CONTRACTORS SERIES BLAST MACHINE
4 AND 6 CU. FT. WITH MILLENNIUM ACS
ELECTRIC REMOTE CONTROLS
0. M. 22560

DATE OF ISSUE: **03/00**
REVISION: **G, 10/16**

⚠WARNING

Do not use this equipment until you have READ this MANUAL and YOU UNDERSTAND its contents. *

These WARNINGS are included for the health and safety of the operator and those in the immediate vicinity.

***If you are using a Clemco Distributor Maintenance and Parts Guide, refer to the orange warnings insert preceding the Index before continuing with the enclosed instructions.**

Electronic files include a Preface containing important information.

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1.0 INTRODUCTION

1.1 Scope of manual

1.1.1 These instructions cover the set-up, operation, maintenance, troubleshooting, and replacement parts for the following Clemco Contractor Series Blast machines with electric Millennium Remote Controls with Abrasive cut-off (ACS).

20″ diameter, 4 cu. ft. capacity
24″ diameter, 6 cu. ft. capacity

1.1.2 These instructions contain 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 operator is trained and qualified to safely operate the blast machine and remote controls, and all other equipment used with the blast machine.

1.1.3 All personnel involved with the abrasive blasting 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 about abrasive blasting 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 Components and Operating Principles

1.3.1 Components

1.3.1.1 The primary components of the Contractor machines are shown in Figure 1. They include the blast machine with Millennium remote controls, electric control panel, with abrasive cut-off switch (ACS), Auto-Quantum abrasive metering valve, frame assembly, optional air filter, and optional air filters.

1.3.2 Instruction Maintenance Manuals

1.3.2.1 The front leg contains a storage area for owner's manuals. After reviewing all the manuals, and start-up and adjustments are completed, remove the urethane cover plate and store manuals in the compartment, for future reference.

1.3.2.2 Individual manuals are included with optional accessories. Manuals provided with systems include:

CPF Particulate Air Filter
Apollo Respirator
Clem-Cool Air Conditioner

1.3.3 Blast Machine

1.3.3.1 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 the requirements of 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 could weaken the vessel. Compressed air pressure could cause a weakened blast machine to rupture, resulting in death or serious injury. Welding, grinding, or drilling on the blast machine vessel, without a National Board ″R″ stamp voids the ASME and National Board certification.

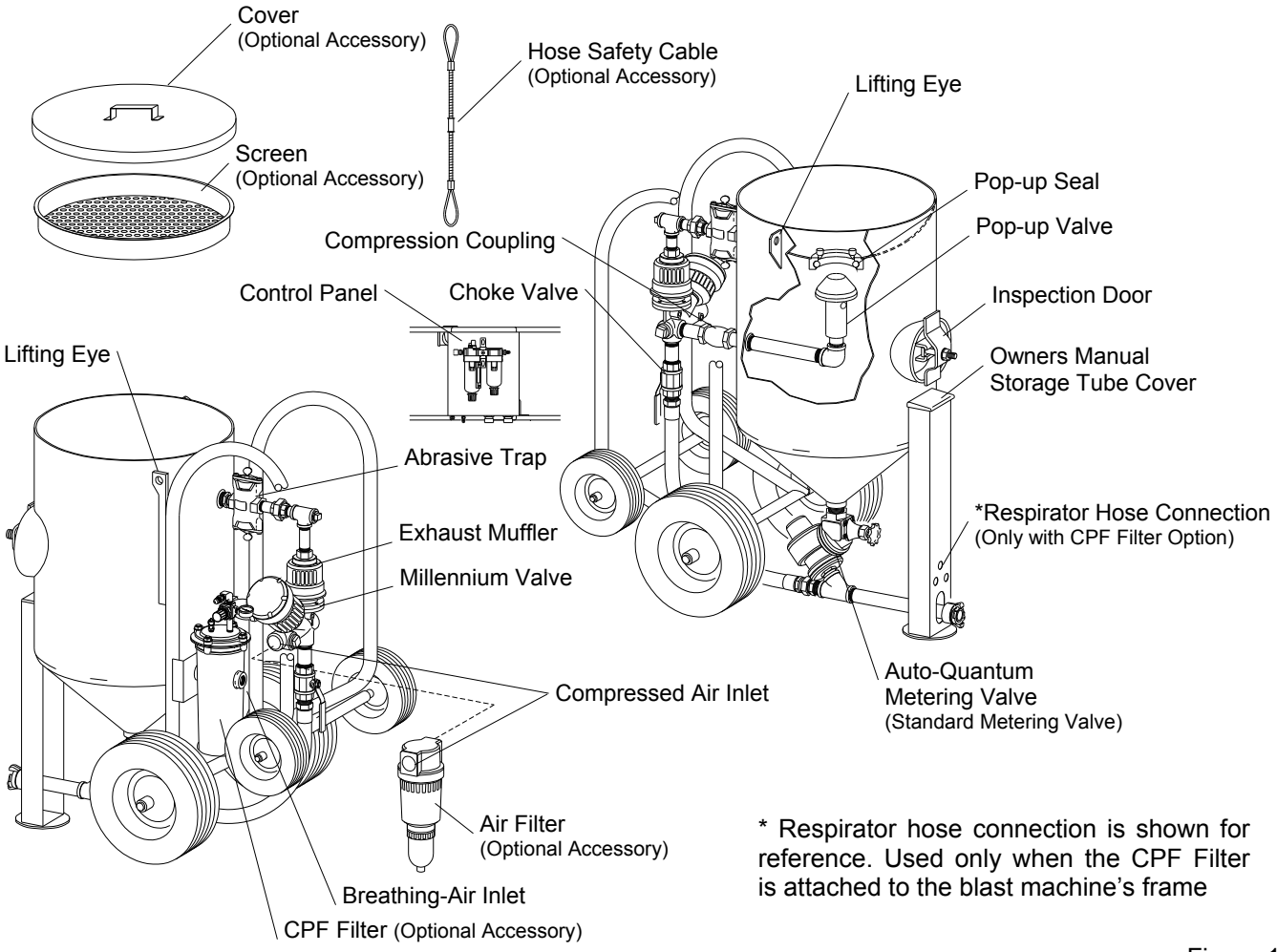
1.3.3.2 All welding repairs to the vessel must be performed by certified welders at shops holding a National Board R Stamp. Welding performed by any welder not properly qualified per the ASME code, voids the Clemco ASME certification.

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

⚠ WARNING

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

1.3.3.4 Use lifting eyes when raising, loading, and unloading the blast machine. Do not use a sling around the cart handles or piping.



* Respirator hose connection is shown for reference. Used only when the CPF Filter is attached to the blast machine's frame

Figure 1

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

1.3.3.6 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.

1.3.4 Remote Controls

1.3.4.1 The components of the Millennium electric remote control system with ACS are shown in Figure 2. They include the Millennium Valve, Auto-Quantum pneumatically-operated abrasive metering valve, RLX Control Handle, 50-ft. control cord, 4-ft. long twinline control hoses, and all necessary fittings

1.3.4.2 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 operator intentionally or unintentionally removes hand-held pressure from the remote 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 electro-pneumatic control circuit occurs, for any reasons such as a break in the cord or the operator drops the blast hose, the remote controls deactivate the blast machine.

⚠ WARNING

Never modify or substitute remote control parts. 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.

1.3.4.3 Millennium Remote Controls are pressure-release-style systems, which control the pressurization and depressurization of the blast machine. Pressurization, which starts blasting, occurs when the control handle is pressed. Depressurization, which stops blasting, occurs when the handle is released.

1.3.4.4 Millennium Electric Remote Controls operate electro-pneumatically on the "return air" principle. When the control handle lever is up, control air from the blast machine travels to the control box and stops.

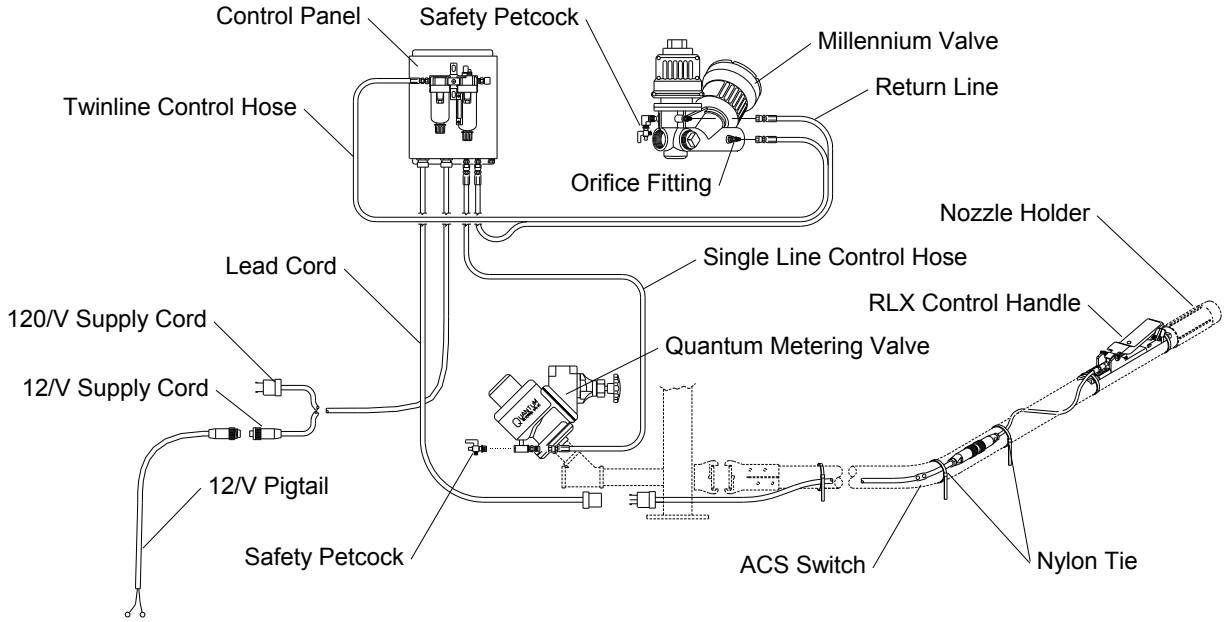


Figure 2

As long as air does not pass through the box, the remote control system remains inactive. From the box, a 12-volt electrical current is sent through the control cord to a switch mounted under the control handle lever. When the control handle lever is pressed, it makes contact with the switch, which engages solenoids in the control box to permit air to pass through the box to open the inlet segment and close the outlet segment of the Millennium valve. This action pressurizes the blast machine and begins the blasting. Releasing the handle exhausts control air at the panel, which closes the inlet segment, and opens the outlet segment to depressurize the machine and stop the blasting.

1.3.4.5 Electric remote controls are used when the nozzle is farther than 100 feet from the blast machine. At that distance pressure drop and actuation time of pneumatic systems may be too great to ensure fast, safe operation. Electric systems are also used in cold weather, when moisture in the air supply of pneumatic systems may freeze and cause the remote controls to fail. For that reason an antifreeze injector is installed on all electric remote control panels.

NOTE: The maximum recommended total length of control cord is 300 feet. Distances greater than 300 feet offer too much electrical resistance, and may cause the controls to malfunction. If an application requires greater distance, cord with larger diameter wire must be provided by the user.

1.3.5 Abrasive Cut-off Feature (ACS) Electric Remote Control Option

1.3.5.1 The abrasive cut-off switch is wired into the 50-ft. control cord behind the control handle connector. The operator uses the switch to close the abrasive valve independently of the air valve, so air without abrasive exits the nozzle for blow-down.

1.3.6 Air Filter, Option

1.3.6.1 The optional filter removes particles and condensed moisture from the compressed air before it enters the machine. Water is drained by use of a manual drain located at the bottom of the filter.

1.3.7 Frame and Cart

1.3.7.1 The frame assembly provides added protection for the piping, valves and accessories. This protection keeps the piping aligned and tight. The wheeled cart assists in the mobility of the machine over smooth flat surfaces. See transporting and moving in Section 3.1.

1.4 Abrasive

⚠ WARNING

Obtain a safety data sheet (SDS) for the blast abrasive. Abrasive blasting with sands containing crystalline (free) silica can lead to serious or fatal respiratory disease. As OSHA recommends, do not use abrasives containing more than trace amounts (more than one percent) free silica.

NOTE: Use only abrasives specifically manufactured for blast cleaning, that are compatible with the surface being blasted. Abrasive produced for other applications may be inconsistent in size and shape, and contain particles that could jam the abrasive metering valve, or cause irregular wear, and produce an unsatisfactory finish..

1.4.1 Selection of blasting abrasive can play a significant part in the health risk, 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.

1.4.2 Abrasive Size

1.4.2.1 The choice of abrasive size depends on the desired profile, cleaning rate, nozzle size and availability of clean dry air. Generally, larger and denser abrasive provide a deeper profile, while smaller abrasives clean faster. Most abrasive blasting is done with abrasive sizes between 16 and 80 mesh. Larger sizes may be used if the nozzle orifice is large enough to prevent particles to pass without jamming. Finer abrasive is especially sensitive to moisture and requires very dry air to prevent bridging in the metering valve.

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

1.4.4 Slags: Slag abrasives are compatible with the blast machine and accessories. Obtain a material safety data sheets (SDS).

1.4.5 Steel: Steel shot and steel grit may be used. Shot applications may require the use of a pneumatically-operated metering valve such as the Auto-Quantum, to prevent surging at startup.

1.4.6 Silicon Carbide, Aluminum Oxide, and Garnet: These are the most aggressive, high-volume abrasives in the blasting industry. Aggressive abrasives such as these may be used, but the service life of any equipment components which come in contact with the abrasive will be reduced. Use a nozzle lined with boron carbide with these abrasives.

1.4.7 Glass Bead: Most beads are treated to ensure free-flow operation even under moderately high-humidity. Glass beads subjected to excessive moisture may be reused after thorough drying and breaking up of any clumps. Clean dry air is a necessity. Glass bead applications may require the use of a pneumatically-operated metering valve, such as the Sentinel or Auto-Quantum, to prevent surging at startup.

1.4.8 Lightweight Abrasive: Plastic media and most agricultural media may be occasionally used in a standard blast machine. Exclusive use of plastic, and some lightweight media, requires a blast machine with a 60º conical bottom to ensure continuous media flow.

2.0 INITIAL SET-UP

2.1 Control Panel, Ref. Figure 2

⚠ WARNING

Do not use 120 volt AC systems for outdoor blasting, or in any application that exposes the control circuit, control panel or power cord to water. Use 12 volt DC controls for those applications. Ignoring this warning could cause electrical shock and possible death.

2.1.1 Attach the 4-ft. twinline hose to the two fittings on the Millennium valve. Either side of the hose can be attached to either fitting.

2.1.2 Attach the free end of the side of the twinline that connects to the orifice fitting, to the fitting on the air filter mounted on the control panel cover.

2.1.3 Attach the free end on the other side of the twinline hose (shown as "Return line" in Figure 2) to the fitting on the bottom of the control panel marked "Air Valve".

2.1.4 Attach one end of the 5-ft. single line hose to the fitting on the bottom of the control panel marked "Grit Valve". Attach the other end to the fitting on the Quantum metering valve.

2.2 Blast Hose and Control Cord Connections, See Figure 2.

⚠ WARNING

Where two or more blast machines are used, care must be taken when tracing and connecting control lines, control cord, and blast hose. Cross connecting control lines or blast hose could lead to serious injury, death, or property damage from unintentional actuation of a blast machine. To prevent cross connecting blast hose and control cords, the cord and hose should be of equal lengths, and the hose, cord, and blast machine couplings clearly marked. Use the optional hose identification kits, part no. 15890 for use with two blast machines, or part no. 15891 for up to four machines, to mark each hose, cord, and corresponding connection per the instructions supplied with the kit. Carefully trace and verify each connection before operating.

2.2.1 Uncoil the blast hose, and lay the 50-ft. control cord alongside it. When additional hoses are connected, the hose and cord should be of equal lengths.
Note: The control cord has the ACS switch wired into it. Place the switch end of the cord at the nozzle end of the blast hose.

2.2.2 Band the control handle to the blast hose close to the nozzle holder, using the two nylon ties provided. Once the control is firmly attached, clip the tie ends so they will not snag the operator's clothing or interfere with the operation of the control handle.

2.2.3 Loosely wrap the whip cord from the electric control handle once around the blast hose, as shown in Figure 3, and then attach it to the control cord. If the cord is not wrapped as described, when the hose bends excessive strain will cause the wires to pull out of the connectors or electric switch.

2.2.4 Band the cord to the hose on both sides of the cord connections, as shown in Figure 3.

NOTICE

Provide enough slack at all cord connections to prevent the cord from pulling out of the connectors when the blast hose is pulled or dragged. Band the cord to the blast hose on both sides of all connections.

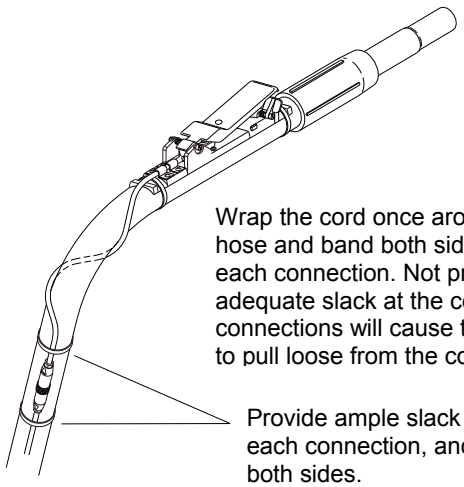


Figure 3

2.2.5 Band the cord to the blast hose every 4 to 6 feet. Also, band the cord on both sides of electrical connection.

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

2.3 Set up for multiple blast machines operating from a common compressed air supply, Figure 4

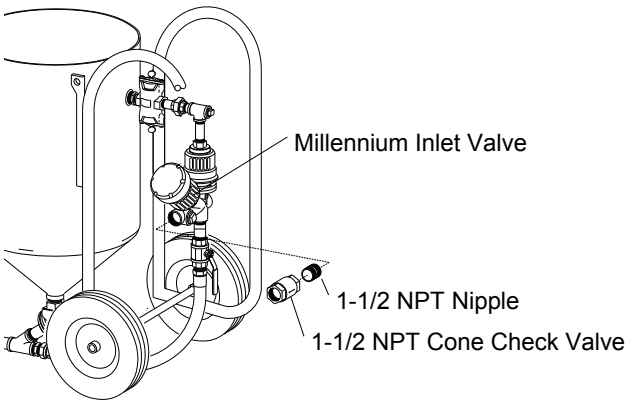


Figure 4

2.3.1 Where multiple blast machines are operating from a single air source, install a check valve at the air supply on each machine. The illustration in Figure 4 shows where to install a cone check valve on the blast machine.

2.3.2 If the machines are close together, use a receiver tank or manifold and run separate air lines to each machine. The check valves may be located on the receiver tank outlets If the airline go directly to the blast machine and no place else.

⚠ CAUTION

If multiple machines are operating from a common compressed air supply and a machine is under pressure, when another machine is pressurized, the sudden, increased demand for air could reverse air from the machine that is under pressure, and could contaminate the compressed air supply with abrasive laden air. Install check valves at the piping inlet to prevent the reversal of air.

2.3.3 Use a Clemco 1-1/2-NPT cone check valve, stock no. 02296. A smaller size valve could restrict air movement and reduce nozzle pressure. Do not use a swing check valve, which may break in blast machine applications. When installing the valve, make sure the directional arrow is pointing in the direction of the air flow, toward the machine.

2.4 Compressed-Air Supply Hose Connection

2.4.1 Apply thread sealant to the male pipe threads of an air fitting that is compatible with the air supply hose fitting, as noted in Section 2.4.2, and install it onto the 1-1/2 NPT air filter located at the blast machine inlet, or the Millennium inlet valve, as shown in Figure 5. **Note that the style of connection shown in Figure 5 is for reference only.**

⚠ WARNING

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

2.4.2 Attach an air line from the compressor to the hose fitting installed on the blast machine inlet. For best blasting performance, use the following guidelines:

Nozzle Orifice Size	Recommended Air Supply Line
No. 3, 3/16"	3/4" ID or larger
No. 4, 1/4"	1" ID or larger
No. 5, 5/16"	1-1/4" ID or larger
No. 6, 3/8"	1-1/2" ID or larger
No. 7, 7/16"	2" ID or larger
No. 8, 1/4"	2" ID or larger

Refer to the compressed air and abrasive consumption table in Figure 7 for approximate air consumption.

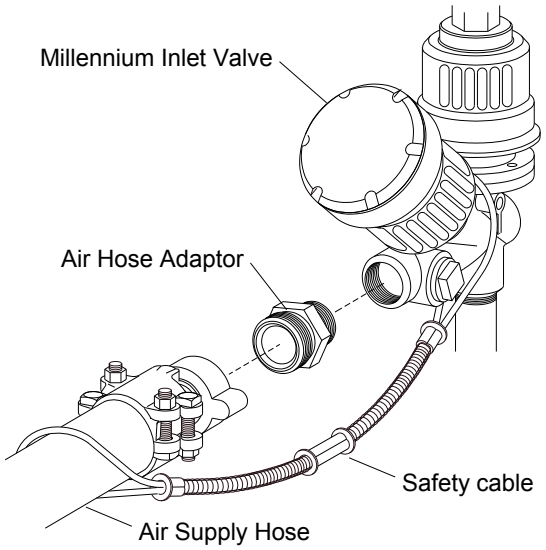


Figure 5.

2.5 Breathing Air Connections, Optional CPF Filter, Refer to CPF Owner's Manual 04143

DANGER

Do not connect the CPF Filter to bottled air or any other air source that does not have a pressure-reducing valve that reduces pressure to maximum of 150 psi. Failure to comply with this warning will cause CPF Filter to explode under the high pressure of bottled air. A rupture of this nature could cause severe injury or death.

2.5.1 The employer is responsible for ensuring that breathing air shall meet the requirements for Grade D or higher quality, as described in Compressed Gas Association Commodity Specification pamphlet G-7.1., titled Commodity Specification For Air, published by Compressed Gas Association Inc., Chantilly, VA. Website: www.cganet.com (29 CFR 1910.134 (i)).

WARNING

Air supply to the respirator system is critical to the safety of the user. Read the CPF Filter and Apollo Respirator manuals carefully. Poor quality air will cause serious respiratory injury or death to the user.

2.5.2 Apply thread sealant to the male threads of an air fitting that is compatible with the air supply hose fitting, as noted in Section 2.5.3, and install it onto the 1-NPT port located at the side of the filter, as shown in Figure 6. Note that the style of connection shown in Figure 6 is for reference only.

2.5.3 Refer to the CPF air filter owner's manual and connect an air supply hose from an air source that meets OSHA requirements for respirable air, to the fitting installed on the CPF Filter inlet, as shown in Figure 6.

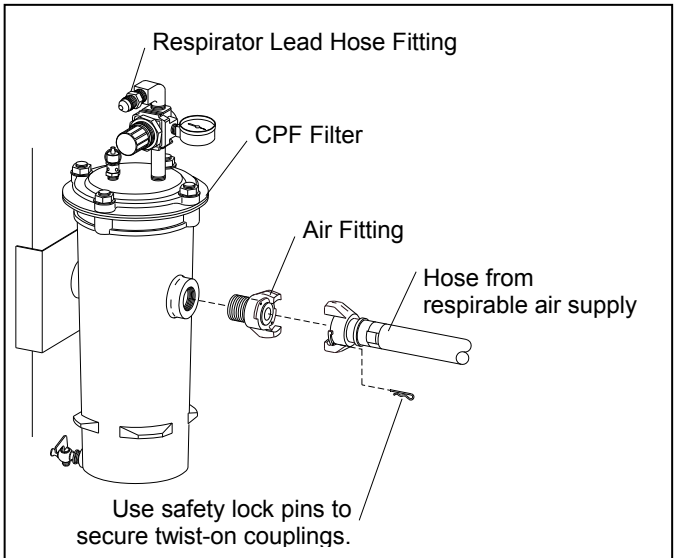


Figure 6

2.5.4 For models with CPF filter attached, connect the 5-ft. respirator lead hose to the fitting at the top of the CPF filter and compatible respirator fitting on the front leg of the blast machine. Refer to Figure 1 for the location of the respirator hose fitting on the leg.

2.5.5 Refer to the Apollo Respirator and CPF Filter manuals for instructions concerning their operation.

3.0 OPERATION

3.1 Transporting and Moving

3.1.1 Transporting a blast machine

⚠ WARNING

- **Always empty the blast machine before lifting or hoisting.**
- **Use the lifting eyes when lifting the machine. Never hoist the machine by the handle or piping, or with a sling through the handle or piping.**
- **Always use lift equipment that is rated higher than the weight of the machine and accessories.**
- **When transporting a machine on a pallet, always secure the machine to a sturdy pallet.**
- **Always securely anchor the machine 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 could result in serious injury or death.**

3.1.1.1 Always empty the machine before transporting. Transporting the machine containing abrasive could increase the weight to an unsafe handling limit, and could cause abrasive to settle in piping.

3.1.2 Moving a blast machine

⚠ WARNING

Do not manually move the machine on an incline, or on a slippery or irregular surface that could cause the operator to slip or lose balance. Sudden weight shifts when the machine is tilted on an incline, and slipping or tripping while moving the machine will cause the operator to lose control of the machine, causing severe injury and property damage.

⚠ WARNING

Never attempt to manually move a blast machine when it contains abrasive. An empty machine may be moved when the following criteria are met:

3.1.2.1 An empty machine may be moved manually, on level flat surfaces.

3.1.2.2 To move the machine, push it in a forward direction. Do not back-up while moving the machine, to avoid tripping hazards that may be out of view.

3.1.2.3 Use the lifting eyes when lifting the machine. Do not use a sling around the cart handles or piping.

3.1.2.4 If the machine contains any abrasive, keep the machine upright. Laying down a machine containing abrasive could cause abrasive to lodge in the piping, cause the machine to malfunction, or damage valves.

3.2 Start-Up

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

3.2.2 Attach an air line from the compressor to the air supply hose connector installed on the blast machine inlet.

3.2.3 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. When connecting the hose with Nylon couplings, make sure the coupling spring lock pins are at 180 degrees (Pins should enter the open hole of the adjoining coupling). The spring lock pins prevent accidental separation of hose couplings during blasting.

3.2.4 Make sure all compressed-air hose connections are secured with safety lock-pins or safety wire to lock the couplings together and prevent accidental separation while under pressure, and safety cables to prevent hose from whipping should separation occur. Lock pins and safety cables are listed in Section 8.2 of this manual.

⚠ WARNING

Hose disconnection while under pressure could cause serious injury or death. . Use safety lock-pins or safety wire to lock the couplings together and prevent accidental separation while under pressure, and safety cables to prevent hose from whipping should separation occur.

3.2.5 Connect an air line between a source of respirable breathing air meeting the requirements for Grade D or higher quality, and the CPF filter inlet. See Section 2.5. The maximum inlet pressure for the CPF Filter must not exceed 150 psi.

⚠ DANGER

Do not connect the CPF Filter, or any other regulator or filter, to bottled air or any other air source that does not have a pressure-reducing valve that reduces pressure to a maximum of 150 psi. Failure to comply with this warning will cause low pressure devices to burst from the excessive pressure of bottled air. A rupture of this nature could cause severe injury or death.

Compressed Air and Abrasive Consumption
Consumption rates are based on abrasives that weigh 100 pounds per cubic foot

Orifice Size (in.)	Pressure at the Nozzle (psi) 50	60	70	80	90	100	125	140	Air, Power and Abrasive Requirements
	11	13	15	17	19	20	25	28	Air (cfm)
No. 2	67	77	88	101	112	123	152	169	Abrasive (lbs/hr)
1/8″	2.5	3	3.5	4	4.5	5	5.5	6.5	Compressor (hp)
	26	30	33	38	41	45	55	61	Air (cfm)
No. 3	150	171	196	216	238	264	319	353	Abrasive (lbs/hr)
3/16″	6	7	8	9	10	10	12	14	Compressor (hp)
	47	54	61	68	74	81	98	108	Air (cfm)
No. 4	268	312	354	408	448	494	608	676	Abrasive (lbs/hr)
1/4″	11	12	14	16	17	18	22	24	Compressor (hp)
	77	89	101	113	126	137	168	186	Air (cfm)
No. 5	468	534	604	672	740	812	982	1085	Abrasive (lbs/hr)
5/16″	18	20	23	26	28	31	37	42	Compressor (hp)
	108	126	143	161	173	196	237	263	Air (cfm)
No. 6	668	764	864	960	1052	1152	1393	1538	Abrasive (lbs/hr)
3/8″	24	28	32	36	39	44	52	59	Compressor (hp)
	147	170	194	217	240	254	314	347	Air (cfm)
No. 7	896	1032	1176	1312	1448	1584	1931	2138	Abrasive (lbs/hr)
7/16″	33	38	44	49	54	57	69	77	Compressor (hp)
	195	224	252	280	309	338	409	452	Air (cfm)
No. 8	1160	1336	1512	1680	1856	2024	2459	2718	Abrasive (lbs/hr)
1/2″	44	50	56	63	69	75	90	101	Compressor (hp)

- For nozzle sizes 3/8″ to 1/2″, 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 are for reference only, and may vary for different working conditions. Several variables, including metering valve adjustments, can affect abrasive flow.
- Figures show approximate compressed air and abrasive consumption when nozzles are new. Consumption will increase as the nozzle wears.

Figure 7

⚠ 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 could cause serious injury or death.

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

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

3.2.8 Close the Quantum abrasive metering valve. Closed position is when the knob has been turned fully clockwise. See Section 4.1.

3.2.9 Open the safety petcock on the inlet section of the Millennium valve and on the Quantum metering valve actuator. The petcock is open when the lever is in-line with the petcock, as shown in Figure 8.

⚠ 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.

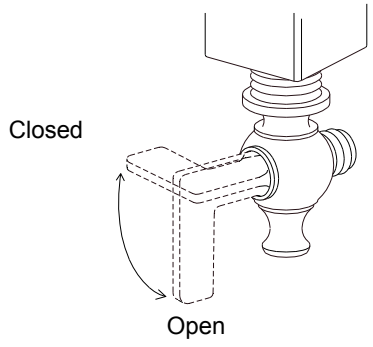
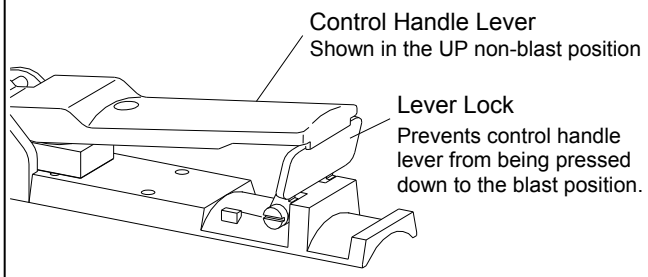


Figure 8

3.2.10 Make sure the control handle lever is in the up (no blast) position as shown in Figure 9, and the handle lever and safety lock move freely.



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

Figure 9

3.2.11 Make sure the handle lever does not engage the switch unless the safety lever lock is intentionally pulled down.

⚠ WARNING

Malfunctioning control handles could 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.

3.2.12 Plug the power cord into an appropriate power source (120-volt AC or 12-volt DC). Do not use 120 volt AC models in any application where water exposure is possible, unless the power source is protected by a ground-fault circuit interrupt. 12-volt units are furnished with a pigtail with ring terminals to attach to a battery.

⚠ WARNING

Do not use electrical adaptors that eliminate the ground prong on 120 volt plugs. Doing so can cause electric shock, and damage equipment.

3.2.13 Make sure all hoses and electrical connections are secure.

3.2.14 Close the air valve on the compressor. Start the compressor, and bring it to operating temperature and pressure. The pressure must be more than 30 psi, but not exceed 150 psi.

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

3.2.16 Pressurize the breathing air supply line, and adjust pressure on the CPF Filter outlet to the pressure stated in the respirator manual.

3.2.17 Load abrasive into the machine according to the instructions in Section 3.8.

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

⚠ 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 could cause abrasive to vent under pressure, causing dust and toxins to become airborne. Noise is produced by the sudden release of compressed air when the machine is pressurized or depressurized. These conditions could cause injury. Both the operator and machine tender must wear suitable personal protective equipment including an approved respirator, plus approved eye, face, and hearing protection.

3.2.19 When the blast operator is ready to blast, the operator or the machine tender, must stand back and face away from the concave filling head of the blast machine and the exhaust muffler, and 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 orifice under the control handle lever but nowhere else. The air escaping at the control handle is an audible signal that air is supplied to the blast machine, which will activate when the control handle is pressed.

3.3 Blasting Attire

3.3.1 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

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. Abrasive blasting produces harmful dust. Failure to wear approved respirators could 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 could cause hearing damage. Everyone in the blasting area must wear approved hearing protection.

3.4 Blasting

3.4.1 Don all protective, blasting attire per Section 3.3.

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

3.4.3 Fold down the safety lever lock and press the remote control handle as shown in Figure 10. Within a few seconds, the pop-up valve will automatically close, and the blast machine will pressurize to start blasting.

⚠ CAUTION

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

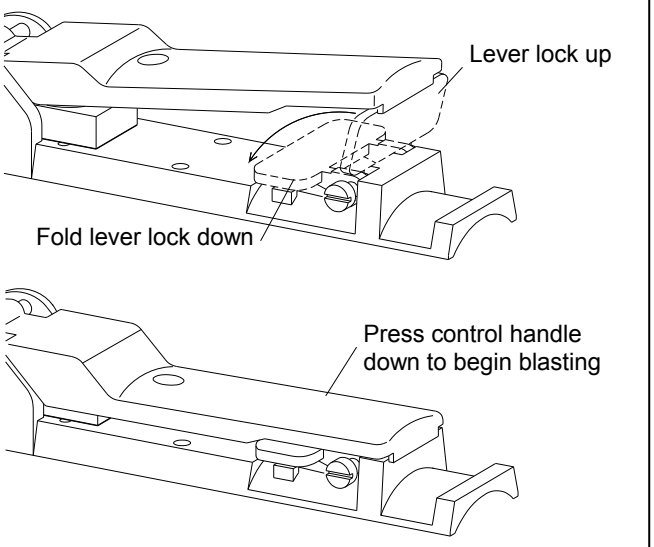


Figure 10

⚠ 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 could result from uncontrolled blasting. Ref. 29 CFR 1910.244 (b).

3.4.4 Press the back button (farthest from the nozzle) on the ACS switch to open the Quantum metering valve. Abrasive flow is "on" when the back push button is pressed. Refer to Section 3.5 for operation of the ACS.

3.4.5 Adjust abrasive flow per Section 4.1.

3.5 Operation of Abrasive Cut-Off Switch (ACS) Figure 11

⚠ WARNING

OSHA sets exposure limits for people and the environment. Airborne dust could 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 as a general area clean-up tool.

3.5.1 The ACS serves two purposes:

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

3.5.2 The ACS switch is wired into the control cord approximately 8″ to 10″ from the connector for the control handle. It is not easily notices as it is under shrink tubing. The switch may be pressed "ON" or "OFF" at any, but will not operate the metering valve unless the control handle is pressed.

3.5.2.1 Blast Mode: Abrasive flow is “ON” when the rear pushbutton is pressed. This action sends control-air to the abrasive metering valve, opens the valve and the blast machine operates normally, with air and abrasive coming out the nozzle.

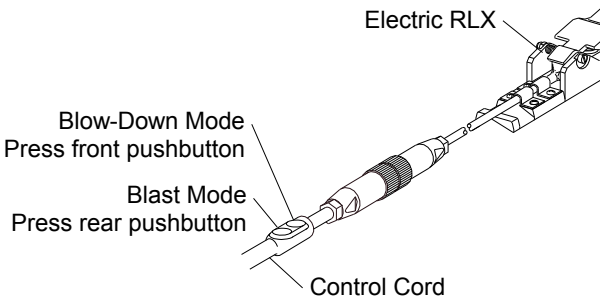


Figure 11

3.5.2.2 Blow-Down Mode: The ACS switch is "OFF" (no abrasive) when the front pushbutton (closest to the nozzle) is pressed, cutting off the air supply to the abrasive metering valve, closing the valve, and stopping the abrasive flow. This action allows air alone to exit the nozzle, which is useful for clearing the blast hose before shutting down, and blowing abrasive off the blasted surface.

3.6 Operation and Function of the Choke Valve Refer to Figure 12

3.6.1 Always fully open the choke valve while blasting; open is when the handle is vertical and aligned with the piping as shown in Figure 12.

3.6.2 Closing the choke valve while blasting, lowers pressure in the pusher line from the pressure in the vessel. Closing the choke valve clears the valve of minor blockage such as damp abrasive, or is used to rapidly empty the machine at the end of the day.

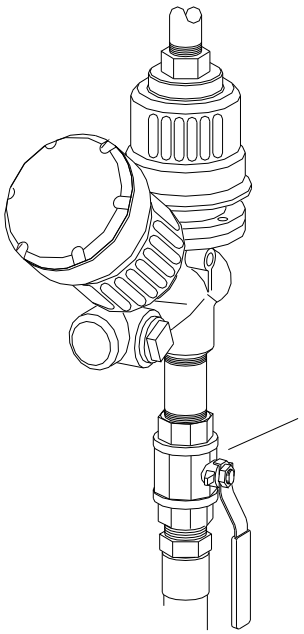


Figure 12

NOTICE

Do not blast with choke valve closed or partially closed. Prolonged blasting with the choke valve partially closed will accelerate wear on the metering valve.

3.7 Stop Blasting

3.7.1 Before releasing the control handle, the operator may use the ACS to shut the abrasive flow to clear the blast hose or to blow-down the work piece. Refer to Section 3.5 for operation of the ACS.

3.7.2 To stop blasting, release the control handle lever. Blasting stops when the control handle is released, regardless of the position of the ACS. The pop-up valve automatically drops when air is expelled from the machine and pressure equalizes.

3.7.3 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.

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

3.7.5 When finished blasting, shutdown per Section 3.10.

3.8 Loading Abrasive into the Blast Machine

⚠ WARNING

When approaching an idle blast machine, and before loading the blast machine with abrasive, always check to 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 could pressurize the machine before the machine tender has moved away from the machine. During pressurization, abrasive could be forced out of the top of the machine, and cause injury.

3.8.1 Load abrasive by pouring it into the concave head. Use a screen (screen comes with blast machine packages) 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.

3.8.2 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.

3.8.3 Begin blasting or resume blasting per Section 3.4.

3.9 Emptying the Machine of Abrasive

3.9.1 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 all 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.

3.9.2 With the blast machine off, turn the blast pressure down to approximately 40-50 psi, close the choke valve and set the abrasive metering valve at full open.

3.9.3 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 will erode the threads on the nozzle holder, which could 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 could 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 could erode nozzle threads.

3.9.4 Point the nozzle (or hose end) into a drum or suitable container, or in the direction of the abrasive disposal site.

3.9.5 Hold the hose securely (do not leave the hose unattended), and pressurize the machine by activating the control handle. Be prepared for severe surging or recoil of the hose.

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

3.9.7 If the nozzle was removed, thoroughly inspect the nozzle holder threads for wear before installing the nozzle washer and attaching the nozzle.

3.10 Shutdown

3.10.1 Empty the blast machine per Section 3.9.

3.10.2 When finished blasting, and after cleanup is completed, remove the respirator outside the respirator-use area where the air is safe to breathe.

3.10.3 Turn off electrical power to the control panel.

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

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

3.10.6 Shutdown the compressor.

3.10.7 Cover the blast machine when not in use. Refer to Section 8.1 for optional covers.

4.0 ADJUSTMENTS

4.1 Abrasive Metering, Figure 13.

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

4.1.2 The hole in the knob enables the operator to monitor its rotation and count turns as the knob is turned. This helps to return the setting to its original position, if temporary adjustments are required.

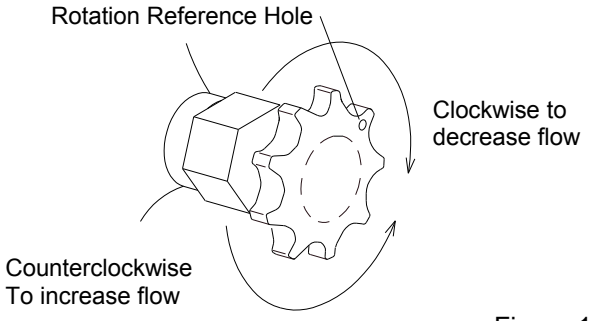


Figure 13

4.1.3 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.

4.1.4 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.

5.0 PREVENTIVE MAINTENANCE

5.1 Daily Inspection

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

- 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. See Section 6.9.
- 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 could 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 could erode nozzle threads.

- Inspect the RLX Control Handle; look for the following:
  - The lever must not engage the switch 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 could 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.

5.1.2 Do the following during blasting:

- 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, or pipe fittings at the bottom of the cone, stop blasting immediately and repair or replace worn parts.

NOTICE

If leaks are allowed to continue, abrasive erosion could 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 could disconnect while under pressure. Impact from nozzles, couplings, hoses, or abrasive, from parts disconnected by pressure during operation could cause severe injury.

5.2 Weekly Inspection

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

- Inspect the blast hose for wear; look for soft spots. Soft spots mean the hose is worn. Replace the blast hose before the tube wears as far as the fabric plies.

⚠ WARNING

Worn blast hose could 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, could 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.
- When an optional air filter is used, inspect the filter element, and clean the bowl.

5.2.2 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 per Section 6.5.

5.3 Monthly Inspection

5.3.1 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. See Section 6.10.
- Inspect the rubber pop-up seal, and replace at the first sign of wear, drying, or cracking. See Section 6.11.

5.4 Periodic Inspection

5.4.1 Millennium Control Valves: For safety and to avoid 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. See Service Maintenance in Sections 6.3, 6.4, 6.5, and 6.9.

5.4.2 Auto Quantum metering: For safety and to avoid 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. See Service Maintenance in Sections 6.6 and 6.7.

5.4.3 RLX Electric 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. See Section 6.8.

6.0 SERVICE MAINTENANCE

⚠ WARNING

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

- **Depressurize the blast machine.**
- **Lock-out (Be certain the air supply is off and that it cannot be started while work is in process) and tag-out (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.**
- **Shorting electrical components could result in serious electrical shocks, or damage equipment. All electrical service must be performed by a qualified electrician.**

6.1 Removing Damp Abrasive From the Blast Machine.

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

6.1.2 For more difficult blockages, proceed as follows: See Section 6.2 to check for obstructions in the metering valve.

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

6.1.2.2 Place the machine so that the outlet 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 could cause severe injury.

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

6.1.2.4 When the obstruction has been removed, depressurize the machine. Remove the nozzle and nozzle washer, and reconnect the hose. Open the choke valve and close the abrasive metering valve. Pressurize the machine to clear the hose. When the hose is cleared, depressurize the machine and attach 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 could 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 could erode nozzle threads.

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

6.2 Clearing Obstructions in the Abrasive Metering Valve and Blast Machine.

6.2.1 If the nature of the obstruction permits emptying the machine of abrasive, do so by following the instructions per Section 3.9.

6.2.2 Turn off the compressed air supply. Lock-out and tag-out the air supply, and bleed the air supply line to the blast machine.

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

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

6.2.5 If the metering valve is clear, remove the blast machine inspection door, and check inside for foreign objects.

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

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

6.2.8 Check to make sure all inspection doors are secure before starting the air supply.

6.3 Millennium Valve Inlet Segment, Figure 14.

NOTE: Two service kits are available for the Millennium valve inlet segment. To avoid unscheduled down time, both kits should be kept on-hand. Replace all the seals provided in the seal service kit whenever the valve is opened. Use the plunger tip kit when replacing the plunger tip.

6.3.1 Unscrew the six socket head screws to remove the cylinder cap, cylinder cap gasket, and spring.

6.3.2 Remove the cylinder sleeve by screwing two 1/4-NC screws into the holes in the end of the sleeve and by pulling the screws to remove the sleeve from the body. If the sleeve is too tight to remove by hand, use a puller. Remove the screws after the sleeve is removed.

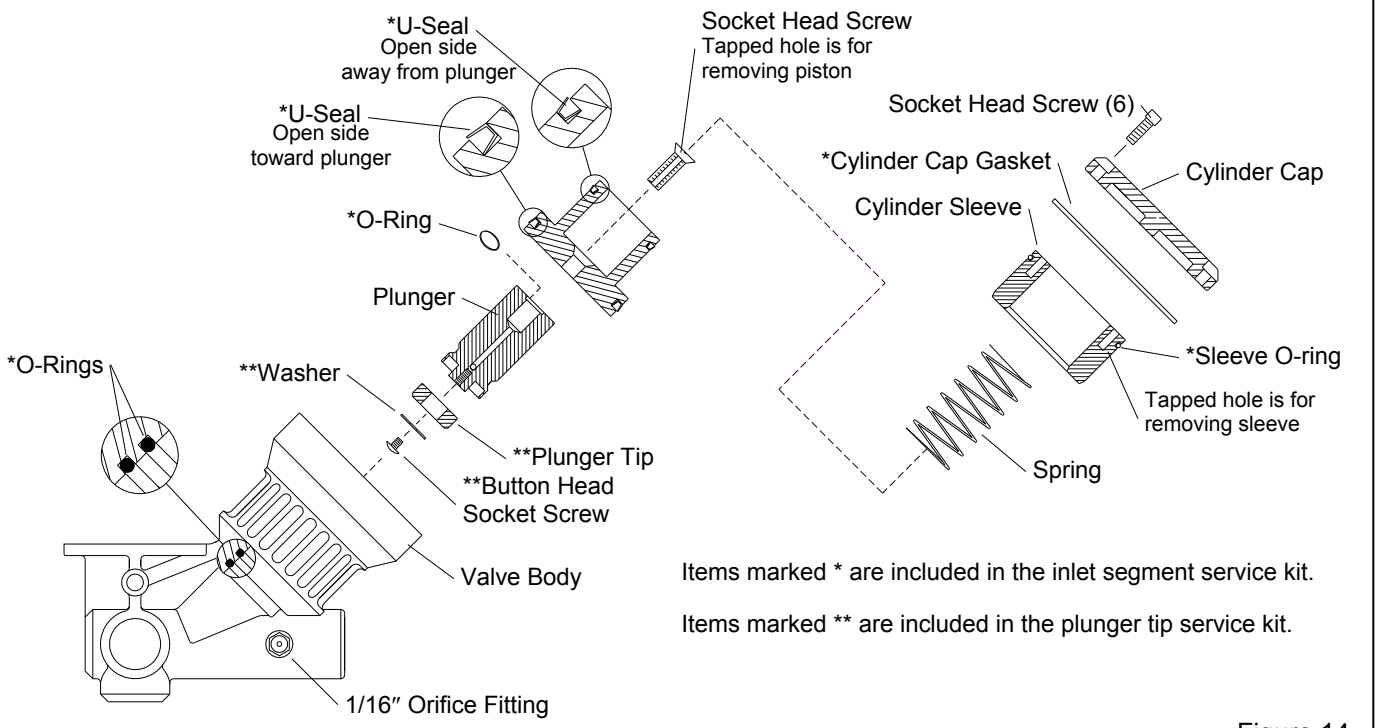
6.3.3 To remove the piston, screw a 1/4-NC screw into the center of the socket head screw, grip the screw, and pull out. If the piston is too tight to remove by hand, use a puller. Remove the screw after the piston is removed.

6.3.4 It is not necessary to separate the plunger from the piston unless the metal of either part is scored. 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 socket screw from inside the piston.

6.3.5 If the plunger tip is worn, use a 3/16″ hex key to remove the button screw, washer and tip.

6.3.6 Clean all items and inspect for wear. Replace all seals and o-rings (they are included in the service kit) and replace all worn or damaged parts.

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



Items marked * are included in the inlet segment service kit.

Items marked ** are included in the plunger tip service kit.

Figure 14

6.3.7 If the plunger and piston were separated as noted in paragraph 6.3.4, apply removable thread sealant to the socket head screw, and reassemble the parts using a new o-ring supplied with the service kit.

6.3.8 Lubricate o-rings and all u-seals with a silicone-based lubricant.

6.3.9 Replace both o-rings in the valve body.

6.3.10 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 14.

6.3.11 Install the plunger and piston assembly into the body. Make sure the open side of the seal does not fold back during assembly. Tucking the lip of the seal in, while applying pressure to the piston eases assembly.

6.3.12 Place the o-ring on the cylinder sleeve, and insert the sleeve (o-ring end faces up) into the body.

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

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

6.3.15 If fittings on the body were removed, make sure the 1/16" orifice fitting is threaded into the port, as shown in Figure 14.

6.4 Millennium Valve Outlet Segment, Ref. Figure 15

NOTE: Two service kits are available for the Millennium valve outlet segment. To avoid unscheduled down time, both kits should be kept on-hand. Replace all the seals provided in the service kit whenever the valve is opened, or when replacing the diaphragm. Use the muffler service kit when replacing the muffler.

6.4.1 Loosen the exhaust piping union nut.

6.4.2 Unscrew the four hex head cap screws securing the outlet body to the inlet, and remove the exhaust assembly.

6.4.3 Screw a 1/4-NC screw into the threaded hole in the bottom of the piston. Grip the screw, and pull out to remove the piston. Remove the screw after the piston is extracted.

6.4.4 Screw 1/4-NC screws into the threaded holes in the bottom of the inner sleeve. Grip the screws, and pull out to remove the sleeve. Remove the screws after the sleeve is extracted.

6.4.5 Remove the diaphragm from the bottom of the exhaust valve body.

6.4.6 Clean all items and inspect for wear. Replace the diaphragm, seals and o-rings (they are included in the service kit) and replace all worn or damaged parts.

- Place the piston into the inner sleeve and check movement. If the parts drag, or if abraded or worn they must be replaced.
- Inspect the machined seat in the exhaust body for wear. The body must be replaced if the seat is worn.

6.4.7 Inspect the exhaust muffler per Section 6.5.

6.4.8 Lubricate the u-seal with a silicone-based lubricant, and place the u-seal into the groove in the piston. The open side of the seal must face the bottom of the piston, as shown in Figure 15.

6.4.9 Verify that the inner sleeve o-ring is in the lower groove, not in the upper groove which has the vent hole.

Items marked * are included in the outlet segment service kit.
Items marked ** are included in the outlet muffler service kit.

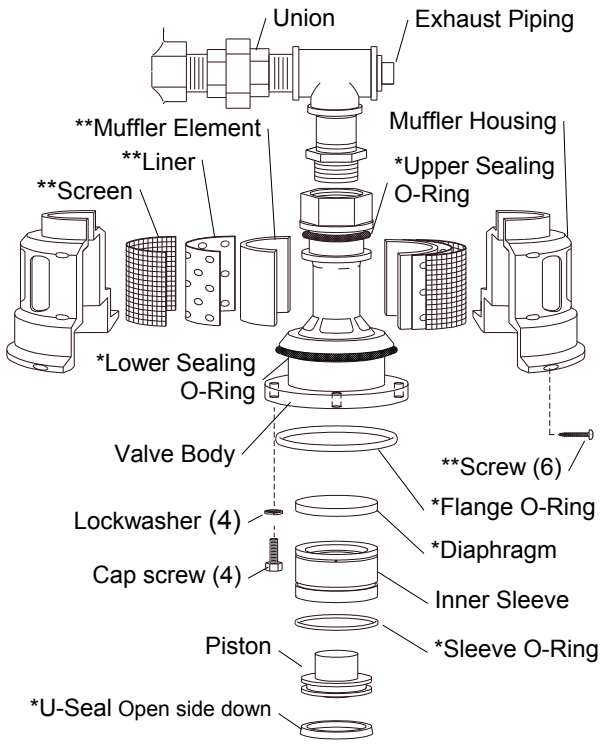


Figure 15

6.4.10 Insert the piston into the sleeve.

6.4.11 Place the diaphragm in the valve body.

6.4.12 Slide the piston and sleeve assembly into the valve body, the piston faces away from the bottom of the body, as shown in Figure 15.

6.4.13 Place the flange o-ring into the flange groove, and position the outlet assembly onto the inlet section. Align the exhaust piping by hand tightening the four cap screws with lock washers, and union nut.

6.4.14 Tighten the four hex head cap screws. After the screws are secure, tighten the exhaust piping union.

6.5 Exhaust Muffler, Figure 15

6.5.1 Separate the two halves of the muffler housing by removing the six screws, and pry the halves apart. Note that the screw holes in the housing are not the same size. The side of the housing with the hex recess has a smaller diameter than the other. The screw is inserted into the larger diameter hole, and grips the smaller diameter hole.

6.5.2 Remove the muffler element, rubber liner and screen from each housing half.

6.5.3 Inspect the inside of the muffler element for sediment that prevents air from passing through the porous element. Replace the elements if blocked.

6.5.4 Inspect the two sealing o-rings on the exhaust body, and replace them if worn or damaged.

6.5.5 Clean and inspect all parts that are to be reused, replace if worn. Reassemble the exhaust muffler in reverse order.

6.6 Quantum Metering Assembly , Ref. Figure 16
Refer to Section 6.7 for the actuator segment.

NOTE: A service kit is available for the Quantum metering assembly. To avoid unscheduled down-time, a kit should be kept on-hand. Replace all the 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.

6.6.1 Empty the machine of abrasive. Turn off the compressed air supply. Lock-out and tag-out the air supply, and bleed the air supply line to the blast machine.

6.6.2 Remove the cleanout cover wing nuts and cleanout cover.

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

Items marked * are included in the metering assembly service kit.

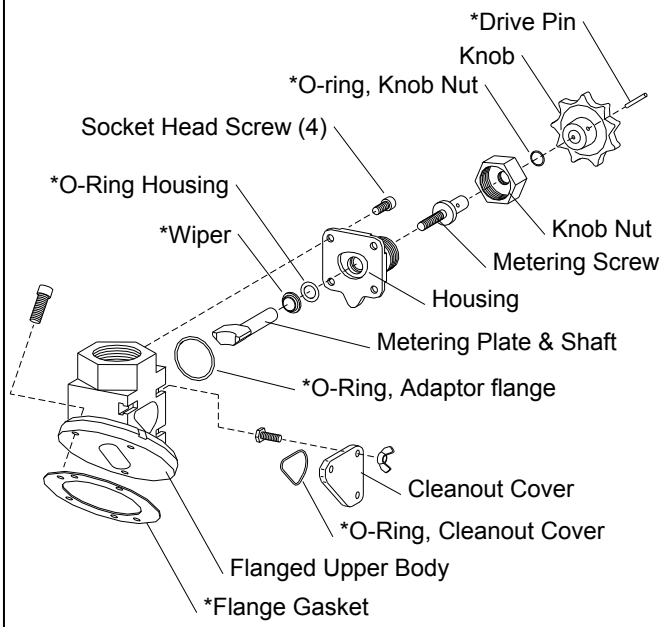


Figure 16

6.6.4 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.

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

6.6.6 Loosen the knob nut, and remove the knob assembly from the housing.

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

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

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

6.6.10 Clean the threads on the metering screw, and test the conditions of the threads with the metering plate shaft. Replace the metering screw if there is any resistance, binding or metal filings.

6.6.11 Remove the o-ring from the knob nut, and remove the o-ring and wiper from the housing.

6.6.12 Thoroughly clean and inspect all parts that are to be reused.

6.6.13 Place a new o-ring in the knob nut.

6.6.14 Place a new o-ring and wiper seal in the housing. A generous amount of silicone-based lubricant helps placement of the parts. The small side of the wiper seal faces away from the o-ring.

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

6.6.16 Reassemble the metering screw, nut, knob, and drive pin. Applying a small amount of silicone-based lubricant on the straight end of the metering shaft eases insertion through the nut o-ring.

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

6.6.18 Place a new o-ring in the groove on the face of the flanged upper body.

6.6.19 Insert the metering plate (flat side up) through the upper body opening. Take care not to lose the 0-ring.

6.6.20 Secure the metering housing finger tight before wrench tightening all screws.

6.6.21 Place a new o-ring on the cleanout cover, and securely attach the cover.

6.6.22 Service of the metering assembly is complete. Test the machine and piping for air leaks before returning to service.

6.7 Actuator Assembly Auto-Quantum Abrasive Metering Valve, Ref. Figure 17 Refer to Section 6.6 for the Quantum metering assembly

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.

6.7.1 Empty all abrasive from the machine per Section 3.9. NOTE: If the metering assembly does not require service, abrasive flow may be stopped by closing the metering valve.

6.7.2 Turn off the compressed air supply. Lockout and tagout the air supply, and bleed the air supply line to the blast machine.

6.7.3 Remove the control line from the fitting on the actuator assembly.

6.7.4 Refer to Figure 17 and remove the screws securing the flanged upper body and outlet flange to the actuator assembly, and then remove the actuator assembly. Both of the flange gaskets, plus the retaining ring, and o-ring will be loose as the actuator assembly is removed. Do not misplace them.

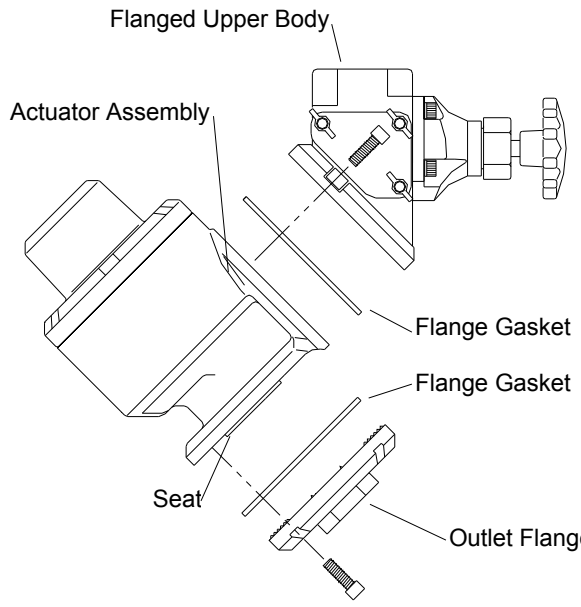


Figure 17

6.7.5 Refer to Figure 18 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.

6.7.6 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.

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

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

6.7.9 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.

6.7.10 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.

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

6.7.12 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 18.

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

6.7.14 If the plunger and piston were separated as noted in Section 6.7.9, apply removable thread sealant to the threads on the piston stop, and reassemble the parts using a new o-ring.

6.7.15 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.

6.7.16 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.

6.7.17 Place the urethane seat into the wear sleeve with the beveled side facing toward the sleeve.

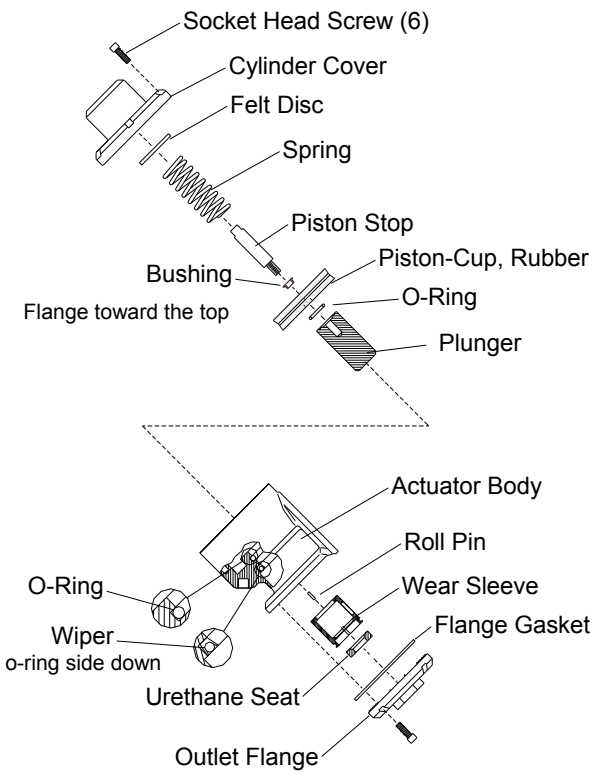


Figure 18

6.7.18 Place the retaining ring o-ring into the groove on the bottom of the retaining ring. Place the retaining ring (o-ring down) on the outlet flange gasket, and align it with the opening.

6.7.19 Assemble the actuator assembly onto the flanged 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. First hand-tighten the outlet flange screws (this ensures that the retaining ring and o-ring do not shift during the remainder of the assembly). Hand-tighten the upper body flange screws before tightening all screws.

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

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

6.8 RLX Electric Control Handle

6.8.1 Spring replacement

6.8.1.1 To replace the lever lock spring, follow the instructions in Section 6.8.2. To replace the handle lever spring, follow the instructions in Section 6.8.3.

6.8.2 Lever lock replacement, Figure 19

6.8.2.1 Remove the lock nut from the shoulder screw. Before removing the screw, note the positions of the spacers and spring, as shown in Figure 19. 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.

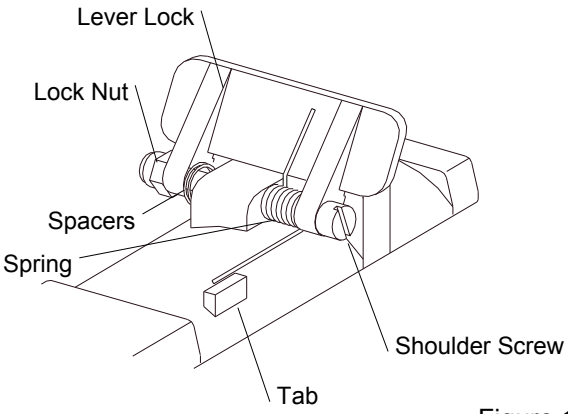


Figure 19

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

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

6.8.3 Handle lever replacement, Figure 20

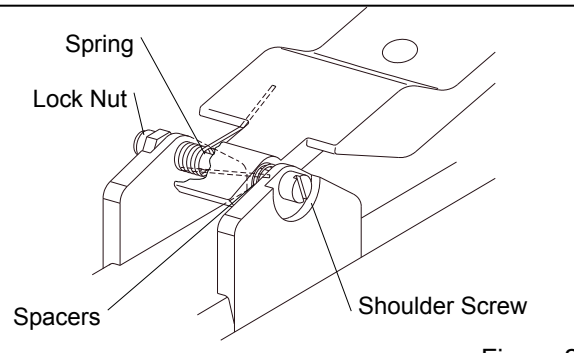


Figure 20

6.8.3.1 Remove the lock nut from the shoulder screw. Before removing the screw, note the positions of the spacers and spring, as shown in Figure 20. The bent end of the spring is against the handle lever, facing up. The straight end is against the body, facing down.

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

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

6.8.4 Switch replacement

6.8.4.1 Remove the handle lever per Section 6.8.3.

6.8.4.2 Remove screws holding the switch and cord clamps.

6.8.4.3 Remove the compression nut, thrust washer and gasket from the connector shell per Figure 21.

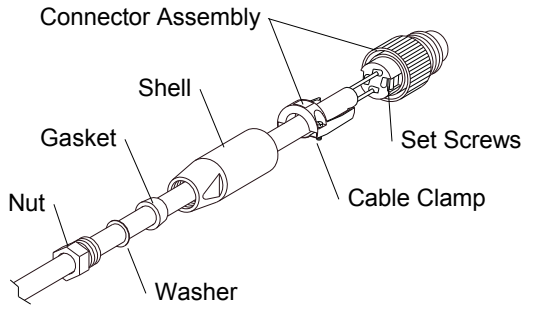


Figure 21

6.8.4.4 Remove the shell from the insert assembly.

6.8.4.5 Loosen the cable clamp and set screws holding the cord, and remove the cord from the assembly.

6.8.4.6 Install a new switch and cord assembly using Terminals No. 1 and 3.

6.8.4.7 Reassemble in reverse order. Make sure the springs are in place, the handle lever and lever lock move freely, and the handle lever will not engage unless the lever lock is down.

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

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

6.9 Abrasive Trap

NOTE: A service kit is available for the abrasive trap. To avoid unscheduled down-time, a kit should be kept on-hand.

6.9.1 All service on the abrasive trap must be done with the compressed air off and the air supply locked-out and tagged-out.

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

6.9.3 To check the abrasive trap screen, loosen the top thumbscrew, and swing the lock bar off the cap, and remove the cap.

6.9.4 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.

6.9.5 To clean the bottom section of the trap, loosen the bottom thumbscrew, and swing the lock bar off the bottom cap, and remove the cap.

6.9.6 Empty abrasive from the bottom and top sections.

6.9.7 Install the screen in the top section. The small end of the screen must face up.

6.9.8 Reassemble the top and bottom caps. Make sure the o-rings are in place on the caps before assembly, and the screen gasket is in place in the top cap.

6.10 Replacing the Pop-Up Valve, Figure 22

6.10.1 All service on the pop-up valve must be done with the compressed air off and the air supply locked-out and tagged-out.

6.10.2 To gain access to the pop-up valve, remove the inspection door assembly.

6.10.3 Using a small pipe wrench, unscrew the pop-up valve guide by turning it counterclockwise. Remove the pop-up valve and guide from the machine.

6.10.4 While the pop-up valve is out, check alignment as follows: Screw a 1-1/4" nipple, which 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.

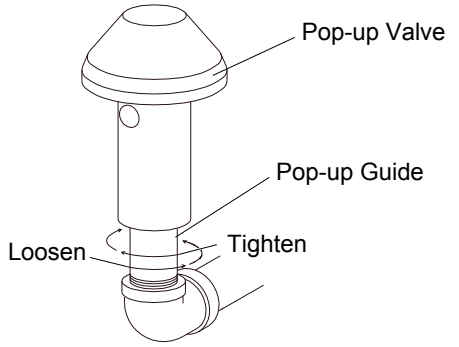


Figure 22

6.10.5 Slide the new pop-up valve over the guide, and then screw the valve guide (with the pop-up valve on it) into position inside the machine. Tighten the guide, it should be 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.

6.10.6 Refer to Figure 23 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.

6.10.7 Put a new gasket on the inspection door assembly before bolting the door onto the machine.

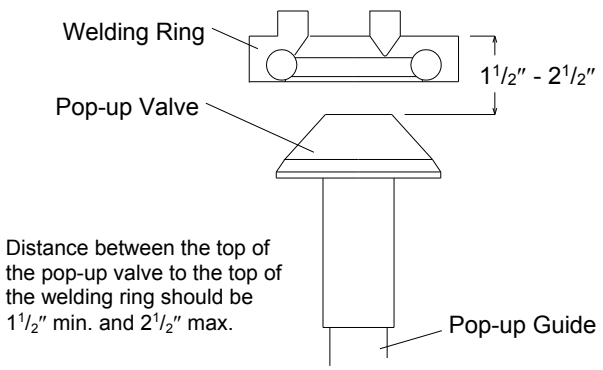


Figure 23

6.11 Replacing the Pop-Up Seal

6.11.1 All service on the blast machine must be done with the compressed air off and the air supply locked-out and tagged-out.

6.11.2 Remove the old seal using fingers, screwdriver, or similar object, to work the seal out of the retaining groove.

6.11.3 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.

6.12 Remove and Install Reusable Control Hose Ends, Refer to Figure 24

NOTE: 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.

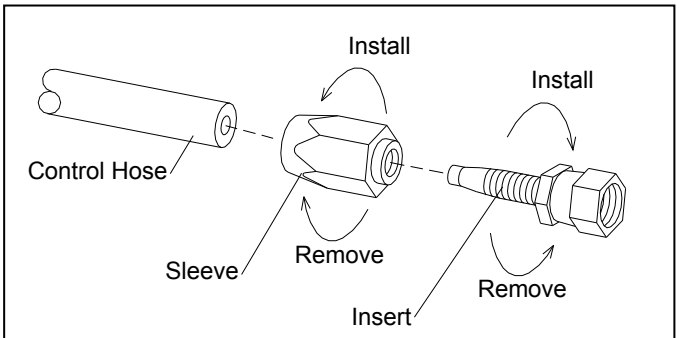


Figure 24

7.0 TROUBLESHOOTING

⚠ WARNING

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

- **Turn off the compressed air, and lock-out and tag-out the 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.**

Shorting electrical components could result in serious electrical shocks, or damage equipment. All electrical troubleshooting must be performed by a qualified electrician.

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, before servicing the equipment.

7.1 Neither Abrasive nor Air Comes Out of the Nozzle When the RLX Control Handle is Pressed

7.1.1 Make sure the machine is pressurized. See Section 7.5.

7.1.2 Depressurize the blast machine. After the pop-up valve has dropped, remove the nozzle, and check it for obstruction.

7.1.3 Make sure the safety petcocks on the millennium valve and Quantum valve are closed.

7.1.4 Listen to the control box to determine if it clicks when the control handle is pressed and released. If it does, the fault probably is not in the electrical system. Confirm this by pushing the white manual override button on the solenoid valves. This should operate the valve if the fault is electrical. If the valves do not operate, proceed from Section 7.1.7 for pneumatic checks.

7.1.5 Check for faults in the control panel by removing the control cord from the 5' lead cord coming from the panel. Hold the lead cord socket so the angled slot is facing up. The slot to the left (counter-clockwise of the angled slot) carries the power from the panel (hot line). Jump between the hot line and the angled slot (media valve solenoid), and listen for the click from the lower solenoid valve. Then jump between the hot line and the slot to the right (air valve solenoid) of the angled slot. The upper solenoid valve should click. If both valves click, check the control cord and electric RLX control handle per Sections 7.1.6 and 7.1.7. If neither solenoid clicks the problem may be in both solenoids, but more likely one of the following.

- Check for faulty fuse or loose connections in the control panel.
- Check for inadequate power to the control panel.
- Check continuity of all panel wiring and solenoids.
- Check for faulty transformer (120 volt systems only),

7.1.6 Check each control cord extension, by connecting them one at a time to the panel, and jump across the extension cord socket as explained in Section 7.1.5. Continue to check all extension cords in like manner.

7.1.7 Check the end control cord (with ACS switch) by jumping across terminals No. 1 and 3 on the lo-profile connector. The upper solenoid (air valve) should click. With the jump in place, push the ACS switch on and off. Moving the ACS switch should cause the lower (media valve) solenoid to click. If the panel does not click, the cord, connectors or switch are defective and should be repaired or replaced. If the panel does click, the remote control handle is the probable cause and should be repaired. See Section 6.8.

7.1.8 Check control lines and fittings for leaks or breaks.

7.1.9 Open the safety petcock, and press the control handle lever. Air should come out the petcock. If it does not, check the air filter and 3/16" supply hose, and orifice fitting for blockage. Clean or replace as necessary.

7.1.10 Make sure both the abrasive metering valve and choke valve are open.

7.2 Air only (no abrasive) Comes Out of the Nozzle

7.2.1 Quantum abrasive metering valve may be closed or needs adjustment. Refer to Section 4.1.

7.2.2 Make sure the ACS switch is in the "on" position (rear button on ACS Switch is pressed).

7.2.3 Blast machine may be empty.

7.2.4 Abrasive may be damp. See Section 6.1 to clear damp abrasive.

7.2.5 Check the media metering valve for obstructions. See Section 6.2.

7.2.6 Open the safety petcock on the Quantum metering valve and press the control handle. If air does not come out the petcock, check for blockage in the hose from the panel, do electrical tests per Section 7.1. If air does come out, the metering valve actuator section is not functioning. Turn off the compressed air supply and inspect the actuator per Section 6.7.

7.2.7 Check for air leaks in hose between the panel and metering valve.

7.3 No Abrasive Flow When the ACS Switch "On" Button is Pressed

7.3.1 Quantum abrasive metering valve may be closed. The valve is closed when the handle is turned fully clockwise. Adjust per Section 4.1.

7.3.2 Leak or blockage in hose or fittings from the control panel to the abrasive valve.

7.3.3 Obstruction in metering valve. See Section 6.1 and 6.2.

7.3.4 Quantum metering valve actuator requires service. See Section 6.7.

7.3.5 Blast machine may be empty.

7.3.6 Do electrical tests per Section 7.1.

7.4 Abrasive Flow Does not Stop When ACS Switch "Off" Button is Pressed

7.4.1 Do electrical tests per Section 7.1.

7.4.2 Quantum metering valve actuator requires service. See Section 6.7.

7.5 Blast Machine will not Pressurize

7.5.1 Listen to the control panel to determine if the solenoid clicks when the control handle is pressed and released.

- If it does click, the fault may not be electrical, proceed from Section 7.1.7 for pneumatic checks.
- If it does not click, do electrical checks per Section 7.1

7.5.2 Make sure the safety petcocks are closed.

7.5.3 Check for air leaks in Millennium valve, connecting hose, and tube fittings in the panel.

7.5.4 Check the air filter on the control panel cover, 3/16" supply hose, and orifice fitting for blockage. Clean as necessary.

7.5.5 Open the safety petcock on the Millennium valve and press the control handle. If air does not come out the petcock, check for blockage in the control lines. If air does come out, the Millennium valve inlet section is not functioning. Turn off the compressed air supply and inspect internal parts for wear, and lubrication. See Section 6.3.

7.5.6 Make sure the compressor is on and all air supply valves to the machine are open.

7.5.7 Close the safety petcock, and press the control handle lever. Make sure no air escapes through vent holes on the cylinder body of the inlet valve body. Air escaping from vent holes indicate worn seals in the inlet valve. See Section 6.3.

7.5.8 Insufficient-size air supply hose or reduced-size fittings between the compressor and blast machine. See Section 2.4.

7.5.9 Dirty filter element in optional air filter. Check element.

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

7.6 Blast Machine will not Depressurize or Depressurizes Too Slowly

7.6.1 Abrasive trap screen blocked, or abrasive trap need cleaning. Clean the trap at least twice daily.

7.6.2 Exhaust muffler blocked. See Section 6.5.

7.6.3 Check for blockage in the control hose.

7.6.4 Remote control valves malfunctioning. Inspect the inlet and outlet valves per Section 6.3 and 6.4.

7.7 Outlet valve will not seal

7.7.1 Outlet valve diaphragm worn, or outlet valve requires service. See Section 6.4.

7.8 Heavy abrasive flow

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

7.8.2 Abrasive metering valve may be open too far. Refer to Section 4.1.

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

7.9 Abrasive surging

7.9.1 A certain 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. Refer to Section 4.1.

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

7.9.3 Quantum abrasive metering valve may require service. See Sections 6.6 and 6.7.

7.10 Intermittent abrasive flow

7.10.1 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, a dryer or after-cooler may be required in the air supply line.

7.10.2 Abrasive may be worn from recycling. Replace abrasive.

7.11 RLX Control Handle Lever Fails to Return to the Non-Blast Position (Up) When Released

7.11.1 Check the handle lever for damage that may cause binding against the body.

7.11.2 Check the spring for damage or fatigue.

7.11.3 Replace the handle lever or spring as necessary.

7.12 RLX Lever Lock Fails to Pop Up When the Handle is Released

7.12.1 Check the lever lock for damage, or build up of debris or abrasive.

7.12.2 Check the lever lock return spring for damage or fatigue.

7.12.3 Replace lever lock or spring as necessary.

8.0 ACCESSORIES AND REPLACEMENT PARTS

8.1 Accessories

(-) Cover, steel for
4 cu. ft., 20" diameter blast machine..... 20358
6 cu. ft., 24" diameter blast machine..... 02336
(-) Cover, poly bag with Clemco logo for
4 and 6 cu. ft. machines, large 15143
(-) Screen, recessed type, for
4 cu. ft., 20" diameter blast machine..... 20357
6 cu. ft., 24" diameter blast machine..... 03100

8.2 Hose Safety Accessories, Figure 25

Item	Description	Stock No.
1.	Safety cable for 1-1/2" to 3" OD hose	15013
	Safety cable for 1-1/2" to 4" OD hose	27405
2.	Lock pin, coupling (package of 25)	11203

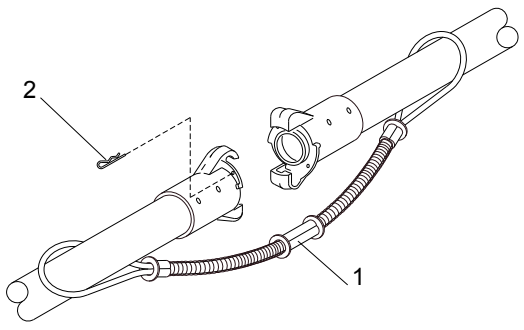


Figure 25

8.3 Blast Machine, Figure 26

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.	Compression coupling, 1-1/4"	01857
5.	Gasket, compression coupling, 1-1/4"	01886
6.	Coupling, 1-1/4" CF for	
	4 cu. ft. w/12" nipple	27720
	6 cu. ft. w/16.5" nipple	24197
7.	Auto-Quantum metering valve	
	without wye and fittings	22760
	with 1-1/4-NPT wye and fittings	24447
8.	Wheel, primary, for	
	4 cu. ft., 12" dia. x 300	20426
	6 cu. ft., 16" dia. x 400	20427
9.	Inspection door assembly, 6" x 8"	02377
10.	Gasket, inspection door, 6" x 8"	02369
11.	Seal, pop-up valve	02325
12.	Pop-up valve, 4", with external sleeve	03699
13.*	Air filter, optional,	
	1-1/2" manual drain	22363
14.	Millennium inlet/outlet valve	21336
15.*	Gasket, CQG, pack of 10	00850
16.	Wye, standard 1-1/4"	01818
17.	Internal pop-up guide, 1-1/4" x 6" toe	01753
18.	Leg cap (manual tube cover)	21517
19.	Axle, 1″ diameter x 30.5″	02402
20.	Washer, 1" thrust	03825
21.	Retaining ring, 1"	03824
22.	Abrasive trap	02011
23.	Wheel, secondary, 10" x 2.75	20349
24.	CPF-20 Air filter, optional	03578
25.	Cartridge, CPF filter	03547
26.*	Coupling, nylon, for	
	4 cu. ft., CQPS-1	21088
	6 cu. ft., CQPS-2	08413
27.*	Nozzle holder, nylon, for	
	4 cu. ft., NHP-1	04106
	6 cu. ft., NHP-2	04127
28.*	Hose, Supa blast, for	
	4 cu. ft., 1" ID x 50 ft.	23104
	6 cu. ft., 1-1/4" ID x 50 ft.	23106
29.*	Nozzle, for	
	4 cu. ft., TMP-5	23521
	6 cu. ft., TXP-6	23525
30.*	Washer, nozzle, for	
	4 cu. ft., NW-25, pack of 10	91024
	6 cu. ft., NW-32, pack of 10	91026
31.*	Gasket, hose coupling, package of 10	
	CQGP-2, for 4 cu. ft. (for Item 26)	08852
	CQGP-3, for 6 cu. ft. (for Item 26)	08853
32.	Adaptor, 1-1/4" NPT x JIC	22529
33.**	Hose, 5-ft respirator extension, coupled.	24510
34.**	Fitting, 1/4" NPT bulkhead	05605
35.**	Adaptor, 1/4" NPT x 3/8" hose	01019

* Models shown are supplied with original blast machine systems.

** Supplied with factory-installed CPF-20 Air Filter option only.

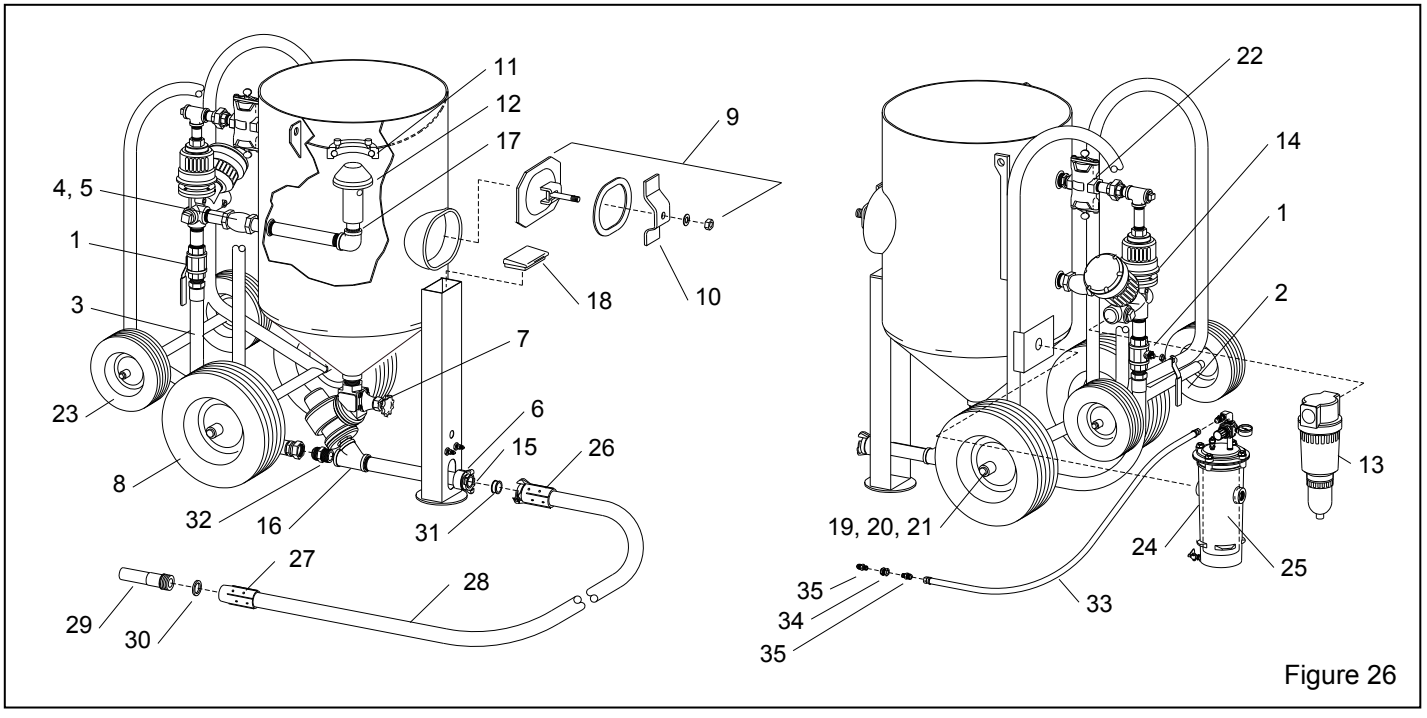


Figure 26

8.4 Remote Control System Parts, Figure 27

Item	Description	Stock No.
1.	Millennium valve	21336
2.	Control panel, complete	
	12 volt	05621
	120 volt	07650
3.	Auto-Quantum metering valve	
	without wye and fittings	22760
	with 1-1/4-NPT wye and fittings	24447
4.	RLX Electric Control handle	10840
5.	Hose, 4-ft. twinline cpld.	21619
6.	Hose, 3/16" x 5-ft. single line cpld.	03083
7	Cord, 50-ft. control w/ ACS switch	10847
8.	Extension cord, 50 ft. twist lock for ACS	15138
9.	Extension cord, 100 ft. twist lock for ACS	19528
10.	Pigtail, 12 volt systems only	10831
11.	Tie, nylon	02195

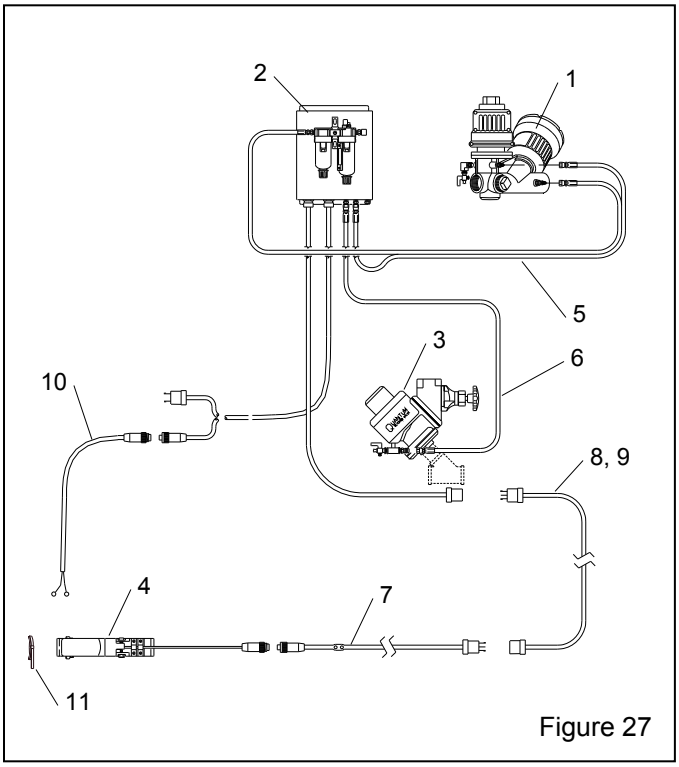


Figure 27

8.5 Quantum Metering Valve Actuator, Figure 28

Item	Description	Stock No.
(-)	Auto-Quantum metering valve	
	without wye and fittings	22760
	with 1-1/4-NPT wye and fittings	24447
*	Service kit, Quantum actuator (Fig. 28a)	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.	Wye, 1-1/2" NPT	01819
18.	Bushing, 1-1/2 NPT x 1-1/4 NPT	01805
19	Nipple, 1-1/4 x close HD	01854
20	Metering assembly	See Section 8.6

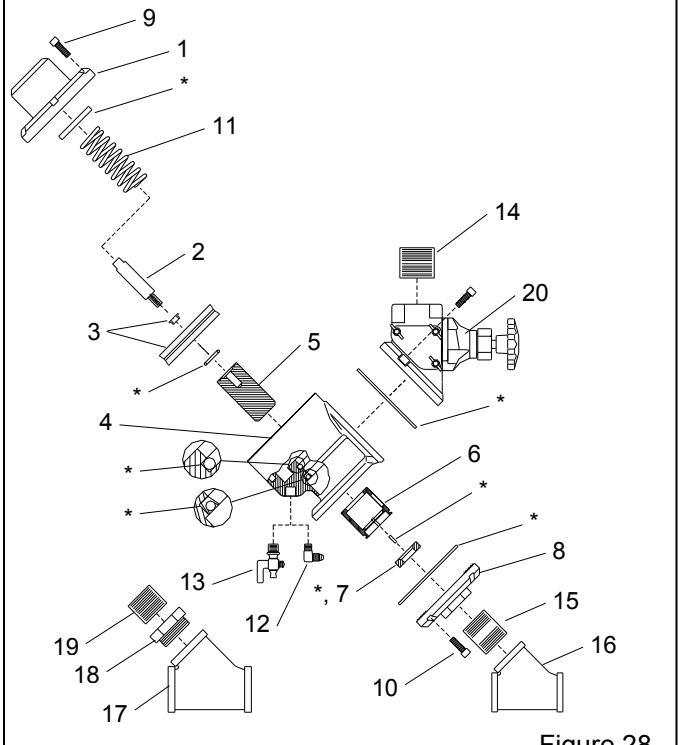


Figure 28

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 old style alum. 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.
9	1	Felt disc

Item 8 is not used with current 21319 outlet flange. Used with early 22077 flange requiring a separate 22429 retaining ring.

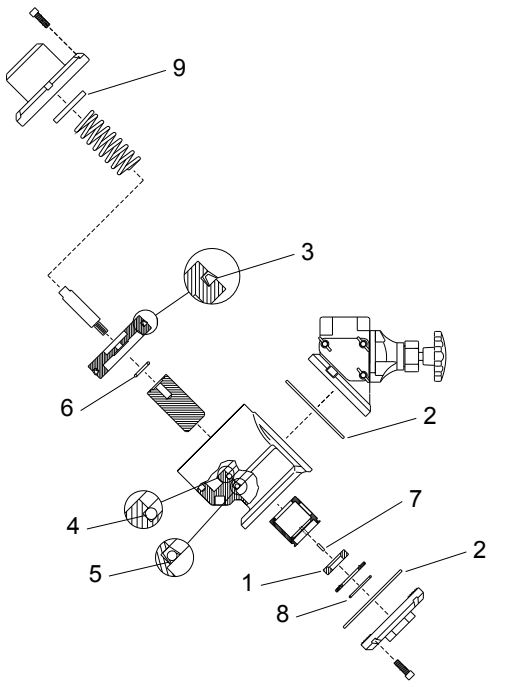


Figure 28a

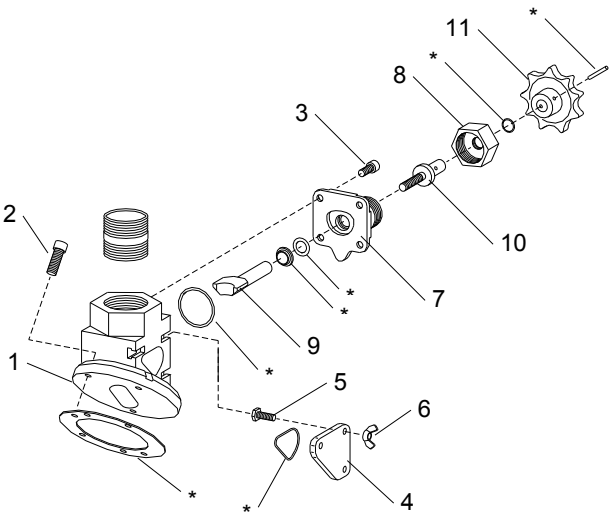


Figure 29

8.6 Auto-Quantum Metering Assembly, Figure 29

Item	Description	Stock No.
*	Service kit, metering assembly (Fig. 29a)	22854
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

22854 SERVICE KIT
QUANTUM METERING ASSEMBLY

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

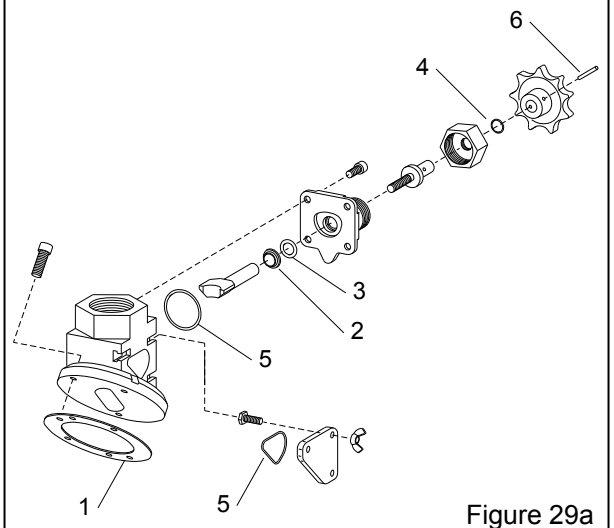


Figure 29a

8.7 Millennium valve service kit 22899
Includes the following four service kits shown in Sections 8.8 and 8.9: 22856, 22898, 22857, & 22868

8.8 Millennium Valve, Inlet Section, Figure 30

Item	Description	Stock No.
*	Service kit, Millennium Inlet seals (Fig 30a)	22856
**	Service kit, Millennium plunger tip (Fig 30b)	22898
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.	Adaptor, 1/8" NPT w/1/16" orifice	01945
14.	Bushing, 1/4" x 1/8" brass	02010
15.	Adaptor, 1/4" NPT	02494
16.	Plug, 1-1/4" NPT	01762

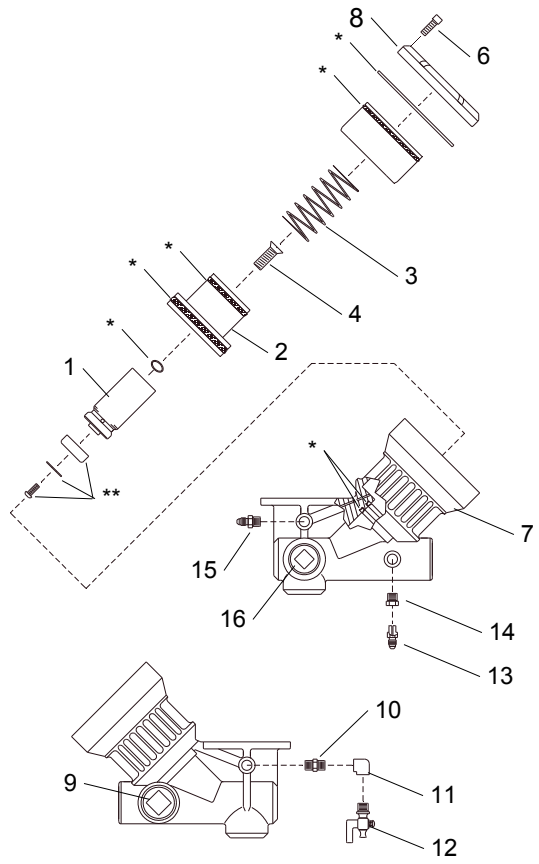


Figure 30

22856 SERVICE KIT
MILLENNIUM INLET SEGMENT 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

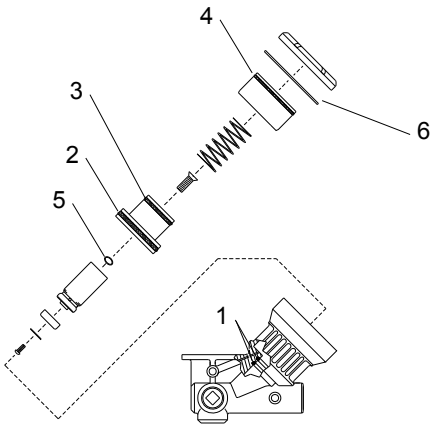


Figure 30a

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

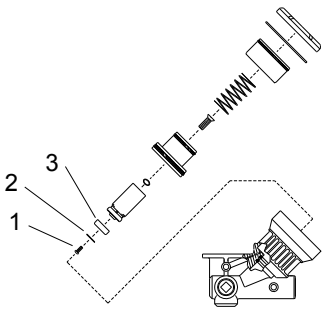


Figure 30b

8.9 Millennium Valve Outlet Segment, Figure 31

Item	Description	Stock No.
*	Service kit, outlet segment (Fig. 31a)	22857
**	Service kit, muffler (Fig. 31b)	22868
1.	Sleeve, inner	22612
2.	Piston	22613
3.	Housing, muffler, 2 required	21346
4.	Valve body, exhaust	21345

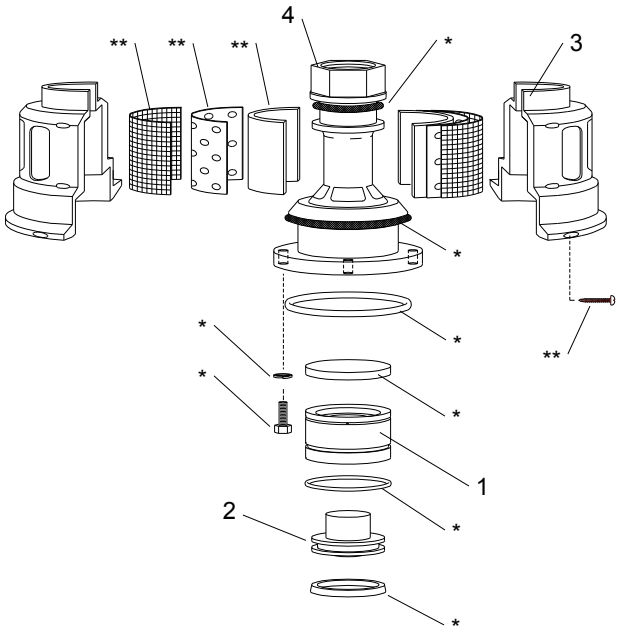


Figure 31

22857 SERVICE KIT
MILLENNIUM OUTLET SEGMENT

Item	Qty	Description
1.	1	O-ring, 1-5/8" ID nominal
2.	1	Diaphragm
3.	1	U-seal, piston
4.	2	O-ring, 3" ID nominal
5.	1	O-ring, 2-7/16" ID nominal
6.	4	Cap screw, 5/16-NC x 1"
7.	4	Lock-washer, 5/16"

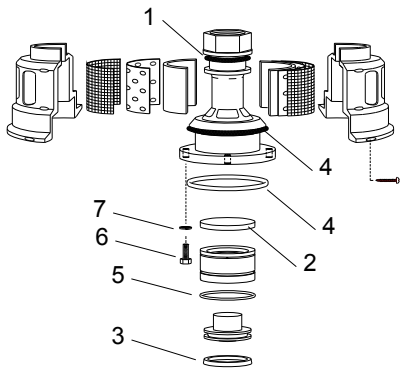


Figure 31a

22868 SERVICE KIT
MILLENNIUM OUTLET MUFFLER

Refer to owner's manual for service instruction.

Item	Qty	Description
1.	2	Muffler element
2.	2	Liner, perforated rubber
3.	2	Screen
4.	6	Screw, 12 x 1"

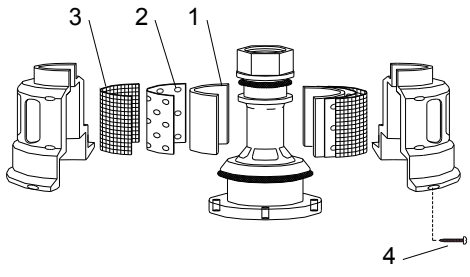


Figure 31b

8.10 Abrasive Trap, Figure 32

Item	Description	Stock No.
(-)	Abrasive trap	02011
*	Service kit, abrasive trap (Fig. 32a)	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

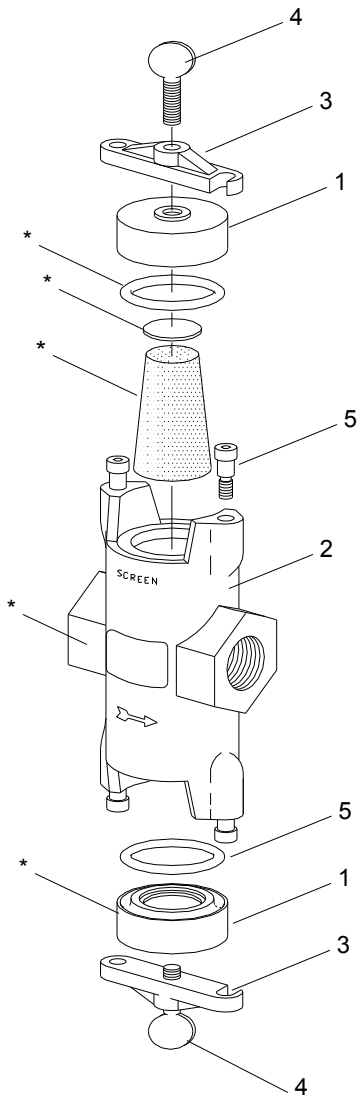


Figure 32

01925 SERVICE KIT
ABRASIVE TRAP

Item	Qty	Description
1	3	Screen
2.	2	O-Ring
3.	1	Gasket, screen, 1/8" thick
4.	1	Decal, "clean screen"

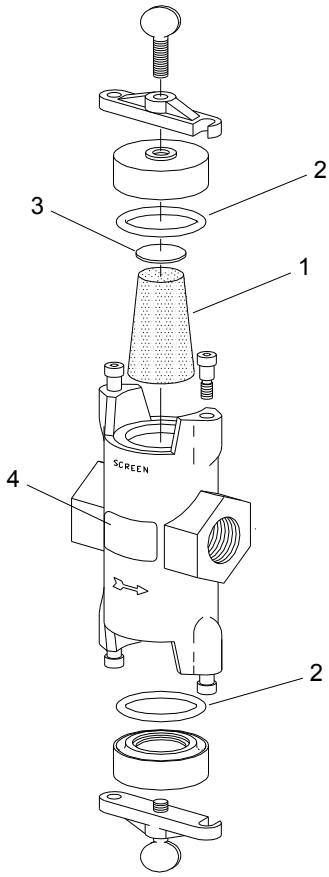


Figure 32a

8.11 Control Panel, Figure 33

Item	Description	Stock No.
(-)	Panel, control	
	12 volt DC	05621
	120 volt AC	07650
1.	Filter, 1/4" w/ auto drain	05617
2.	Lubricator (antifreeze injector) 1/4"	05616
3.	Solenoid, 3- way	
	12 volt AC	07662
	12 volt DC	07664
4.	Transformer (120 volt only)	02198
5.	Supply cord, 5-ft.	
	120 volt AC, w/15 amp twist-lock plug	02216
	12 volt DC, w/lo-profile connector	10833
6.	Lead cord, 5-ft. w/twist-lock connector	07675
7.	Tubing, 1/4" white poly, specify ft. required	03427
8.	Tubing, 1/4" orange poly, specify ft. reqd.	05615
9.	Tubing, 1/4" green poly, specify ft. required	05614
10.	Tubing, 1/4" blue poly, specify ft. required	05613
11.	Tubing, 1/4" red poly, specify ft. required	05612
12.	Nipple, 1/4" hex	02808
13.	Coupling, 1/4" bulkhead	05605
14.	Elbow, 1/4" NPT x 1/4" compression	03428
15.	Connector, 1/8" NPT x 1/4" compression	03430
16.	Tee 1/4" compression	03351
17.	Adaptor, bulkhead 1/8" NPT x 3/16" hose	03432
18.	Fitting, exhaust	03438
19.	Adaptor, 1/4" NPT	02494
20.	Elbow, 1/4" brass street	02027
21.	Connector, lo-profile, male	10828
22	Connector, female twist-lock	06327
23.	Plug, 15 amp twist-lock	02275
24.	Connector, 1/2" strain relief	02213
25.	Locknut, 1/2" conduit	12713
26.	Fuse, 2-Amp, 1/4 x 1-1/4, 120-v only	03039
27.	Fuse block, 120-volt only	03040

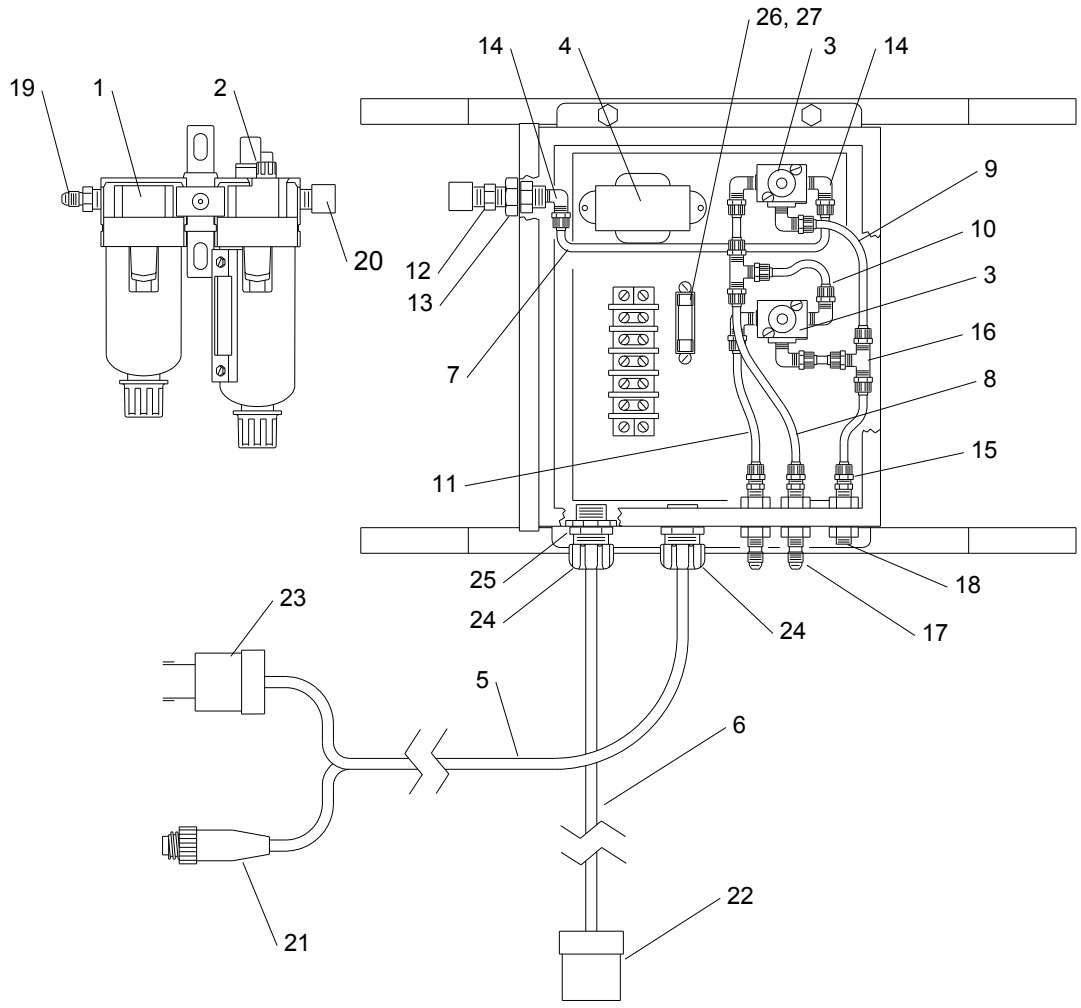


Figure 33

8.12 RLX Electric Control Handle, Figure 34

Item	Description	Stock No.
(-)	RLX Electric Control Handle w/ Lo-Profile connector	10840
(-)	RLX Electric Control Handle w/ Twist-Lock connector	05801
1.	Handle lever	10573
2.	Body	10568
3.	Lever lock	10564
4.	Clamp, switch cord	05810
5.	Spring, lever (2 required)	05823
6.	Switch with cord	24842
7.	Screw, 8-32 X 3/8" rd. hd. (4 required)	05814
8.	Nut, 8-32 lock, ss (2 required)	05815
9.	Spacer washer, stainless steel (4 required	05434
10.	Screw, 3/16" X 1-1/4" shoulder (2 required)	05817
11.	Ties, nylon wire	02195
12.	Connector, Lo-Profile male (for 10840 only)	10828
13.	Connector, Twist-Lock male (for 05801 only)	02899

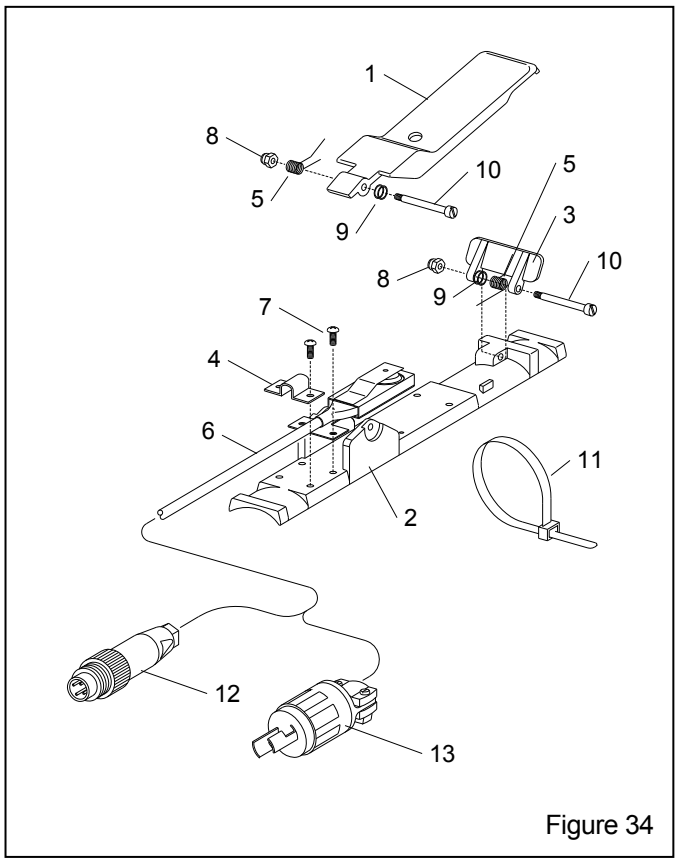


Figure 34