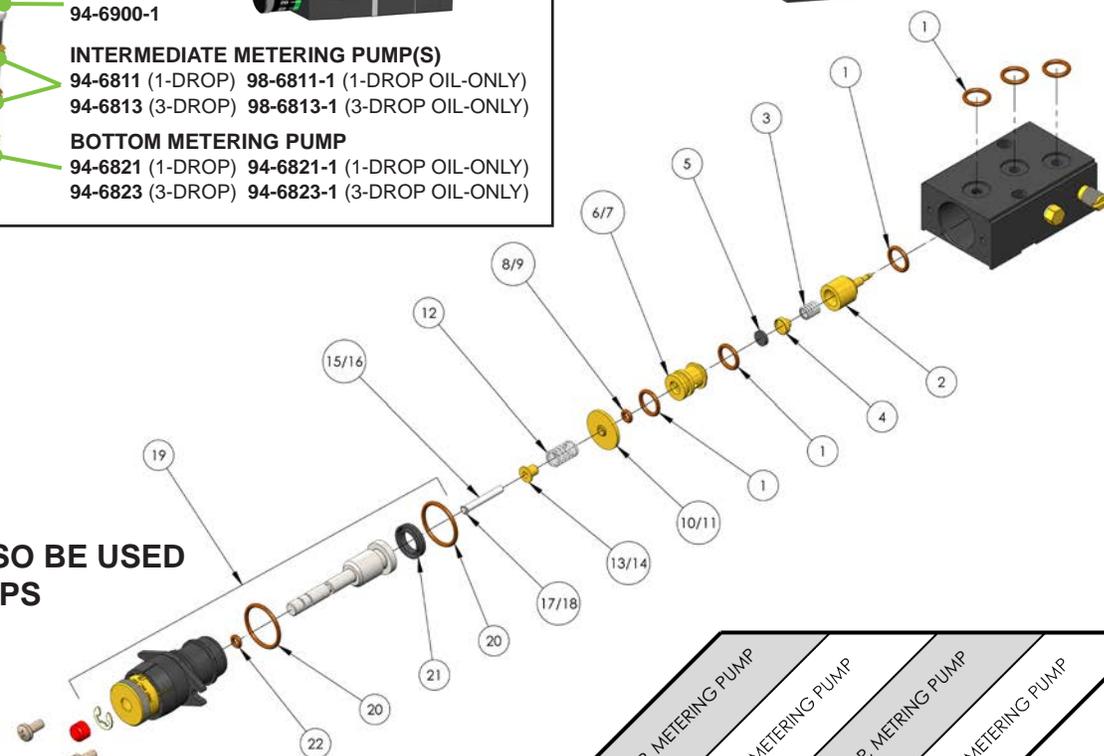


INTERMEDIATE METERING PUMP(S)
 94-6811 (1-DROP) 98-6811-1 (1-DROP OIL-ONLY)
 94-6813 (3-DROP) 98-6813-1 (3-DROP OIL-ONLY)

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)

PULSE R™ ASSEMBLY
 305310-A1 (18mm WAFER)
 305310-C1 (9.4mm WAFER)





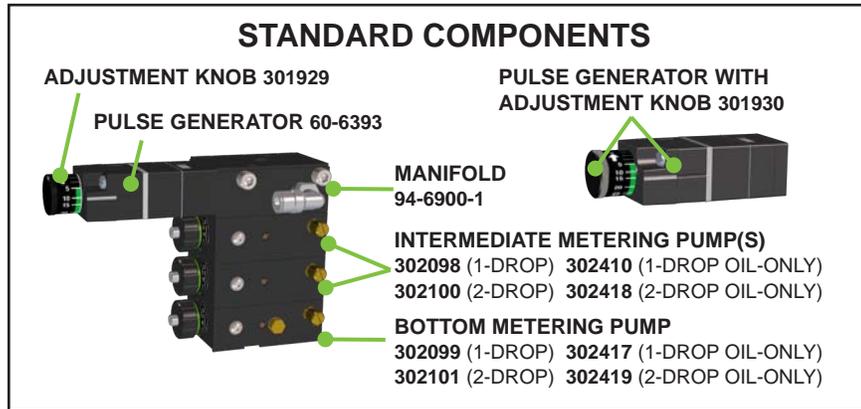
NOTE: KITS CAN ALSO BE USED WITH OIL-ONLY PUMPS

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

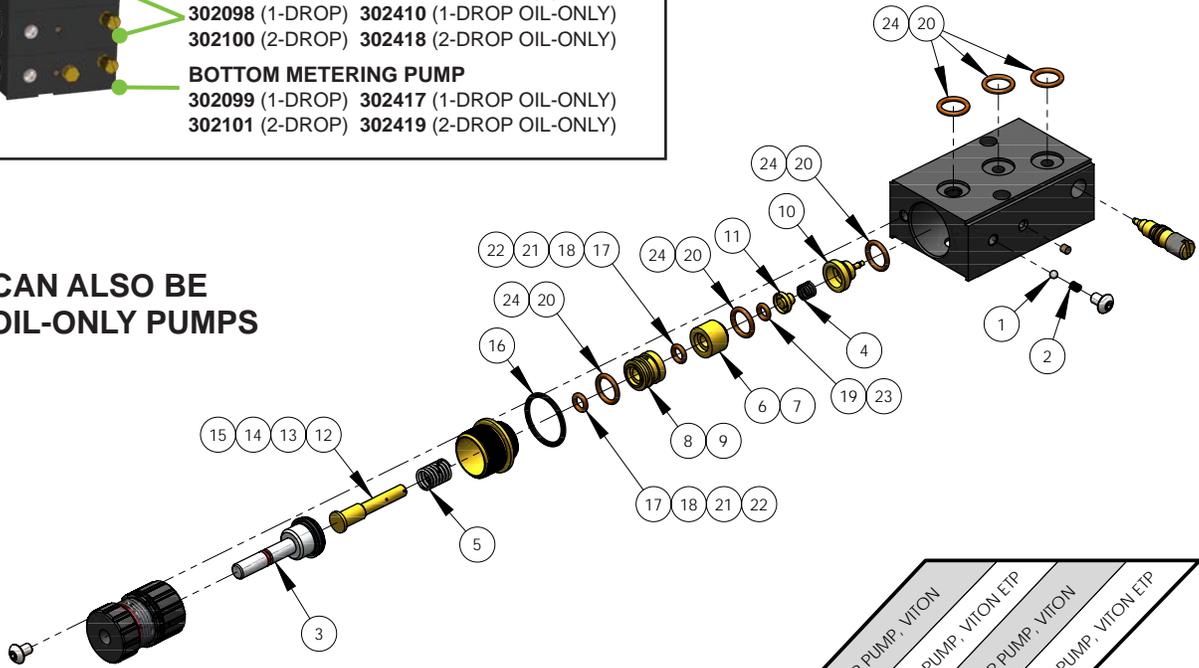
ITEM NO.	DESCRIPTION	PART NUMBER	KIT PARTS			
			94-6831-1 QTY.	94-6831-2 QTY.	94-6833-1 QTY.	94-6833-2 QTY.
1	O-RING, ID .364, CS .070, VITON	2-012-V884-75	6	6	6	6
2	HOUSING, CHECK VALVE, METERING PUMP	89-6900-10	1	-	1	-
3	SPRING, CHECK VALVE, INJECTOR PUMP	9303-108	1	-	1	-
4	BODY, CHECK VALVE, INJECTOR 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 57: Standard pump components

Appendix D: MV Pump Components



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	KIT PARTS			
			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

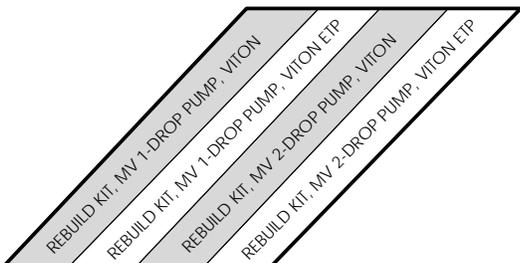
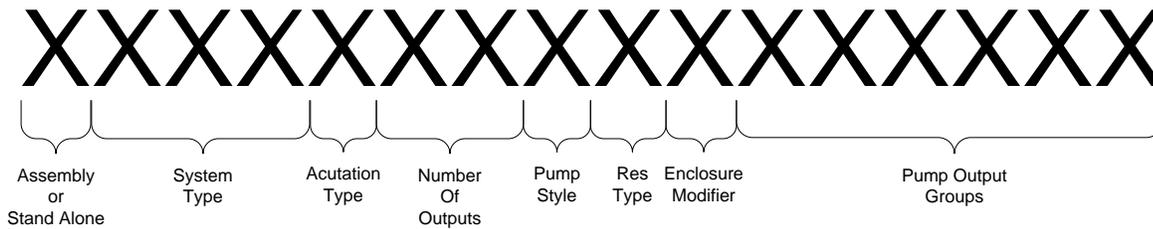


Figure 58: MV pump components

Appendix E: System Part Numbering Scheme



1st Character: Assembly or Stand Alone

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

2nd, 3rd & 4th Character: System Type

Designator	Description
100	Coolubricator
110	Coolubricator w/ Pulse R timer

5th 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

6th and 7th Character: Number of Outputs

Designator	Description
01-16	1-16 outputs

8th 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

9th 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

10th Character: Enclosure Modifier

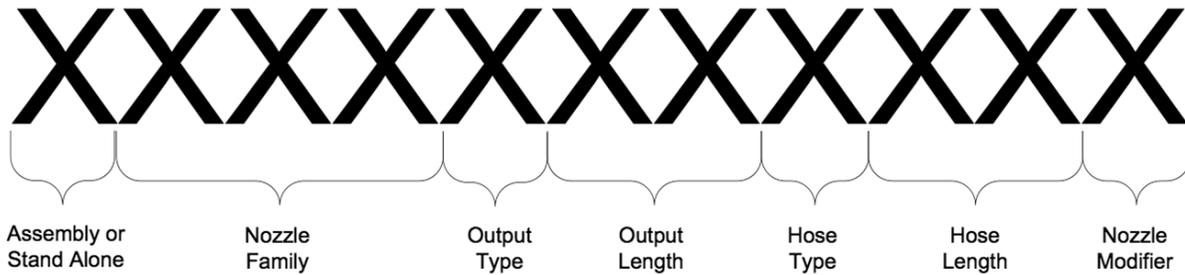
Designator	Description
A	Standard Enclosure
B	Standard Enclosure w/ Magnet Mount
C	Standard Enclosure w/ Key Lock
D	Standard Enclosure w/ Magnet Mount and Key Lock
E	No Enclosure and Bottom Magnet Mount
X	No Enclosure

11th to 16th Character: Pumps Grouped as Selected Pump Style

Designator	Description
1	Pump Grouping, 1 Pump
2	Pump Grouping, 2 Pumps
3	Pump Grouping, 3 Pumps

Figure 59: 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
101	Coolubricator 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
E	3-outlet BAT ¹	100
K	Guide Lube Point 1/8" NPT - Ftg ¹	100
L	Guide Lube Point 1/4" NPT - Ftg ¹	100
M	1/8" OD Copper Nozzle	100
N	Splitter ²	100
P	1/4"-Copper Fan Spray	100, 200
R	Band Saw Blade Nozzle ¹	100
S	Band Saw Guide Nozzle ¹	100

¹Nozzle Modifier does not apply

²Articulated Arm does not apply

6th & 7th Character: Output Length (6" increments standard. Special lengths additional cost)

Designator	Description
06-36	Length (in inches) ¹
XX	Predefined Length Nozzle

¹on 1.63" BAT use 01. BAT limited to 01, 03 & 07

Splitters limited to 06,12,18

Use 00 for guide lube

Band Saw Blade use 01, 02 or 03

8th Character: Hose Type

Designator	Description	Use with system type
A	Polyurethane Coaxial Hose	100, 200
B	Braided Stainless Steel Coaxial Hose	100, 200
C	1/8" Coiled Tubing (10' long minimum)	100
D	1/8" Straight Tubing	100

9th & 10th Characters: Hose Length (5ft increments standard. Special lengths additional cost)

Designator	Description
05-50	Length (in feet)

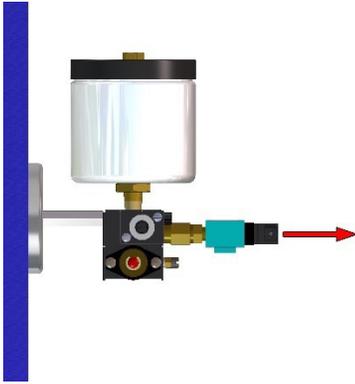
11th Character: Nozzle Modifier

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

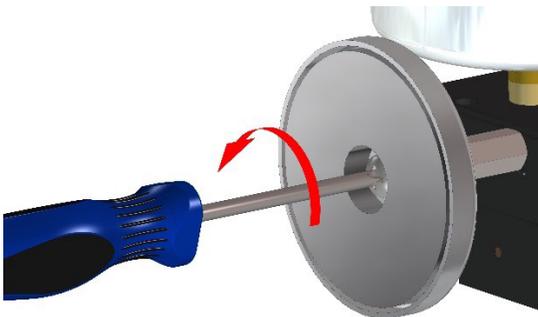
Figure 60: Nozzle part numbering scheme

Appendix G: Magnet Mount Location Change Instructions

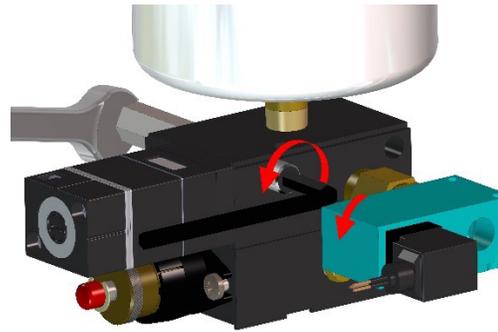
Disconnect air and power from the system, then remove the system from the mounting location.



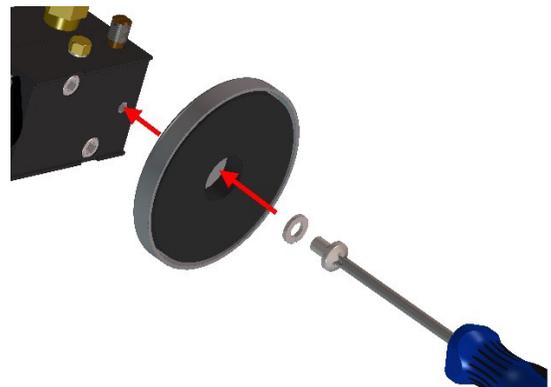
- 1) Using a phillips head screwdriver, loosen and remove the 1/4-20 x 3/8" phillips head screw and 1/4" lock washer securing the magnet to the coupling nut.



- 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 61: 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™.

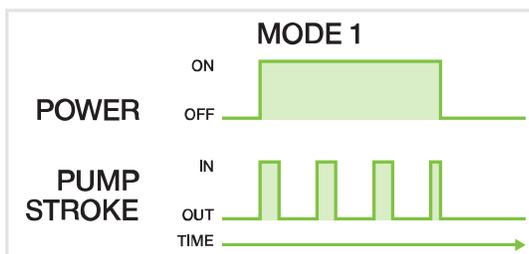


Figure 62: Mode 1 timing diagram

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™.

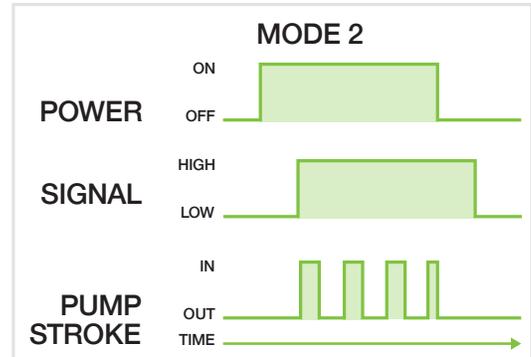


Figure 63: Mode 2 timing diagram

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.

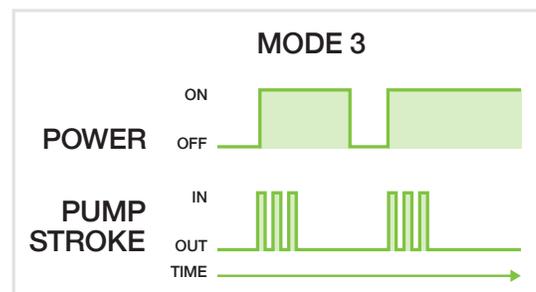


Figure 64: Mode 3 timing diagram

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.

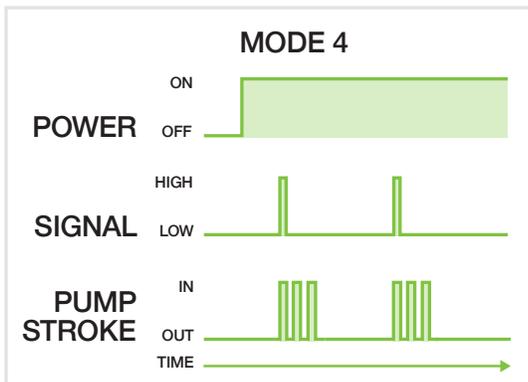


Figure 65: Mode 4 timing diagram

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 66: 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 67: Unlocking the keypad

Additional Information:



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