

Precision Lubrication Systems

for **Air Tools, Hoists,** and
Air Motors

Micro-Lubrication Specialists

Presented by

Master Pneumatic

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History

October 11, 2004

The critical nature of precision lubrication of pneumatic devices has existed for years. There are many ways to lubricate power tools, cylinders, motors, hoists and other types of actuation products....some more effective than others.

This booklet addresses primarily power tool lubrication. Additional information on lubrication of the other devices mentioned above is available. We have differing methods of providing positive lubrication for single and multiple spindle pneumatic power tools. Multiple spindle tools are usually lubricated by stacked injection lubricators which are activated either by a directional control valve or by a timing circuit. The oil lines are external and enter the air supply at the inlet to the air motor where the precise volume of oil specified is atomized.

These stacks are configured to deliver the specified amount of oil every 1, 5, or 10 cycles of the tool. The injectors are available with full stroke volume of $\frac{1}{2}$, 1, or 2 drops per cycle. This volume is adjustable by way of a control knob in increments (44 clicks) but not to an off position. We can also include additional counter mechanisms which can take the lube event out to every 100 cycles of the tool. This is not common in multiple applications.

For single tool lubrication systems, there are many variations. We could have stations which are: moving or stationary; single, double, or triple (or more); horizontal or vertical; centrally fed oil supply or individually filled reservoirs; and so on. The single most important point is to specify the correct lubricator. There are two basic types on the market, mist and single point.

Mist lubricators have a place in the lubrication market where the device to be lubricated is in very close proximity with a straight run to the tool, and no other devices in between. If this is not the case, the oil that is atomized exits the mist lubricator and "wets out": on the wall of the hose; at any bend in the circuit; and at any device between the mist lubricator and the power tool. Oil will find its way to the tool but it will be in slugs, intermittently.

History

(continued)

At this point the operator will usually turn down, or turn off the mist lubricator. Any tool manufacturer will tell you that their tool will operate best when it consistently receives the correct amount of oil. Too much or too little does not maximize tool performance and life.

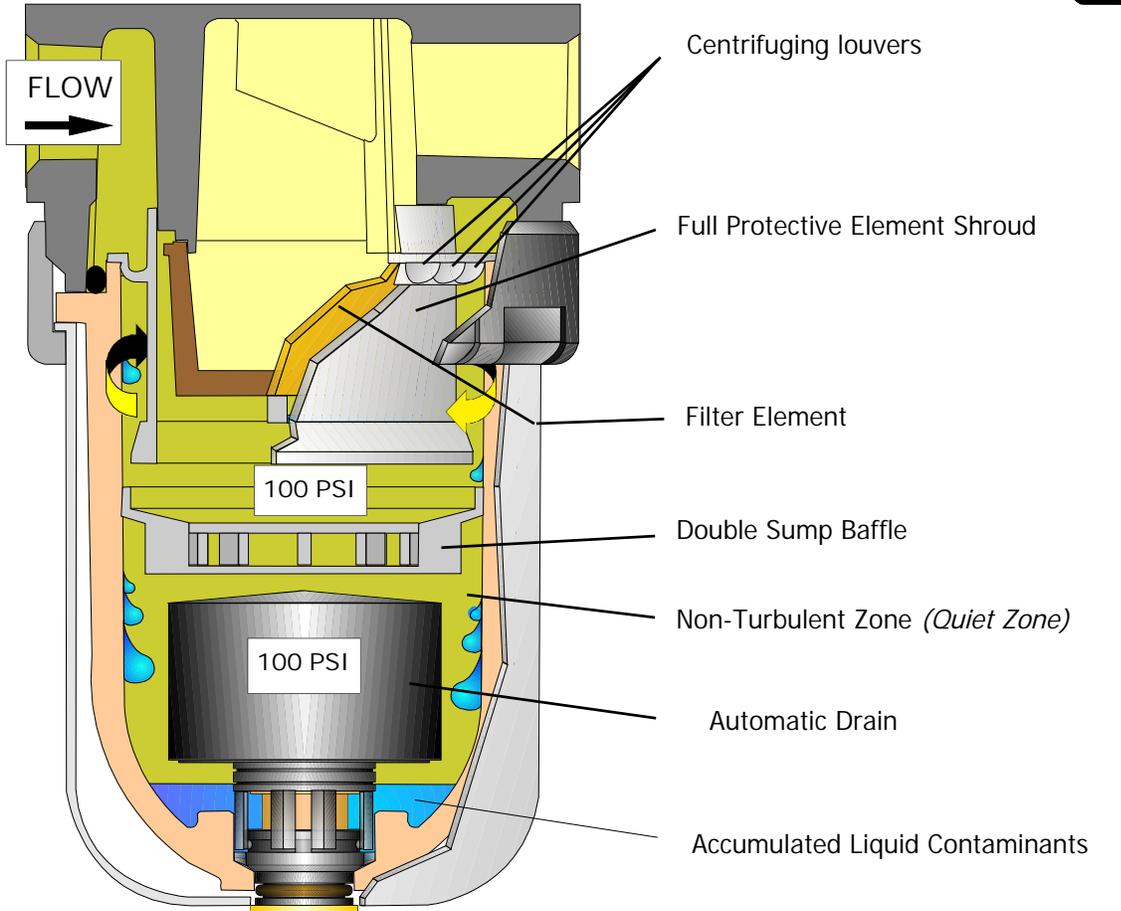
Single Point Lubricators (SPL's) eliminate the over and under lubrication problems associated with power tools. SPL's deliver the correct amount of oil, at the tool, consistently. Every time the tool is cycled, oil is delivered via an internal oil capillary tube 6" before the tool in a fine, consistent state rather than in a slug periodically. The volume of oil can be as low as 1/20th of a drop up to ½ of a drop, and can be delivered every 1, 5, or 10 cycles of the tool. We use a variation of engineered coaxial fittings and disconnects to ensure the simultaneous delivery of air and oil from the SPL to the tool. [This minimizes oil usage; reduces excess oil mist in the tool exhaust \(which can end up on the employee or the product being manufactured \); reduces power tool maintenance and downtime; increases tool performance and life.](#)

Numerous articles have been written on the benefits of single point lubrication v. mist lubrication for power tools. They have been used in the Automotive Industry, as well as other industries, across the Western Hemisphere dating back to the very early 1970's. Further information can be supplied upon request.

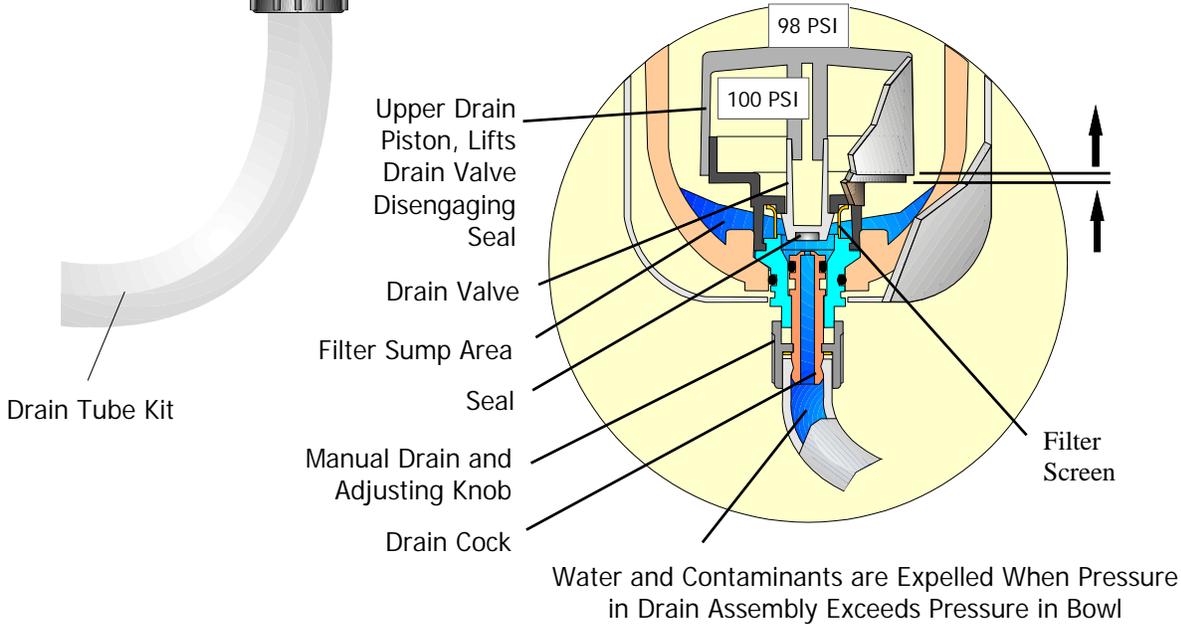
Master Pneumatic can assist you in the design and build of the equipment needed upstream of the filter-regulator-lubricator combo. Our employees have been extensively involved in this arena for over 30 years. From the early stages of program design, through installation, and continuing on to the necessary training, M/P has the resources to see the program through.

Thank you.

AUTOMATIC DRAIN FILTER

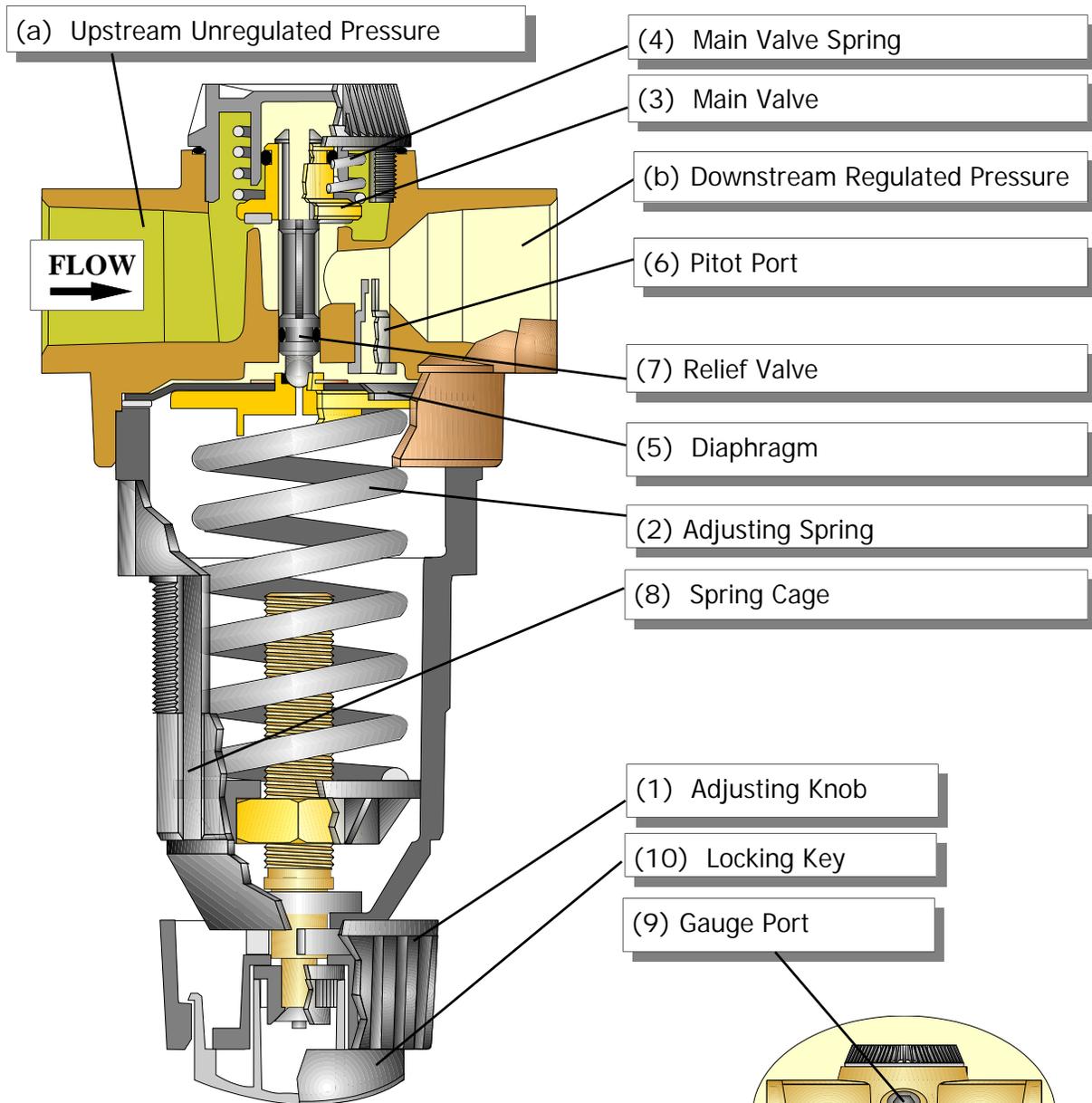


AUTOMATIC DRAIN FILTER IN OPERATION



All pneumatic tools should receive clean, dry air. Our Filters are standard with 5 μ particulate elements. Our automatic drains remove water, as described above, when there is pressure differential in the sump and water is present. Our double baffle system is superior to all other general line filters in the world.

PRESSURE REGULATOR



When the adjusting knob (1) is turned full counter-clockwise, the adjusting spring (2) has no tension on it. If there is air pressure in the upstream air supply system, the main valve (3) will be held closed by it and the main valve spring (4). There will be no air pressure downstream (to the right) of the regulator.

When adjusting knob (1) is turned clockwise, force is applied to the adjusting spring (2), and to the main valve (3). The main valve opens. Air pressure builds up downstream (to the right) of the regulator. Air pressure also builds up on top of diaphragm (5) through the pitot port (6). Air pressure on top of the diaphragm (5) and the main valve (3) eventually equal and surpass the force of the adjusting spring (2). The main valve closes and air pressure downstream (to the right) of the regulator is greater than 0 psi. The regulated pressure is proportional to the pressure applied by the adjusting spring and depends upon how many clockwise turns have been applied to the adjusting knob (1).

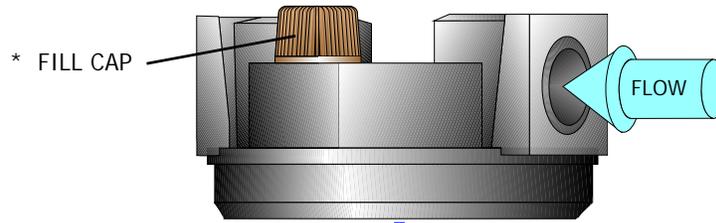
When an air tool or valve is operated, air pressure on top of the diaphragm (5) decreases due to air being "drawn up" through the pitot port (6). The adjusting spring forces the main valve (3) open just enough for the air pressure on the diaphragm and main valve to balance the force of the adjusting spring (2) and maintain the set pressure.

All standard M/P regulators are self-relieving. This means that if you turn the adjusting knob (1) counter-clockwise to reduce the air pressure, the reduced spring force on the diaphragm (5) allows the diaphragm to move downward, away from the relief valve (7). Air pressure downstream (to the right) of the regulator bleeds out through a small port in the Spring Cage (8) of the regulator.

Regulated pressure normally is read from an air gauge installed in the gauge port (9) of the regulator. Remove Key (10) to lock the regulator setting against unauthorized adjustments.

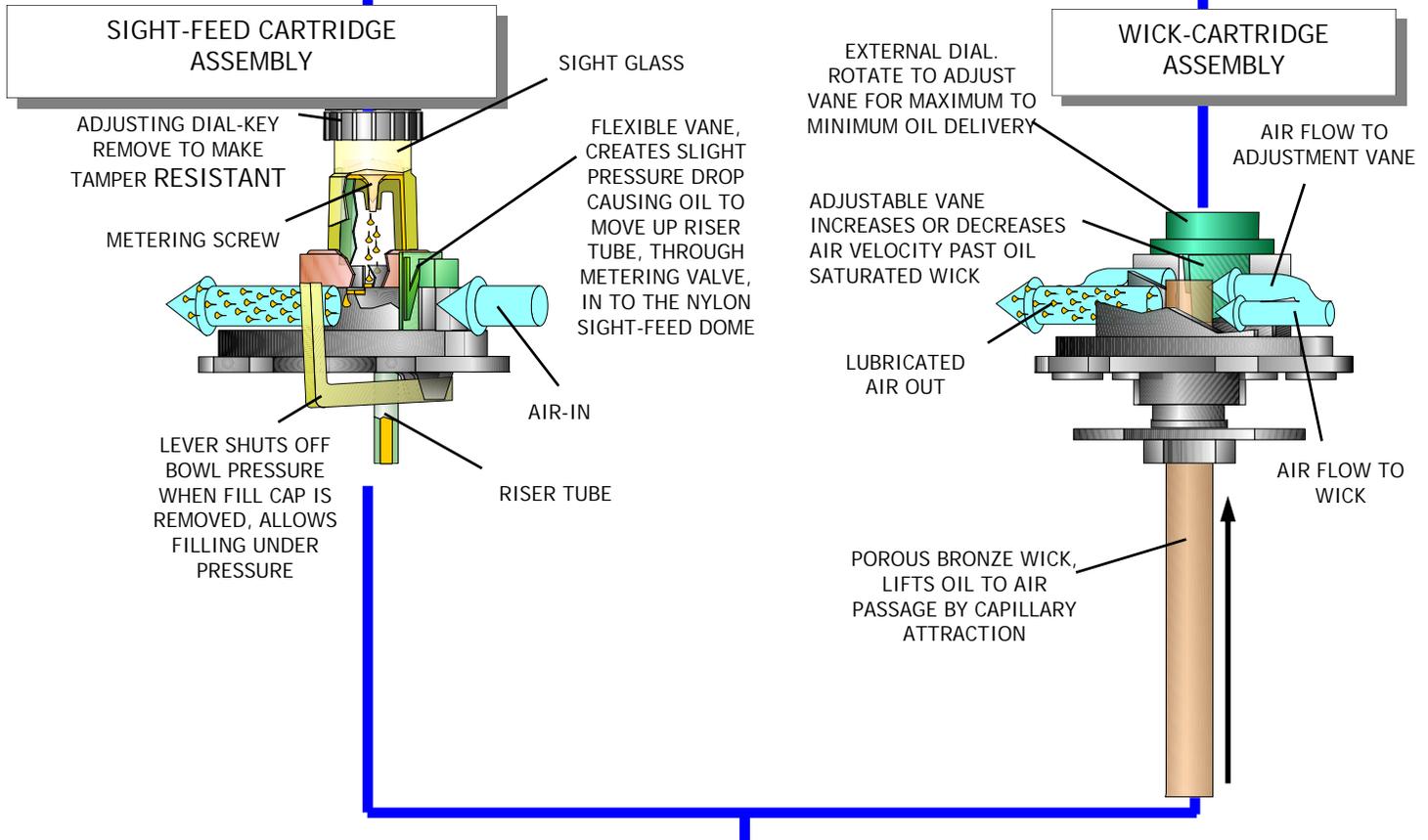
L28 SERIES LUBRICATORS

With interchangeable replacement cartridges



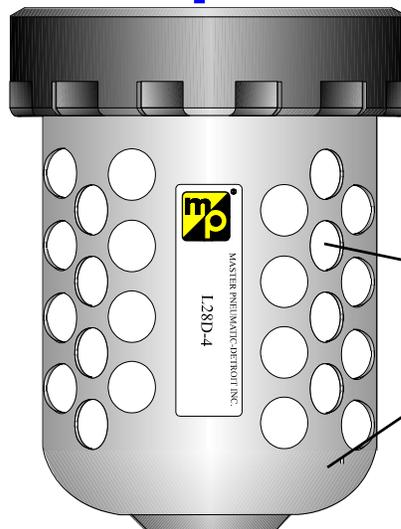
L28D SIGHT FEED PRESSURE DIFFERENTIAL LUBRICATOR

L28W WICK FEED EXTERNALLY ADJUSTABLE LUBRICATOR



*** NOTE:**

SHUT OFF AIR WHEN REMOVING FILL CAP FROM L28W.

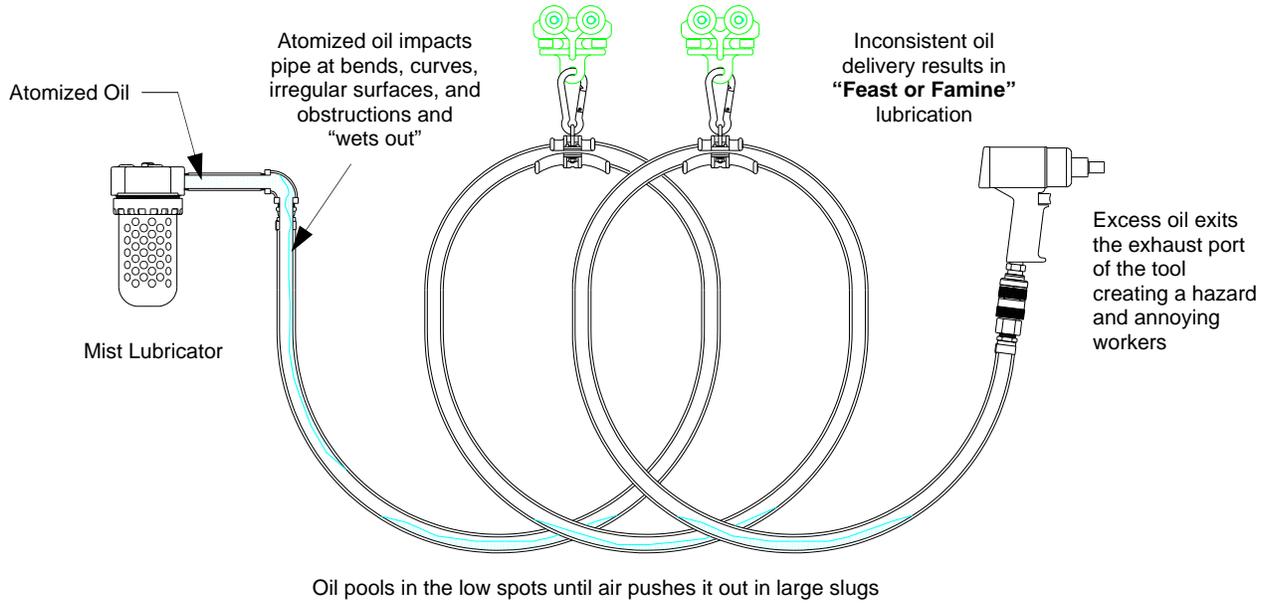


TRANSPARENT BOWL

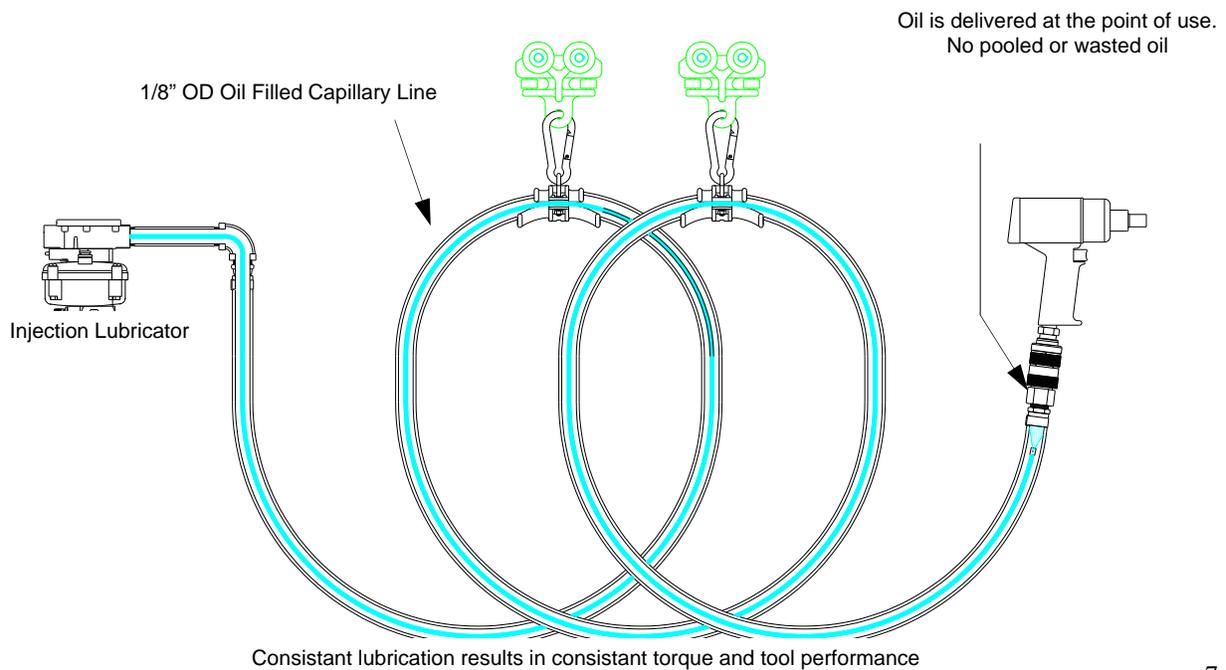
"SHATTERGUARD" - PROTECTIVE METAL BOWL GUARD.

PNEUMATIC TOOL LUBRICATION

CONVENTIONAL "MIST" METHOD

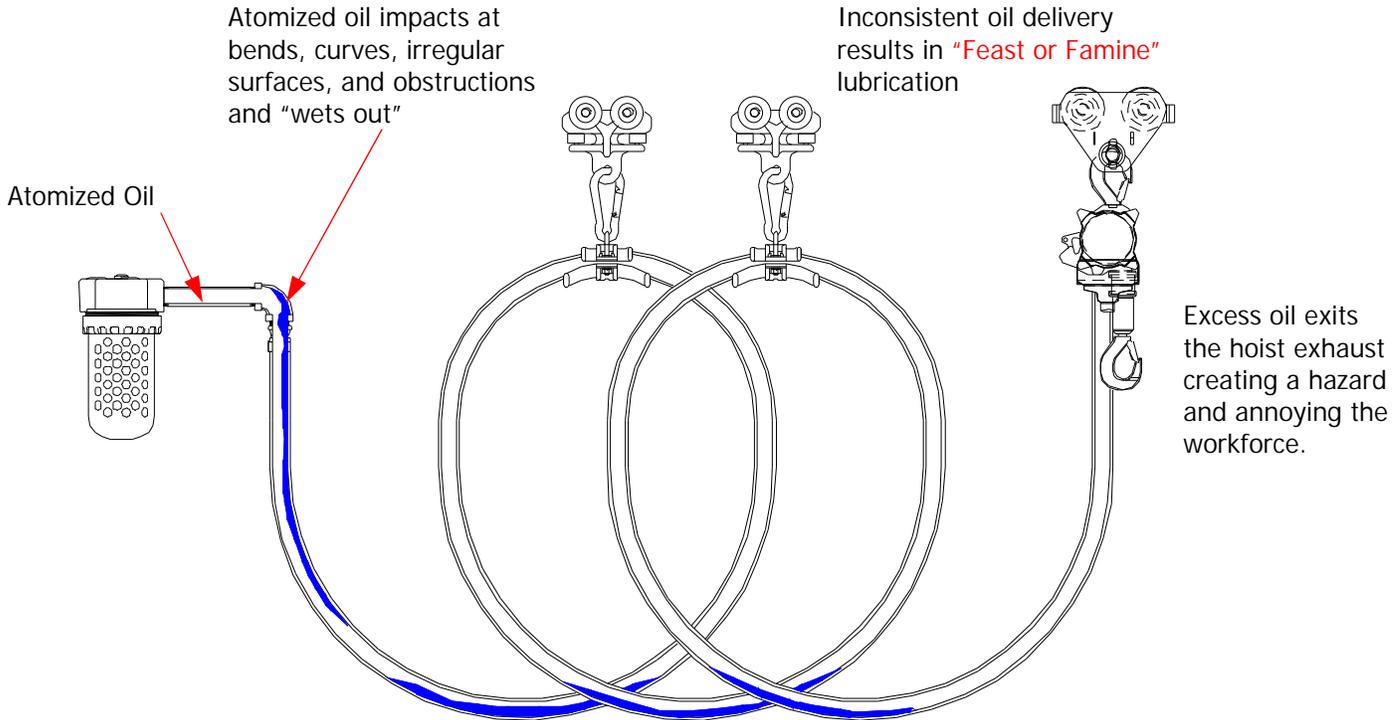


MASTER PNEUMATIC'S "INJECTION" METHOD



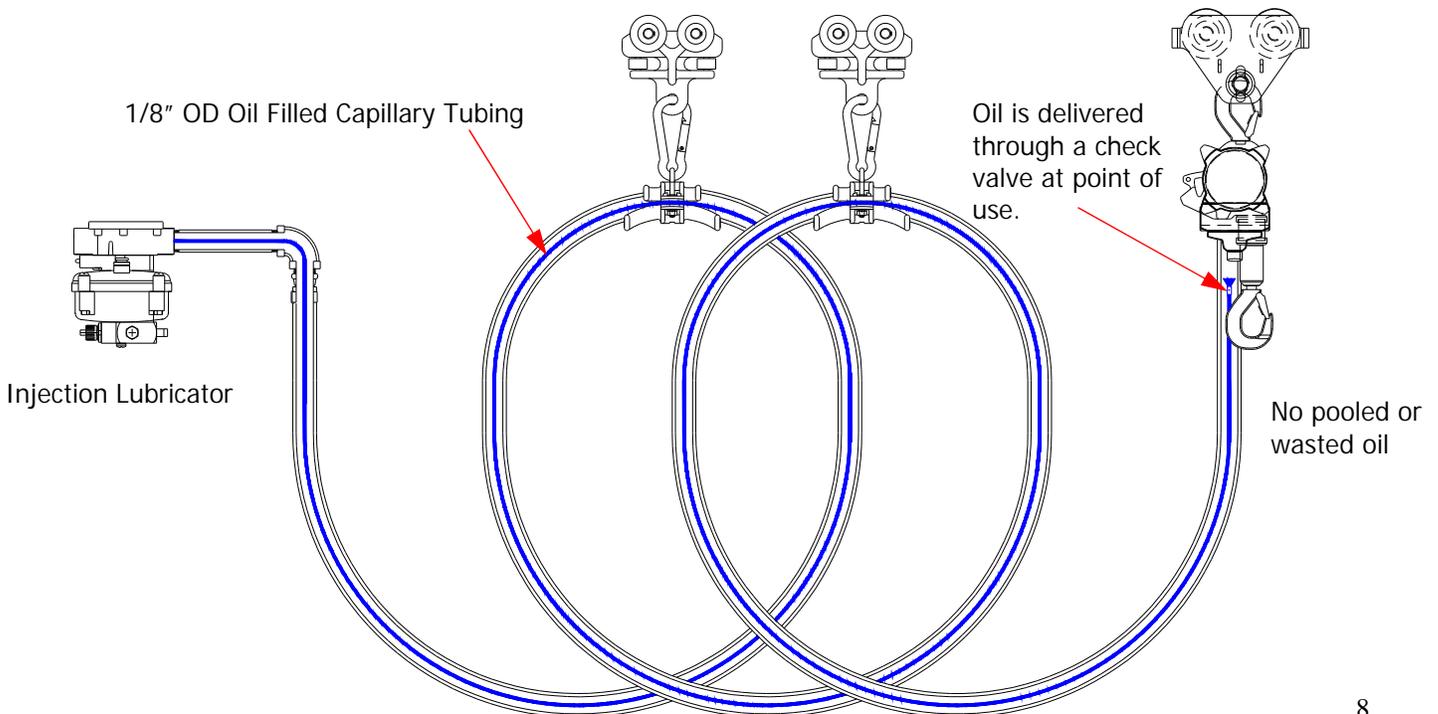
PNEUMATIC HOIST LUBRICATION

CONVENTIONAL "MIST" METHOD



Oil pools in the low spots until the hose is straightened or the air pushes it out in large slugs.

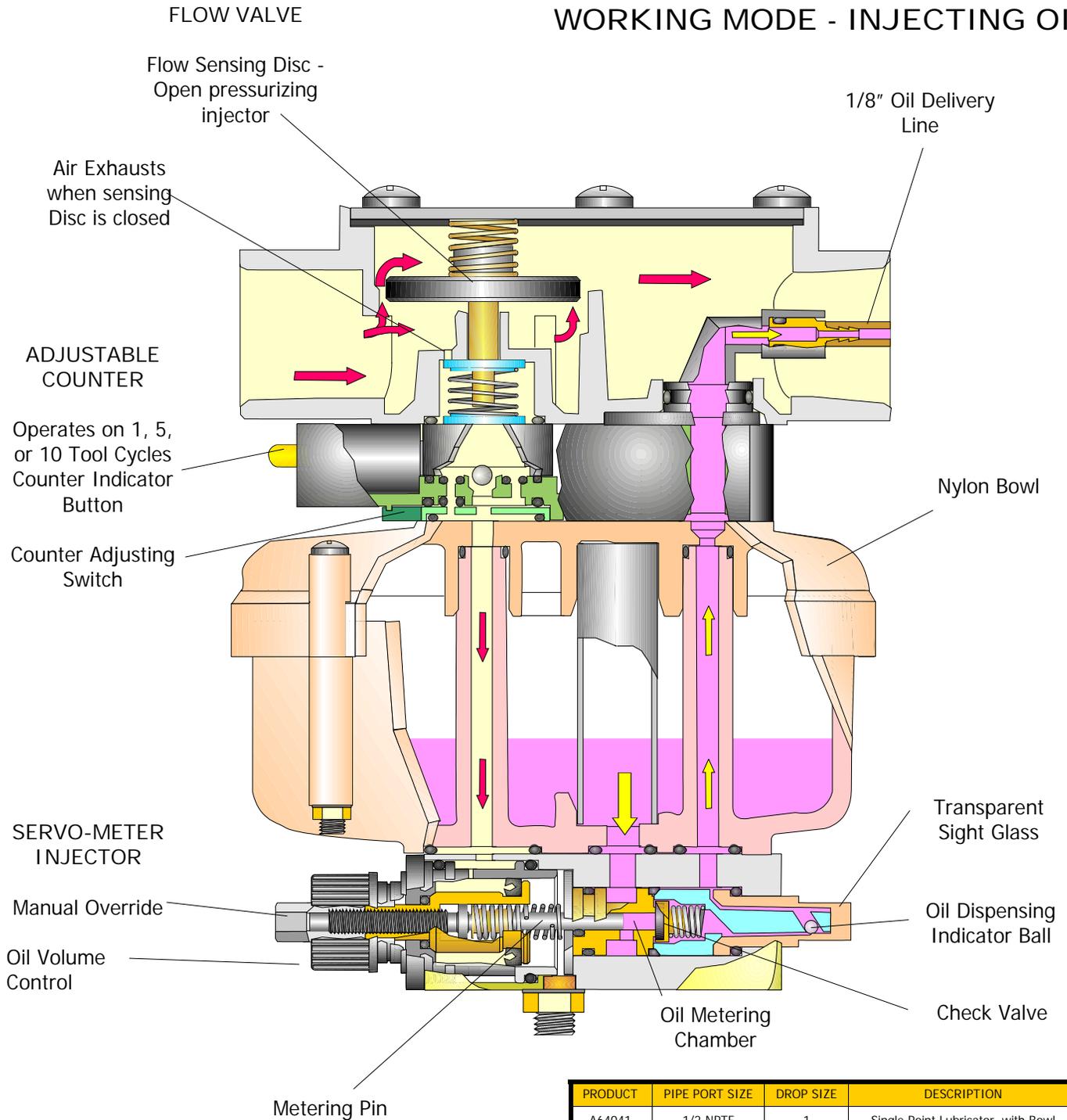
MASTER PNEUMATIC'S "INJECTION" METHOD



Precise oil delivery volumes, delivered consistently, results in improved hoist performance, longer hoist life, and lower repair costs.

SERV-OIL AIR TOOL INJECTION LUBRICATOR

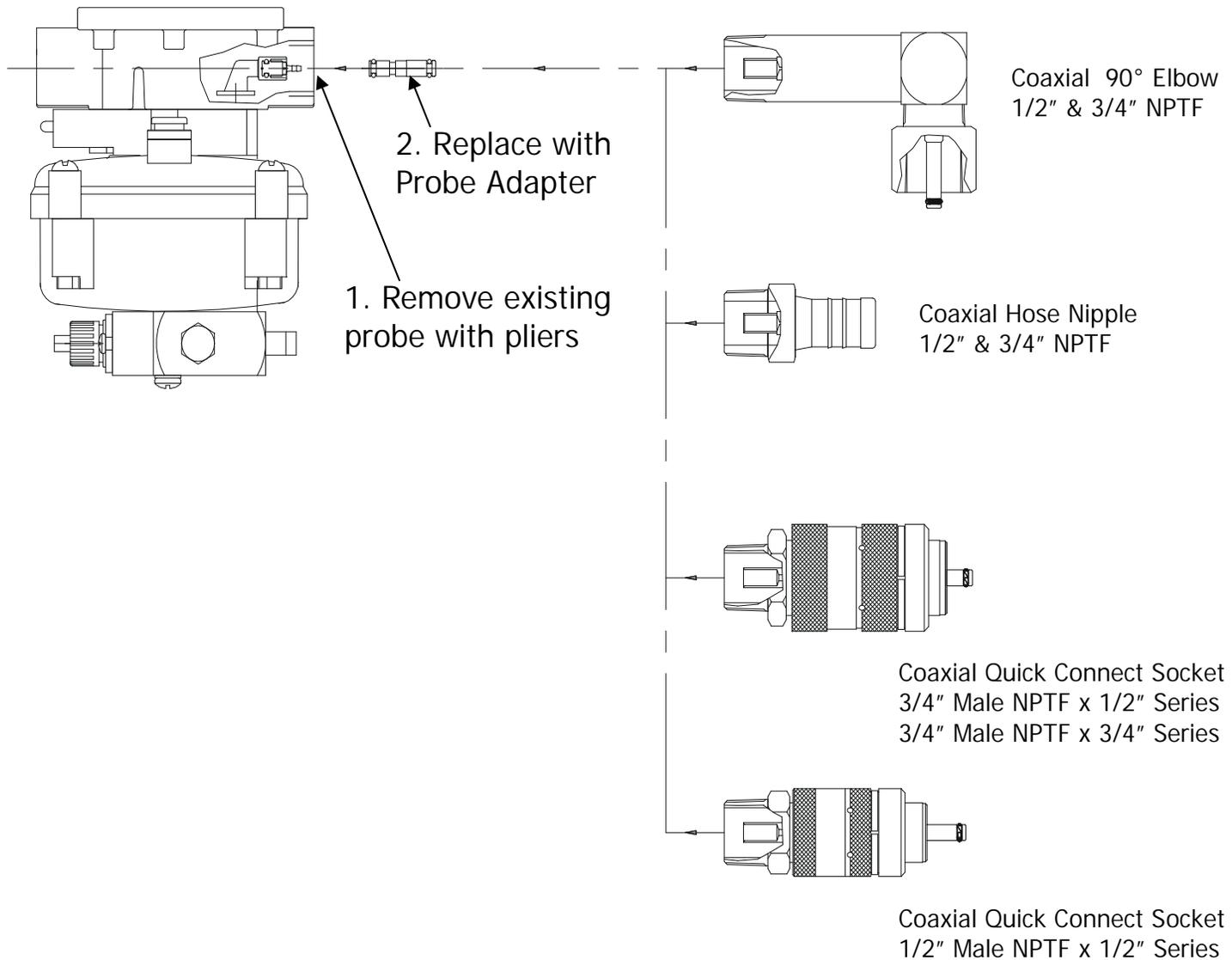
WORKING MODE - INJECTING OIL



PRODUCT	PIPE PORT SIZE	DROP SIZE	DESCRIPTION
A64041	1/2-NPTF	1	Single Point Lubricator, with Bowl
A64045	1/2-NPTF	1/2	Single Point Lubricator, with Bowl
A64042	1/2-NPTF	2	Single Point Lubricator, with Bowl
A64061	3/4-NPTF	1	Single Point Lubricator, with Bowl
A64065	3/4-NPTF	1/2	Single Point Lubricator, with Bowl
A64062	3/4-NPTF	2	Single Point Lubricator, with Bowl
A64041W	1/2-BSPP	1	Single Point Lubricator, with Bowl
A64045W	1/2-BSPP	1/2	Single Point Lubricator, with Bowl
A64042W	1/2-BSPP	2	Single Point Lubricator, with Bowl
A64061W	3/4-BSPP	1	Single Point Lubricator, with Bowl
A64065W	3/4-BSPP	1/2	Single Point Lubricator, with Bowl
A64062W	3/4-BSPP	2	Single Point Lubricator, with Bowl



Coaxial Fittings

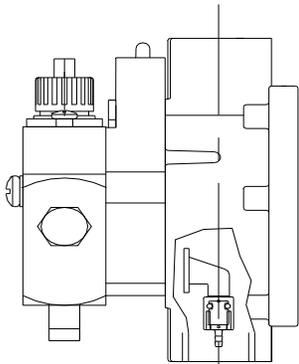


Various types of Coaxial Fittings are made to suit multiple applications. These fittings eliminate the need to manually connect the oil filled capillary tube to the Single Point Lubricator (SPL).

The O-Ring probe makes an ID/OD seal that prevents leakage of the internal oil capillary tube. Installing and removing these DIRECT CONNECT Coaxial Fittings does not adversely affect the function of the capillary tube.

Coaxial Fittings

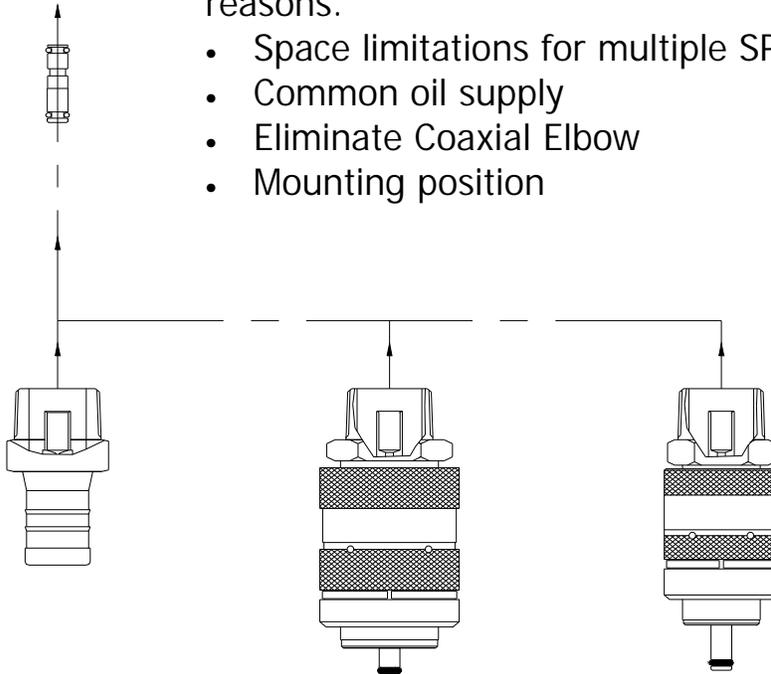
Single Point Lubricators (SPL's) can be installed vertically as well as horizontally. In these applications, an external oil supply is required. The supply can be a dedicated reservoir or a Central Oil Delivery System.



Remove existing barb and replace with probe adapter as shown on previous page.

Vertical installation is used for numerous reasons.

- Space limitations for multiple SPL's
- Common oil supply
- Eliminate Coaxial Elbow
- Mounting position



Single Point Lubricators

Some examples of available SPL's

SPL with integral 10 ounce reservoir, pulse counter with 1/2" or 3/4" NPTF Female ports (BSPP optional)



SPL with external 10 ounce reservoir, pulse counter with 1/2" or 3/4" NPTF Female ports (BSPP optional) Shown with Coaxial Socket



SPL without reservoir, with frequency generator with 1/2" or 3/4" NPTF Female ports (BSPP optional)



SPL without reservoir, double pulse counter with 1/2" or 3/4" NPTF Female ports (BSPP optional)



FRL Combos

The Filter-Regulator-Lubricator (FRL) Combinations (Combos) are virtually endless. Below are some examples.



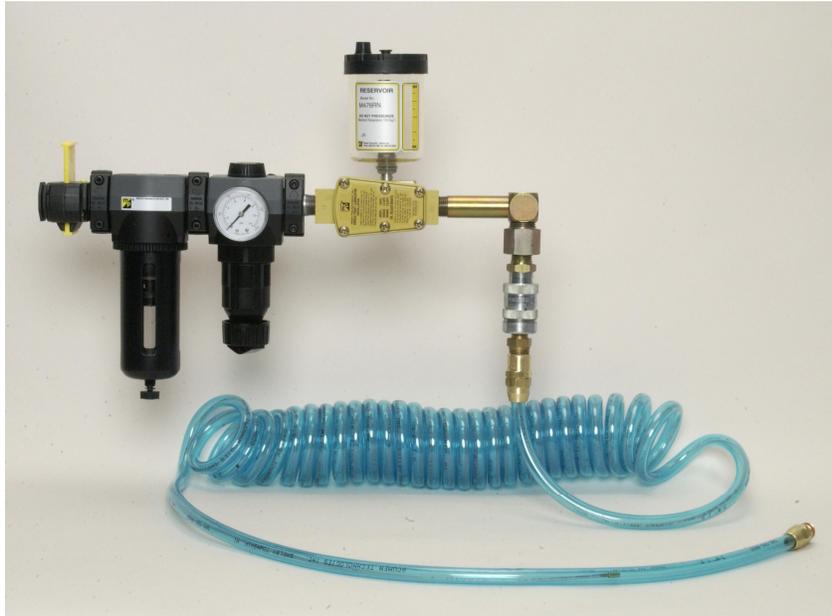
Lockout Valve, Filter, Regulator, SPL w/ integral reservoir, Coaxial Elbow & Quick Disconnect Socket are shown left. Also Shown is a Coaxial Coiled Urethane Hose Assembly.

Lockout Valve, Filter, Regulator, SPL w/ integral reservoir and Coaxial Elbow and are shown right. Also shown is a Coaxial Straight Urethane Hose Assembly with a Coaxial Male Fitting for manual attachment to the Coaxial Elbow.



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Lockout Valve, Filter, Regulator, SPL w/ external reservoir, Coaxial Elbow & Quick Disconnect Socket are shown left. Also Shown is a Coaxial Coiled Urethane Hose Assembly.

Lockout Valve, Filter, Regulator, SPL w/ external reservoir and Coaxial Elbow and are shown right. Also shown is a Coaxial Straight Urethane Hose Assembly with a Coaxial Male Fitting for manual attachment to the Coaxial Elbow.



Coaxial Connections

Various Coaxial Connectors are made for the numerous FRL Combos. Below are a few examples.



Coaxial 90° Elbows are available in 1/2" & 3/4" NPTF. They are used to position the Coaxial Whip Hose and/or Tool Hose Assemblies perpendicular to the SPL. (shown left)



Direct Connect Coaxial Sockets are available in 3 configurations:

- 3/4 Series x 3/4" Male NPT
- 1/2 Series x 3/4" Male NPT
- 1/2 Series x 1/2" Male NPT

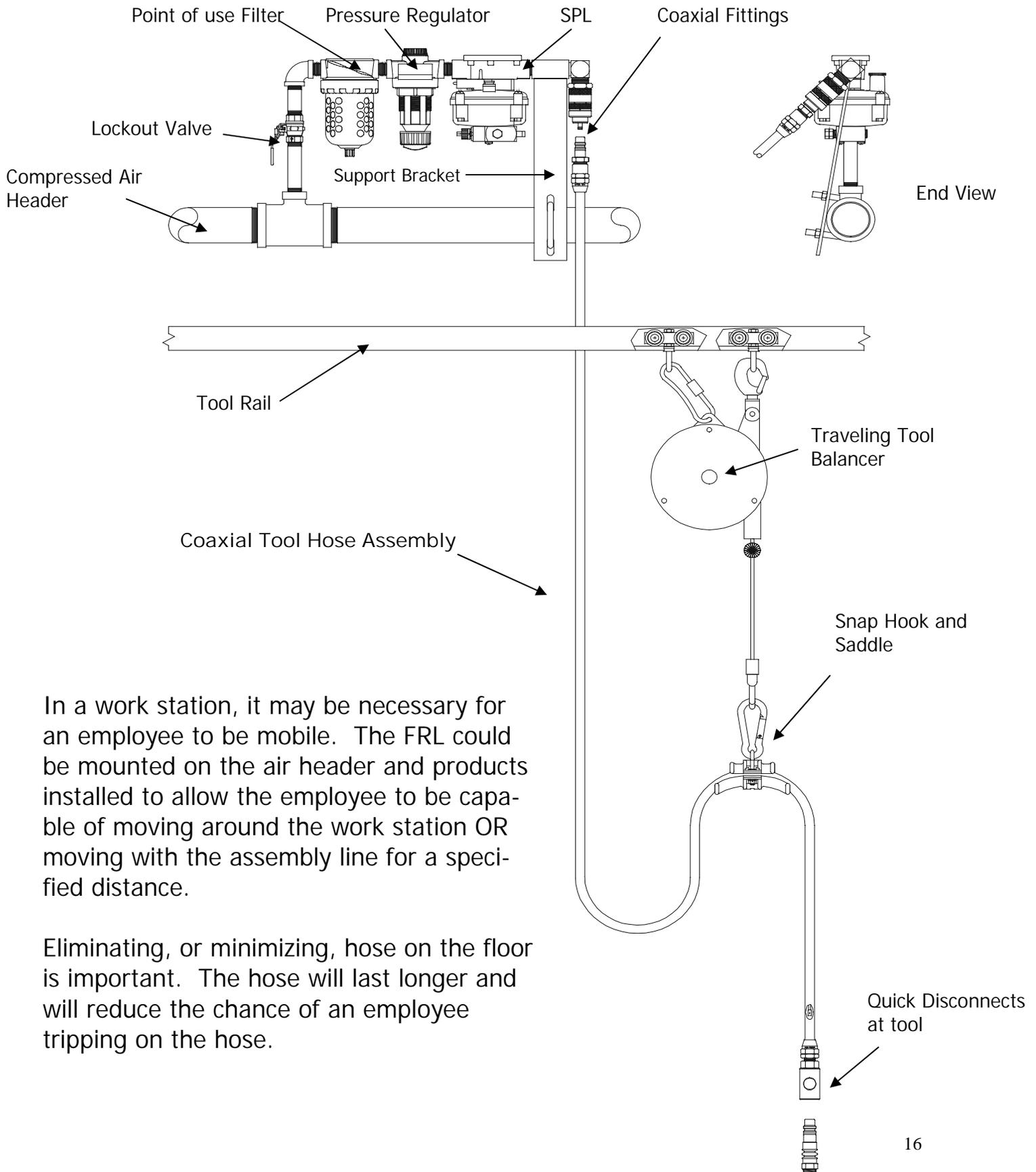
These are Zero Pressure Quick Connect Sockets. (shown left)

Coaxial Quick Connect Plugs (shown right) are made to connect to the Coaxial Sockets which are installed in the SPL, Coaxial Elbow or on the end of the Coaxial Whip Hose Assembly



Male Coaxial Connectors (shown left) are made to thread into the SPL or Coaxial Elbow. These are NOT quick connects and the air supply must be off to install or remove.

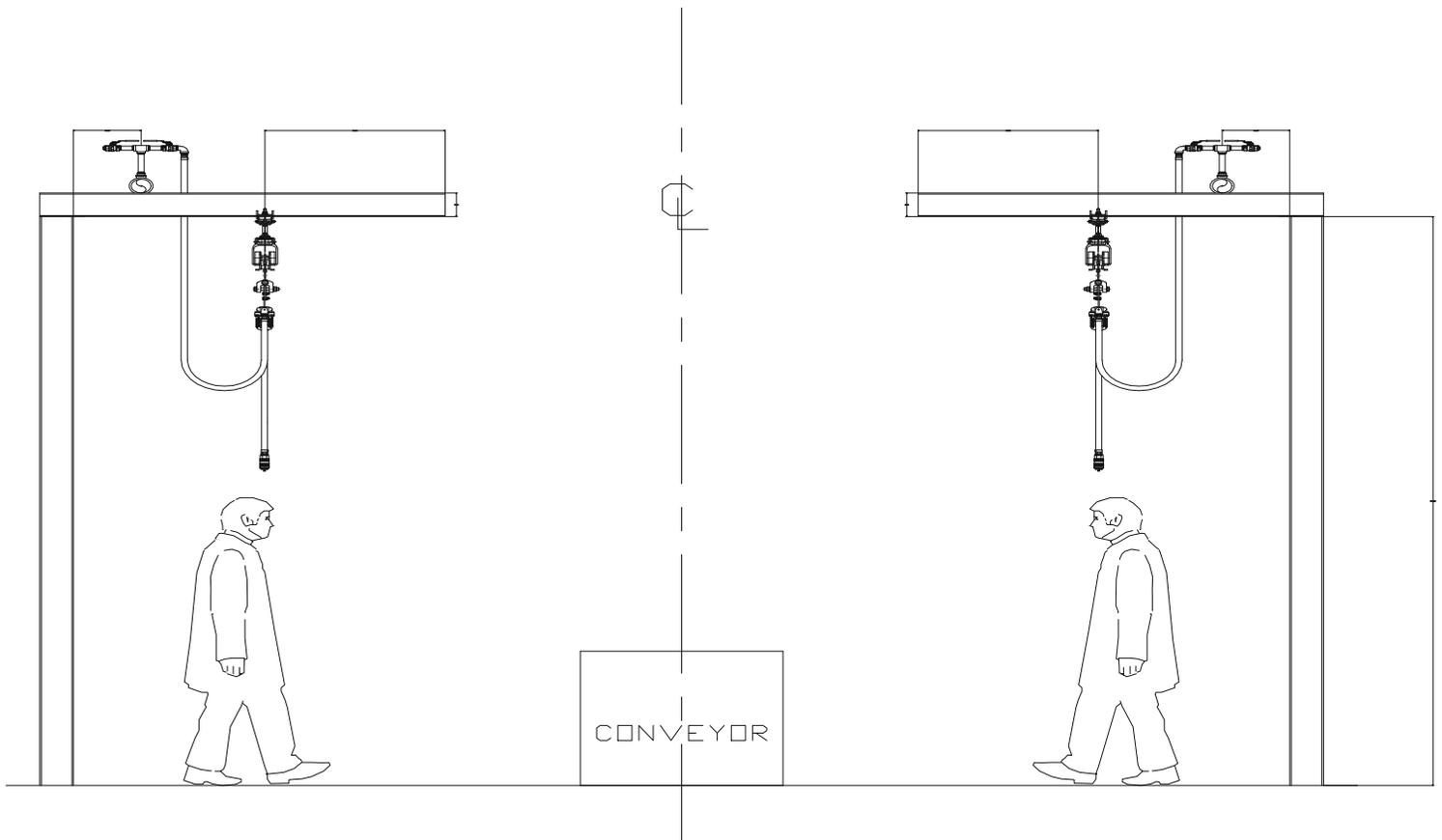
Basic Work Station



In a work station, it may be necessary for an employee to be mobile. The FRL could be mounted on the air header and products installed to allow the employee to be capable of moving around the work station OR moving with the assembly line for a specified distance.

Eliminating, or minimizing, hose on the floor is important. The hose will last longer and will reduce the chance of an employee tripping on the hose.

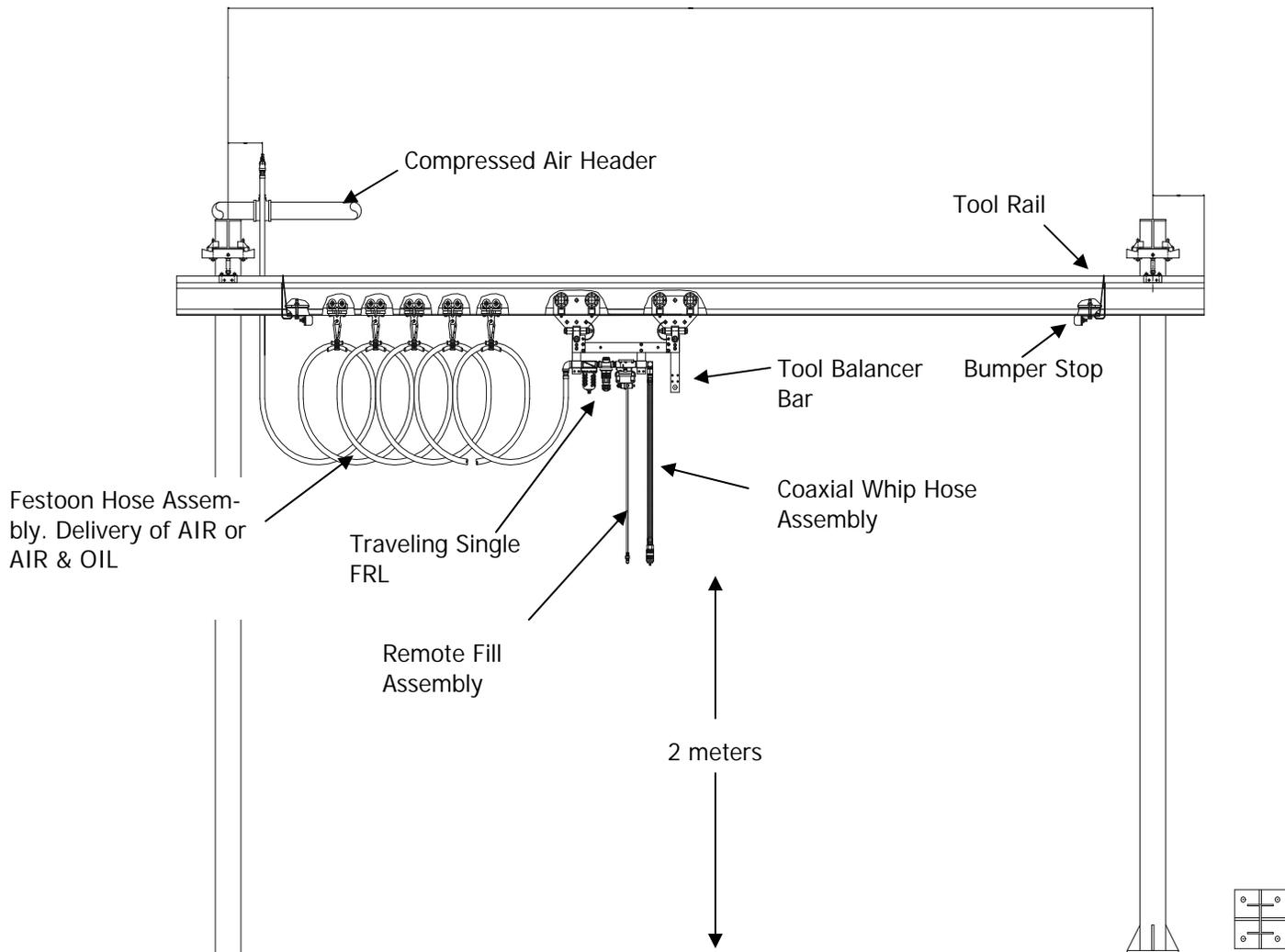
Basic Work Station



Assembly processes determine how air preparation products (FRL's) are installed. Some applications require the employee to be able to move around the product to be assembled. In these applications, the FRL Combo may be stationary and the Coaxial Tool Hose may be mounted on a balancer, or coiled to allow the employee to be mobile BUT minimize hose on the floor.

Basic Work Station

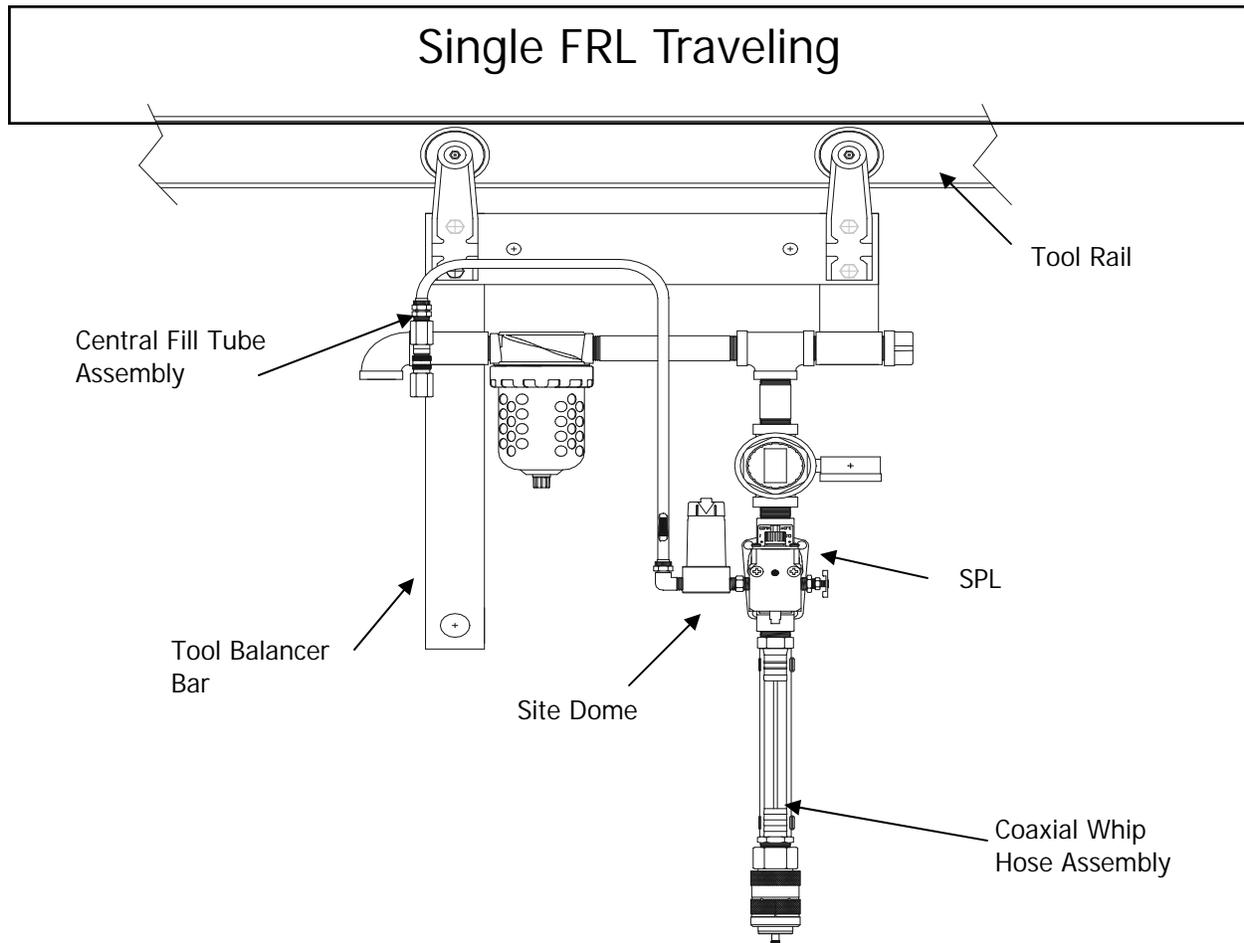
Single FRL Traveling



Many vehicular assembly processes require air preparation products (FRL's) to move on tool rail. The employee is able to move with the product to be assembled on the conveyor. Factors that need to be considered are too numerous for this publication but a partial list would include:

- Tool rail type and height
- Process time allowed in station
- Number of jobs to be performed and by how many employees
- Type of tools being used
- Oil supply method

Basic Work Station

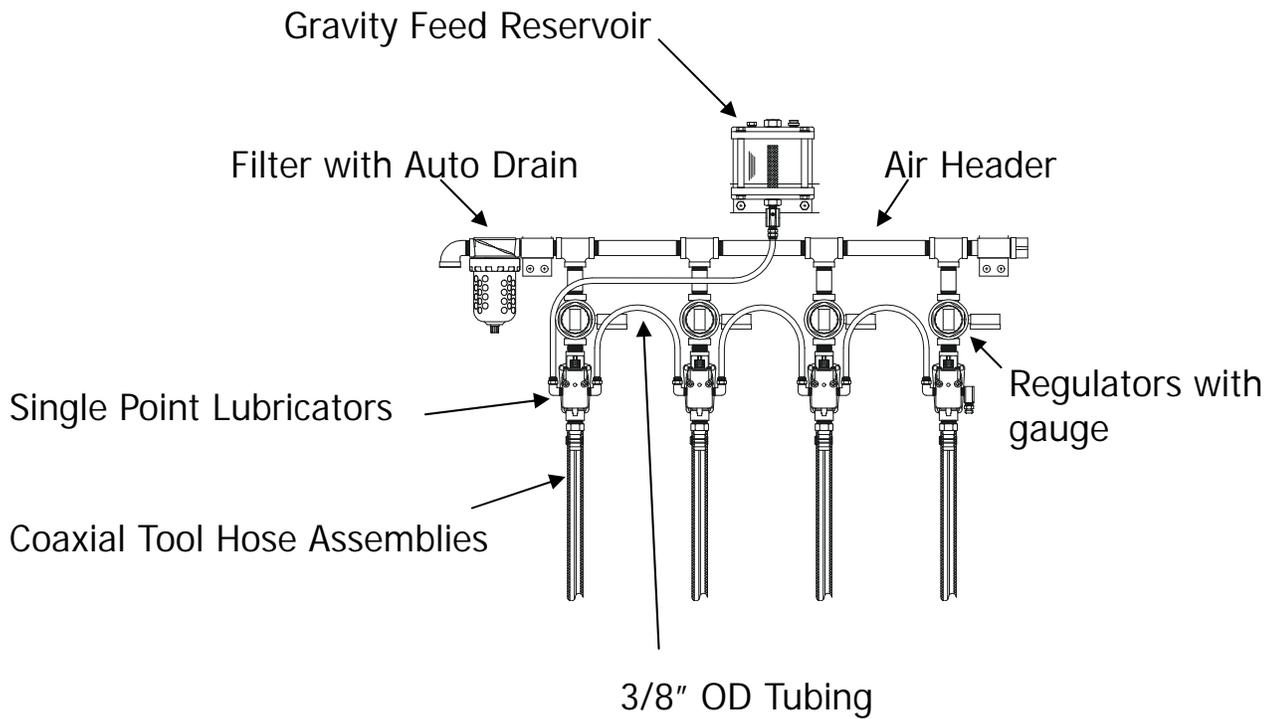


In the illustration above, a Single Traveling FRL Combo was used. The SPL does not include the integral reservoir. Instead, a Central Oil Delivery System was installed to keep oil supplied to over 1000 SPL's. This design is compact, lower cost, and requires less maintenance.

The site dome is used during start-up of the system and then functions as visual indication of oil delivery. The short length of tubing installed at the inlet to the site dome includes a fluid filter and quick connects to attach to the festoon hose assembly. The Balancer Bar is used to suspend a tool balancer. The Coaxial Whip Hose Assembly was designed to extend to 2 meters off the floor.

Basic Work Station

4 Tool Workstation

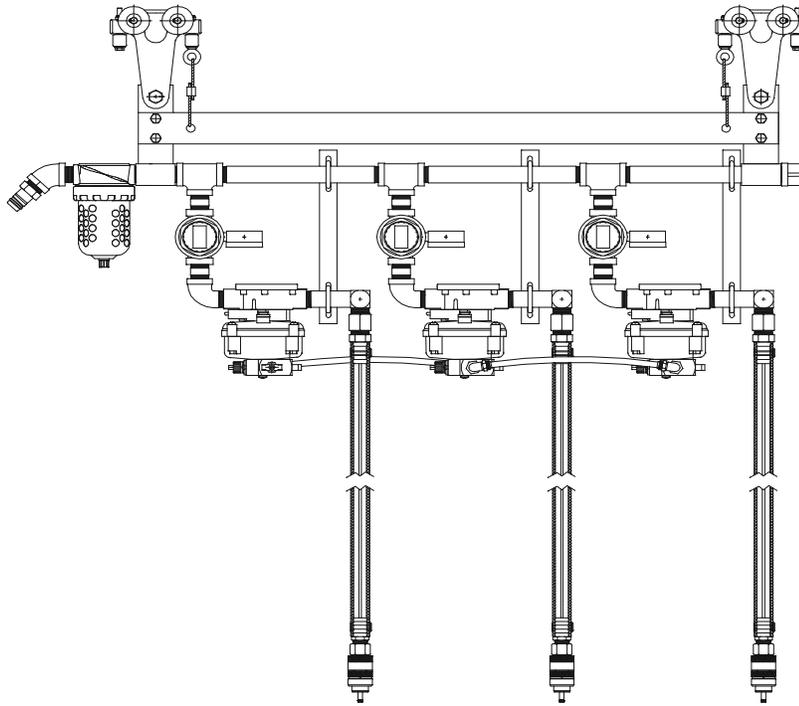


In the illustration above, four tools can be independently operated at a work station. The SPL's do not include the integral reservoir. Instead, a Central Oil Delivery System was installed to keep oil supplied to all four SPL's. This design is compact, lower cost, and requires less maintenance.

One common Filter with individual Regulators for each SPL.

Basic Work Station

Triple FRL Traveling



Above, a Triple Traveling FRL Combo is illustrated. These SPL's include the integral reservoirs. All three SPL's are connected with 3/8" OD tubing to allow maintenance to fill only one SPL to keep all three full. This design was built for an assembly process where three separate tools, each having different pressure requirements, were used in the same workstation.

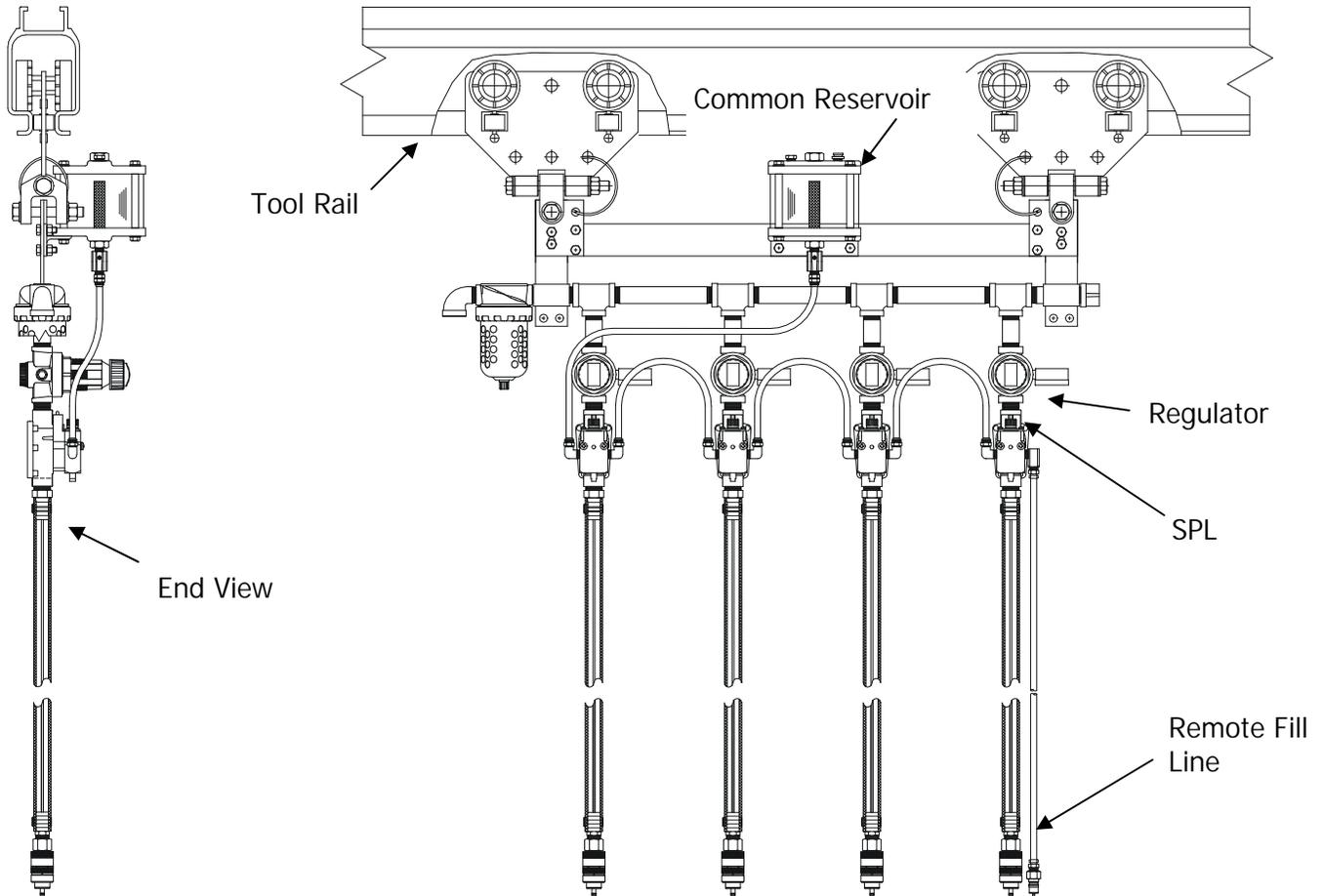
Other options that could have been included are:

- Remote or Central Fill
- Balancer Bars
- Lower profile

The Coaxial Whip Hose Assemblies were designed to extend to 2 meters off the floor.

Basic Work Station

Multiple FRL Traveling

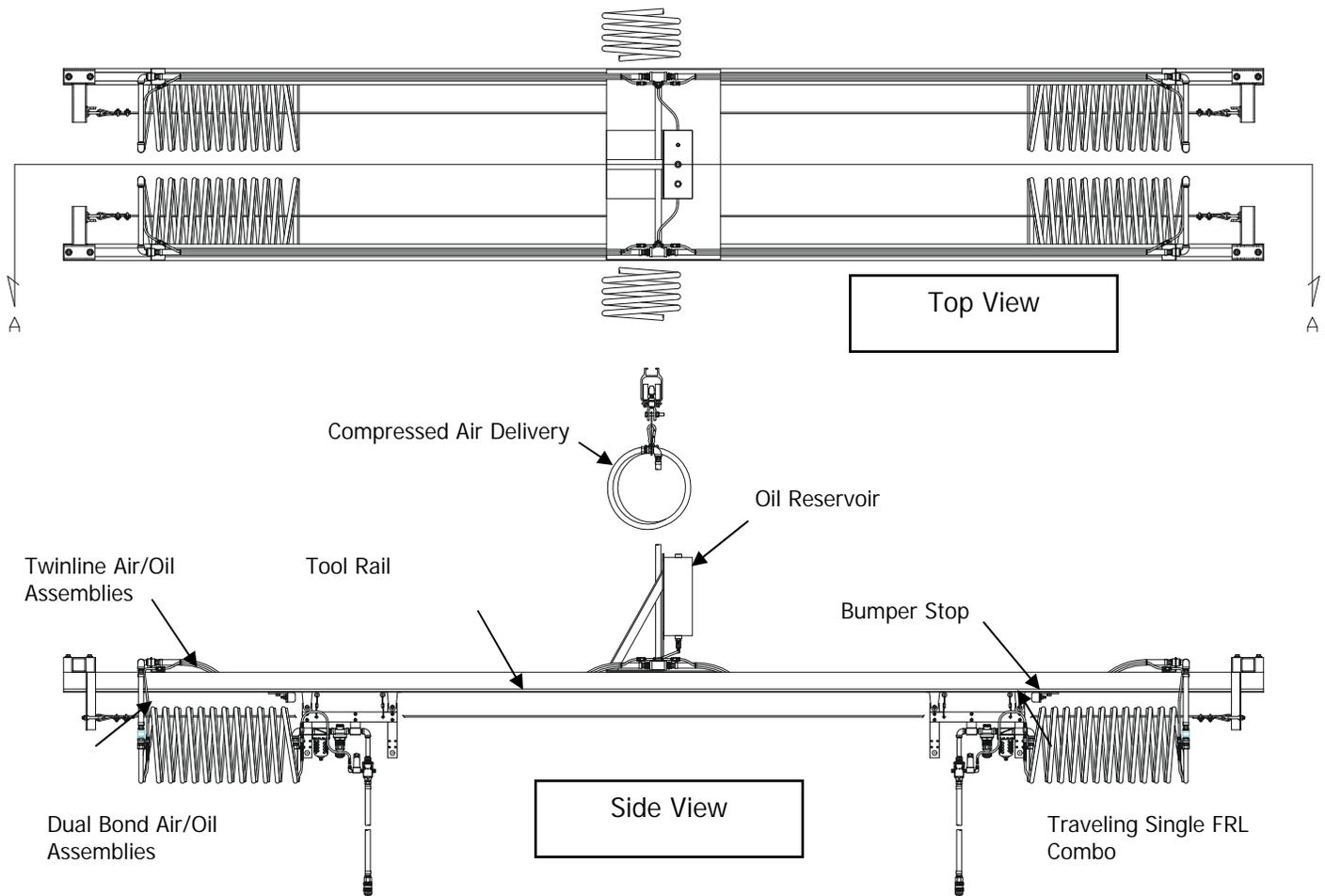


Above, a Quad Traveling FRL Combo is shown. These SPL's do not include the integral reservoirs. All four SPL's are connected with 3/8" OD tubing connected to a 1 liter reservoir mounted on the Load Bar. This allows maintenance to fill only one reservoir, from the floor, to keep all four SPL's with supply oil. This design was built for an assembly process where two employees were operating four separate tools, each having different pressure requirements, in the same workstation.

A very compact design for the application.

Bridges

Bridges are often used to give employees mobility in one or more locations. Multiple tools and fixtures can be suspended from the bridge and the bridge can move on tool rail runways within a work station. Depending on space and conveyor line speed, numerous employees can perform multiple tasks in close proximity to each other.

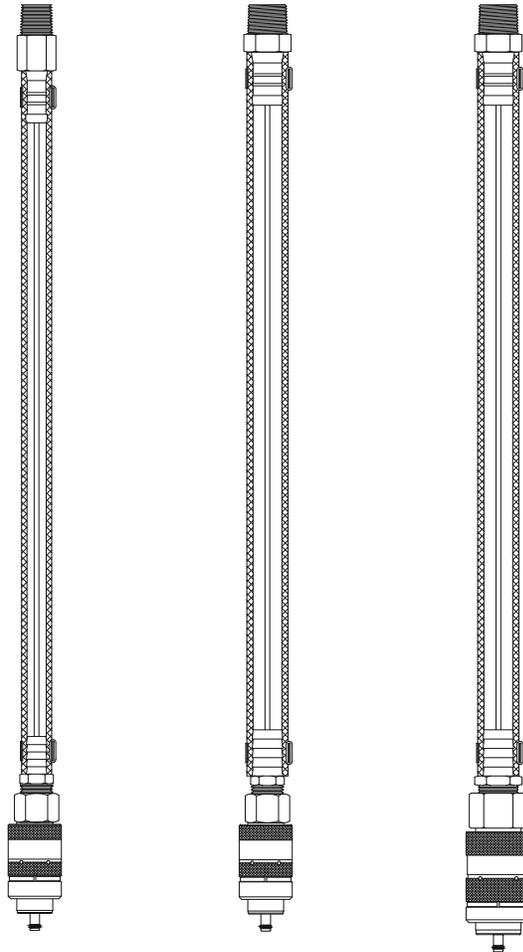


In the drawing above, up to four employees are performing assembly operations in a single station. The can move back and forth with their tools on the bridge and the bridge can be moved with the assembly line.

One common reservoir is installed in the middle of the bridge at the point compressed air is brought to the bridge. Air and oil are delivered by twinline hose to the outside of the bridge and then delivered to coiled dual bond hose assemblies to the traveling FRL Combos.

Coaxial Whip Hose Assemblies

The Coaxial Whip Hose Assembly is used to allow employees to disconnect the Coaxial Tool Hose Assembly from the SPL without the use of a ladder. They are to extend from the SPL to approximately 2 meters from the floor. In most plants, this is enough height to prevent an employee from a head injury and yet low enough to disconnect the Coaxial Tool Hose Assembly.



Unlike the Coaxial Tool Hose Assembly, the Whip Assembly has the internal oil capillary tube connected at both ends of the assembly. The hose has an inner non-stretch tube.

The upstream end has a Direct Connect Coaxial Male nipple to connect to either a Coaxial 90° Elbow or directly to the SPL. The downstream connector is a Coaxial Quick Disconnect Socket.

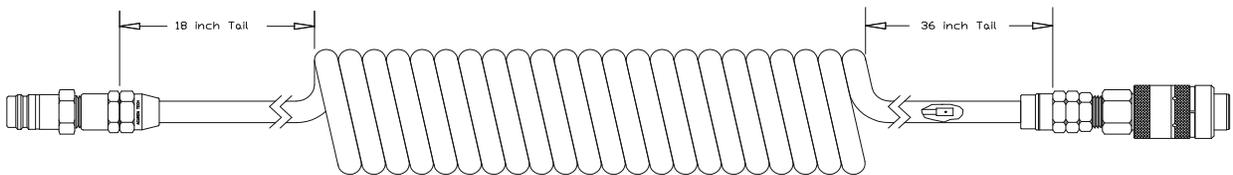
The assemblies can be made in any length, and made in either 1/2" or 3/4" ID hose.

6'8" from floor



Coaxial Hose Assemblies Selection Criteria

The Coaxial Tool Hose Assembly is a hose assembly with an internal oil line. The oil line is connected to a Coaxial Plug for quick connecting to the FRL Combo and ends within the last foot of hose before the tool with an oil check valve. It is at this point where inrushing air shears the oil and dispenses a small amount of oil, consistently, to the tool.



There are many factors to consider when choosing the correct Coaxial Tool Hose Assembly. Some of the factors to consider are:

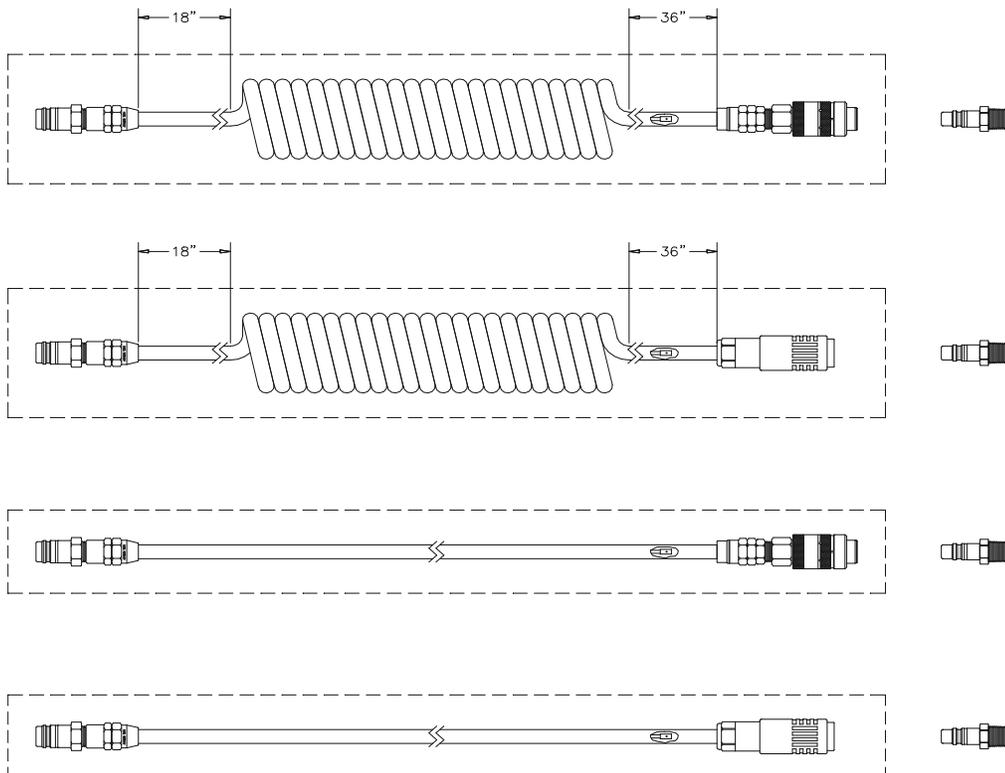
- Tool rail height
- Ergonomics
- Safety
- The job to be performed
- Commonality
- Air tool SCFM requirements
- Cost

These are only a few and are not necessarily listed by importance.

Coaxial Tool Hose Assemblies

These assemblies are made in configurations too numerous to count.
The hose can be:

- Rubber
 - Urethane (reinforced w/ inner braid or non reinforced)
 - Different colors
 - Straight or Coiled
 - If coiled, straight tails on either side of the coil in various lengths
 - Coaxial Plug on upstream end either 1/2" or 3/4" series
 - Quick disconnect on the tool end
1. Zero pressure connect / disconnect
 2. Industrial interchange or hybrid
 3. Non mar for product protection (bump & scratch)
 4. High flow
- Manufactured by M/P or by the user with the proper training by M/P

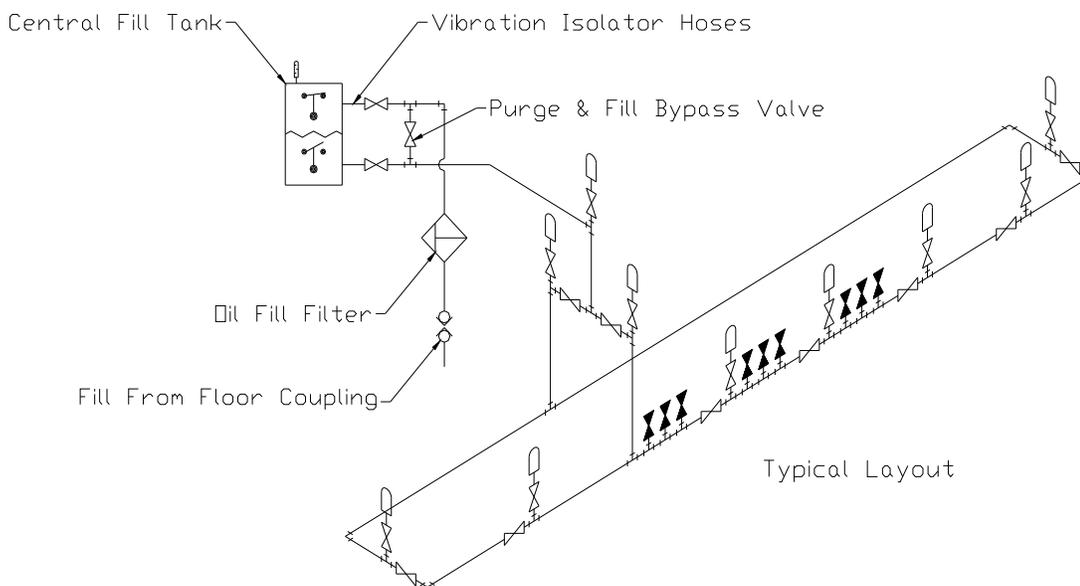


Central Oil Delivery System

The installation of a Central Oil Delivery System provides a number of benefits to the end user. The system consists of a ¾" black pipe header installed as a closed loop. We can design the system with isolation valves at appropriate intervals, vents with shut off valves (see drawing on next page), and takeoffs at 5' (typ.) or 10' centers to feed the Single Point Lubricators (SPL's). Once the system is purged and filled, maintenance employees no longer need to service hard to reach, or hard to find, reservoirs on a regular basis. There is one point per loop that needs to be serviced, from floor level, in much less frequency.

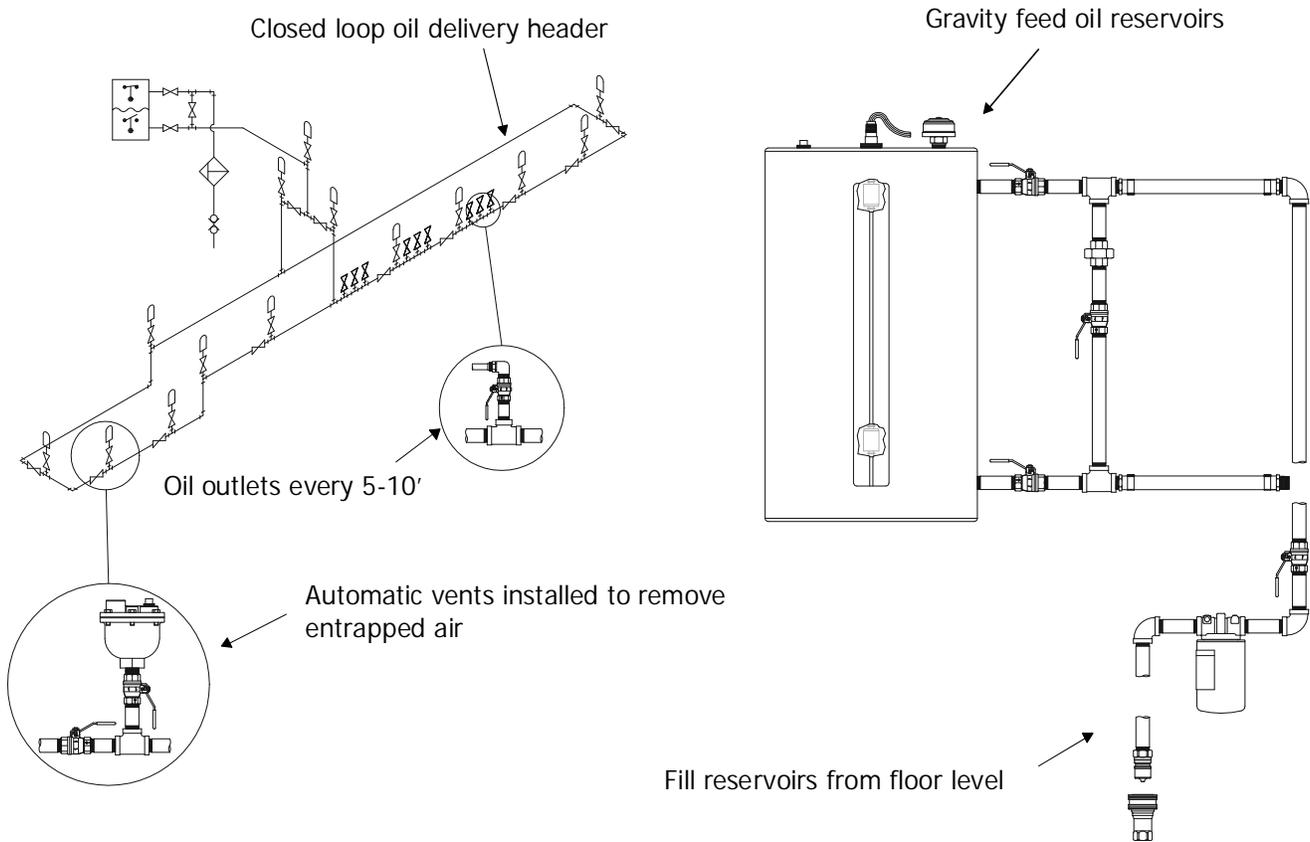
Each header loop is serviced by a gravity feed reservoir mounted above the loop (see drawing on next page). We can supply a 30 gallon translucent tank which includes the following:

- § HI-LO level switch
- § Visual level indicator lamps
- § Full useable 25 gallon range
- § Air shut off valve
- § Inlet filter necessary quick disconnects for air and oil supply Vibration isolation hoses
- § Electrical junction – control box we design for each system to address individual plant requirements. A typical system layout is shown below.



Central Oil Delivery System

Gravity Feed Oil Delivery



Oil header loops can be up to 1000' in total length. Hundreds of reservoirs can be kept full with only one tank to fill periodically from the floor level.

Remember



Specify Serv-Oil

Pneumatic tools receiving a small amount of lubrication, consistently, will:

- ◇ Increase tool life 2 1/2– 3X
- ◇ Reduce repair costs by 50-90%
- ◇ Improve tool performance (torque consistency, power, heat, etc.)
- ◇ Reduce oil in environment improving health & safety conditions
- ◇ Improve productivity



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