WETBLAST FLEX™ LP

WATER-INJECTION ABRASIVE-BLAST SYSTEM

WITH MILLENNIUM ACS PNEUMATIC REMOTE CONTROLS

O. M. 28649

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⚠ WARNING

Do not use this equipment before READING this MANUAL and UNDERSTANDING its contents.

These WARNINGS are included for the health and safety of the operator and those in the immediate vicinity. Failure to read and understand these warnings can result in injury or death.

Electronic files include a preface containing the same important information as in the orange cover.

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1.0 INTRODUCTION

1.1 Scope of manual

1.1.1 These instruction covers the setup, operation, maintenance, troubleshooting, and replacement parts for Clemco's Wetblast FLEX™ LP water injection abrasive blast system with model, 2448 6-cuft capacity blast machine and low-pressure blasting option.

The following manuals are for accessories provided with a FLEX™ package.

CPF Particulate Air Filter .....Manual No. 04143
APOLLO 600 HP Respirator .....Manual No. 23930
Clem-Cool Air Conditioner .....Manual No. 23837

1.1.2 Important safety information: All operators and personnel involved with the abrasive blast process must read and understand the contents of these instructions, including the orange cover. It is equally important that the blast operator is trained and qualified to safely operate the blast machine and remote controls, and all other equipment used with the blast machine system.

1.1.3 All personnel involved with the abrasive blast process must be made aware of the hazards associated with abrasive blasting. The Clemco booklet "Abrasive Blasting Safety Practices" is included with every blast machine, and contains important safety information that may not be included in equipment operation manuals. To order additional copies, visit www.clemcoindustries.com or email info@clemcoindustries.com.

1.2 Safety Alerts

1.2.1 Clemco uses safety alert signal words, based on ANSI Z535.4-2011, to alert the user of a potentially hazardous situation that may be encountered while operating this equipment. ANSI's definitions of the signal words are as follows:

This is the safety alert symbol. It is used to alert you to potential physical injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

NOTICE

Notice indicates information that is considered important, but not hazard-related, if not avoided, could result in property damage.

⚠ CAUTION

Caution indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

⚠ WARNING

Warning indicates a hazardous situation that, if not avoided, could result in death or serious injury.

⚠ DANGER

Danger indicates a hazardous situation that, if not avoided, will result in death or serious injury.

1.3 Table of Contents

* This section is especially important when using the injector at the blast machine.

1.4 Components

1.4.1 The primary components of the blast and injector system are shown in Figure 1. They include:

1. 6 cuft capacity blast machine equipped for low pressure blasting with Millennium remote controls and pneumatically-operated Auto-Quantum abrasive metering valve.
2. Low-pressure blasting, pressure-regulator circuit.
3. Wetblast injector™ system.
4. 120-gallon capacity water tank.
5. Transport platform and frame assembly with forklift pockets and lifting eyes.
6. All interconnecting plumbing and controls.

1.4.2 Optional accessory package includes operator safety equipment, coupled blast hose, nozzle, and related spare parts.

1.5 Instruction Maintenance Manuals

1.5.1 After reviewing all the manuals, and start-up and adjustments are completed, store manuals in a convenient location for future reference.

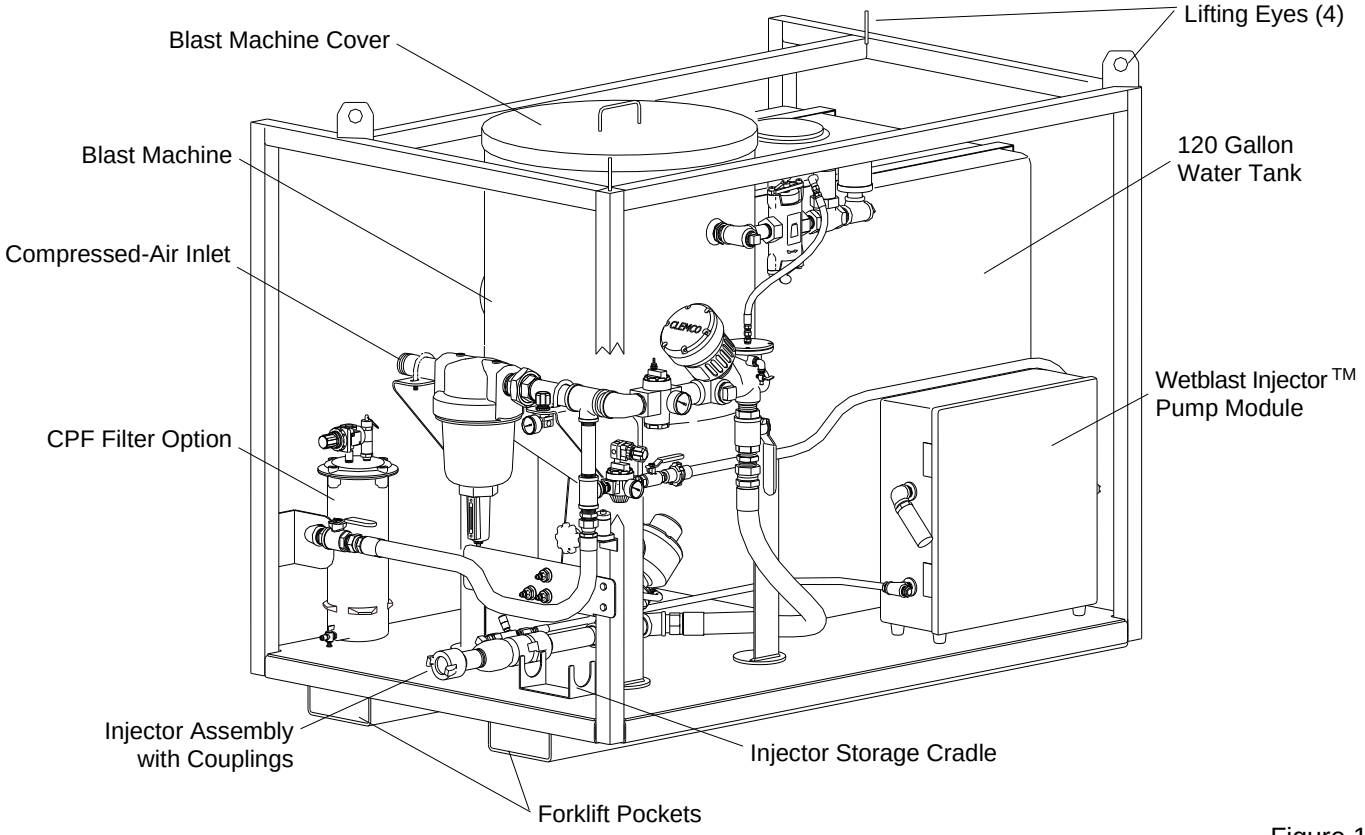


Figure 1

1.6 Description and Operating Principles

1.6.1 Blast machine – Figure 2

1.6.1.1 Blast machine operation is controlled using pressure-release-style remote controls, which enable the pressurization and depressurization of the blast machine. Pressurization, which starts blasting, occurs when the operator presses the control handle. Depressurization, which stops blasting, occurs when the handle is released. Refer to Section 1.6.2 for remote control operating principles.

1.6.1.2 Blasting may be done at pressures as low as 5 psi to a maximum or 120 psi. The low-pressure-blasting option utilizes line pressure to initially seal the machine, but immediately drops to the pressure set at the blast-pressure pilot regulator. Refer to Section 5.2 to adjust blast pressure.

1.6.1.3 Clemco blast machines (pressure vessels) are certified to conform to the ASME (American Society of Mechanical Engineers) Boiler and Pressure Vessel Code, Section VIII, Division 1. It is the owner's responsibility to maintain the integrity of the vessel in accordance with state regulations. Regulations may include regular inspection and hydrostatic testing as described in National Board inspection code and jurisdictional regulations and/or laws.

⚠ WARNING

Welding, grinding, or drilling on the blast machine can weaken the vessel. Compressed-air pressure can cause a weakened blast machine to rupture, resulting in death or serious injury. Welding, grinding, or drilling on the vessel, without a National Board R stamp, voids the Clemco ASME certification.

1.6.1.4 All welding repairs to the vessel must be performed by certified welders at shops holding a National Board R Stamp. Welding performed by any welder not properly qualified per the ASME code voids the Clemco ASME certification.

1.6.1.5 Do not exceed the maximum working pressure rating (PSI) of the blast machine. The maximum pressure rating is stamped into the ASME nameplate which is welded to the side of the vessel.

⚠ WARNING

Excessive compressed-air pressure can cause a blast machine to rupture. To prevent serious injury or death, do not exceed the rated pressure of the blast machine.

1.6.1.6 OSHA does not require pressure relief valves on blast machines when air compressors supplying air to the blast machines are built to ASME[(1)] code and comply with OSHA[(2)] regulations. OSHA regulation 1910.169 refers to the ASME code when describing the necessity of pressure relief valves on compressed air equipment. **DO NOT** operate blast machines with air compressors that are not equipped with properly-functioning pressure relief valves.

[(1)] American Society of Mechanical Engineers, Boiler and Pressure Vessel Code, Section VIII, Division 1,

[(2)] Occupational Safety and Health Administration, 29 CFR 1910, 169.

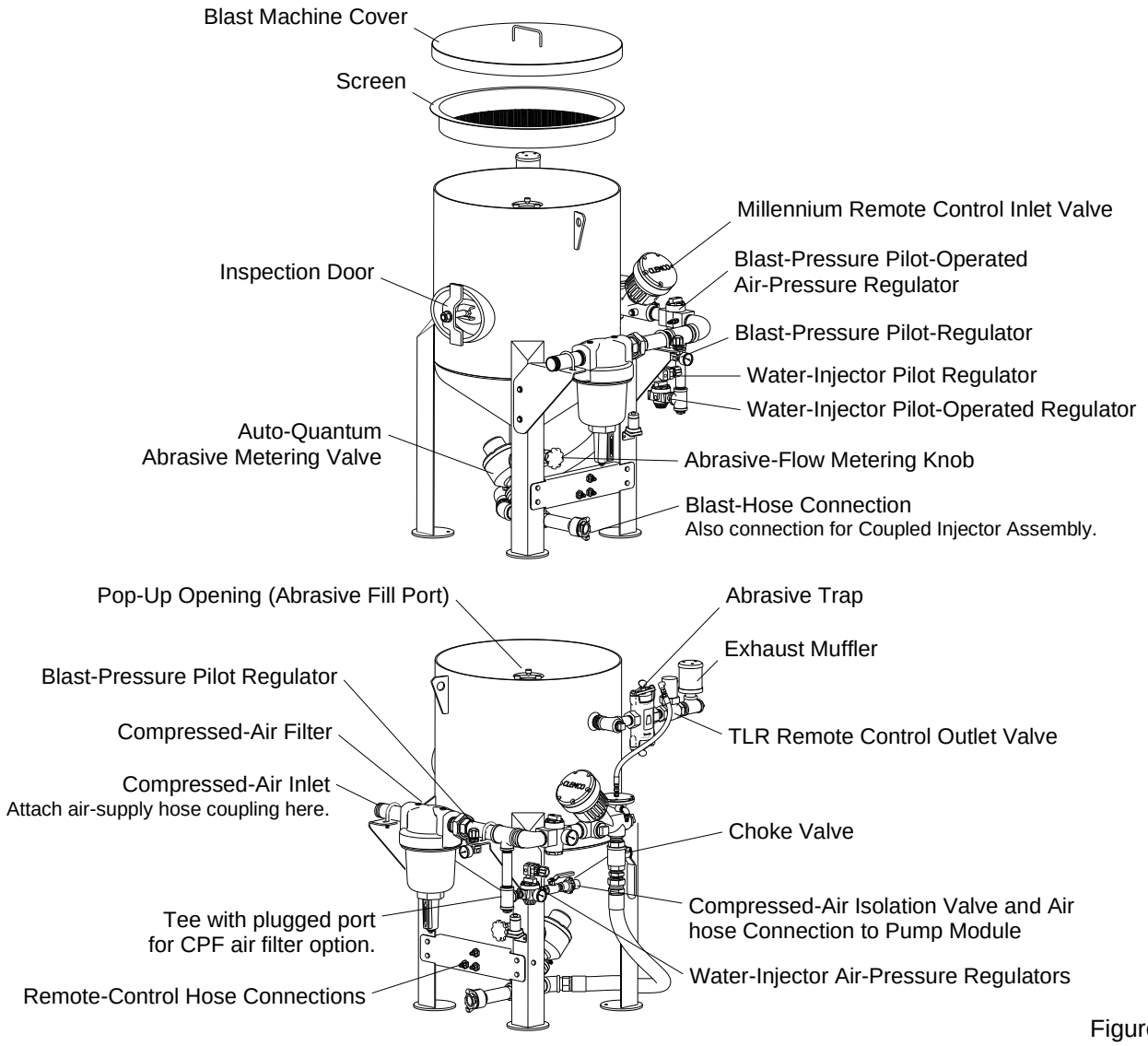


Figure 2

1.6.2 Remote controls with abrasive cut-off (ACS) Figure 3

1.6.2.1 The blast machine is equipped with remote controls that allow the blast operator to pressurize the machine to start blasting, and depressurize it to stop blasting, from a control handle located at the nozzle.

1.6.2.2 The remote control system is an OSHA-required safety device. The control handle, located near the blast nozzle, is the activator for the remote control system. When the blast operator intentionally or unintentionally removes hand-held pressure from the control handle, the machine depressurizes, stopping air and abrasive flow through the nozzle. The remote control system "fails to safe", which means when any interruption in the control-air circuit occurs, for any reason such as a break in the control line, the compressor stops running, or should the operator drop the blast hose, the remote control depressurizes the blast machine and blasting stops.

⚠ WARNING

Never modify or substitute remote control parts. Parts from other manufacturers are not compatible with Clemco equipment. If ANY part of the remote control system is altered, involuntary activation, which may cause serious injury, can occur.

1.6.2.3 The components of the remote control system are shown in Figure 3. They include the Millennium inlet valve, piston-style outlet valve, RLX control handle, 50 ft twinline and single-line control hoses and all interconnecting hoses and fittings.

⚠ WARNING

Moist air that freezes can cause blockage at the control handle or in the control lines. Blockage can cause involuntary activation of the remote controls, or prevent the controls from deactivating upon release of the control handle. This situation can result in serious injury or death. If remote controls are operated in freezing or near freezing weather, install a Clemco Anti-Freeze Injector, stock no. 05537, on the remote control air-supply line.

1.6.2.4 Clemco remote controls operate pneumatically on return air. Control air travels from the orifice fitting located on the inlet end of the blast-pressure regulator, down the outbound line (shown shaded in Figure 3) and escapes through the opening located under the RLX control handle lever. The normally-closed inlet valve remains closed, and the normally-open outlet valve remains open. As long as air escapes through the handle's opening, the remote control system remains dormant.

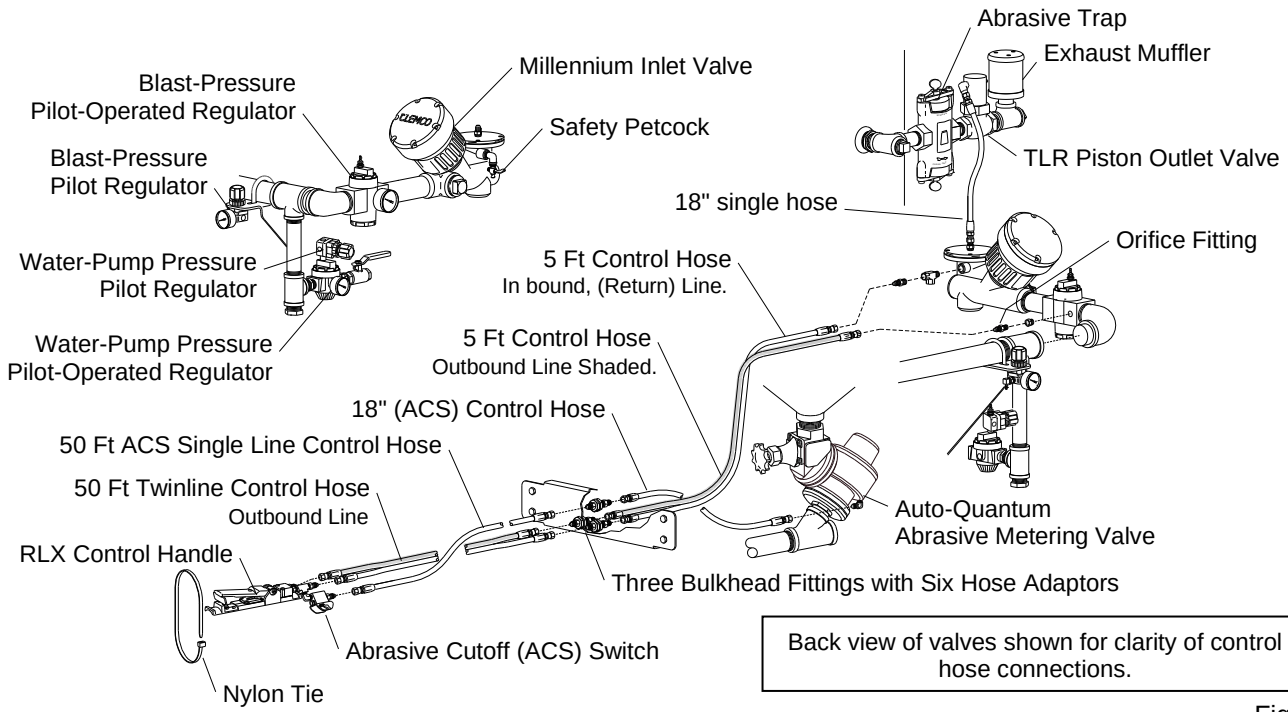


Figure 3

1.6.2.5 When the lever is pressed, a rubber button seals the opening, and outbound air returns through the inbound line to open the inlet valve and close the outlet valve. This action pressurizes the blast machine and begins the blasting. Releasing the handle exhausts the control air, which causes the inlet valve to close, and the outlet valve to open to depressurize the blast machine and stop the blasting.

1.6.2.6 Abrasive cut-off switch (ACS)

1.6.2.6.1 The abrasive cut-off switch is situated directly behind the RLX control handle. It closes the metering valve so that air alone, without abrasive exits the nozzle. This feature is used to clear the blast hose and to blow-down and wash-down the blast surface. The switch may be toggled from open to close at any time, but will not operate the metering valve unless the control handle is pressed.

1.6.3 Injector-pump module – Figure 4

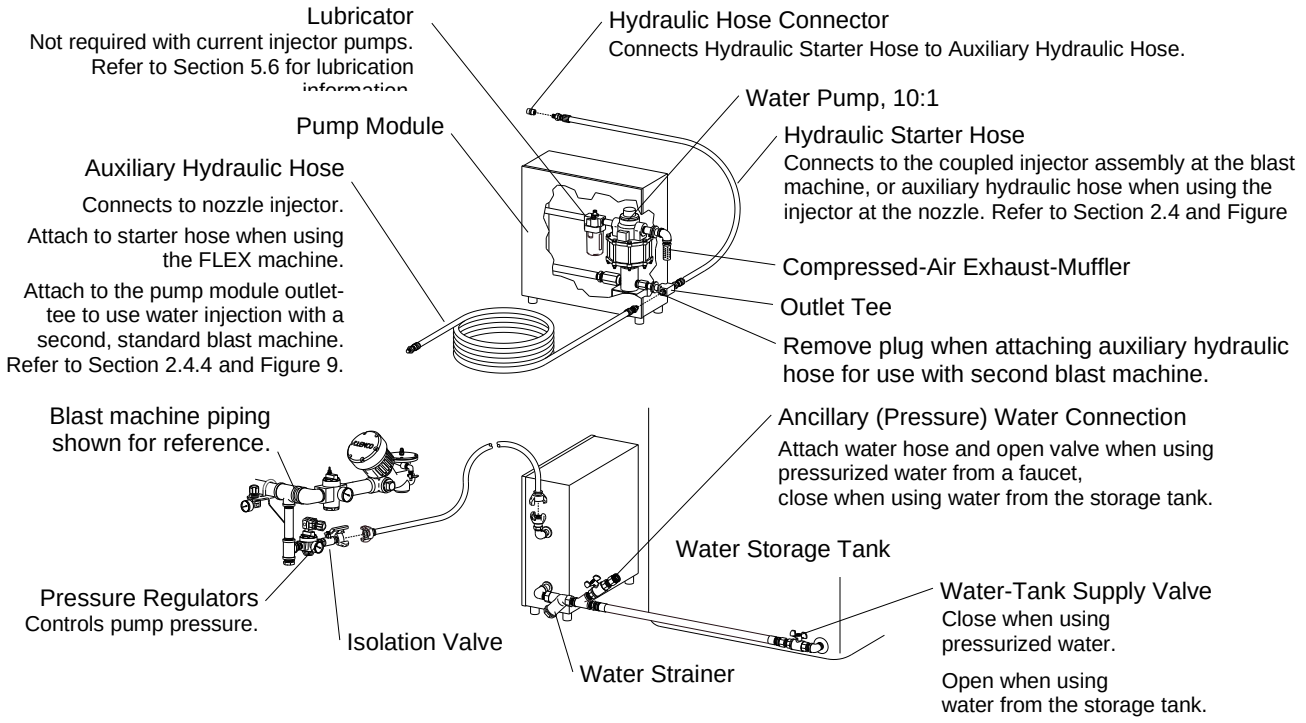
1.6.3.1 The pump module houses a 10:1 compressed-air-driven water pump.

1.6.3.2 External inlet connections are located on the right side on the enclosure. They include the compressed-air supply connection and water supply connection and strainer. The water supply hose from the water storage tank is attached; use the angled water supply connections when using pressurized water from a faucet.

1.6.3.3 External outlet connections are located on the left side of the enclosure and include the exhaust muffler and hydraulic hose connections.

1.6.3.4 The water outlet tee is for attaching the hydraulic starter hose; this hose connects to the coupled injector assembly when using the injector at the blast machine, as shown in Figure 4 and Figure 9. The tee also has a plug on the unused leg; when using the nozzle injector with a separate (additional) blast machine, remove the plug and attach the hydraulic. Refer to Section 2.4.4.

1.6.3.5 The air supply for the pump comes from a set of pressure regulators located on the blast-machine inlet piping. Presetting the pilot regulator permits the main, pilot-operated regulator to open and supply air to the pump when the blast machine pressurizes and stops when the blast machine depressurizes.



Some items rotated for clarity.

Figure 4

1.7 Low-Pressure Blasting

1.7.1 Blasting may be done at pressures lower than the 40 to 50 psi required for pressurizing the blast machine. The low-pressure-blasting feature utilizes line pressure to initially seal the machine, but before the vessel's pressure increases, it drops to the pressure set at the blast-pressure pilot regulator.

1.7.2 The primary components of the low-pressure regulator assembly are shown in Figure 5.

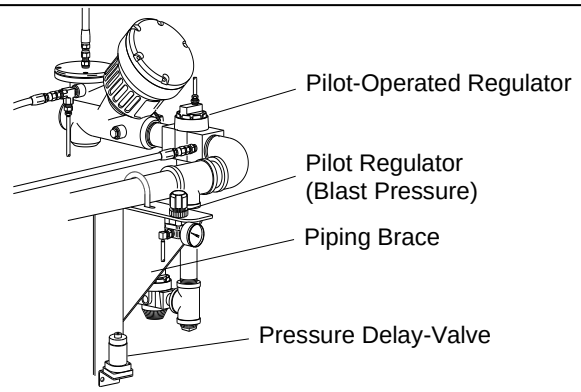


Figure 5

1.8 Abrasive

⚠ WARNING

Before blasting, obtain a safety data sheet (SDS) for the blast abrasive and identify all substances removed by the blasting process. Abrasive containing crystalline (free) silica or toxic metals can lead to serious or fatal lung disease. Consult OSHA regulations concerning the use of abrasive containing free silica and toxic metals.

NOTE: Selection of blasting abrasive can adversely affect the health risk to the operator, productivity, and maintenance of the blast machine. DO NOT USE abrasives containing more than one percent crystalline (free) silica. Obtain safety data sheets (SDS) for the blasting abrasive prior to blasting, paying particular attention to the health risks and presence of any hazardous/toxic substances.

1.8.1 The system can use any non-metallic abrasives specifically manufactured for blast cleaning, that are compatible with the surface being blasted. Abrasives commonly chosen for most applications include crushed glass or garnet.

1.8.2 Abrasive mesh size: The choice of abrasive size depends on the desired profile, cleaning rate, nozzle size and availability of clean dry air. Generally, larger and denser abrasives provide a deeper profile, while smaller abrasives clean faster. Most abrasive blasting is done with abrasive sizes between 16 and 80 mesh. Finer abrasives are especially sensitive to moisture and require dry air to prevent bridging.

1.8.3 Sand: Sand should NEVER be used because of the respiratory hazards associated with the use of abrasive containing free silica.

1.8.4 Slags: Slag abrasives may be used. Obtain a safety data sheets (SDS).

1.8.5 Steel: Steel shot and steel grit are not suitable for the wetblast injector™ system.

1.8.6 Silicon carbide, aluminum oxide, and garnet: These are the most aggressive of the commonly used abrasives. Aggressive abrasives may be used, but the service life of any equipment components that are exposed to the abrasive will be reduced. Use a nozzle lined with boron carbide with these abrasives.

1.8.7 Crushed glass: Crushed glass absorbs moisture from moderately-high ambient humidity. Glass subjected to moisture may be reused only after thorough drying and breaking up of any clumps.

1.9 Transporting and Moving

⚠ WARNING

- **Make sure the water tank and all other equipment are securely attached to the platform and that tie-down straps are secure.**
- **Use lifting eyes or forklift slots when lifting or moving the machine. Never move or hoist the machine by the any other means.**
- **Always use lift equipment that is rated higher than the weight of the machinery.**
- **Use a spreader for uniform, vertical lift on each lifting eye.**
- **Always secure the platform and frame to the transport vehicle.**
- **Anyone using material handling equipment to move, transport, or lift the machine must be trained and experienced with the hazards associated with this type of machinery.**
- **Failure to observe these warnings can result in serious injury or death.**

2.0 INITIAL SETUP

⚠ WARNING

Moist air that freezes can cause blockage at the control handle or in the control lines. Blockage can cause involuntary activation of the remote controls, or prevent the controls from deactivating upon release of the control handle. This situation can result in serious injury or death. If remote controls are operated in freezing or near freezing weather, install a Clemco Anti-Freeze Injector, stock no. 05537, on the remote control air-supply line.

2.1 Compressed-Air Supply and Air Hose Connection

2.1.1 Install an air-supply hose coupling that is compatible with the compressed-air supply hose from the compressor, to the compressed-air filter at the blast-machine inlet piping. For best blasting performance, use1-1/4" ID or larger air line when using up to a 5/16" orifice nozzle, 1-1/2" or larger when using up to a 3/8" nozzle, and 2" or larger when using up to a 1/2" nozzle.

Refer to the compressed-air table in Figure 6 for approximate air consumption.

2.2 Nozzle and Blast Hose Ratio

2.2.1 To prevent water, air, and abrasive surging at the nozzle, it is especially important that the ratio of the nozzle orifice size (smallest inside diameter) and the blast hose inside diameter be maintained. A proper ratio ensures that the velocity inside the hose is sufficient to keep the water, air, and abrasive mixture suspended and flowing evenly through the nozzle, while minimizing blast hose wear. **Proper sizing is especially important when the water injector is placed at the blast machine.**

NOTE: When blasting at low pressure (between 50 psi and 70 psi), reducing the ID of the hose by one size maintains velocity within the hose and help to keep abrasive suspended and flowing smoothly.

2.2.2 The recommended nozzle/hose combinations are:

No. 4, 1/4" orifice ..... use 1" ID blast hose
No. 5, 5/16" orifice ..... use 1" ID blast hose
No. 6, 3/8," orifice ..... use 1-1/4" ID blast hose
No. 7, 7/16" orifice ..... use 1-1/4" ID blast hose
No. 8, 1/2" orifice ..... use 1-1/4" or 1-1/2" ID blast hose

COMPRESSED AIR CONSUMPTION TABLE

	Pressure at the Nozzle (psi)								
Nozzle Orifice Size (in.)	50	60	70	80	90	100	125	140	Air, Power Requirements
No. 3	26	30	33	38	41	45	55	61	Air (cfm)
3/16"	6	7	8	9	10	10	12	14	Compressor (hp)
No. 4	47	54	61	68	74	81	98	108	Air (cfm)
1/4"	11	12	14	16	17	18	22	24	Compressor (hp)
No. 5	77	89	101	113	126	137	168	186	Air (cfm)
5/16"	18	20	23	26	28	31	37	42	Compressor (hp)
No. 6	108	126	143	161	173	196	237	263	Air (cfm)
3/8"	24	28	32	36	39	44	52	59	Compressor (hp)
No. 7	147	170	194	217	240	254	314	347	Air (cfm)
7/16"	33	38	44	49	54	57	69	77	Compressor (hp)
No. 8	195	224	252	280	309	338	409	452	Air (cfm)
1/2"	44	50	56	63	69	75	90	101	Compressor (hp)

* When using 3/8" to 1/2" orifice nozzles, blast machines should be equipped with 1-1/4" or larger piping and inlet valve to prevent pressure loss.
* Air requirements were measured by a flow meter under actual blasting conditions, and are therefore lower than figures for air alone, with no abrasive.
* Horsepower requirements are based on 4.5 cfm per horsepower.
* Figures show approximate compressed-air consumption when nozzles are new. Consumption will increase as the nozzle wears.

Figure 6

2.3 Blast Hose and Control Hose Connections Figure 7

Most accessories are factory installed; the following instructions are for those systems ordered without accessories and show how to install replacement hoses.

2.3.1 Uncoil the blast hose, and lay the 50 ft twinline hose and 50 ft single-line hose alongside it. Hoses should be of equal length.

2.3.2 Band the control handle to the blast hose close to the nozzle holder, as shown in Figure 7. Use the two nylon ties provided or similar means to secure the control handle to the hose. Once the handle control is firmly attached, clip the tie ends so they do not snag the operator's clothing or interfere with the operation of the control handle.

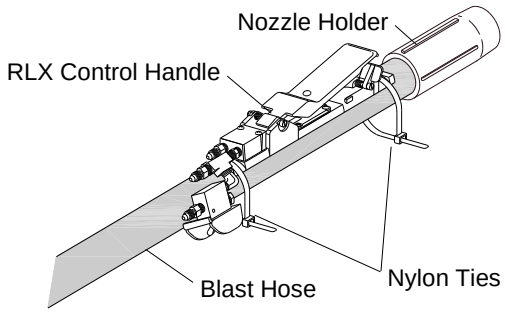


Figure 7

2.3.3 Refer to Figure 8 and attach the 50 ft twinline hose to the two fittings on the back of the control handle. Either side of the hose can be attached to either fitting.

2.3.4 Attach the 50 ft single-line control hose to the fitting on the ACS switch mounted on the control handle.

2.3.5 Make sure all fittings are tight. Leaks will cause the system to malfunction.

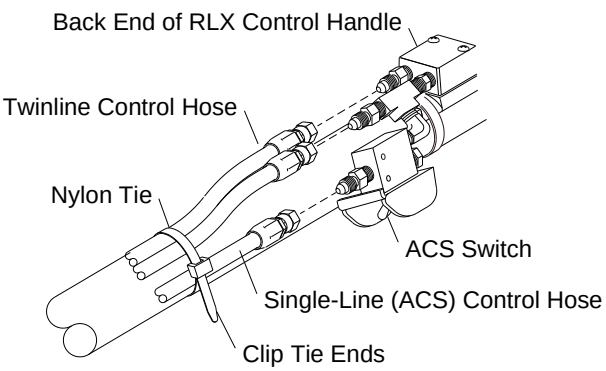


Figure 8

2.3.6 Working from the control handle back, band the twinline and single-line hoses to the blast hose every four to six feet, as shown in Figure 8, and as close to the couplings as possible.

2.3.7 Place the nozzle washer in the nozzle holder, and screw the nozzle into the holder. The nozzle must seat tightly against the nozzle washer.

2.4 Wetblast Injector™ Placement Options

2.4.1 The injector may be placed in one of two locations, as follows and, as shown in Figure 9.

NOTE: The system includes a coupled injector assembly, which is installed at the blast machine, and a threaded injector, which is installed at the nozzle. The pump module is capable of supporting two injectors; the threaded injector could be installed on the blast hose of second, separate blast machine, using the 52 ft hydraulic hose provided, this allows water-injection wetblasting with a second blast machine. Refer to Sections 2.4.4 and 3.3.3.

2.4.2 Coupled injector at the blast machine
Refer to the upper illustration in Figure 9.

2.4.2.1 The upper illustration in Figure 9 shows the injector installed onto a pipe assembly with quick couplings, and attached to the blast machine's blast hose connection. The benefits of this installation are:

- The operator does not have to manage the additional bulk and weight of the hydraulic water hose.
- After the injector assembly is attached to the 5 ft hydraulic starter-hose, it does not need to be removed when blasting is finished. The twist-on quick couplings makes it easy to attach and detach the injector. When not in use it can be stored in the storage cradle on the platform.
- Connecting and disconnecting the blast hose and control hoses are fast and simple.
- The operator controls the following functions from the nozzle.
  - Starts and stops blasting.
  - Starts and stops abrasive flow. Shutting off abrasive flow allows air and water to continue from the nozzle for washing-off the blast surface. It also clears the blast hose of abrasive before shutting OFF the blast machine.

2.4.2.2 Apply pipe thread sealant to the male threads on the hydraulic starter hose and screw the hose into the flow-control valve (installed on the injector assembly), as shown in the upper illustration in Figure 9.

2.4.3 Injector at the nozzle

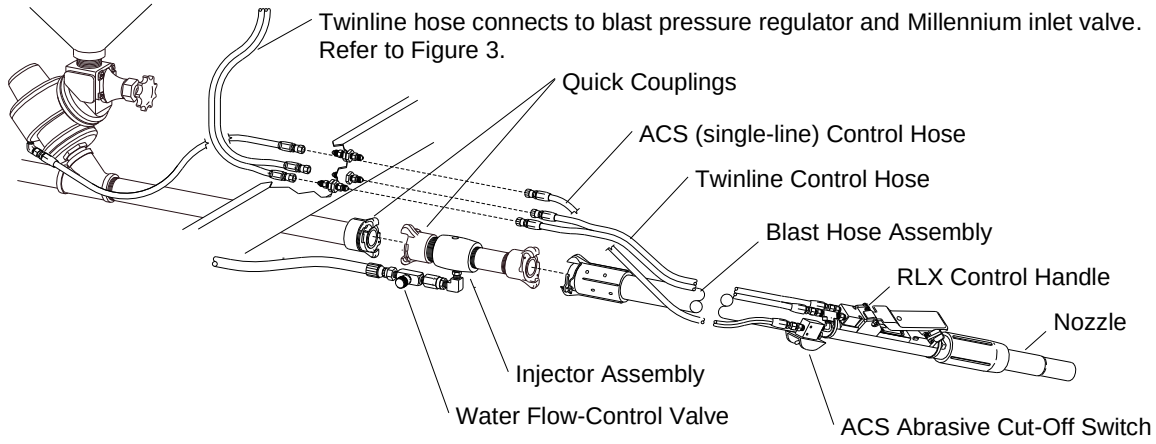
Refer to the lower illustration in Figure 9.

NOTE: The nozzle injector may also be installed on the blast hose of a second blast machine, refer to Sections 2.4.4, 3.3.3 and 4.10.

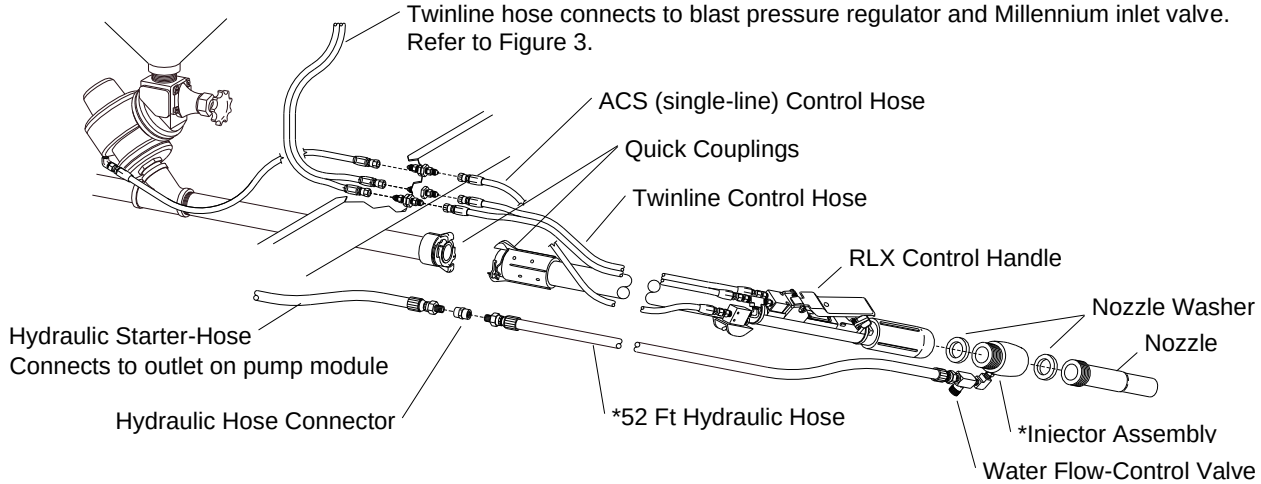
2.4.3.1 The lower illustration in Figure 9 shows the injector installed at the nozzle. The benefits of this set up are:

- The operator controls the following functions from the nozzle.
  - Starts and stops blasting.
  - Starts and stops abrasive flow. Shutting off abrasive flow allows air and water to continue from the nozzle for washing-off the blast surface. It also clears the blast hose of abrasive before shutting OFF the blast machine.
  - Controls water flow from start and stop to adjusting water flow rate.

2.4.3.2 Apply pipe thread sealant to the male threads on one end of the 52 ft hydraulic hose and to the 5 ft hydraulic starter hose, then connect the hoses using the connector, as shown in the illustration.



Injector Installed at the Blast Machine
Some items are removed or rotated for clarity.



* This hose and injector could be connected to the outlet tee on the pump module, for use on a second blast machine, as noted in Section 2.4.4, while the coupled injector is installed at the blast machine, as shown in upper illustration.

Injector Installed at the Nozzle
Some items are removed or rotated for clarity.

Figure 9

2.4.4 Using a nozzle injector with an additional blast machine

NOTICE

For both injectors to work independent of the other, the pump-pressure pilot-regulator must be equipped with the optional shuttle valve kit. Without the shuttle valve, water injection to the separate blast machine will stop when the FLEX machine operator stops blasting.

2.4.4.1 When using the injector system to provide wetblasting capability to a second blast machine, refer to the following instructions to install a shuttle valve on the air supply side of the water-pump pilot-regulator.

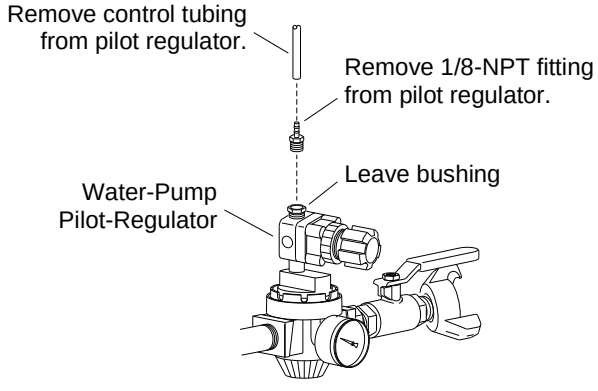
2.4.4.2 Make sure the compressed-air supply is locked out and tagged out and the air line is bled.

⚠ WARNING

Failure to observe the following before performing any maintenance can cause serious injury or death from the sudden release of compressed air.

- **Depressurize the blast machine.**
- **Lockout and tagout the compressed-air supply**
- **Bleed the air-supply line to the blast machine.**

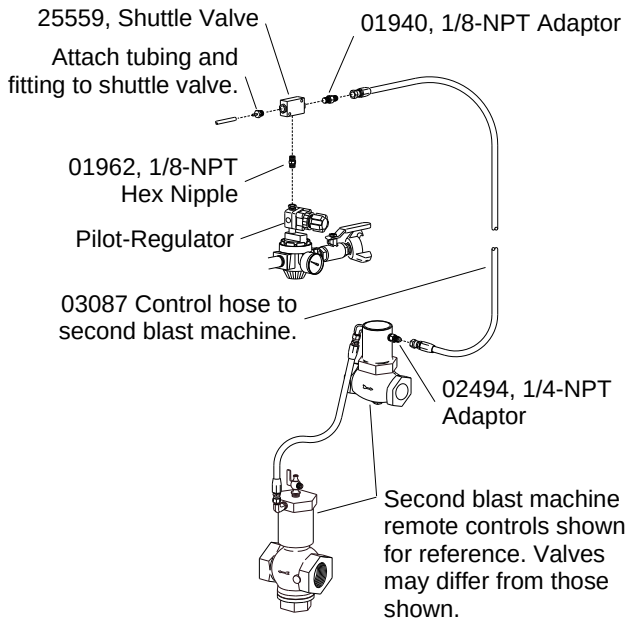
2.4.4.3 Temporarily remove the existing urethane control tubing and 1/8-NPT barb fitting from the bushing on the water-pump pilot-regulator, as shown in Figure 10.



FLEX pump regulator without a shuttle valve.

Figure 10

2.4.4.4 Apply pipe thread sealant on all male pipe threads and install the shuttle valve and fittings, as shown in Figure 11.



Bill of material to add the shuttle valve.

Qty	Stock No.	Description
1	25559	Shuttle valve, 1/8-NPT
1	01940	1/8-NPT adaptor
1	02494	1/4-NPT adaptor
1	01962	1/8-NPT hex nipple
1	03087	Hose, 3/16" x 50' single-line hose, or other length of hose to reach second blast machine.

Figure 11

2.5 Breathing-Air Connections, Optional CPF Filter – Figure 12.

Refer to CPF operations Manual 04143 for filter operating instructions.

NOTE: Use pipe thread sealant on all male pipe threads. Sealant is not required on JIC threads.

2.5.1 Make sure the compressed-air supply is locked out and tagged out and the air line is bled.

2.5.2 Remove the pipe plug from the accessory tee and install the 1"-NPT x 1"-JIC adaptor.

2.5.3 Thread the 1" lock nut onto the elbow; make sure the concave side of the nut faces toward the air filter.

2.5.4 Insert the elbow through the mounting bracket and tighten it into the CPF inlet port.

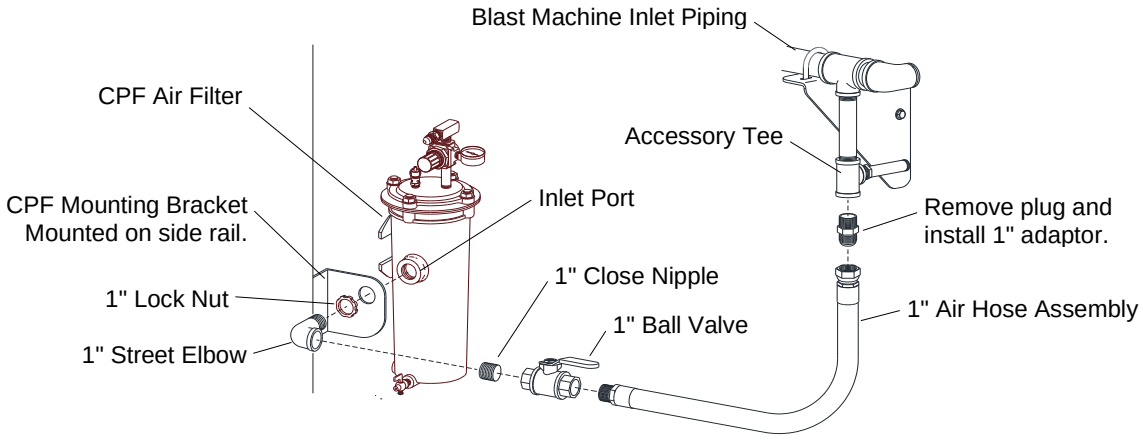


Figure 12

2.5.5 Tighten the lock nut against the mounting bracket to secure.

2.5.6 Install the close nipple, ball valve and male end of the hose assembly into the elbow, as shown in Figure 12.

2.5.7 Attach the female end of the air hose assembly to the adaptor on the accessory tee.

2.5.8 Open and close the ball valve as needed to supply air to the CPF filter.

2.6 Identify pumps that require lubrication

2.6.1 Water pumps used with current injector system are pre-lubricated and do not require additional lubrication. Systems that require lubrication are identified by an inline lubricator located within the pump-module enclosure, as shown in Figure 13. Open the enclosure door to access the lubricator.

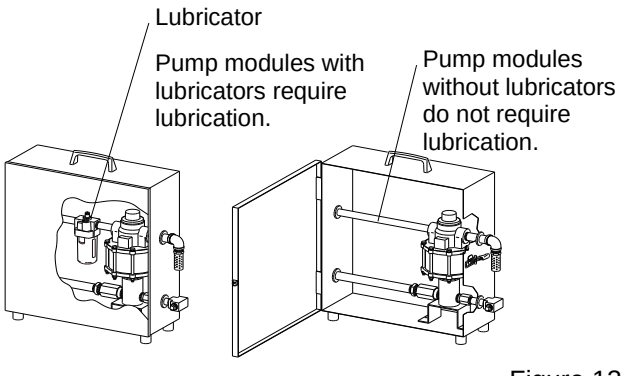


Figure 13

2.6.2 Refer to the label on the pump for the pump model. The pumps are identical except the 10-5 series is pre-lubricated at factory, and therefore does not require a lubricator in the air-drive supply line. The addition of the letter "L", the 10-5L series has a suffix to denote the pump requires a lubricator in the air-drive supply line.

Refer to the label on the pump for the pump model

SC Hydraulic Pump Model Lubrication Requirement
10-5000W005 (10-5 series) ..... Lubricant not required
10-5000W005L (10-5L series) ..... Lubricant is required

NOTE: Lubrication instructions are provided for those that download or otherwise obtain this manual for use with injector systems having 10-5L Series Pumps.

3.0 ROUTINE SETUP

3.1 Filling Water Tank

NOTE: If pressurized water (water from a faucet) is available, a water hose may be attached directly to the ancillary water connection on the platform, as shown in Figure 4. When using pressurized water, make sure the water-tank supply valve is closed. Water supply from a pressurized source must not exceed 150 psi.

NOTICE

Pressurized water can pass through the pump when the pump is not running. When water from a pressure source (faucet) is used, the flow-control valve must be turned OFF as soon as the operator stops blasting. Failure to shut OFF the flow-control valve can cause water to enter the blast hose and possibly the blast machine.

3.1.1 Make sure the water-tank supply valve and ancillary water-supply valves are shut OFF; valves are off when the handles are perpendicular (90°) of the valve.

3.1.2 Unscrew the lid and fill the tank with water. Securely attach lid when the tank is full.

NOTE: When rust inhibitor or other additives are required, they should be mixed with the water at the recommended dilution.

3.2 Attach Compressed-Air Supply

3.2.1 Locate the compressor upwind from the blasting operation to prevent contaminated air from entering the compressor intake.

3.2.2 Connect an air-supply line from the compressor to the air hose connector previously installed on the blast-machine's inlet filter.

3.2.3 Make sure that all compressed-air supply hose connections are secured with safety lock pins and safety cables to prevent accidental separation or disconnection. Lock pins and safety cables are listed in *Section 9.1: Blast Machine and Accessories.*

⚠ WARNING

Hose disconnection while under pressure can cause serious injury or death. Use safety lock pins and safety cables on all coupling connections to help prevent hose couplings from accidental disconnection.

3.3 Wetblast Injector™ Placement Options

3.3.1 Injector at the blast machine
Refer to the upper illustration in Figure 9.

3.3.1.1 Make sure the coupling gaskets are in place and in good condition before connecting the injector assembly with couplings to the blast machine's hose coupling. Note that the coupling on the flow-control end of the assembly connects to the blast machine.

3.3.1.2 Make sure the coupling gaskets are in place and in good condition before connecting the blast hose to the quick coupling on the injector assembly.

3.3.1.3 Make sure that all blast hose connections and compressed-air supply hose connections are secured with safety lock pins and safety cables to prevent accidental separation or disconnection. Lock pins and safety cables are listed in *Section 9.1: Blast Machine and Accessories.*

⚠ WARNING

Hose disconnection while under pressure can cause serious injury or death. Use safety lock pins and safety cables on all coupling connections to help prevent hose couplings from accidental disconnection.

3.3.1.4 Attach the twinline control hose to the two lower fittings on the blast machine's cross-panel. Either side of the hose can be attached to either fitting.

3.3.1.5 Attach the single ACS line to the upper fitting on the panel.

3.3.1.6 Make sure all fittings are tight. Leaks will cause the system to malfunction.

3.3.1.7 Place the nozzle washer in the nozzle holder, and screw the nozzle into the holder. The nozzle must seat tightly against the nozzle washer.

3.3.1.8 Proceed to Section 4.0.

3.3.2 Injector at the nozzle
Refer to the lower illustration in Figure 9.

NOTE: The Nozzle injector may also be installed on the blast hose of another separate blast machine; refer to the lower illustration in Figure 9, Figures 10, and 11, and Sections 2.4.4 and 4.10.

3.3.2.1 Make sure the coupling gaskets are in place and in good condition before connecting the blast hose to the quick coupling on the blast machine.

3.3.2.2 Make sure that all blast hose connections and compressed-air supply hose connections are secured with safety lock pins and safety cables to prevent accidental separation or disconnection. Lock pins and safety cables are listed in *Section 9.1: Blast Machine and Accessories.*

⚠ WARNING

Hose disconnection while under pressure can cause serious injury or death. Use safety lock pins and safety cables on all coupling connections to help prevent hose couplings from accidental disconnection.

3.3.2.3 Attach the twinline control hose to the two lower fittings on the blast machine's cross-panel. Either side of the hose can be attached to either fitting.

3.3.2.4 Attach the single ACS line to the upper fitting on the panel.

3.3.2.5 Make sure all fittings are tight. Leaks will cause the system to malfunction.

3.3.2.6 Place a nozzle washer in the nozzle holder and screw the injector assembly into the holder. The injector must seat tightly against the nozzle washer.

3.3.2.7 Apply pipe thread sealant to the male threads on the hydraulic hose and screw the hose into the flow-control valve (installed on the injector assembly), as shown in the lower illustration in Figure 9.

3.3.2.8 Place the nozzle washer in the injector, and screw the nozzle into the holder. The nozzle must seat tightly against the nozzle washer.

3.3.2.9 Proceed to Section 4.0.

3.3.3 Using a nozzle injector with an additional blast machine

3.3.3.1 Make sure the shuttle valve is installed on the air supply side of the water-pump pressure regulator, as shown in Figure 11. Refer to Section 2.4.4.

3.3.3.2 When ready for operation, open the isolation valve.

3.3.3.3 Set up the FLEX machine with the coupled injector at the blast machine, as noted in Section 2.4.2. NOTE: Air must be supplied to the FLEX system in order for the pump to operate.

3.3.3.4 Set up the second machine with the injector at the nozzle, as noted in Section 2.4.3.

3.3.3.5 Proceed to Section 4.0.

4.0 OPERATION

4.1 Pre-Blast Inspection and Settings

4.1.1 Blasting segment inspection and settings

Refer to Section 4.1.2 to inspect the water (wetblast) segment.

4.1.1.1 Make sure the choke valve is open, (handle position aligned with the valve and piping).

4.1.1.2 Make sure that all blast hose and compressed-air hose connections are secure, and that coupling lock pins and safety cables are in place.

⚠ WARNING

If twist-on type air-hose couplings are used, they must be secured by safety pins or wires to prevent accidental disconnection. Hose disconnection while under pressure can cause serious injury or death.

4.1.1.3 Close the Quantum abrasive metering valve. The valve is closed when the knob is turned fully clockwise . Refer to Section 5.1.

4.1.1.4 Open the safety petcock on the Millennium inlet valve. The valve is open when the lever is in-line with the petcock, as shown in Figure 14.

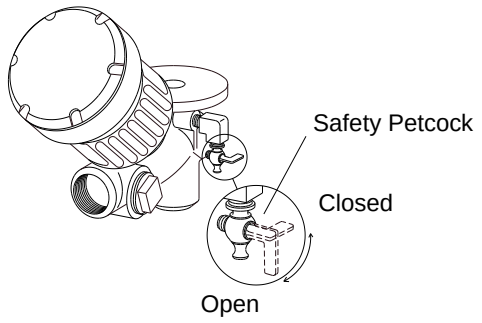


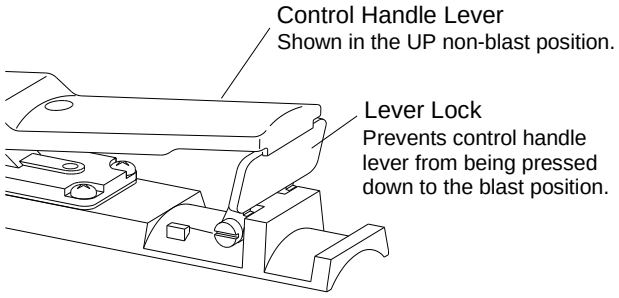
Figure 14

⚠ WARNING

To prevent severe injury or death from accidental activation of the blast machine, open the safety petcock when the blast machine is not in use. Opening the petcock prevents unintentional blasting. The control handle cannot activate the machine when the petcock is open.

4.1.1.5 Make sure the control handle lever is in the up (no blast) position, as shown in Figure 15, and that the handle lever and safety lever lock move freely.

4.1.1.6 Make sure the handle lever does not seal the opening on the control handle, unless the safety lever lock is intentionally pulled down.



The lever lock must be pulled down before the control handle lever can be pressed.

Figure 15

⚠ WARNING

Malfunctioning control handles can cause unintentional actuation of a blast machine, or prevent a machine from deactivating upon release. Malfunctioning control handles must be taken out of service immediately and repaired or replaced. Serious injury or death can result from unintentional blasting.

4.1.1.7 Make sure all operator safety equipment is set up per instructions in the applicable manual. Refer to Section 1.1.1 for a list of manuals for accessories provided with a systems package.

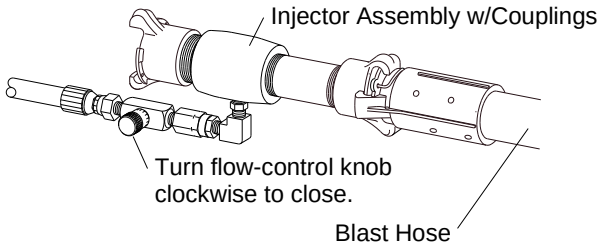
4.1.2 Water segment inspection and settings

4.1.2.1 Make sure the water tank is full.

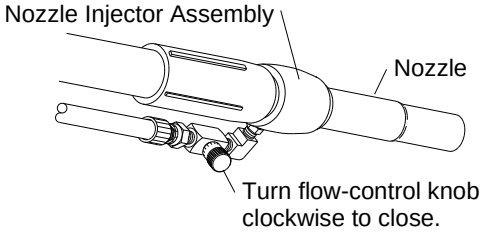
4.1.2.2 Pump lubrication: Refer to Section 2.6 for lubrication information.

4.1.2.3 Make sure the injector is setup at the machine, as noted in Section 3.3.1 or at the nozzle, as noted in Section 3.3.2.

4.1.2.4 Make sure the water flow-control valve is closed (knob turned fully clockwise), as shown in Figure 16.



Injector Located at Blast Machine



Injector Located at Nozzle

Figure 16

4.1.2.5 Open the water-tank's supply valve.

4.1.2.6 Open the ancillary water valve, shown in Figure 17, to purge air from the water line; close the valve as soon as water comes out. NOTE: All air must be purged from the water supply line for the pump to self-prime.

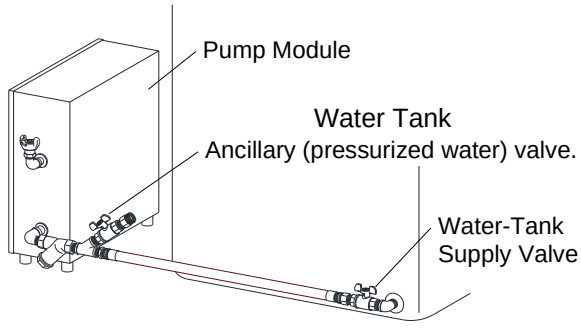


Figure 17

4.1.2.7 Make sure the air-supply isolation valve, (located on the outlet side of the water-pump's pilot-operated regulator, as shown in Figure 18) is closed.

4.1.2.8 Refer to Figure 18 and turn the pilot-regulator control knob counterclockwise to approximate "0" psi.

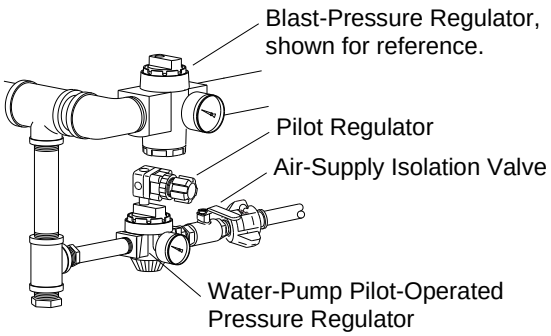


Figure 18

4.1.3 Compressed-air supply

4.1.3.1 Close the air valve on the compressor. Start the compressor, and bring it to operating temperature and pressure. The pressure must be at least 50 psi, but not exceed 150 psi.

4.1.3.2 Slowly open the compressor air valve to pressurize the air-supply line. Listen for any open lines or leaks.

4.1.3.3 Set blast-pressure pilot regulator to preferred blasting pressure, between 5 and 120 psi. Refer to Section 5.2.

4.1.3.4 After respirators and respirator accessories are set up, pressurize the breathing-air supply line, and adjust pressure on the CPF Filter outlet to the pressure stated in the respirator manual.

4.1.3.5 Load abrasive into the machine according to the instructions in Section 4.12.

4.1.4 Prime pump

4.1.4.1 Complete the water segment inspection and setting, as noted in Section 4.1.2.

4.1.4.2 Refer to Figure 18 and open the pump's air-supply isolation valve.

4.1.4.3 Slowly increase the pump air pressure to 10 - 15 psi, per Section 5.5. The pump should begin to stroke rapidly as soon as air is supplied.

4.1.4.4 Open the flow-control valve, the pump should prime itself and water flow should start within a few seconds, and the stroke should slow as water pressure builds between the pump and injector.

NOTICE

Make sure the water supply reaches pump within a few seconds of starting. Running the pump dry will damage the hydraulic piston and cylinder assembly.

4.1.4.5 Slowly increase air pressure to 30 - 40 psi and let pump run until all air has purged from the system.

4.1.4.6 Close the flow-control valve.

4.1.4.7 If pump does not self-prime from the water tank, and if pressurized water (from a faucet) supply is available, repeat the process using pressurized water.

4.2 Blasting Attire

⚠ WARNING

Before blasting, test the coating and substrate for toxic materials (such as lead or other heavy metals, or asbestos). These hazards require special measures to protect the operators and the environment.

No dust is safe to breathe. Dry abrasive blasting produces harmful dust. Although blasting with water injection reduces dust at the blast surface, supplied air respirators are required for the safety of the operator. Evaporation can cause dust to become airborne. Failure to wear approved respirators can result in serious lung disease or death. Blast operators must wear properly-fitted and maintained NIOSH-approved, type-CE supplied-air respirators approved for abrasive blasting.

During abrasive blasting, abrasive particles and dust in the area around the blast machine and blast nozzle become airborne. Everyone working in the vicinity of abrasive blasting must wear properly-maintained, NIOSH-approved, respiratory protection and eye protection appropriate for the job site hazards.

Loud noise generated by the use of compressed air can cause hearing damage. Everyone in the blasting area must wear approved hearing protection.

4.2.1 Operators and anyone else that may be exposed to the hazards generated by the blasting process must wear appropriate protective gear, including abrasive-resistant clothing, leather gloves, eye and hearing protection, and a NIOSH-approved Type CE Supplied-Air Respirator.

⚠ WARNING

Everyone except for the blast operator or blast machine tender must stay clear of the blast machine. The machine tender or blast operator may pressurize or depressurize the machine at any time, which can cause abrasive to vent under pressure, causing dust and toxins to become airborne. Both the operator and machine tender must wear suitable personal protective equipment including an approved respirator, plus approved eye, face, and hearing protection.

4.2.2 Do not allow anyone around the blast machine except machine tenders, who are appropriately attired in approved protective equipment.

4.3 Pressurize Blast Machine to Start Blasting

4.3.1 Don all protective blasting attire, per Section 4.2.

4.3.2 When the blast operator is ready to blast, the operator or the machine tender must close the safety petcock. Closing the petcock prepares the machine for remote operation and activation by the control handle. Air should be heard escaping from the opening under the control handle lever, as shown in Figure 19, but nowhere else. The air escaping at the control handle is an audible signal meaning air is supplied to the blast machine, which will activate when the control handle is pressed.

4.3.3 Hold the blast hose securely and point the nozzle only toward objects intended to be blasted.

4.3.4 Fold down the safety lever lock and press the remote control handle, as shown in Figure 19. Within a few seconds, the pop-up valve will automatically close, and the blast machine will pressurize to start blasting.

⚠ CAUTION

Be prepared for recoil from the blast hose. Blasting should begin within a few seconds after pressing the control handle lever.

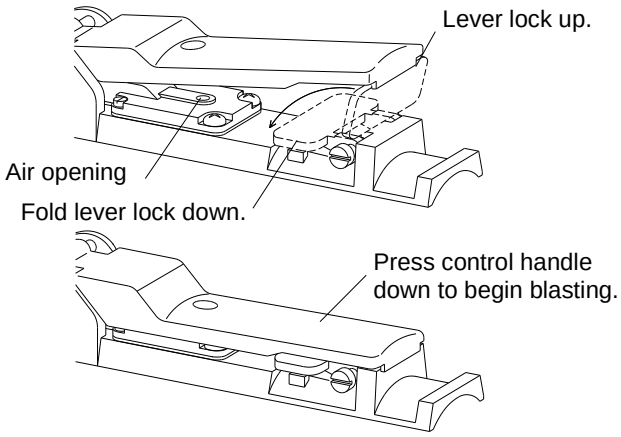


Figure 19

⚠ WARNING

OSHA requires the use of remote controls on all blast machines when an operator controls the nozzle. To comply with OSHA regulations, the remote control handle, which starts and stops the flow of air and abrasive, must be held down manually. Never tie down the control handle lever or attempt to bypass any part of the remote control system. Doing so will defeat the purpose of the fail-to-safe feature of the remote control. Serious injury or death can result from uncontrolled blasting. Ref. 29 CFR 1910.244 (b).

4.4 Check Abrasive Flow

4.4.1 Make sure the toggle on the ACS switch is pointing away from the nozzle to open the Quantum metering valve. Refer to Section 4.6 for operation of the ACS.

4.4.2 Adjust abrasive flow per Section 5.1.

4.5 Check Water Flow

It is helpful to have another person check the water system while the operator manages the nozzle.

4.5.1 Adjust the pump's pilot regulator to approximately 30 psi. Open the air-supply valve to the pump module. The pump will rapidly stroke. Immediately open the water flow-control valve about one turn. The pump should prime within a few seconds; the stroke should slow down, and water will exit the adaptor. **NOTE: When the injector is placed at the nozzle, hold the end of the hose down to prevent water from accumulating inside the hose.**

4.5.2 Close the water flow-control valve and set the pressure regulator to about 40 psi.

4.5.3 When ready to blast proceed to Section 4.8 when using the injector at the blast machine, or Section 4.9 when using the injector at the nozzle.

4.6 Operation of the Abrasive Cut-Off Switch (ACS) – Figure 20

4.6.1 The ACS serves three purposes:

1. Clearing abrasive from the blast hose when blasting is finished. This is helpful in many applications and necessary when the blast hose is vertical to prevent abrasive from collecting in low spots in the blast hose, eliminating excessive abrasive slugging at startup.

2. Blowing abrasive off the blasted surface. NOTE: Small amounts of residual abrasive may exit the nozzle with the air, requiring blowing off or otherwise cleaning surface outside the blasting area prior to painting.

3. Assisting in drying the surface after it is washed-down.

⚠ WARNING

OSHA sets exposure limits for people and the environment. Airborne dust can increase the exposure levels beyond permissible limits. OSHA prohibits blowing with compressed air as a cleaning method for lead-based paint dust or other hazardous dust, unless the compressed air is used in conjunction with a ventilation system designed to capture the volume of airborne dust created by the compressed air, 29 CFR 1926 (h). The ACS is for blowing off abrasive from a blasted surface, NOT for general area cleanup.

4.6.2 The abrasive cut-off switch is situated directly behind the control handle. The switch may be flipped open or closed at any time, but will not operate the metering valve unless the control handle is pressed.

4.6.2.1 Blast Mode: Moving the ACS toggle away from the nozzle to the "ON" ("CYL" port) position sends control-air to the abrasive metering valve, opens the valve so that the blast machine operates normally, with air and abrasive coming out the nozzle.

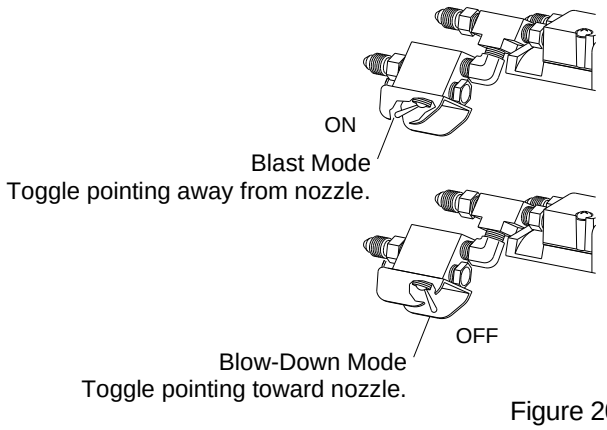


Figure 20

4.6.2.2 Blow-Down Mode: Moving the ACS toggle toward the nozzle, to the "OFF" position, cuts off the control-air to the abrasive metering valve, closes the valve and stops the abrasive flow. This action allows air alone to exit the nozzle, useful for clearing the blast hose before shutting down, and blowing abrasive and water off the blasted surface.

4.7 Dry Blasting

The FLEX system provides means to dry blast when wetblast is not required.

⚠ WARNING

Dry abrasive blasting produces harmful dust. Blast operators must wear properly-fitted and maintained NIOSH-approved, type-CE supplied-air respirators approved for abrasive blasting. Failure to wear approved respirators can result in serious lung disease or death.

During abrasive blasting, abrasive particles and dust in the area around the blast machine and blast nozzle become airborne. Everyone working in the vicinity of abrasive blasting must wear properly-maintained, NIOSH-approved, respiratory protection, hearing and eye protection appropriate for the job site hazards.

NOTICE

When dry blasting, the wetblast system must be isolated, as noted below. Failure to isolate the water system can result in abrasive backing up into the water system.

4.7.1 Perform routine start up except:

1. Remove the injector assembly; this will avoid unnecessary wear on the injector.
2. Make sure the air-supply isolation valve (shown in Figure 18) to the pump module is closed.
3. Make sure the water-supply valve to the pump module is closed.

4.8 Wetblasting with Injector at the Blast Machine

4.8.1 Setup per Section 3.3.1.

4.8.2 Do all setup and preliminary operations, as described in Section 4.1 through Section 4.6.

4.8.3 Begin dry blasting and open the water flow-control valve approximately 1/2 turn. It is easier if another person opens and adjusts the flow-control valve while the operator manages the nozzle.

4.8.4 Adjust abrasive flow per Section 5.1 and water flow per Section 5.6.

4.9 Wetblasting with Injector at the Nozzle

4.9.1 Setup per Section 3.3.2.

4.9.2 Do all setup and preliminary operations, as described in Section 4.1 through Section 4.6.

4.9.3 Begin dry blasting and open the water flow-control valve approximately 1/2 turn.

4.9.4 Adjust abrasive flow per Section 5.1 and water flow per Section 5.6.

4.10 Using FLEX Injector with an Additional Blast Machine

NOTE: A shuttle valve must be attached to the top of the pump-pressure pilot-regulator per Section 2.4.4.

4.10.1 Operation of the FLEX blast machine

4.10.1.1 Setup per Section 2.4.2 and 3.3.3.

4.10.1.2 Do all setup and preliminary operations, as described in Section 4.1 through Section 4.6.

4.10.1.3 Begin dry blasting and open the water flow-control valve approximately 1/2 turn. It is easier if another person opens and adjusts the flow-control valve while the operator manages the nozzle.

4.10.1.4 Adjust abrasive flow per Section 5.1 and water flow per Section 5.6.

4.10.2 Operation of second, separate blast machine

NOTE: Air must be supplied to the FLEX in order for the second machine to control the pump.

4.10.2.1 Setup per Section 2.4.4 and 3.3.3.

4.10.2.2 Set up the second machine per the operation instructions for the machine.

4.10.2.3 Begin dry blasting and open the water flow-control valve approximately 1/2 turn.

4.10.2.4 Adjust abrasive flow per operating instructions for the machine.

4.10.2.5 Adjust water flow per Section 5.6.

4.11 Stop Blasting

4.11.1 Before releasing the control handle, the operator may use the ACS to stop the abrasive flow to clear the blast hose, and if conditions permit, blow-down the work piece. Refer to Section 4.6 for operation of the ACS.

4.11.2 To stop blasting; release the control handle lever. The outlet valve opens, and the blast machine depressurizes. The pop-up valve automatically drops when air is expelled from the machine and pressure equalizes. The air supply to the pump module also shuts off, stopping the pump.

4.11.3 When the control handle lever is released, the safety lever-lock will flip up to lock the handle lever in the up (no blast) position. Make sure the safety lever-lock is up to prevent the handle lever from engaging.

4.11.4 The air supply to the pump automatically shuts off when the control handle is released. The operator or machine tender should close the water flow-control valve to prevent water saturation in the blast hose, especially when using pressurized water.

NOTICE

Pressurized water can pass through the pump when the pump is not running. When water from a pressure source (faucet) is used, the flow-control valve must be turned OFF as soon as the operator stops blasting. Failure to shut OFF the flow-control valve can cause water to enter the blast hose and possibly the blast machine.

4.11.5 Always open the safety petcock during work breaks and before filling the blast machine. Opening the petcock prevents unintentional blasting.

4.11.6 When finished blasting, shutdown per Section 4.14.

4.12 Loading Abrasive into the Blast Machine

⚠ WARNING

When approaching an idle blast machine, and before loading the blast machine with abrasive, always make sure the safety petcock is open. If it is closed, open it while standing back and facing away from the concave head and exhaust muffler. This step is especially important if one worker (a machine tender) loads the machine with abrasive while another worker (the blast operator) controls the blasting. The blast operator can pressurize the machine before the machine tender has moved away from the machine. During pressurization, abrasive can be forced out of the top of the machine, and cause injury.

4.12.1 Load abrasive by pouring it into the concave head. Use the screen placed over the head to prevent objects from falling inside. Foreign objects will jam the machine. Abrasive flows through the filling port into the machine. Keep the abrasive level below the pop-up valve to prevent abrasive above the pop-up valve from being forced up and out of the machine when it pressurizes.

4.12.2 When the ready to blast, the operator or machine tender, while standing back and facing away from the concave filling head and exhaust muffler, closes the safety petcock.

4.12.3 Begin blasting or resume blasting per Section 4.3.

4.13 Emptying the Machine of Abrasive

4.13.1 Emptying the blast machine produces minimal dust; do not use water when purging the blast machine of abrasive.

1. Remove the injector assembly; this will avoid unnecessary wear on the injector.
2. Make sure the air-supply valve to the pump module is closed.
3. Make sure the water-supply valve to the pump module is closed.

4.13.2 When working in environments subject to extreme temperature changes, or very humid conditions, condensation may develop inside the machine. Condensation dampens abrasive and causes flow problems. To prevent this, empty the machine of abrasive when shutting down for the day. This will eliminate trouble from moist abrasive when starting a new day's blasting. One way to avoid having to empty the machine is to load only as much abrasive as will be used during the work period. If the machine must be purged of abrasive, do the following.

4.13.3 With the blast machine off, adjust blast pressure to approximately 50 psi, per Section 5.2, close the choke valve and set the abrasive metering valve to full open.

4.13.4 To prevent rapid wear of the nozzle holder threads, the nozzle should be firmly attached to the nozzle holder. Removing the nozzle is discouraged. If circumstances require the nozzle to be removed, also remove the nozzle washer. Purging the machine without a nozzle in place will erode the thread area of the nozzle holder, which can cause a hazardous condition.

⚠ WARNING

The threads on the nozzle and nozzle holder must be inspected each time the nozzle is secured to the holder. A loose-fitting nozzle may eject under pressure and can cause severe injury. Check the threads for wear, and make sure the nozzle holder securely holds the nozzle. The nozzle washer must also be inspected for wear. Worn nozzle washers can cause nozzle thread erosion.

4.13.5 Point the nozzle into a drum or suitable container, or in the direction of the abrasive disposal site.

4.13.6 Hold the hose securely and pressurize the machine by activating the control handle. Be prepared for severe surging, or recoil of the hose.

4.13.7 When the machine is empty, release the control handle lever, open the safety petcock, and open the choke valve.

4.13.8 If the nozzle was removed, thoroughly inspect the nozzle holder threads for wear before reinstalling the nozzle washer and nozzle.

4.14 Shutdown

4.14.1 Empty the blast machine per Section 4.13.

4.14.2 When finished blasting, and after cleanup is completed, remove the respirator outside the blasting area, in a clean environment where the air is safe to breathe.

4.14.3 Close the compressed-air supply valve at the compressor.

4.14.4 Drain receiver tank, air filter, and water collecting devices, and bleed the compressed-air supply hose.

NOTICE

If there is any chance of the machine being subject to freezing temperature, drain all water from the pump and open the ancillary (pressurized water) valve. Failure to drain water from the system can cause irreparable damage to the pump and water connections. Refer to Section 6.6 for additional information for operating in cold temperature.

4.14.5 Shutdown the compressor.

4.14.6 Cover the blast machine when not in use.

5.0 ADJUSTMENTS

5.1 Abrasive Metering – Figure 21

5.1.1 Optimum abrasive flow depends on the type and size of abrasive and blasting pressure, and can best be determined by experience. Use as little abrasive as possible while maintaining the maximum cleaning rate. The air/abrasive mixture should be mainly air. As a rule, the stream of abrasive coming out of the nozzle should barely discolor the air when seen against a contrasting background.

5.1.2 Abrasive flow is adjusted at the metering valve located at the bottom of the blast machine. Use the metering knob to adjust abrasive flow.

5.1.3 The hole in the knob enables the operator to monitor its rotation. Counting turns is helpful for returning to the original setting if temporary adjustments are required.

5.1.4 The valve is closed when the knob is turned fully clockwise. Begin with the knob set 1-1/2 turns from fully closed. While the operator is blasting, the machine tender turns the knob no more than 1/4 turn counterclockwise to increase abrasive flow. Allow 10 to 15 seconds for the flow to stabilize before readjusting. Continue making adjustments as described until correct flow is attained.

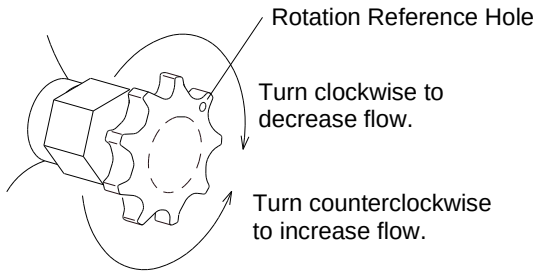


Figure 21

5.2 Blast-Pressure Regulator – Figure 22

5.2.1 NOTE: The blast machine is initially pressurized at line pressure and then drops to the pressure at which the pilot regulator is set. The delay (time between initial pressurization to when pressure changes to the pressure set at the blast-pressure regulator) is set by the adjusting pressure delay valve, as noted in Section 5.3.

5.2.2 Set blast pressure to the desired pressure, using the pilot pressure regulator located on the piping brace, as shown in Figure 22.

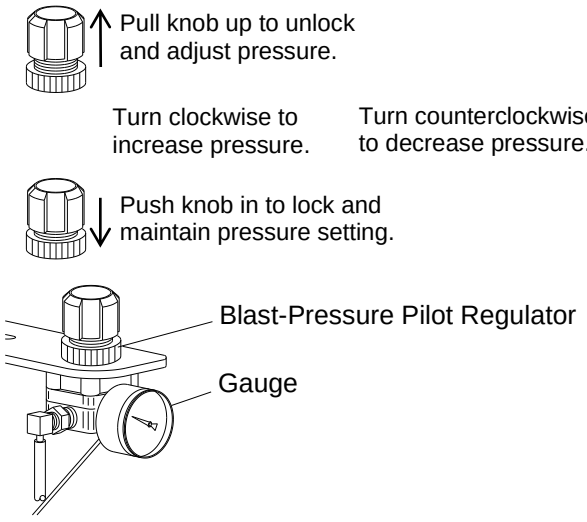


Figure 22

5.2.3 To set blast pressure, pull up the regulator knob to unlock it, turn clockwise to increase pressure or counterclockwise to decrease pressure. After pressure is set, push the knob down to lock it and maintain the setting.

5.3 Low-Pressure Delay Valve – Figure 23

Adjust blast pressure per Section 5.2 before adjusting the pressure delay valve.

5.3.1 The delay valve located on the blast machine leg, adjusts the time it takes from the initial pressurization of the machine to when pressure changes to the pressure set at the blast-pressure pilot regulator.

5.3.2 Use a screwdriver inserted into the adjustment slot at the top of the delay valve and turn it fully clockwise to close.

5.3.3 Turn the slot one-half turn counterclockwise for the initial adjustment.

5.3.4 Pressurize the blast machine and observe the blast pressure gauge.

- If the machine does not pressurize turn the slot a few degrees clockwise to increase the delay.
- If the machine pressurizes and the gauge needle increases above the set pressure, turn the slot a few degrees counterclockwise to decrease the delay.
- If the machine pressurizes and the needle does not increase above set pressure, the delay is set correctly.

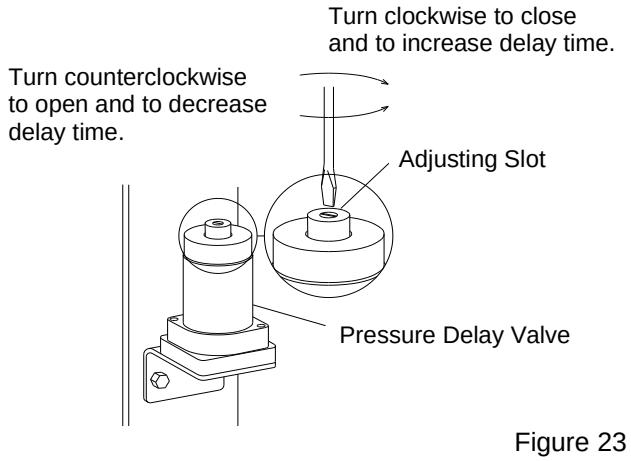


Figure 23

5.4 Water Pressure (water-pump air-drive pressure) – Figure 24

5.4.1 Water pressure is controlled using the pilot regulator located on the blast machine piping, as shown in Figure 24.

5.4.2 Maximum operating pressure for the pump is 100 psi. The pump ratio is 10 to 1, meaning water outlet pressure is ten times air inlet pressure. For example if the air regulator is set at 30 psi, water outlet pressure will be 300 psi. Operating pressure is usually set between 30 and 40 psi.

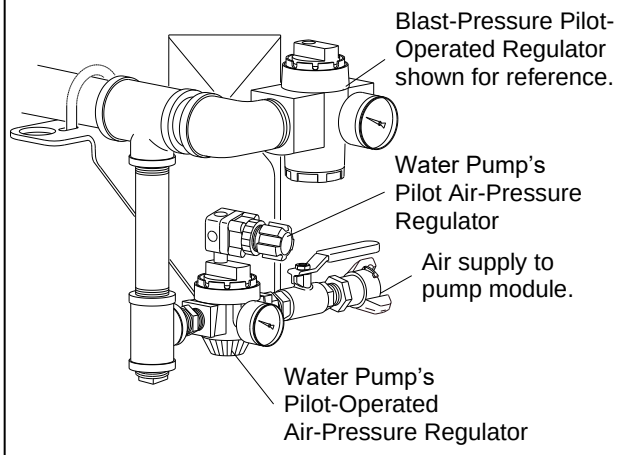


Figure 24

5.4.3 To adjust, refer to Figure 25 and pull the control knob on the pilot regulator to unlock it, turn it clockwise to increase pressure or counter-clockwise to decrease pressure. Once operating pressure is set, push in on the knob to lock it and maintain the setting.

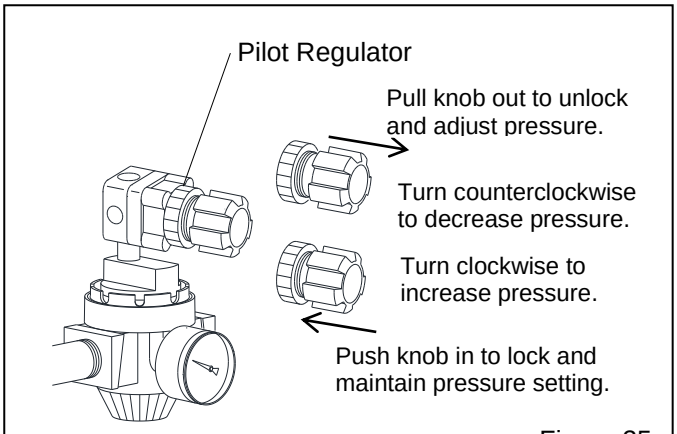
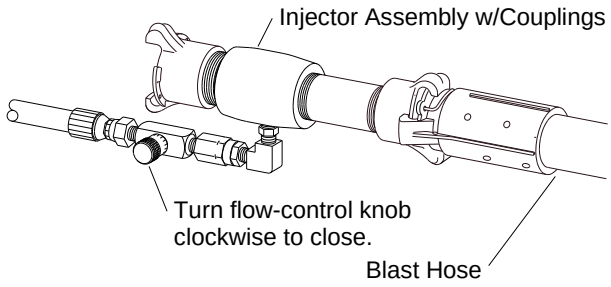


Figure 25

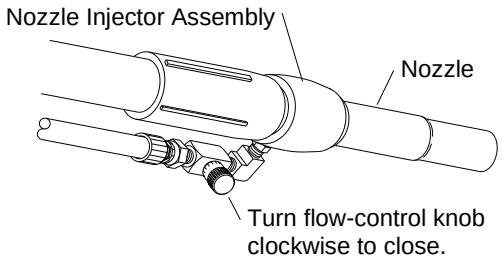
5.5 Water Flow

5.5.1 Adjust water flow by turning the flow-control-valve knob. The valve is closed when the knob is turned fully clockwise, as shown in Figure 26.

5.5.2 Begin with the flow valve fully closed. Start blasting and slowly open the valve until the correct water to air and abrasive mixture is attained. Usually the flow will be set with the valve about 1/2 to 3/4 turns open.



Injector Located at Blast Machine



Injector Located at Nozzle

Figure 26

5.6 Water Pump Lubricator – Figure 27

NOTE: Refer to Section 2.6 to identify water pumps that require lubrication. Lubrication instructions are provided for those that download or otherwise obtain this manual for use with injector systems having 10-5L Series Pumps.

NOTICE

Lack of lubrication can cause premature failure of the pump. Pump damaged caused by lack of lubrication is not covered under warranty.

5.6.1 Make sure the air-supply valve to the pump module is closed and the air line is bled.

⚠ WARNING

The air supply to the pump module must be turned off and the line bled before removing the lubricator filler cap or bowl. Failure to eliminate internal air pressure can cause severe injury from the sudden release of compressed air.

5.6.2 The lubricator is located within the pump module. Open the door to access the lubricator.

5.6.3 Remove the filler cap and fill the lubricator with a good grade of petroleum-based lubricating oil such as Castrol Brayco Micronic 783, AeroShell Fluid 71 or equivalent. A good quality oil specifically manufactured for air tools may be used if the recommended lubricants are not available.

5.6.4 Begin blasting and adjust water flow, per Section 5.4.

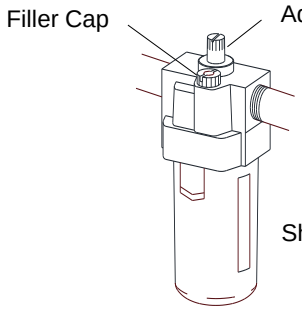


Figure 27

5.6.5 Turn the adjustment knob to provide one drop of oil for every twenty strokes of the pump. If excessive amounts of oil appear to be flow through the pump during operation, as noted at the module's exhaust muffler, reduce the lubrication rate.

6.0 PREVENTIVE MAINTENANCE

6.1 Water-Pump Lubricator

6.1.1 Refer to Section 2.6 for lubrication information.

6.2 Daily Inspection

6.2.1 With the air off, before blasting, do the following:

- Make sure the water tank is filled.
- Empty the abrasive trap and clean the abrasive trap screen. **Do this at least twice a day, or more often if the machine is frequently cycled.** Failure to clean the abrasive trap on a regular basis is a major cause of system malfunction. Refer to Section 7.5.
- Check to make sure that couplings are secure and lock pins and safety cables are in place.
- Make sure the nozzle washer is in place and not worn.

⚠ WARNING

The threads on the nozzle and nozzle holder must be inspected each time the nozzle is secured to the holder. A loose-fitting nozzle may eject under pressure and can cause severe injury. Check the threads for wear, and make sure the nozzle holder securely holds the nozzle. The nozzle washer must also be inspected for wear. Worn nozzle washers can cause nozzle thread erosion.

- Inspect the RLX control handle; look for the following:
  - The lever must not seal the opening on the control, unless the safety lever lock is pulled down.
  - The **handle lever** must return to the "up" position when released.
  - The **safety lever lock** must return to the "up" position when the handle lever is released.
  - Both the handle lever and safety lever lock must move freely with no drag or binding.

⚠ WARNING

Malfunctioning control handles can cause unintentional actuation of a blast machine, or prevent a machine from deactivating upon release. Malfunctioning control handles must be taken out of service immediately and be repaired or replaced. Serious injury or death can result from unintentional blasting.

6.2.2 Before blasting but with the blast machine pressurized, do the following:

- Check the control handle for leaks.
- Inspect all couplings and coupling gaskets for leaks.
- Check the blast machine for leaks. **If leaks are found around the pop-up valve, inspection door, pipe fitting ports on the side of the machine or at the bottom of the machine's cone, stop blasting immediately and repair or replace worn part**s.

NOTICE

If leaks are allowed to continue, abrasive erosion can cause extensive or irreparable damage to the blast machine.

- Check all external piping, control hoses, and valves for leaks. If leaks are found, stop blasting and repair.
- Inspect blast hose, couplings, and nozzle holders for leaks. At the first sign of a leak, stop blasting and inspect all items for wear.

⚠ WARNING

Leaks around couplings and nozzle holders indicate worn or loose-fitting parts. Nozzle holders and couplings that do not fit tight on hose, and nozzles that do not fit tight in nozzle holders can disconnect while under pressure. Impact from nozzles, couplings, hoses, or abrasive, from parts disconnected by pressure during operation can cause severe injury.

6.3 Weekly Inspection

6.3.1 With the air off, before blasting, do the following:

- Inspect the blast hose for wear by squeezing the hose every three to four feet, feel for soft spots. Replace the blast hose before the tube wears as far as the fabric plies.

⚠ WARNING

Worn blast hose can suddenly burst. Couplings and nozzle holders may not adequately grip worn hose causing them to blow-off under pressure. Compressed air and abrasive escaping from a burst hose, or disconnected coupling or nozzle holder, can cause severe injury.

- Remove the nozzle for inspection. Replace with a new nozzle if the orifice diameter is worn 1/16" or more, or if the liner is cracked.
- Inspect the compressed-air-filter element, and clean the bowl.

6.3.2 During blasting, do the following:

- Note the time it takes to fully depressurize the machine after the control handle is released. When depressurizing time increases noticeably, inspect the exhaust muffler for blockage and replace as needed.

6.4 Monthly Inspection

6.4.1 With the air off, before blasting, do the following:

- Check the pop-up valve's urethane coating for cracks and grooves. Replace the pop-up valve at the first sign of wear. Refer to Section 7.9.
- Inspect the rubber pop-up seal, and replace at the first sign of wear, drying, or cracking. Refer to Section 7.10.

6.5 Periodic Inspection

6.5.1 Remote control valves: For safety and unscheduled downtime, periodically inspect the internal parts of the inlet and outlet valves, and abrasive trap. Inspect for wear and lubrication on O-rings, pistons, springs, seals, and castings. Refer to Service Maintenance Sections 7.3, 7.4, 7.5.

6.5.2 Auto Quantum metering: For safety and unscheduled downtime, periodically inspect the internal parts of the Quantum actuator and metering assembly. Inspect for wear and lubrication on O-rings, pistons, springs, seals, and castings. Refer to the Service Maintenance in Sections 7.6 and 7.7.

6.5.3 RLX control handle: Periodically clean around the springs, handle lever, and lever lock to ensure that the unit is free of abrasive and debris that may cause the handle lever or lever lock to bind. Refer to Section 7.8.

6.5.4 Pump Module: Remove the water-inlet strainer cap and remove the screen for inspection, clean as needed.

6.6 Operating and Storing the Unit in Freezing or Near Freezing Temperature

NOTICE

If there is a chance of the machine being exposed to freezing temperature, drain all water from the storage tank and pump, and open the ancillary (pressurized water) valve. Failure to drain water from the system can cause irreparable damage to the pump and water connections.

6.6.1 Water freezes and expands at 32° F. When shutting down be sure to drain the water tank, refer to Figure 28 and open the water-tanks supply valve and ancillary water valve to allow for expansion. Drain all water from the pump module by removing the plug on the inlet strainer.

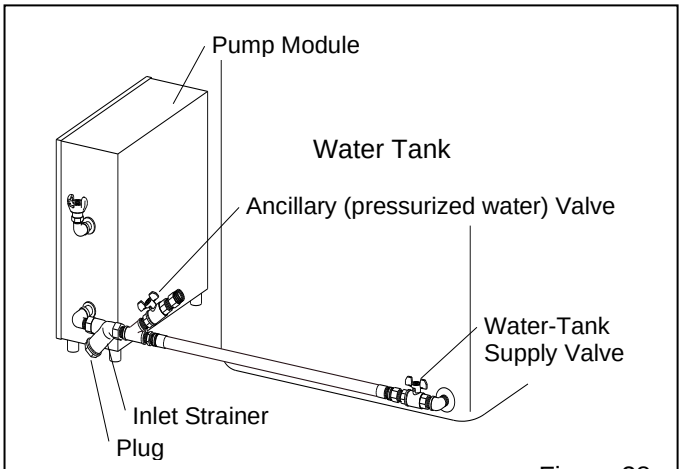


Figure 28

6.6.2 Avoid storing the machine where it will be subject to freezing conditions unless all water has been purged from the water tank, water lines, pump, and hoses. All valves should be open to allow for expansion.

7.0 SERVICE MAINTENANCE

⚠ WARNING

Failure to observe the following before performing any maintenance can cause serious injury or death from the sudden release of compressed air.

- **Depressurize the blast machine.**
- **Lockout (be certain the air supply is off and that it cannot be started while work is in process) and tagout (be certain the air supply is clearly marked to prevent re-starting while work is in process) the compressed-air supply.**
- **Bleed the air-supply line to the blast machine.**

7.1 Removing Damp Abrasive from the Blast Machine

7.1.1 To clear a minor blockage caused by damp abrasive, during operation, rapidly open and close the choke valve several times.

7.1.2 For more difficult blockages, proceed as follows:

Refer to Section 7.2 to check for obstructions in the metering valve.

7.1.2.1 With the blast machine depressurized, disconnect the blast hose and remove the gasket from the quick coupling on the machine.

7.1.2.2 Place the FLEX so that the blast machine's outlet (blast hose connection) is pointed away from any objects or persons.

⚠ WARNING

The machine's outlet must be pointed away from any objects or persons. Stand clear of the path of exiting abrasive. It may come out at high velocity. Impact from exiting abrasive can cause severe injury.

7.1.2.3 Close the choke valve and fully open the abrasive metering valve. Pressurize the machine to force out any damp abrasive.

7.1.2.4 When the obstruction has been removed, depressurize the machine. Remove the nozzle and nozzle washer, and reconnect the blast hose. Open the choke valve and close the abrasive metering valve. Pressurize the machine to clear the blast hose. When the hose is cleared, depressurize the machine and reattach the nozzle washer and nozzle.

⚠ WARNING

The threads on the nozzle and nozzle holder must be inspected each time the nozzle is secured to the holder. A loose-fitting nozzle may eject under pressure and can cause severe injury. Check the threads for wear, and make sure the nozzle holder securely holds the nozzle. The nozzle washer must also be inspected for wear. When nozzle washers are worn, abrasive can erode nozzle threads.

7.1.2.5 With the hose cleared, start the machine using normal procedures.

7.2 Clearing Obstructions in the Abrasive Metering Valve and Blast Machine

7.2.1 If the nature of the obstruction permits emptying the machine of abrasive, do so by following the instructions per Section 4.13.

7.2.2 Turn OFF the compressed-air supply. Lockout and tagout the air supply, and bleed the air-supply line to the blast machine.

7.2.3 Remove the wing nuts securing the abrasive metering valve's cleanout cover.

7.2.4 Check the metering valve for blockage, by inserting fingers into the opening to feel for an obstruction or foreign object.

7.2.5 If the metering valve is clear, remove the blast-machine's inspection door and check inside for foreign objects.

7.2.6 Make sure the inspection-door gasket is in good condition and in place before bolting the door onto the machine.

7.2.7 Make sure the abrasive metering valve cleanout cover O-ring is in good condition and in place before reassembling the cleanout cover.

7.2.8 Check to make sure all inspection doors and cleanout covers are secure before starting the air supply.

7.3 Millennium Inlet Valve

NOTE: Two service kits are available for the Millennium valve inlet segment. To avoid unscheduled downtime, both kits should be kept on-hand. Replace all the seals provided in the seal service kit whenever the valve is opened. Items shown with a single asterisk (*) are included with the seal kit, refer to Page 44 - Figure 57. Use the plunger tip kit when replacing the plunger tip.

7.3.1 Inlet Valve Disassembly

7.3.1.1 Make sure the machine is depressurized. Turn OFF the compressed-air supply. Lockout and tagout the air supply, and bleed the air-supply line to the blast machine.

7.3.1.2 Unscrew the six socket-head screws to remove the cylinder cap, cylinder cap gasket, and spring, as shown in Figure 29.

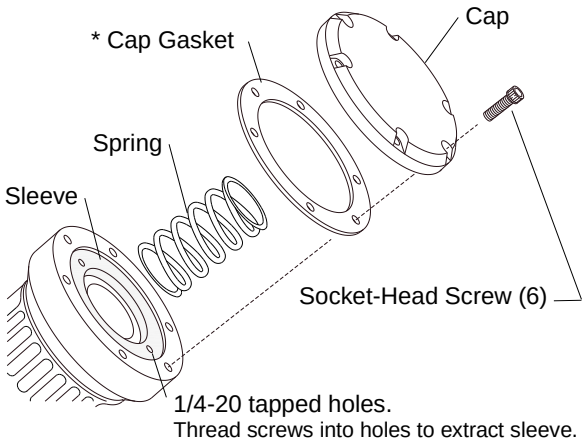


Figure 29

7.3.1.3 If the cylinder sleeve cannot be removed by hand, thread two 1/4-NC screws into the holes in the end of the sleeve and pull the screws to remove the sleeve from the body. If the sleeve is too tight to remove by hand, use a puller attached to the screws. Remove the screws after the sleeve is removed.

7.3.1.4 Refer to Figure 30 and grip the edge of the dual piston, and pull the piston/plunger assembly from the body. If unable to remove the piston by hand, screw a long 1/4-NC screw into the threaded center of the socket-head screw, grip the screw, and pull out. If the piston is too tight to remove by hand, use a puller attached to the screw. Remove the screw after the piston is removed.

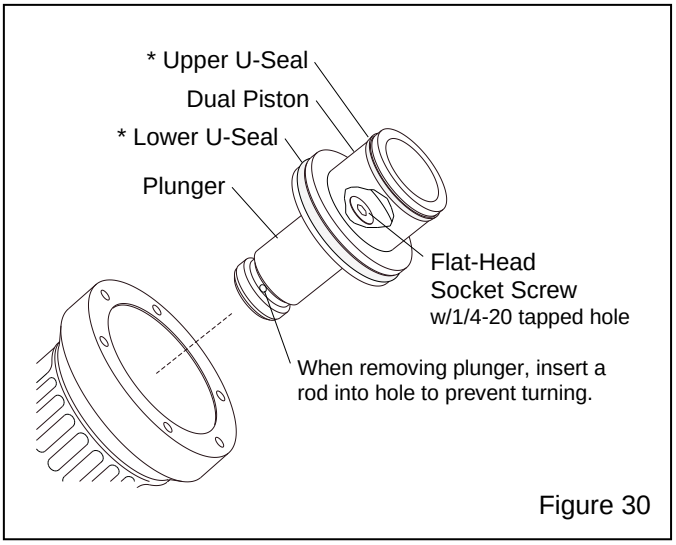
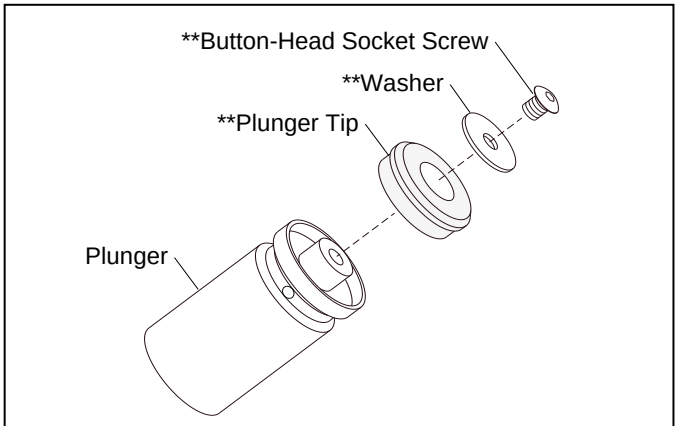


Figure 30

7.3.1.5 It is not necessary to separate the plunger from the dual piston unless the metal of either part is scored or otherwise needs to be replaced. To remove the plunger, insert a rod through the hole in the lower part of the plunger. Hold the rod to prevent the plunger from turning, while using a 5/16" hex key to remove the flat-head socket screw from inside the piston.

7.3.1.6 If the plunger tip is worn, use a 3/16″ hex key to remove the button screw, washer, and tip, as shown in Figure 31.



** included in the plunger tip service kit.
Figure 31

7.3.1.7 Refer to Figure 32 and remove both O-rings from the inside the valve body.

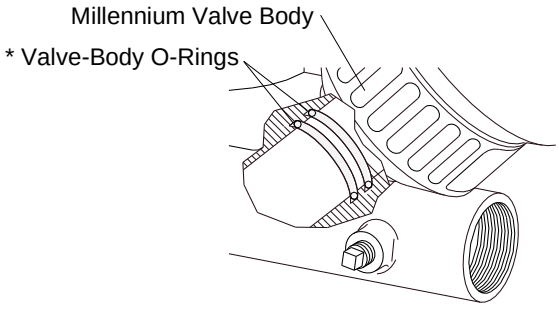


Figure 32

7.3.2 Inlet Valve Reassembly

Reassembly is done in reverse order. Refer to the illustration used for disassembly to reassemble. Clean and inspect for wear all parts to be reused; replace worn parts. Lubricate all O-rings and U-seals with O-ring lubricant or lightweight tool oil at assembly.

7.3.2.1 Clean all items and inspect for wear. Replace all seals and O-rings (included in the service kit).

- Inspect the plunger tip. Replace the tip if worn or damaged.
- Inspect the machined plunger seat in the valve body for wear. Replace the body if the seat is worn.
-

7.3.2.2 Refer to Figure 32 and install new valve-body O-rings.

7.3.2.3 Refer to Figure 31 and install new plunger tip.

7.3.2.4 If the plunger and piston were separated, as noted in paragraph 7.3.1.5, refer to Figure 33 and apply removable thread sealant to the threads on the flat-head socket screw, and reassemble the parts using the new O-ring supplied with the service kit.

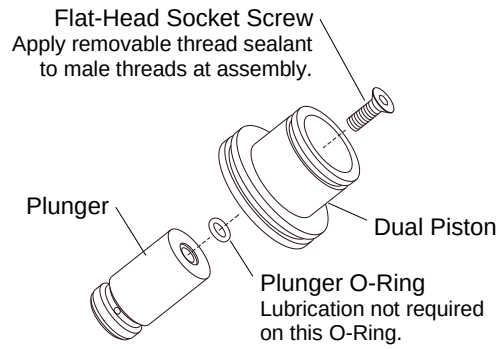


Figure 33

7.3.2.5 Place the U-seals into the grooves on the piston; the open side of the large seal faces the plunger, and the open side of the small one faces away from the plunger, as shown in Figure 34.

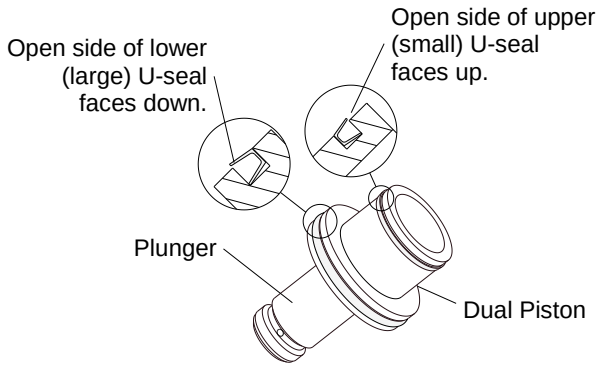


Figure 34

7.3.2.6 Install the plunger and dual piston assembly into the body. Make sure the open side of the large (lower) U-seal does not fold back during assembly. The cylinder is chamfered to help slip the lip in. Tucking the lip of the seal in, while applying pressure to the piston eases assembly.

7.3.2.7 Refer to Figure 35 and place the O-ring on the cylinder sleeve, and insert the sleeve (O-ring end up) into the body. Make sure the open side of the upper (small) U-seal does not fold back during assembly; the sleeve is chamfered to make assembly easier.

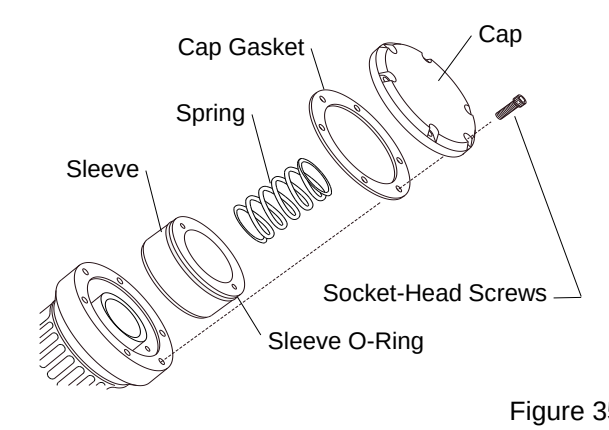


Figure 35

7.3.2.8 Install the spring, cylinder cap gasket, and cylinder cap.

7.3.2.9 Tighten the six socket-head screws in sequence to secure the cap.

7.4 Piston Outlet Valve – Figure 36

7.4.1 All service on the outlet valve must be done with the air OFF and the air-supply locked-out and tagged-out. It is not necessary to remove the valve from the blast machine.

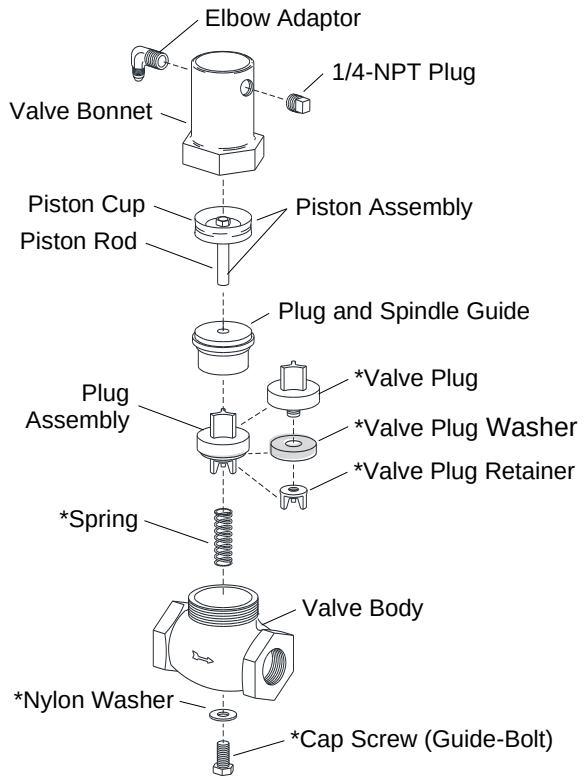
7.4.2 Remove the control hose from the valve bonnet's elbow adaptor. NOTE: The elbow adaptor and plug do not need to be removed unless they need to be replaced.

7.4.3 Use a large wrench to loosen the bonnet from the valve body, until it can be removed by hand.

7.4.4 To remove the bonnet, lift it straight up until the piston rod clears the spindle guide.

7.4.5 Remove the spindle, plug assembly, and spring from the valve body.

7.4.6 Remove the piston from the bonnet by pulling the piston rod.



*Items included in service kit.
For replacement parts, refer to Section 9.3.

Figure 36

7.4.7 Inspect all parts for wear and damage as follows:

- Inspect the valve plug washer, valve plug, and plug retainer for damage. Replace all damaged parts. When reassembling the valve plug assembly, tighten the retainer enough to compress the washer, but not so tight to cause it to bulge.
- Examine the body casting for wear. If the body or the machined seat is worn, replace the body.
- Examine the spring guide-bolt and nylon washer. If either is worn, replace both.
- The spring is approximately 1-5/8″ long; if it is abrasive-worn, rusty, or compressed, replace it.
- The piston cup should fit snugly against the bonnet's cylinder wall. If it does not, replace the piston assembly.
- The piston rod should be free of deep abrasion and move freely in the spindle guide's bore. If it is badly abraded, drags in the bore, or is loose in the bore, replace the piston assembly.

7.4.8 Lubricate the cylinder wall and piston cup with lightweight machine oil or tool oil.

7.4.9 Install the piston into the bonnet's cylinder. Cocking the piston so it enters the bonnet at a slight angle, and rotating it while applying pressure makes assembly easier. Do not push the piston fully into the bonnet; the rod should be even with the opening.

7.4.10 Place the spring over the guide-bolt, and place the plug assembly (retainer down) on the spring.

7.4.11 Place the spindle in the body. The large opening faces down, and fits over the plug fins. The spindle shoulder will not rest on the valve body due to the force of the spring.

7.4.12 To assemble the bonnet to the valve body, first insert the piston rod into the spindle guide hole. While keeping the bonnet, spindle, and body aligned, screw the bonnet onto the body. If all parts are correctly aligned, the body will screw on hand-tight until it is seated. **NOTE: If the bonnet does not screw on hand tight, do not force it. Recheck alignment and repeat assembly.**

7.4.13 After the bonnet is fully seated on the body, tighten the assembly with a wrench.

7.4.14 Attach the control hose to the fitting on the bonnet.

7.5 Abrasive Trap – Figure 37

⚠ WARNING

To avoid serious injury from the sudden release of compressed air, all service on the abrasive trap must be done with the air OFF and the air-supply locked-out and tagged-out.

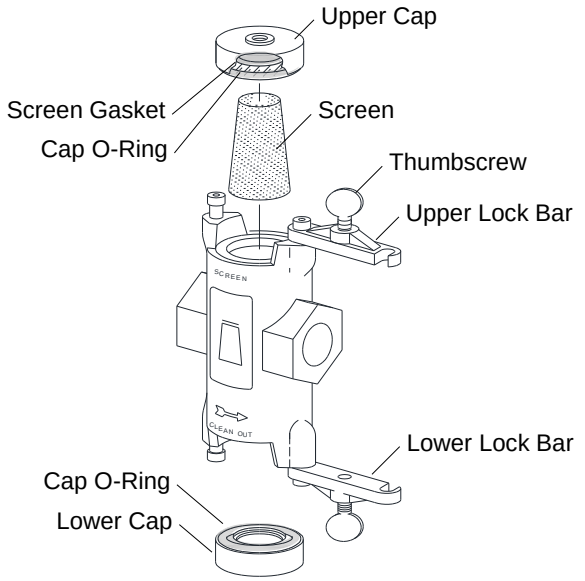
NOTE: Clean the abrasive trap screen and empty the trap at least twice daily. Failure to clean the trap on a regular basis is a major cause of system malfunction.

7.5.1 To check the abrasive trap screen, loosen the thumbscrew on the upper lock bar, swing the lock bar off the cap, and remove the cap.

7.5.2 Remove the screen and inspect it for wear and blockage. Replace it when it is clogged or worn. Keep spare screens on hand. Do not install the screen in the trap until the bottom section of the trap is cleaned per the following instructions.

7.5.3 To clean the bottom section of the trap, loosen the thumbscrew on the lower lock bar, swing the lock bar off the lower cap, and then remove the cap.

7.5.4 Empty abrasive from the bottom and top sections.



Make sure the screen gasket is in the upper cap.

Figure 37

7.5.5 Install the screen in the top section. The smallest diameter end of the screen must face up, as shown in Figure 37.

7.5.6 Reassemble the upper and lower caps.
NOTE: The upper and lower caps are identical except the screen gasket is glued into the upper cap. Make sure the screen gasket is in place in the upper cap, and the O-rings are in place on both caps before assembly.

7.6 Auto Quantum Metering Valve - Metering Segment – Figure 38

Refer to Section 7.7 to service the actuator segment.

NOTE: Service kits are available for the Quantum metering assembly and actuator segment. Keeping kit(s) on-hand will avoid unnecessary downtime. Replace all seals provided in the kit whenever the valve is opened.

If immediate service is required and a service kit is not readily available, take extreme care not to misplace or damage O-rings, gaskets, or other seals. Thoroughly clean all reusable parts.

7.6.1 Empty the machine of abrasive per Section 4.13. Turn OFF the compressed-air supply, lockout and tagout the air supply, and bleed the supply line to the blast machine.

7.6.2 Remove the cleanout cover wing nuts and cleanout cover.

7.6.3 Remove the four socket head screws securing the metering housing, and remove the housing assembly.

Items marked with * are included in the metering segment service kit.

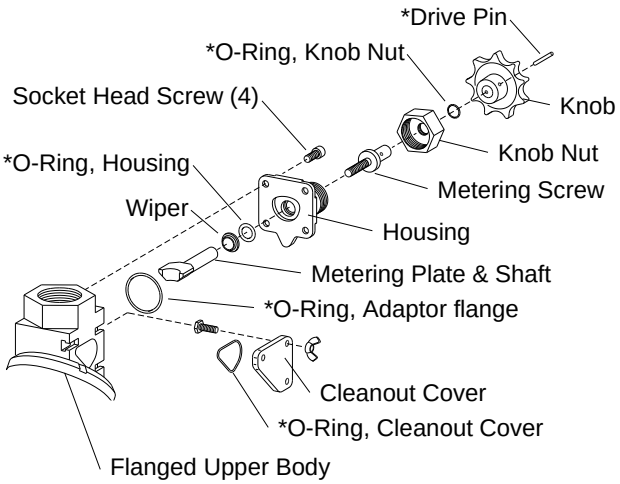


Figure 38

7.6.4 The flanged upper body and actuator do not need to be removed from the blast machine to service the metering assembly. Thoroughly inspect both items for wear, and replace if worn.

7.6.5 Turn the metering shaft clockwise to remove the shaft from the metering screw.

7.6.6 Loosen the knob nut, and pull the knob assembly from the housing.

7.6.7 Use a drive pin and hammer to force the roll pin from the knob, and remove the knob.

7.6.8 Remove the metering screw by pushing it out the front of the knob nut.

7.6.9 Inspect the metering screw for damage and any signs of abrasive ingress or metal filings.

7.6.10 Clean the threads on the metering screw, and test the condition of the threads by screwing it into the metering plate shaft. Replace the metering screw if there is any resistance, binding or metal filings.

7.6.11 Remove the O-ring from the knob nut, and remove the O-ring and wiper from the housing.

7.6.12 Thoroughly clean and inspect all parts that are to be reused. Replace all worn parts.

7.6.13 Place a new O-ring in the knob nut.

7.6.14 Place a new O-ring and wiper seal in the housing, as shown in Figure 38. The small side of the wiper seal faces away from the O-ring. A generous amount of silicone-based lubricant eases installation.

7.6.15 Insert the metering plate shaft through the housing bore, and wipe off any lubricant on the metering plate side of the bore.

7.6.16 Reassemble the metering screw, nut, knob, and drive pin. NOTE: applying a small amount of silicone-based lubricant on the unthreaded end of the metering shaft eases insertion through the nut O-ring.

7.6.17 Apply molybdenum disulfide or graphite-based anti-seize lubricant to the metering shaft and metering screw threads, and thread the shaft onto the screw.

7.6.18 Place a new O-ring in the groove on the face of the upper body.

7.6.19 Insert the metering plate (flat side up) through the upper body opening. Take care not to displace the internal O-ring.

7.6.20 Secure the metering housing finger tight before tightening all screws.

7.6.21 Place a new O-ring on the cleanout cover, and securely attach the cover.

7.6.22 Service of the metering assembly is complete. Test the machine and piping for air leaks before putting into service.

7.7 Auto Quantum Metering Valve Actuator Segment – Figures 39 and 40

Refer to Section 7.6 to service the metering segment.

NOTE: Service kits are available for the Quantum metering assembly and actuator segment. Keeping kit(s) on-hand will avoid unnecessary downtime. Replace all seals provided in the kit whenever the valve is opened.

If immediate service is required and a service kit is not readily available, take extreme care not to misplace or damage O-rings, gaskets, or other seals. Thoroughly clean all reusable parts.

7.7.1 Empty all abrasive from the machine per Section 4.13. NOTE: If the metering assembly does not require service, abrasive flow may be stopped by closing the metering valve.

7.7.2 Turn OFF the compressed-air supply. Lockout and tagout the air supply, and bleed the air-supply line to the blast machine.

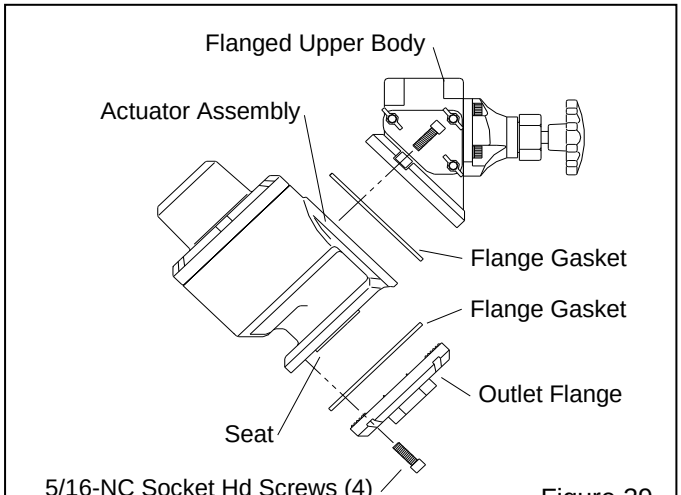


Figure 39

7.7.3 Refer to Figure 39 and remove the screws securing the upper body and outlet flange to the valve actuator assembly, and then remove the actuator assembly.

7.7.4 Refer to Figure 40 and unscrew the six socket head screws, and then remove the cylinder cover, spring and felt disc. Spring compression is removed when the cover is approximately 9/16" from the actuator body.

7.7.5 Use a hammer handle or similar object to push the plunger from the bottom (wear sleeve), forcing the plunger/piston assembly out the top of the body.

7.7.6 Pry the urethane seat from the bottom of the wear sleeve.

7.7.7 Remove the wear sleeve and roll pin from the body.

7.7.8 It is not necessary to separate the plunger from the piston unless either part is scored or worn. To separate the parts, hold the plunger in a vise with the vise jaws covered with copper or similar protection (if the plunger is damaged it does not matter if the vise jaws mar the plunger). Using a wrench placed on the flats of the piston stop, unscrew the stop.

7.7.9 Remove the wiper and O-ring from the actuator body.

- Inspect the urethane seat. Replace if worn or damaged.
- Inspect the body and outlet flange for wear. Replace if worn.

7.7.10 Clean all items and inspect for wear. Replace worn or damaged parts.

7.7.11 Replace the wiper and O-ring in the actuator body, the O-ring side of the wiper must face toward the bottom of the body, as shown in Figure 40.

7.7.12 Lubricate the O-ring and wiper in the actuator body, with a silicone-based lubricant.

7.7.13 If the plunger and piston were separated, as noted in Section 7.7.8, apply removable thread sealant to the threads on the piston stop, and reassemble the parts using a new O-ring.

7.7.14 Install the plunger and piston assembly into the actuator body. Tuck in the lip of the piston cup while applying pressure to the piston, to make sure the leading lip on the piston does not curl.

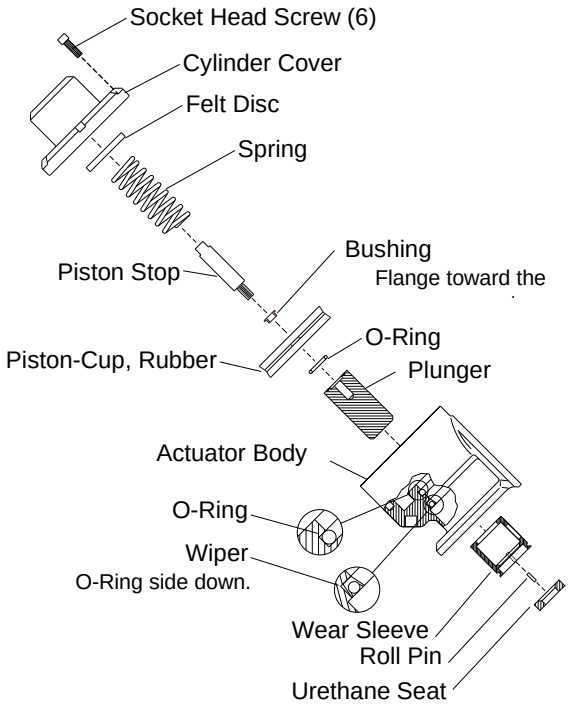


Figure 40

7.7.15 Place the roll pin and wear sleeve in the actuator body. The sleeve is correctly positioned when the alignment slot in the sleeve fits the roll pin in the body.

7.7.16 Place the urethane seat into the wear sleeve, with the beveled side toward the sleeve.

7.7.17 Assemble the actuator assembly onto the upper body and outlet flange. NOTE: The upper body is secured with three screws, and the outlet flange is secured with four screws. The gaskets are the same for both parts. Align the gaskets so the mounting holes match the pattern in the flange. Hand-tighten the upper body and outlet flange screws before tightening all screws.

7.7.18 Install the felt disc, spring, and cylinder cover, and tighten the screws to secure.

7.7.19 Connect the control line to the compatible fitting on the actuator assembly, and test the operation before putting the valve in service.

7.8 RLX Control Handle

NOTE: A service kit is available for the RLX control handle. To avoid unscheduled downtime, a kit should be kept on-hand.

7.8.1 Spring replacement

7.8.1.1 To replace the lever lock spring, follow the instructions in Section 7.8.2**.** To replace the handle lever spring, follow the instructions in Section 7.8.3.

7.8.2 Lever lock replacement – Figure 41

7.8.2.1 Remove the lock nut from the shoulder screw. Before removing the screw, note the positions of the spacers and spring, as shown in Figure 41. The bent end of the spring is toward the inside, forcing the lever lock up. The straight end is toward the outside, facing down and against the tab.

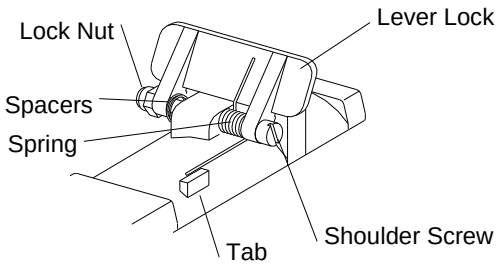


Figure 41

7.8.2.2 Install a new lever lock and spring, and reassemble in reverse order.

7.8.2.3 Make sure the lever lock moves freely, raises to full up position, and that the handle lever does not engage unless the lever lock is pulled down.

7.8.3 Handle lever replacement – Figure 42

7.8.3.1 Remove the lock nut from the shoulder screw. Before removing the screw, note the positions of the spacers and spring, as shown in Figure 42. The bent end of the spring goes against the handle lever, facing up. The straight end goes against the body, facing down.

7.8.3.2 Install a new handle lever and spring, and reassemble in reverse order.

7.8.3.3 Make sure the handle lever moves freely, raises to full up position, and does not engage unless the lever lock is pulled down.

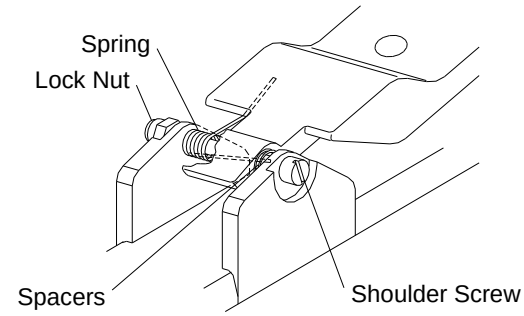


Figure 42

7.8.4 Rubber button replacement

7.8.4.1 Remove the old rubber button.

7.8.4.2 Install the new button, stem first, by pushing it from the bottom side of the handle lever. Pull the stem to seat the button.

7.8.4.3 Trim the button stem flush with the top of the handle lever.

7.8.5 Gasket replacement

7.8.5.1 Remove the handle lever per Section 7.8.3.

7.8.5.2 Remove the six screws holding the pneumatic adaptor to the body.

7.8.5.3 Install a new gasket.

7.8.5.4 Place the pneumatic adaptor on the gasket and hand tighten all screws before tightening them in sequence to uniformly-compress the gasket.

7.8.5.5 Reassemble the handle lever, making sure the spacer washers and spring are in place.

7.8.5.6 Make sure the handle lever moves freely, raises to full up position, and does not engage unless the lever lock is pulled down.

7.9 Replacing the Blast-Machine's Pop-Up Valve

7.9.1 Empty the machine of abrasive as described in Section 4.13.

7.9.2 Depressurize the blast machine, and lockout and tagout the air supply.

⚠ WARNING

Failure to observe the following procedure before performing any maintenance can cause serious injury or death from the sudden release of compressed air.

- **Depressurize the blast machine.**
- **Lockout and tagout the compressed-air supply.**
- **Bleed the air-supply line to the blast machine.**

7.9.3 To gain access to the pop-up valve, remove the inspection-door plate as follows:

1. Loosen the inspection-door clamp nut enough to slide the clamp bolt from behind the bolt bracket, and then remove the clamp and bolt assembly, as shown in Figure 43.

2. Push the inspection-door plate into the blast machine and rotate it so it can be removed through the inspection door. If the plate is stuck to the inspection-hole ring, rap the plate with a rubber mallet or similar tool to loosen it.

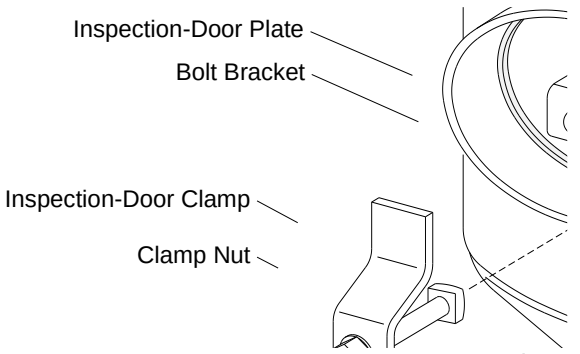


Figure 43

7.9.4 Remove the door gasket if it is cracked, dry, or otherwise damaged, and clean the surface of the inspection-door plate. Use rubber-based glue to adhere the new gasket to the plate. Allow the adhesive to cure before bolting the plate onto the machine.

7.9.5 Use a short pipe wrench to unscrew the pop-up valve guide from the elbow by turning it counterclockwise, as shown in Figure 44. Remove the pop-up valve and guide from the machine.

7.9.6 While the pop-up valve is out, check alignment as follows: Screw a 1-1/4" nipple that is at least 12" long into the elbow in place of the pop-up guide. Check the alignment through the pop-up filling port. The nipple should be close to the center of the port. If it is not, adjust the horizontal pipe. A misaligned pop-up valve could result in early valve failure or abrasive leakage when the machine is pressurized or depressurized.

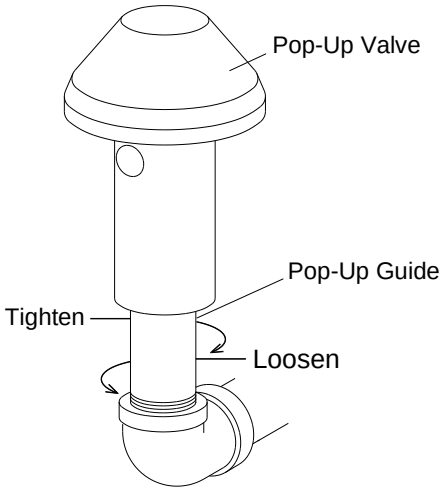


Figure 44

7.9.7 Slide the new pop-up valve over the guide and then screw the guide (with the pop-up valve on it) into position inside the machine. Tighten the guide wrench-snug, but not wrench-tight. Over-tightening the guide will make it difficult to remove the next time the pop-up valve needs replacement.

7.9.8 Refer to Figure 45 to check the pop-up height. If the pop-up sits too low, misalignment could occur when the pop-up comes up against the seal. If the pop-up sits too high, it will take longer for abrasive to flow through the opening when filling. Adjust the height by replacing the guide with one that is longer or shorter.

7.9.9 Bolt the plate onto the machine.

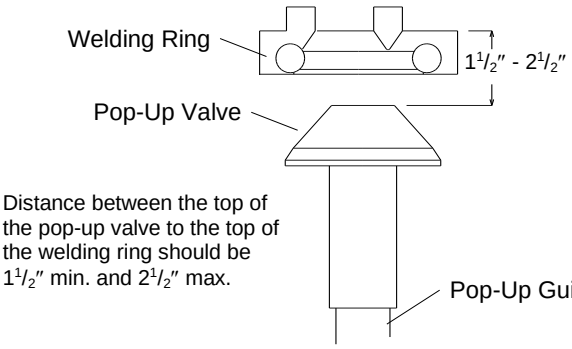


Figure 45

7.10 Replacing the Blast-Machine's Pop-Up Seal Figure 46

7.10.1 Observe the warning in Paragraph 6.7.2; all service on the blast machine must be done with the compressed air OFF and the air-supply locked out and tagged out.

7.10.2 Remove the old seal by using a finger, screwdriver, or similar object to work the seal out of the retainer groove. If for any reason replacement cannot be made from the top of the machine, observe the warning at the beginning of this section, and empty the machine and bleed the air-supply line. Remove the inspection-door plate and work through the inspection-door opening.

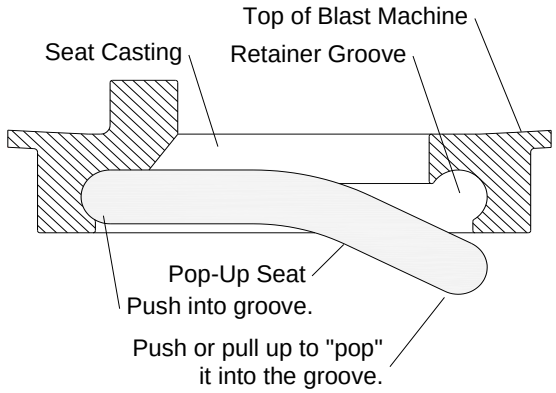


Figure 46

7.10.3 Push the new seal all the way through the port and then fit it into the retaining groove. For the last few inches, pull up on the seal and allow it to pop into position.

7.11 Replacing Injector Sleeve – Figure 47

7.11.1 Remove the hydraulic hose from the injector; the male ends of the hydraulic hose swivel to facilitate the removal and reattachment of the hose.

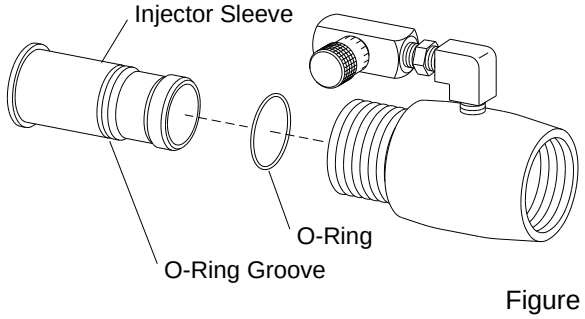


Figure 47

7.11.2 Remove the injector-adaptor assembly from the blast hose and remove the nozzle from the injector.

7.11.3 Remove the sleeve from the blast hose end of the injector-adaptor body. Abrasive and mineral deposits may make it difficult to remove; drive the sleeve out with a dowel or press it out as needed.

7.11.4 Place a new O-ring into the O-ring groove.

7.11.5 Lubricate the O-ring with silicone grease or similar lubricant and fully insert the sleeve into the body.

7.11.6 Make sure the nozzle washers are in good condition before connecting the injector to the blast hose and installing the nozzle.

7.11.7 Reattach the hydraulic hose.

7.12 Remove and Install Reusable Control-Hose Ends – Figure 48

7.12.1 Control hoses may be shortened and cut to length as follows:

1. Remove the hose end by placing the sleeve in a vise or use a backup wrench on the sleeve to prevent it from turning. Unscrew the insert by turning it counterclockwise.
2. Turn sleeve clockwise to remove from the hose.
3. Cut hose to length.
4. Turn sleeve counterclockwise to install on hose. Do not over-tighten the sleeve; stop tightening as soon as the hose bottoms-out against the sleeves internal shoulder. Over tightening will cause the hose to curl inward and could cause blockage.
5. Push end of insert into sleeve, and turn clockwise to tighten until the insert hex is against the sleeve.

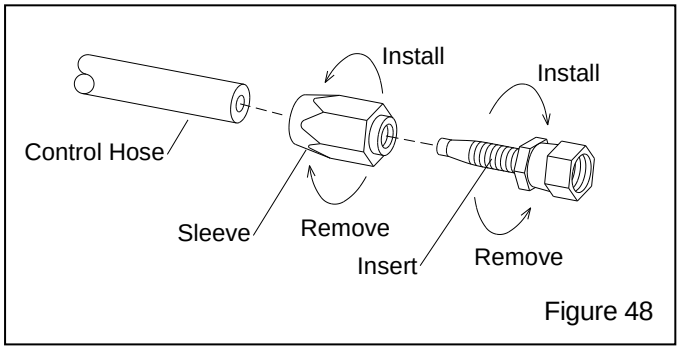


Figure 48

7.13 Water Pump

Refer to the water pump manual to service the pump

8.0 TROUBLESHOOTING

NOTE: This section only identifies conditions and problems in the blast machine and remote control system. Always refer to the appropriate section of this manual, or manuals for accessory equipment when troubleshooting and before servicing the equipment.

⚠ WARNING

To avoid serious injury, observe the following when troubleshooting the machine and remote controls.

- **Turn OFF the compressed air and Lockout (be certain the air supply is off and that it cannot be started while work is in process) and tagout (be certain the air supply is clearly marked to prevent re-starting while work is in process) the compressed-air supply.**
- **When checking the controls requires air, always enlist the aid of another person to operate the control handle while holding the nozzle securely and pointing it in a safe direction.**
- **Never strap the remote control handle lever down in the operating position.**

8.1 Neither abrasive nor air exits the nozzle while the machine is under pressure

8.1.1 Nozzle may be obstructed. Depressurize the blast machine. After the pop-up valve has dropped, remove the nozzle, and check it for obstruction.

8.1.2 Valves may be closed. Make sure that both the abrasive metering valve and choke valve are open.

8.2 Air only (no abrasive) exits the nozzle

8.2.1 Abrasive metering valve may be closed or needs adjustment. Adjust abrasive flow, per Section 5.1.

8.2.2 The ACS switch may be OFF. Make sure the ACS is in the blast position (toggle pointing away from nozzle).

8.2.3 Blast machine may be empty.

8.2.4 Abrasive may be damp. Refer to Section 7.1 to clear damp abrasive.

8.2.5 Obstruction in abrasive metering valve. Check the abrasive metering valve for obstructions. Refer to Section 7.2.

8.2.6 The abrasive metering valve actuator may require service. Refer to Section 7.7.

8.2.7 Air leak. Check for air leaks in the single-line hose between the ACS and metering valve.

8.3 Heavy abrasive flow

8.3.1 Make sure the choke valve is fully open. The valve is open when the handle position is aligned with the piping.

8.3.2 Abrasive metering valve may be open too far. Adjust abrasive flow, per Section 5.1.

8.3.3 Check the abrasive metering valve for wear. Look for wear on the abrasive valve metering plate.

8.4 Abrasive surging

8.4.1 A moderate amount of abrasive surge is normal at start-up. Should the flow of abrasive continue to surge, reduce the amount of abrasive in the air stream by adjusting the metering valve, per Section 5.1.

8.4.2 Blockage in outlet passage. Check the abrasive trap and exhaust muffler for blockage. Slow depressurization will load the blast hose with abrasive, and cause surging at start-up. See Section 8.7.

8.4.3 Choke valve closed or partially closed. Make sure the choke valve is fully open. The valve is open when the handle position is aligned with the piping.

8.5 Intermittent abrasive flow

8.5.1 Moisture in the blast machine or in the air supply. Drain moisture from the compressor's receiver tank, and the blast machine's air filter. If problem with moisture persists, an after-cooler or air dryer may be required in the air-supply line.

8.6 Blast machine does not pressurize

8.6.1 Make sure the compressor is ON and all air-supply valves to the machine are open.

8.6.2 Make sure the safety petcock on the inlet valve is closed.

8.6.3 Inspect the rubber button on the control handle for wear or damage, and make sure the opening on the control handle seals when the handle is pressed.

8.6.4 Check for air escaping through the opening under the control handle lever. If no air is escaping, the orifice fitting on the blast-pressure regulator (shown in Figure 49) is blocked, or the line from the orifice to the control handle is blocked and must be cleared.

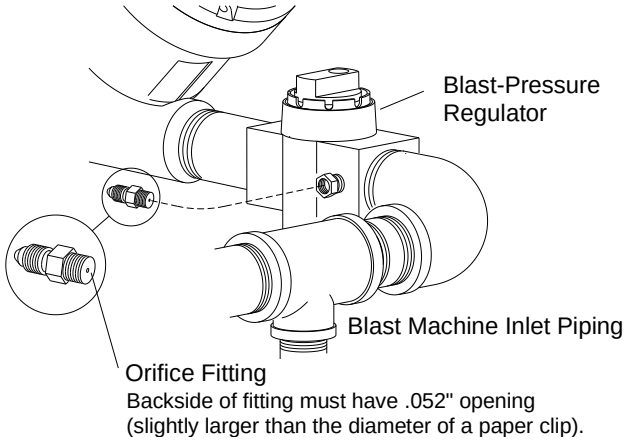


Figure 49

8.6.5 Press the control handle lever. Feel for and listen for air leaks on the handle. No air should escape when the handle lever is pressed. If there is a leak, it must be located and repaired.

8.6.6 Check control lines and fittings for air leaks.

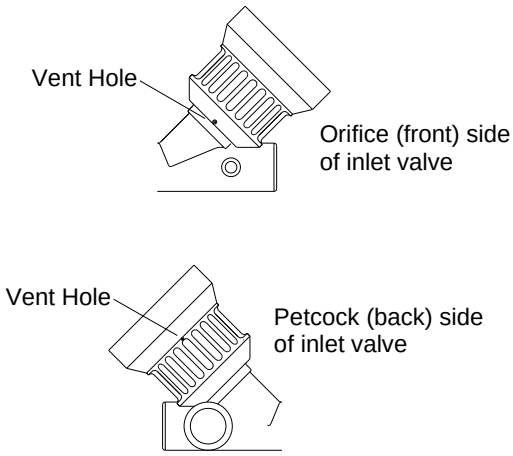
8.6.7 Open the safety petcock, and press the control handle lever; air should come out of the petcock. If it does not, check for the following:

- Opening on the control handle is not sealed off.
- Air leaks in control handle.
- Line from the control handle to the upper fitting on the inlet valve is blocked.

If air comes out the petcock, the Millennium valve is not functioning. Turn OFF the compressed-air supply and service the Millennium valve per Section 7.3.

8.6.8 Pressure delay valve closed or shifts too fast, adjust per Section 5.3.

8.6.9 Close the safety petcock, and press the control handle lever. Make sure that no air escapes through either of the two vent holes in the inlet valve body, shown in Figure 50. Air escaping from either of the vents indicates worn seals in the inlet valve. Service the valve per Section 7.3.



Air leaking through either vent hole
is an indication that the inlet valve requires service

Figure 50

8.6.10 Inlet valve malfunctioning. Inspect internal parts for wear, and lubrication. Refer to Section 7.3.

8.6.11 Compressor too small for the nozzle. Refer to the compressed-air consumption table in Figure 6 for nozzle air consumption.

8.6.12 Insufficient-size air-supply hose or reduced-size fittings between the compressor and blast machine. Refer to Section 2.1.

8.6.13 Dirty element in compressed-air filter. Inspect filter element.

8.6.14 Pop-up valve stuck, or internal piping worn or out of alignment. Inspect internal piping.

8.7 Blast machine does not depressurize or depressurizes too slowly

8.7.1 Abrasive trap screen blocked, or abrasive trap needs cleaning. Inspect the screen and empty the trap at least twice daily

8.7.2 Exhaust muffler blocked. Replace muffler.

8.7.3 After releasing the control handle, open the safety petcock on the inlet valve.

- If the machine does depressurizes, control air remains in the control lines, refer to Paragraphs 8.7.4, 8.7.5, 8.7.6, and 8.7.7.
- If the machine does not depressurize, the inlet valve is not fully closing or the outlet valve is not fully opening, refer to Paragraph 8.7.8.

8.7.4 Check the pneumatic adaptor gasket on the control handle for swelling, which restricts air flow through the handle.

8.7.5 Check for blockage in the control hose.

8.7.6 Check the orifice fitting on the blast machine's blast-pressure regulator (shown in Figure 49). The orifice on the 1/8-NPT end of the fitting (the end that threads into the bushing on the regulator) must have a 0.052" opening. A full port fitting will cause the remote controls to malfunction.

8.7.7 Make sure the inlet valve closes. If it does not seal-off incoming air, service the Millennium valve per Section 7.3.

8.7.8 Disassemble the piston outlet valve, clean and lubricate it. Replace all worn or broken parts. Refer to Section 7.4.

8.8 Outlet valve does not seal

8.8.1 Outlet valve requires service. Refer to Section 7.4.

8.9 RLX control handle fails to return to the non-blast position (up) when released

8.9.1 Inspect the handle for damage and accumulation of debris or abrasive that could cause binding. Clean and replace as necessary.

8.9.2 Check the spring for damage or fatigue. Replace as necessary.

8.10 RLX lever lock fails to return (up) to the lock position when the handle is released

8.10.1 Inspect the lever lock for damage, or accumulation of debris or abrasive that could cause binding. Clean and replace as necessary.

8.10.2 Check the lever lock return spring for damage or fatigue. Replace as necessary.

8.11 No water from the injector

8.11.1 Observe pump stroke. If pump rapidly strokes, pump is not properly primed. Refer to Section 4.1.4 to prime pump.

8.11.2 Water flow-control valve closed or blocked. Open flow control or inspect the valve for blockage.

8.11.3 Air supply (isolation) valve to pump module closed. Make sure the air-supply valve is open.

8.11.4 Water supply valve to pump module closed. Make sure water supply valve is open.

8.11.5 Pump-module pressure-regulator set too low or turned off. Check pressure; set to between 30 and 40 psi.

8.11.6 Inlet strainer screen blocked. Inspect screen; clean or replace as needed.

8.11.7 Pump requires service. Refer to the pump operations manual.

8.12 Pump does not prime (pump rapidly strokes but does not pump water)

8.12.1 Make sure all air is bled from water supply, refer to Sections 4.1.2.

8.12.2 If pump does not self-prime from the water tank, and if pressurized water (from a faucet) supply is available, repeat the priming process using pressurized water. Once primed, switch supply back to the water tank.

8.12.3 Inspect the needle valve and check valve for blockage.

8.12.4 Make sure the check valve (located on the coupled injector assembly) is installed correctly; the arrow should point toward the outlet in the direction of water flow.

9.0 ACCESSORIES AND REPLACEMENT PARTS

9.1 Blast Machine and Accessories – Figure 51

Item	Description	Stock No.
1.	Ball valve, 1-1/4" with handle	02397
2.	Handle, 1-1/4" ball valve	22532
3.	Pusher line assembly, 1-1/4" x 31"	23675
4.	Air filter, 1-1/2-NPT manual drain	01284
5.	Coupling, 1-1/4" CF	00551
6.	Gasket, CQG for 00551 coupling, pk. 10	00850
7.	Metering valve, Auto-Quantum w/fittings	24447
8.	Inspection-door assembly, 6" x 8"	02377
9.	Gasket, inspection-door, 6" x 8"	02369
10.	Seal, pop-up valve	02325
11.	Pop-up valve, 4", with external sleeve	03699
12.	Wye, standard 1-1/4"	01818
13.	Internal pop-up guide, 1-1/4" x 9.5" toe	01757
14.	Adaptor, 1-1/4-NPT x JIC	22529
15.	Safety cable, 1-1/2" to 3" OD hose	15013
16.	Lock pin, coupling (package of 25)	11203
17.	Cover, 24" diameter	02336
18.	Screen, 24" diameter	03100
19.	Muffler, 1" exhaust	05068
20.*	CPF air filter	03578
	refer to CPF filter manual No. 04143 for parts	
21.*	Nut, 1" lock	11917
22.*	Elbow, 1" 90º street	01775
23.*	Nipple, 1" x close	01701
24.*	Ball valve, 1" with handle	02396
25.*	Adaptor, 1-NPT x JIC	11720
26.*	Hose assembly, 1" ID x 32", coupled	22864
27.**	Coupling, nylon, CQPS-2	08413
28.**	Gasket, CQGP-3, pack of 10, for item 28	08853
29.**	Nozzle holder, with	
	Contractor threads, NHP-2	04127
	1-1/4 nozzle threads, HEP-2	07721
30.**	Hose, Supa blast, 1-1/4" ID x 50 ft	23106
31.**	Nozzle, with	
	Contractor threads, SXS-7	100867
	1-1/4 threads, SAS-7	28082
32.**	Washer, nozzle, pack of 10	
	NW-32, for SXS nozzles	91026
	NW-4, for SAS nozzles	00869

* Supplied with factory-installed CPF air filter option
** Supplied with accessory kit

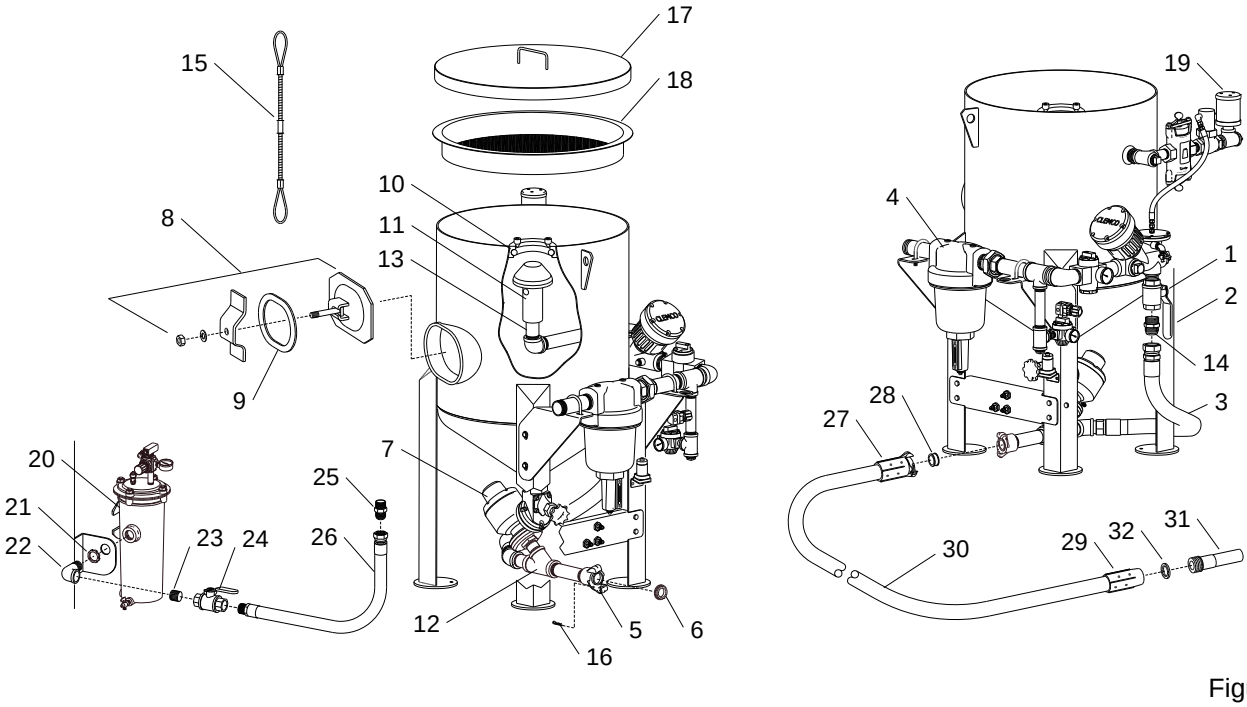
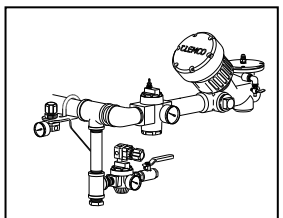
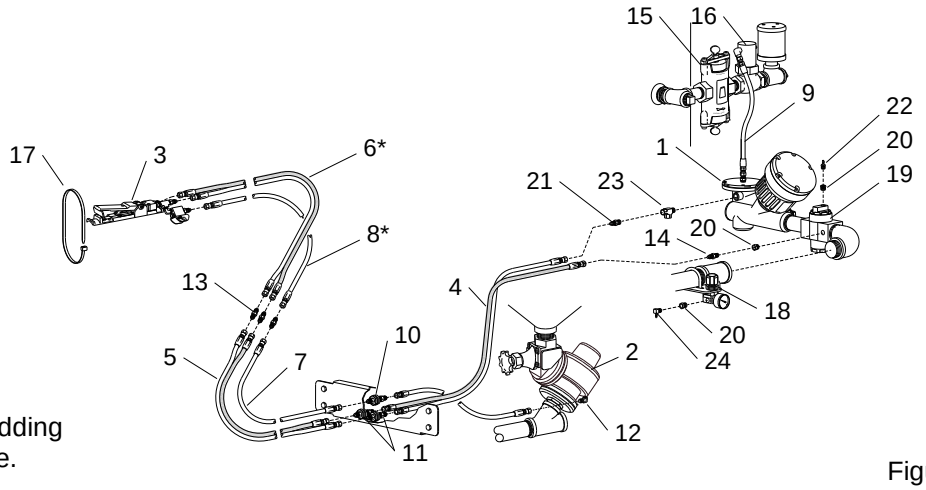


Figure 51

9.2 Remote Control System – Figure 52

Item	Description	Stock No.
1.	Millennium inlet valve	23620
2.	Metering valve, Auto-Quantum w/fittings	24447
3.	RLX control handle w/ ACS	07625
4.	Hose, 4' twinline coupled	21619
5.	Hose, 52' twinline coupled, first hose	28569
6.*	Hose, 50' twinline coupled, extension	01951
7.	Hose, 52' 3/16" single-line, first hose	28570
8.*	Hose, 50' 3/16" single-line, extension	03087
9.	Hose, 3/16" x 18"	02454
10.	Fitting, 1/4-NPT bulkhead each, 3 used	05605
11.	Adaptor, 1/4-NPT each, 6 used	02494
12.	Adaptor, 1/8-NPT elbow	02827
13.	Union, 3/16" hose	01944
14.	Orifice, .052"	20429
15.	Abrasive trap, 1-NPT	02011
16.	Outlet valve, TLR 1-NPT piston	01967
17.	Tie, nylon	02195
18.	Regulator, 1/4" pilot w/gauge	12050
19.	Regulator, 1-1/2" pilot-operated w/gauge	12051
20.	Bushing, 1/4 x 1/8-NPT	02010
21.	Adaptor, 1/4-NPT	02494
22.	Fitting, 1/8-NPT x 1/8" barb, straight	11732
23.	Tee, 1/4-NPT M/F/F	20847
24.	Fitting, 1/8-NPT x barb, elbow	11733


View of piping shown for reference.



* Use 50-ft extensions when adding additional lengths of blast hose.

Figure 52

9.3 TLR Piston Outlet Valve – Figure 53

Item	Description	Stock No.
(-)	Outlet valve, 1" piston-type, complete	01967
(-)	Service kit, includes items marked *, quantities shown in ( )	01928
1.	Elbow, 1/4-NPT adaptor	02513
2.	Plug, 1/4-NPT	01950
3.	Bonnet	01970
4.	Piston and rod assembly	01976
5.	Plug and spindle guide	01971
6.*	Valve plug (1)	01972
7.*	Washer, valve plug (2)	01969
8.*	Retainer, valve plug washer (1)	01986
9.	Valve body	01968
10.*	Spring, 7/16" x 1-5/8" long (1)	01974
11.*	Washer, nylon (1)	01979
12.*	Cap screw, 3/8-NC x 3/4" (1)	03251

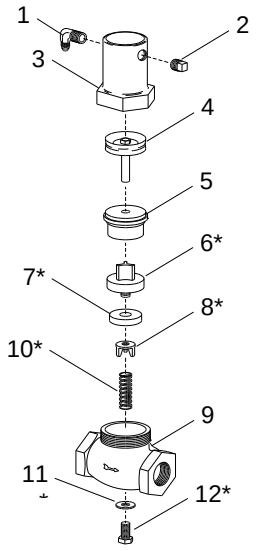


Figure 53

9.4 Low-Pressure Delay System – Figure 54

Refer to Section 9.2 for remote control system parts.

Item	Description	Stock No.
1.	Valve, pressure delay	28625
2.	Sub-plate, pressure delay valve	28624
3.	Regulator, 1/4" pilot with gauge	12050
4.	Tubing, 1/8" urethane, specify ft required	12475
5.	Orifice, .052"	20429
6.	Bushing, 1/4 x 1/8-NPT	02010
7.	Fitting, 1/8-NPT x 1/8" barb	11732
8.	Nipple, 1/4-NPT hex	02808
9.	Fitting, 1/8-NPT elbow x 1/8" barb	11733
10.	Tee, 1/4-NPT M/F/F	20847
11.	Adaptor, 1/4-NPT	02494
12.	Regulator, 1/2" pilot-operated	11345
13.	Regulator, 1-1/2" pilot-operated w/gauge	12051
14.	Fitting, tube, 10-32 thread x 1/8" barb	11731
15.	Bracket, pressure delay valve mounting	28650
16.	Tee, 1/8" barb	11734

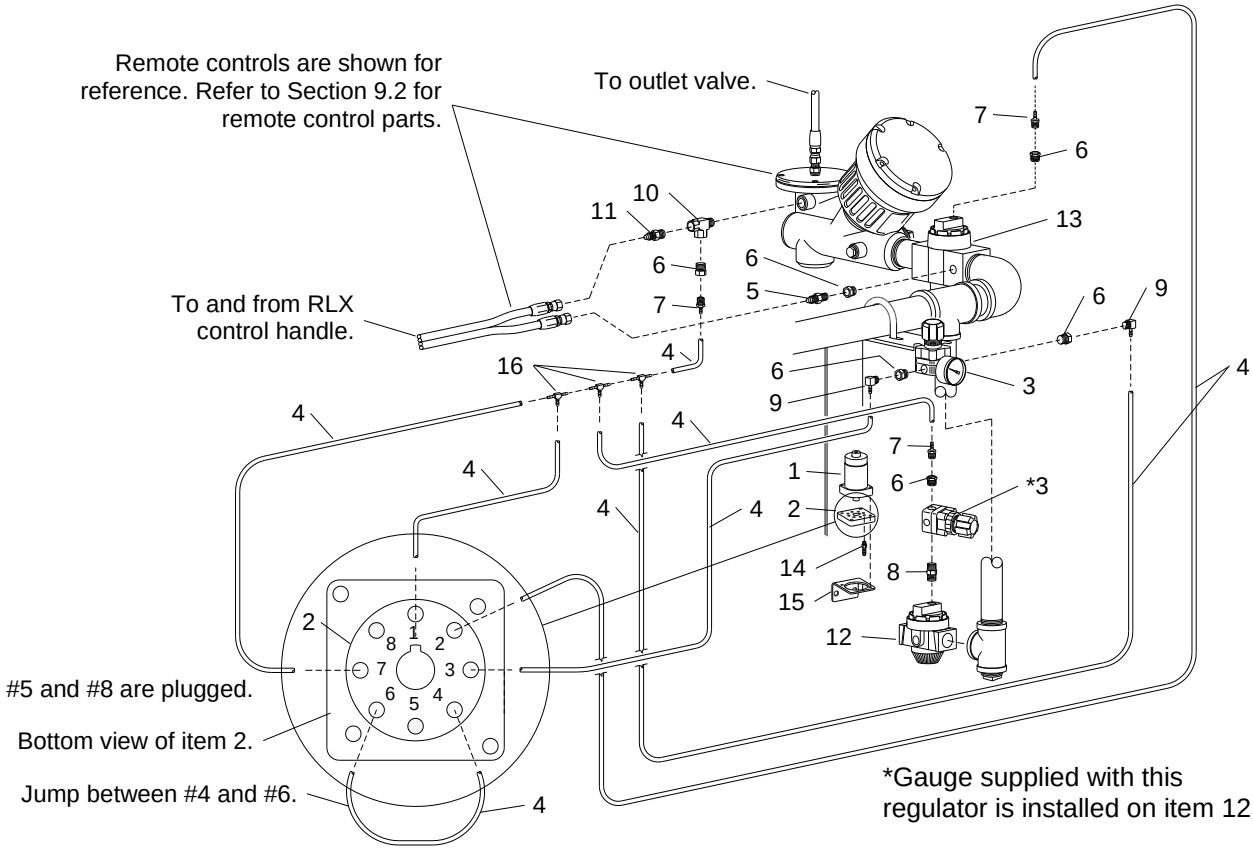


Figure 54

9.5 Auto-Quantum Metering Valve – Figure 55

Item	Description	Stock No.
(-)	Auto-Quantum metering valve w/fittings	24447
(-)	Service kit, Quantum actuator Includes items called out in Figure 55a	24446
1.	Cover, cylinder	21317
2.	Stop, piston	21323
3.	Piston-cup w/bushing	21329
4.	Valve body	21349
5.	Plunger, grit valve	21326
6.	Wear sleeve, grit valve	21342
7.	Seat, urethane	21344
8.	Flange, outlet w/retaining ridge	21319
9.	Screw, 5/16-NC x 1-3/4" socket head	21321
10.	Screw, 5/16-NC x 1" socket head	21318
11.	Spring	20600
12.	Adaptor, 1/4-NPT elbow	02513
13.	Petcock, 1/4-NPT	01993
14.	Nipple,1-1/2" x close schedule 80	01791
15.	Nipple, 1-1/4" x 2"	01718
16.	Wye, 1-1/4"	01818
17.	Screw, 3/8-NC x 1" socket head	22655
18.	Metering assembly Refer to Section 9.6 for parts	24587

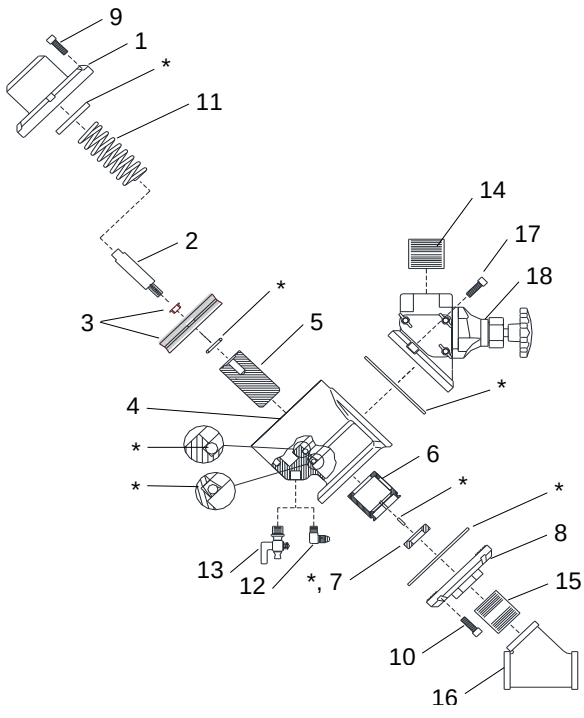


Figure 55

24446 SERVICE KIT
QUANTUM ACTUATOR

Item	Qty	Description
1.	1	Seat, urethane
2.	2	Gasket, flange
3.	1	U-seal, 3-1/2" ID For early style with aluminum piston
4.	1	O-ring. 1-1/2" ID x 3/16" nom.
5.	1	Wiper, plunger
6.	1	O-ring, 31/64" ID
7.	1	Roll pin, 1/8" x 1/2"
8.	1	O-ring, 1-1/2" ID x 3/32" nom. For early style with separate retaining ring
9.	1	Felt disc

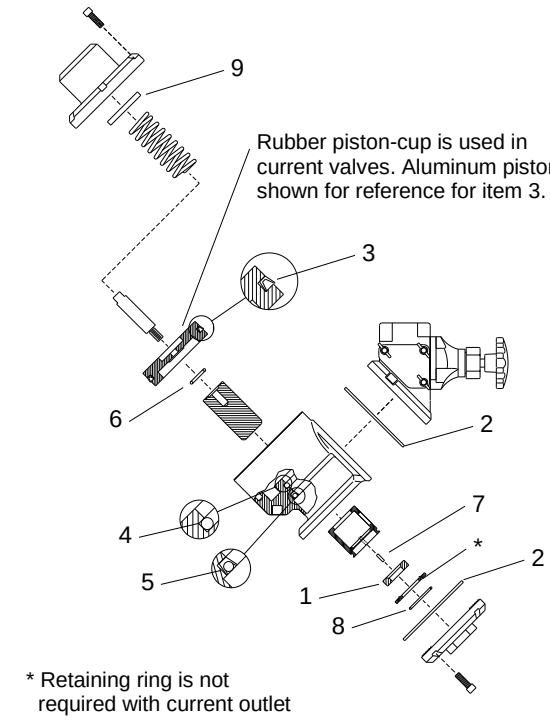


Figure 55a

9.6 Auto-Quantum Metering Segment – Figure 56

Item	Description	Stock No.
(-)	Service kit, metering section Includes items called out in Figure 56a ..	22854
(-)	Metering assembly, Includes all items shown in Figure 56 ...	24587
1.	Upper body, flanged	21314
2.	Screw, 3/8-NC x 1" socket head	22655
3.	Screw, 5/16-NC x 3/4" socket head	22767
4.	Cover, cleanout	22620
5.	Screw, 1/4-NC x 3/4" hex head cap	03052
6.	Nut, 1/4-NC wing	03113
7.	Housing, knob	22761
8.	Nut, knob-housing	22762
9.	Metering plate and shaft	22763
10.	Metering screw	22764
11.	Knob, adjustment	22766

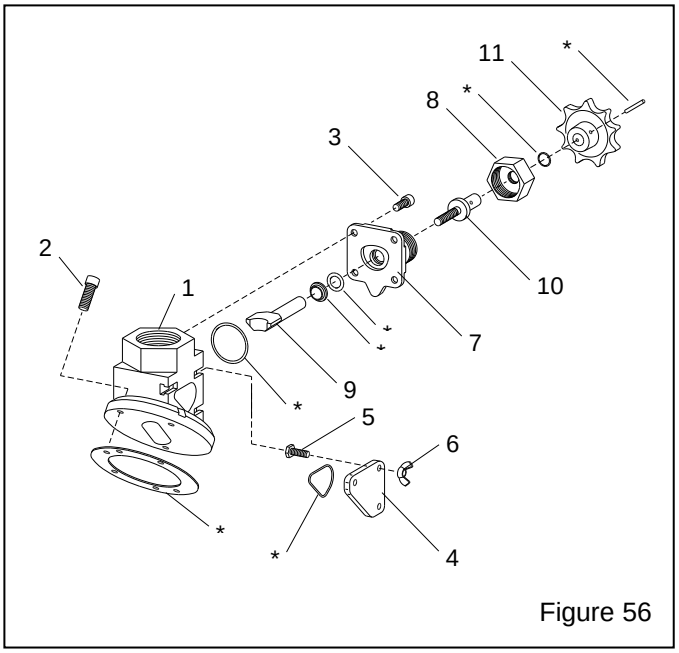


Figure 56

22854 SERVICE KIT
QUANTUM METERING SECTION

Item	Qty	Description
1.	1	Flange gasket
2.	1	Wiper seal
3.	1	O-ring, 3/4" OD nominal
4.	1	O-ring, 5/8" OD nominal
5.	2	O-ring 1-1/2" ID nominal
6.	1	Roll pin

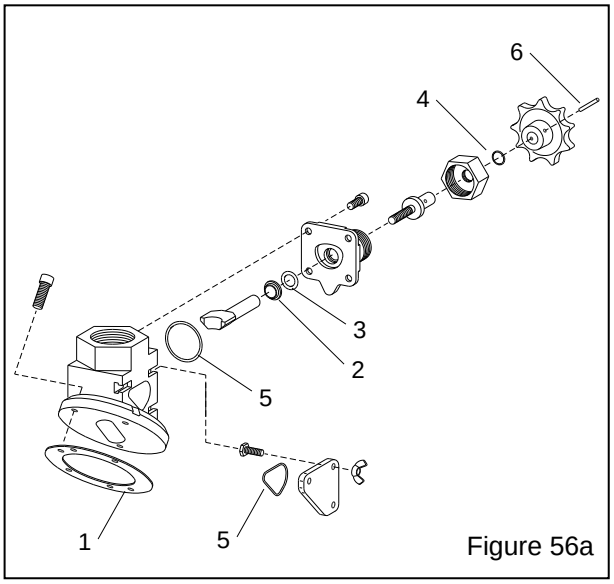


Figure 56a

9.7 Millennium Inlet Valve – Figure 57

Item	Description	Stock No.
*	Service kit, Millennium inlet seals Includes items called out in Figure 57a	22856
**	Service kit, Millennium plunger tip Includes items called out in Figure 57b	22898
(-)	Millennium inlet valve	23620
1.	Plunger	22600
2.	Dual piston	22602
3.	Spring, 4" long	22604
4.	Screw, socket, w/internal threads	22650
5.	Sleeve, cylinder	22603
6.	Screw, 5/16-NC x 1-1/4", socket head	22611
7.	Body, inlet valve	21338
8.	Cap, cylinder	21339
9.	Plug, 1-1/2-NPT	02477
10.	Nipple, 1/4-NPT hex	02808
11.	Elbow, 1/4-NPT 90° female	06373
12.	Petcock, 1/4-NPT	01993
13.	Plug, 1/4-NPT	01950
14.	Adaptor, 1/4-NPT	02494
15.	Plug, 1-1/4-NPT	01762
16.	Plate, remote outlet adaptor	23597
17.	Gasket, adaptor plate	23261

Refer to Section 9.2, Figure 51 for additional fittings.

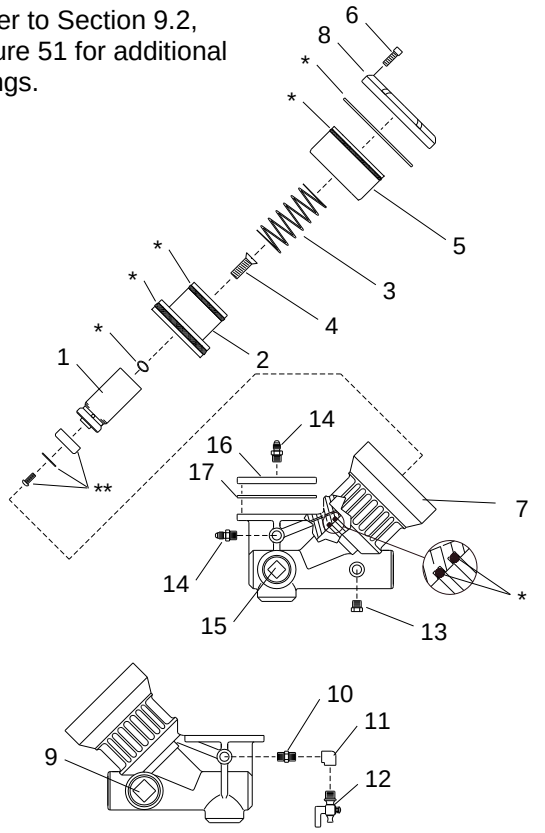


Figure 57

22856 SERVICE KIT
MILLENNIUM INLET VALVE SEALS

Item	Qty	Description
1.	2	O-ring, 2-1/8" OD, nominal
2.	1	U-seal, dual piston lower, 3-1/2" ID
3.	1	U-seal, dual piston upper, 2-3/8" ID
4.	1	O-ring, 4-1/8" OD, nominal
5.	1	O-ring, 31/64" ID, nominal
6.	1	Gasket, cylinder cap

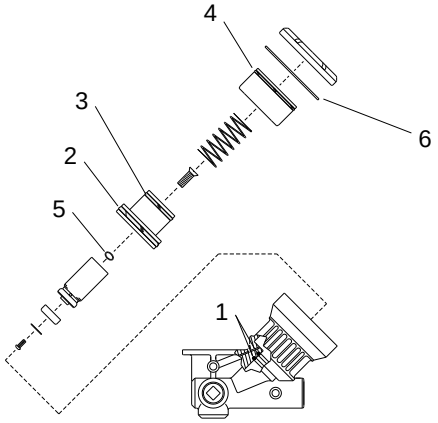


Figure 57a

22898 SERVICE KIT
MILLENNIUM PLUNGER TIP

Item	Qty	Description
1.	1	Screw, 5/16-NC button head
2.	1	Washer, plunger tip
3.	1	Tip, replaceable plunger

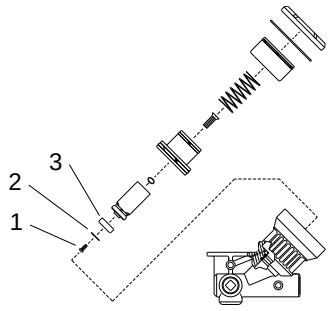


Figure 57b

9.8 RLX Pneumatic Control Handle with ACS Figure 58

Refer to Section 9.9 for RLX replacement parts.

Item	Description	Stock No.
(-)	RLX control handle assembly w/ ACS	07625
1.	RLX control handle, standard	10565
2.	Switch assembly, ACS pneumatic	07654
3.	Elbow, 1/8-NPT male	03085
4.	Tee, 1/8-NPT brass	02171
5.	Adaptor, 1/8-NPT	01940
6.	Guard, ACS pneumatic switch	07655
7.	Breather muffler, 1/8-NPT	07657
8.	Switch only, ACS	07658
9.	Connector, 1/8-NPT brass	01962

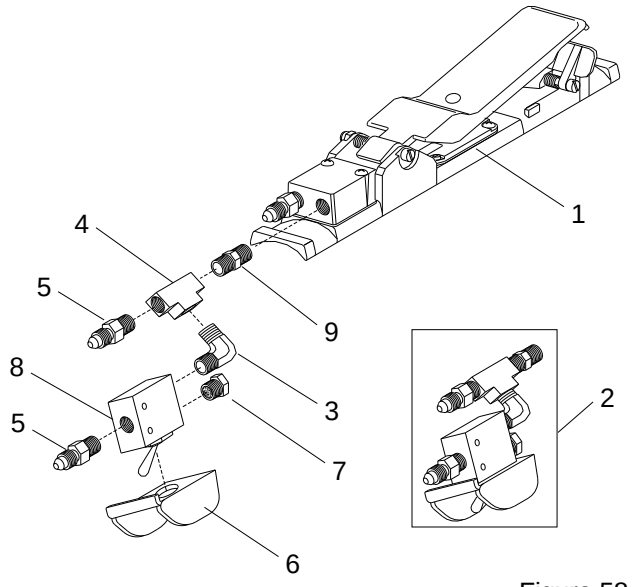


Figure 58

9.9 RLX Pneumatic Control Handle – Figure 59

Item	Description	Stock No.
(-)	RLX pneumatic control handle assembly	10565
(-)	Service kit, pneumatic RLX Includes items called out in Figure 59a	22859
1.	Handle lever	10573
2.	Body	10568
3.	Pneumatic adaptor	10562
4.	Adaptor, 1/8-NPT (2 required)	01940
5.	Tie, nylon wire	02195

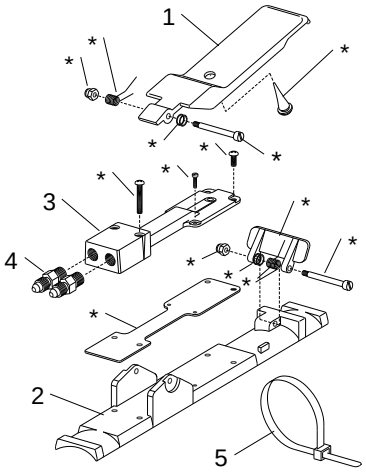


Figure 59

22859 SERVICE KIT
RLX PNEUMATIC CONTROL HANDLE

Item	Qty	Description
1.	1	Lever lock
2.	2	Spring
3.	2	Nut, 8-32 lock, ss
4.	4	Spacer washer, stainless steel
5.	2	Screw, 3/16" x 1-1/4" shoulder
6.	2	Screw, 8-32 x 1"
7.	2	Screw, 4-40 x 3/8"
8.	3	Rubber button
9.	1	Gasket, pneumatic adaptor
10.	2	Screw, 8-32 x 3/8"

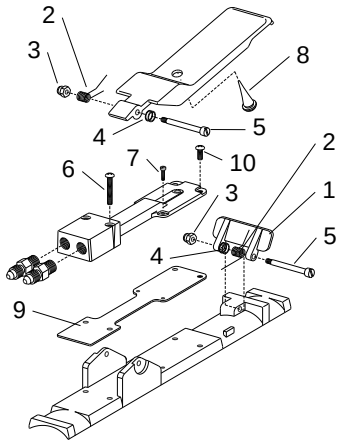


Figure 59a

9.10 Abrasive Trap – Figure 60

Item	Description	Stock No.
(-)	Abrasive trap	02011
(-)	Service kit, abrasive trap Includes items called out in Figure 60a	01925
1.	Cap	02014
2.	Body	02015
3.	Lock bar	02016
4.	Screw, 3/8-NC x 1" thumb	03289
5.	Shoulder screw, 3/8" x 3/8"	03291

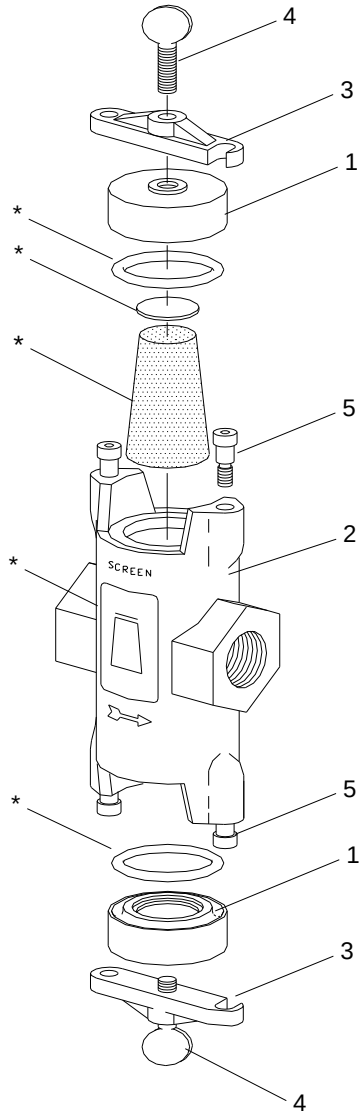


Figure 60

01925 SERVICE KIT
ABRASIVE TRAP

Item	Qty	Description
1.	3	Screen
2.	2	O-ring
3.	1	Gasket, screen, 1/8" thick
4.	1	Label, "Clean screen twice daily"

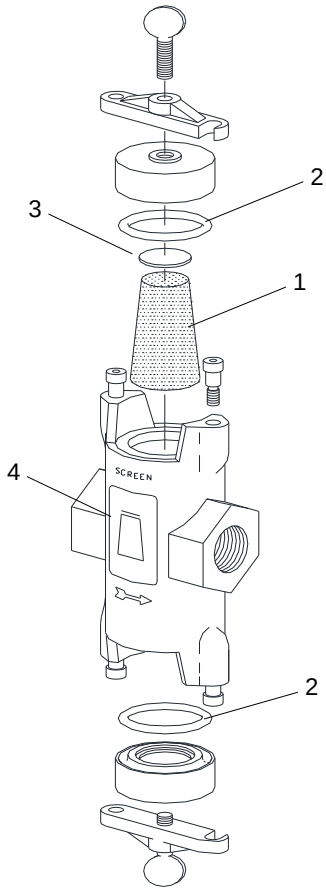
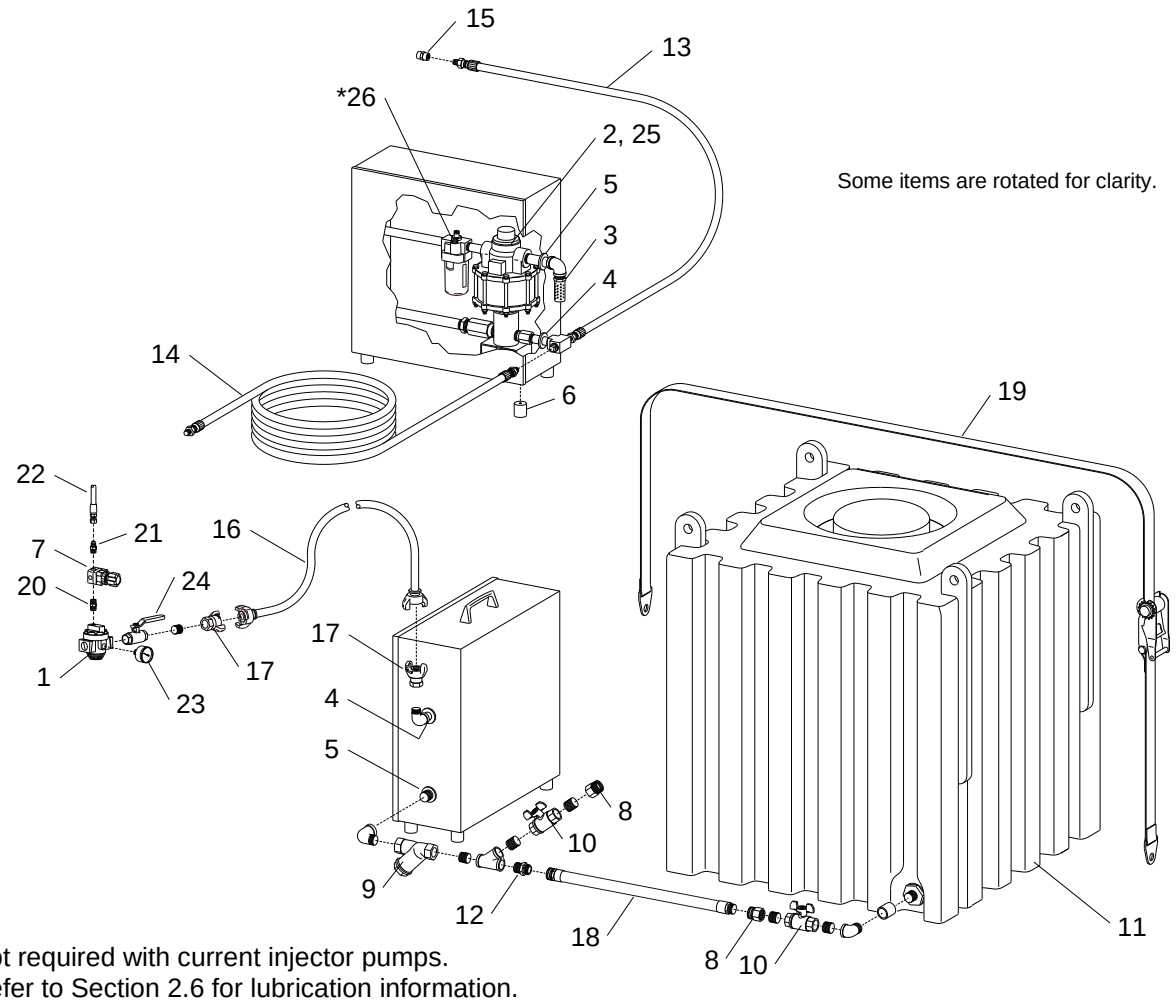


Figure 60a

9.11 Pump Module and Water Tank – Figure 61

Item	Description	Stock No.
1.	Pressure regulator, 1/2" pilot-operated	11345
2.	Pump, water injector	05532
3.	Muffler, 3/4-NPT air	05529
4.	Grommet, 7/8" ID rubber	00183
5.	Grommet, 1" ID rubber	00184
6.	Foot, cabinet enclosure, each	05525
7.	Regulator, 1/4" pilot w/gauge	12050
8.	Adaptor, 3/4-FPT x fem water swivel	05524
9.	Strainer, 3/4-NPT water, 100 mesh	15011
10.	Ball valve, 3/4-NPT with handle	28551
11.	Tank, 120-gallon water	28550
12.	Adaptor nipple, 3/4-NPT x 3/4" water	28554
13.	Hose, hydraulic starter, 5 ft coupled	28565
14.	Hose, hydraulic	
	52 ft long, 3/8" ID first hose	28559
	50 ft long, 3/8" ID extension hose	05527
15.	Connector, 1/4-FNP hydraulic hose	02162
16.	Air hose assembly, 1/2" x 82" coupled	28566
17.	Coupling, 1/2-FPT twist-on	00594
18.	Hose, 3/4" x 19" water	28553
19.	Strap, 2" x 10' tie-down, each	28552
20.	Nipple, 1/4-NPT hex	02808
21.	Adaptor, 1/4-NPT	02494
22.	Hose, 3/16" x 18"	02454
23.	Gauge, 1/4-NPT CBM	11830
24.	Valve, 1/2-NPT ball, with handle	01241
25.	Service kit, water pump, includes air motor kit and hydraulic kit	
	<>Confirm kit number<>	05484
26.*	Lubricator, 1/2-NPT	05531



* Not required with current injector pumps.
Refer to Section 2.6 for lubrication information.

Figure 61

9.12 Injector Assemblies – Figure 62

Item	Description	Stock No.
1.	Adaptor-injector assembly w/couplings for use at the blast machine	28580
2.	Nozzle adaptor-injector assembly 1-1/4" nozzle thread, 1" ID injector sleeve	05540
3.	Nozzle adaptor-injector assembly, option 50mm nozzle thread, 1" ID injector sleeve	05541
4.	Nozzle adaptor-injector assembly, option 50mm nozzle thread, 1-1/4" ID injector sleeve	05598
5.	Body, 1-1/2-NPSM entry injector	28573
6.	Body, 1-1/4" threaded injector adaptor	05506
7.	Body, 50mm threaded injector adaptor	05507
8.	Injector assembly, 1" ID for 5540 includes items 11, 15, & one from 16	05536
9.	Injector assembly, 1" ID for 5541 includes items 12, 14, & one from 17	05534
10.	Injector assembly, 1-1/4" ID for 5598 includes items 13, 14, & one from 18	05535
11.	Sleeve, 1" ID injector, for 1-1/4" body	05508
12.	Sleeve, 1" ID injector for 50mm body	05509
13.	Sleeve, 1-1/4" ID injector for 50mm body	05510
14.	O-ring, 1-3/8 ID	05516
15.	O-ring, 1-1/4" ID	05523
16.	Washer, NW-4 nozzle, pack of 10	00869
17.	Washer, NW-25 nozzle, pack of 10	91024
18	Washer, NW-32 nozzle, pack of 10	91026
19.	Elbow, 1/4-NPT 90° street	02027
20.	Nipple, 1/4-NPT hex	02808
21.	Valve, 1/4-NPT flow control	05528
22.	Coupling, CF-2, 1-1/2-NPT	00553
23.	Gasket, CQG, pack of 10	00850
24.	Coupling, CF, 1-1/4-NPT	00551
25.	Nipple, 1-1/4-NPT x 4" galv.	01924
26.	Elbow, 1/4-NPT x 90°	06373
27.	Valve, 1/4-NPT check	28557
28.	Lock pin, coupling (package of 25)	11203
29.	Hose, hydraulic starter, 5-ft coupled	28565
30.	Cradle, injector assembly storage	On request

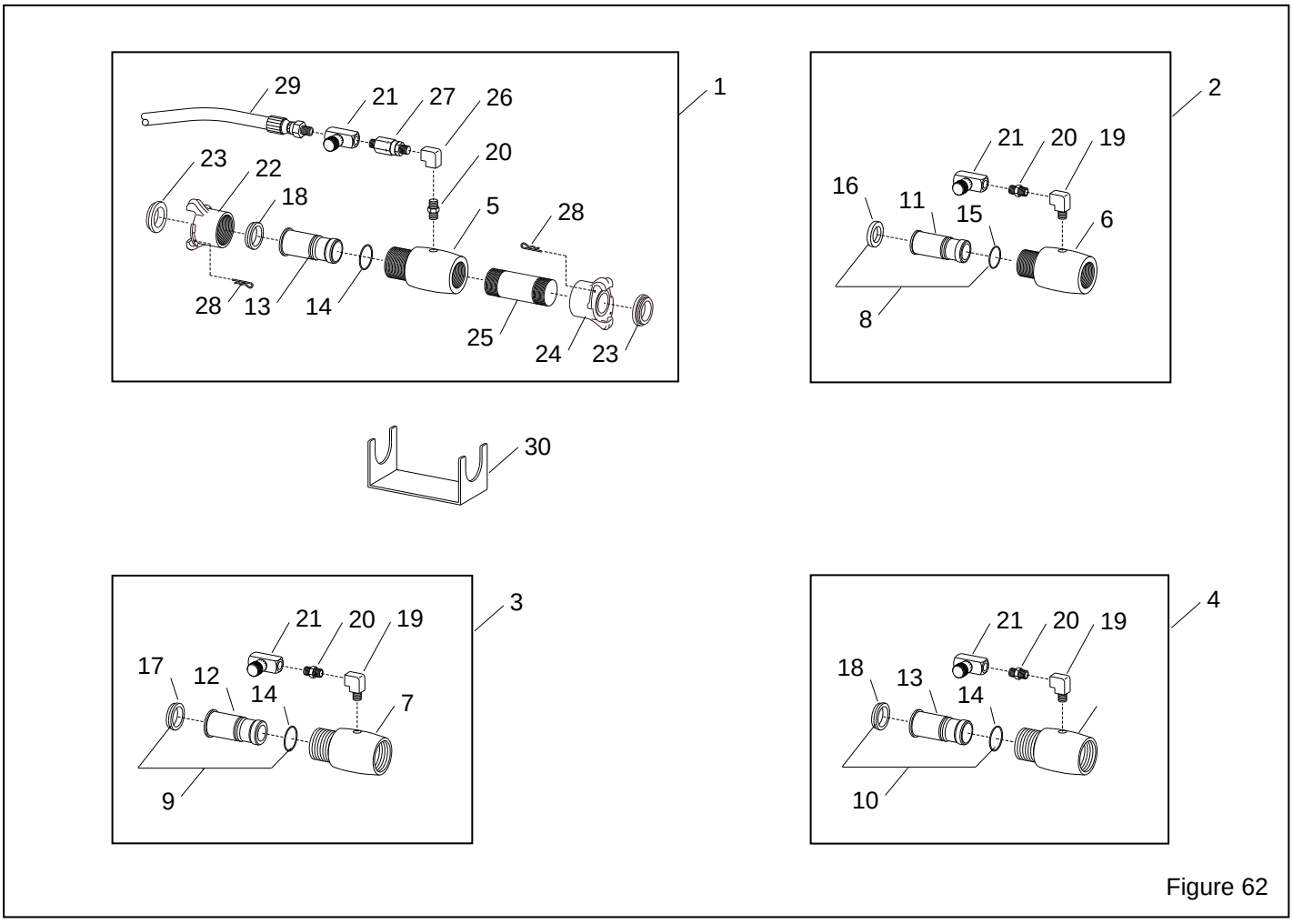


Figure 62