BIG CLEM

BULK BLAST MACHINES

O. M. 05110

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⚠ 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

1.1.1 These instructions cover the set-up, operation, maintenance, troubleshooting, and replacement parts for all Big Clem Bulk Blast Machines. In addition to this manual, the following separate manuals are provided for accessories.

ACE Air Valve Owner's Manual 23938
RLX Control Handle Owner's Manual 10574
Multiple-Outlet Hose Kits Instruction Sheet 11337
One of the following metering valve manuals:
Quantum Abrasive Metering Valves 22565
Sentinel Abrasive Metering Valve 20951

1.1.2 This manual contains 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; It contains important safety information about abrasive blasting that may not be included in equipment operation manuals. The booklet is available in both English and Spanish; to request copies, 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 Basic Components

1.3.1 Typical components and call outs are shown in Figure 1. Big Clem bulk blast machines come in three sizes; 60, 120 and 160 cu. ft. capacity. Each size is available as a stationary, yard-towable and highway-towable (highway towable models include fenders, lights and electric brakes). Refer to Figure 2 for remote control system.

1.3.2 Big Clems are furnished with manually-operated inlet and vent (bleed-off) valves, 1-1/4" piping, a water separator tank, and two operator stations that are independently operated with pneumatic (or optional electric) pressure-hold remote controls. One or two additional operator stations may be added to 120 cu. ft. and 160 cu. ft. machines at time of purchase, or may be field installed later.

1.3.3 Abrasive Chamber (blast tank) and Water Separator

1.3.3.1 Big Clem abrasive chambers and water separator tanks are pressure vessels manufactured to American Society of Mechanical Engineers (ASME) standards, as described in Section VII, Div. 1, and carry National Board certification. 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.

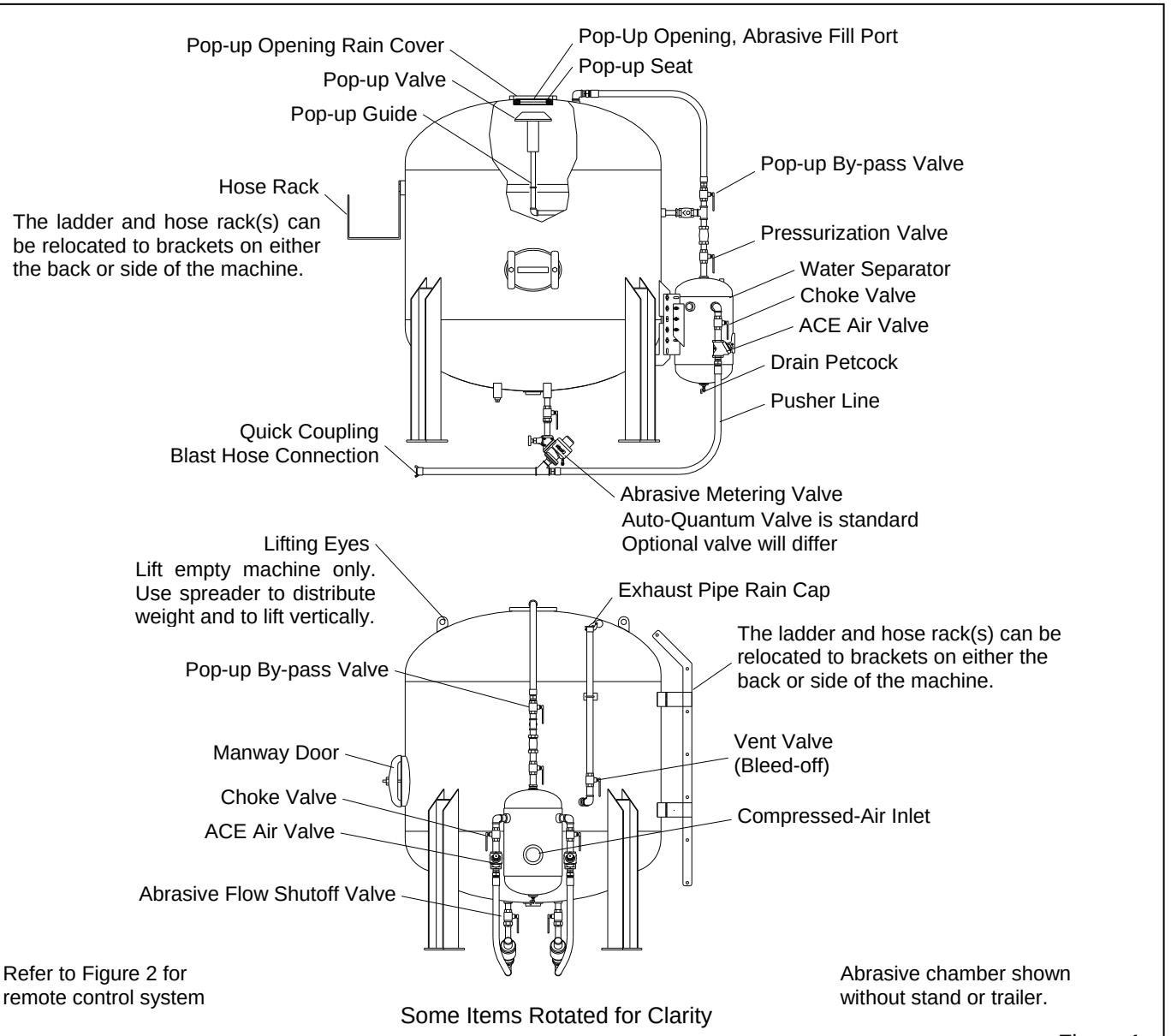


Figure 1

1.3.3.2 Refer to the National Board Label on the abrasive chamber and water separator for the vessel's maximum pressure (psi) ratings. Do not exceed the rated pressure.

⚠ WARNING

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

1.3.3.3 All welding repairs done on 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 ASME and National Board certification of the vessel.

⚠ WARNING

Welding, grinding, or drilling on the abrasive chamber and water separator could weaken the vessels. Compressed air pressure could cause a weakened vessel to rupture, resulting in death or serious injury. Welding, grinding, or drilling on the abrasive chamber or water separator vessels without a National Board ″R″ stamp voids the ASME and National Board certification.

1.3.3.4 OSHA does not require pressure relief valves on blast machines when air compressors supplying air to the blast machines are built to ASME[(1)] specifications and comply with OSHA[(2)] regulations. ASME Manual Section VIII, Division 1, UG-125, paragraph A90 (g) states that pressure relief valves or protective devices **"...need not be installed directly on a pressure vessel when the source of pressure is external to the vessel and is under such positive control that the pressure in the vessel cannot exceed the maximum allowable working pressure at the operating temperature..."**. OSHA regulation 1910.169 refers to the above 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, 1989
[(2)] Occupational Safety and Health Administration, 29 CFR 1910, Subpart M - Compressed Gas and Compressed-Air Equipment.

1.3.4 Using Lifting Eyes

⚠ WARNING

Improper rigging of this equipment could result in injury and death. Use only qualified riggers and operators when picking and moving this equipment.

1.3.4.1 Lifting eyes are for lifting empty vessels only. Do not use the lifting eyes to lift the machine when it contains any abrasive. Use a spreader for uniform, vertical lift on each lifting eye.

⚠ WARNING

Empty this equipment before lifting. The lifting eyes will not support the weight of the equipment if it contains abrasive. If overloaded or lifted laterally the lifting eyes may fail, resulting in serious injury or death. Always use lift equipment that is rated higher than the weight of the machine and accessories.

1.3.5 Remote Controls

1.3.5.1 The principal components of the pneumatic remote control system are shown in Figure 2. The system includes the abrasive metering valve, air valve, RLX control handle with abrasive cut-off (ACS) air switch assembly, 50-ft. twinline control hose, 50-ft. single-line hose, interconnecting hoses and hose unions. Valves may differ from those shown, but connections and operation are similar. Refer to Section 2.3 for pneumatic connections and Section 2.4 for electrical connections.

1.3.5.2 The remote control system is an OSHA-required safety device; it is required when an operator mans the nozzle. The control handle, located near the blast nozzle, is the activator of the remote control system. When the operator intentionally or unintentionally removes hand-held pressure from the control handle, the abrasive metering valve and air valve return to their normally-closed (NC) positions, stopping air and abrasive flow through the nozzle. The remote control system "fails to safe", which means when any interruption in the control-air circuit occurs, for any reason such as a break in the line, the compressor stops running, or should the operator drop the blast hose, blasting will stop.

⚠ WARNING

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

1.3.5.3 When compressed air is supplied to the blast machine, air enters the water separator and remote control air circuit used to operate the remote controls. The pusher-lines also pressurize up to the normally-closed ACE air valves. When the abrasive chamber pressurization valve is opened, air enters the abrasive chamber and automatically seals the pop-up valve and pressurizes the chamber. Although the machine is under pressure, neither air nor abrasive comes out the nozzle because the normally-closed abrasive metering valve shuts off abrasive flow, and the ACE air valve stops air flow. Blasting will not start until the operator activates the control handle.

1.3.5.4 The remote controls are pressure-hold type controls, meaning pressurization and depressurization of the blast machine abrasive chamber are separate functions from the remote control. The operator manually pressurizes and depressurizes the chamber, using hand operated valves. Pressure remains in the abrasive chamber until it is manually depressurized.

1.3.5.5 The remote controls operate pneumatically on the return-air principle (See Figure 2). A stream of control air travels from the orifice, down the outbound twinline and escapes through an opening located under the control handle lever. As long as air escapes through

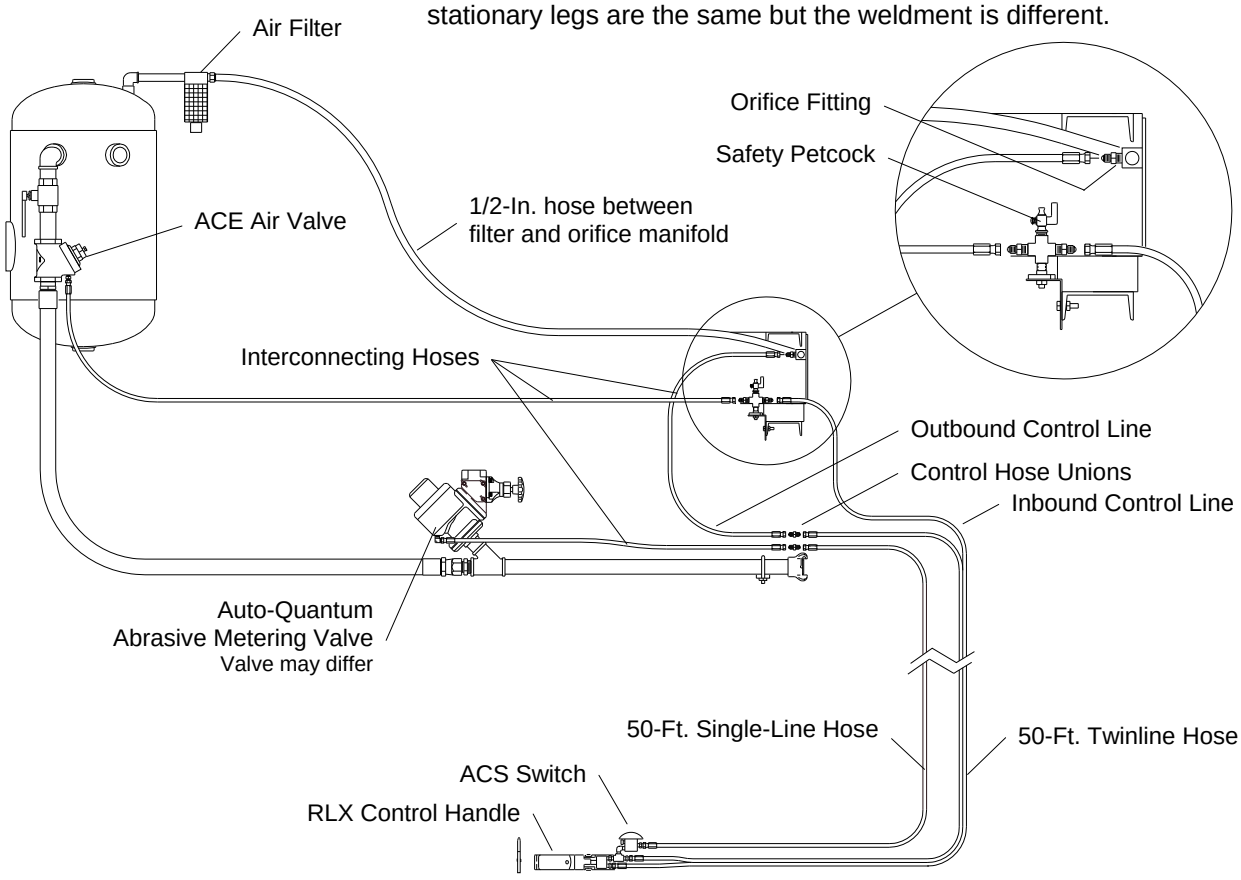


Figure 2

the opening, the remote control abrasive metering valve and air valve remains closed. When the control handle lever is pressed, a rubber button seals the opening, and control air from the outbound line returns through the inbound twinline, opening both the abrasive metering valve and air valve to start the blasting process (on electric remote systems the pneumatic circuit is completed electrically). Releasing the handle exhausts the control air, causes the valves to close and blasting stops.

1.3.5.6 An abrasive cut-off switch (ACS) is a standard feature of the pressure-hold remote controls. The ACS switch is mounted on the control handle on pneumatic controls. On electric controls the switch is wired into the cord about 6 to 8 inches behind the RLX connection. The operator uses the switch to close the abrasive valve independently of the air valve. Refer to Section 4.6 for operation of the ACS.

1.3.6 Electric (electro-pneumatic) Control Option

1.3.6.1 Electric controls are recommended when the nozzle and remote control handle are farther than 100 feet from the blast machine. Pressure drop of pneumatic systems over longer distances increases response time, which prevents fast, safe operation. Contact your local Clemco Distributor for more information.

1.3.7 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.

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

hazardous/toxic substances. 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.

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

1.3.7.3 Sand: Sand should never be used because of the respiratory hazards associated with abrasive containing free silica.

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

1.3.7.5 Steel: Steel shot and steel grit may be used but attention must be given to moisture and weight. Steel abrasive rusts under humid conditions, especially with day and night temperature changes, or when compressed air supplied to the vessel is damp with condensation. Refer to Section 1.3.8 and 2.1.3 for weight capacities.

1.3.7.6 Silicon Carbide, Aluminum Oxide, and Garnet: These are the most aggressive of the commonly used abrasives. Aggressive abrasive such as these may be used, but the service life of any equipment components which come in contact with the abrasive will be reduced. To avoid unscheduled down time, periodically inspect hoses and nozzles for abrasive wear. Use nozzles lined with boron carbide with these abrasives.

1.3.7.7 Glass Bead: Glass bead can be used but is usually not used in bulk blast machines.

1.3.7.8 Lightweight Abrasive: Plastic media and most agricultural media which generally require a blast machine with 60° conical bottom, are not suited for use in bulk blast machines.

1.3.8 Abrasive Capacity

NOTE: Tare weight specific to each machine is shown on a label attached to the trailer tongue.

All Big Clems may be loaded to full capacity with dry abrasive with a relative density of 100 lbs. per cu ft. or less. Never load portable Big Clems to full capacity with steel grit or other metallic abrasive. However, there is no weight limit on a stationary, stand-mounted machine.

⚠ WARNING

Do not load towable machines in excess of the gross vehicle weight (GVW) shown in Section 2.1.3 Loads heavier than the GVW. will cause unsafe conditions, affecting brakes, damage to the trailer, suspension or tires.

2.0 INITIAL SET-UP

2.1 Set-Up for Towing

2.1.1 Yard and highway towable models are identical, except highway models have a braking system, lights, fenders, and special safety equipment.

2.1.2 The minimum tow vehicle for the 60 cu. ft. trailer is a 1-ton flatbed truck. The minimum tow vehicle for the 120 and 160 cu. ft. trailer is a 1-1/2 ton flatbed truck.

⚠ WARNING

Check with state Department Of Motor Vehicles or Department of Transportation to ensure that the tow vehicle and vehicle operator are approved and licensed for towing vehicles with the gross vehicle weight of the Big Clem. Undersized or otherwise defective vehicles or inexperienced operators may produce hazardous conditions that could cause severe injury, death, or property damage.

2.1.3 The tow vehicle must be rated for towing the following maximum gross vehicle weights. The GVW is calculated by adding the abrasive weight to the tare weight of the Big Clem. **Tare weight specific to each machine is shown on a label attached to the trailer tongue.**

MODEL	MAX. GVW
60 cu. ft.	10,000 lbs.
120 cu. ft.	16,000 lbs.
160 cu. ft.	20,000 lbs.

2.1.4 Install a user provided electric brake controller and the seven-pole socket, which comes with a highway-towable Big Clem, onto the tow vehicle. Refer to the sheet packed with the controller and socket for installation and operating instructions. The controller connects the braking system of the tow vehicle and the Big Clem trailer.

2.1.5 Install an approved hitch onto the tow vehicle. Adjust the height so the hitch and eye match when the trailer is empty and level. Make sure all safety locks pins or other safety devices are in place before towing.

⚠ WARNING

Towing and braking apparatus and installation of the apparatus must conform to state and federal DOT requirements. Non-approved hardware or defective installation may produce hazardous conditions that could cause severe injury, death, or property damage.

2.1.6 The safety chain is supplied without a fastening device. Attach an approved hook or other connector that complies with all applicable codes.

2.1.7 Attach the breakaway chain to the back of the tow vehicle, NOT TO THE HITCH. The chain must have enough slack, so it does not pull tight and engage the breakaway switch during normal towing and maneuvering.

2.2 Air Hose and Connectors

2.2.1 Attach an air-supply hose fitting to the air inlet on the water separator tank. Compressor size and air hose requirements are determined by the nozzle size and number of nozzles. Use the chart in Figure 3 to determine cfm consumption and minimum size air hose.

Nozzle Orifice Size	Number of Nozzles	CFM New		Worn	Minimum Air Line ID
5/16"	2	340	to	480	2"
5/16"	3	510	to	720	2-1/2"
5/16"	4	680	to	960	3"
3/8"	2	480	to	630	2-1/2"
3/8"	3	720	to	945	3"
3/8"	4	960	to	1260	3"
7/16"	2	630	to	820	2-1/2"
7/16"	3	945	to	1230	3"
7/16"	4	1260	to	1640	3"
1/2"	2	820	to	1040	3"
1/2"	3	1230	to	1560	3"
1/2"	4	1640	to	2080	4"

Minimum ID air line recommendations for multiple nozzles. CFM shown is the approximate cfm required at 125 psi, when the nozzle is new, and when worn. A nozzle is considered worn when the orifice is 1/16" larger than its original size.

Figure 3

NOTE: 120 cu. ft. and 160 cu. ft. models are supplied with 4" inlet piping. It may be difficult to acquire large (4" ID) hose or piping that is required when multiple large nozzles are used. A manifold may be used to allow the use of two or more, smaller diameter air lines that will at least equal the volume of the ID of air line suggested in Figure 3. Care should be taken to make sure none of the fittings reduces the area from the sizes shown.

2.2.2 Do not use fittings or adaptors that decrease the ID of the plumbing or compressed air-supply line. The compressor must provide adequate output, and the hose or plumbing between the compressor and the inlet must have sufficient capacity to supply the cfm shown in the table.

NOTE: The maximum recommended nozzle orifice size is 1/2" diameter. Larger diameter nozzles may result in lower nozzle pressure.

2.3 Pneumatic Control Hose and Blast Hose Connections. Refer to Section 2.4 for electric controls.

⚠ WARNING

Carefully trace, connect, and mark, control lines and blast hoses on multiple-outlet blast machines. Inadvertent switching of control lines or blast hoses between operator stations will cause actuation of a blast line not intended for use. Unintentional actuation of a blast hose may lead to injury and property damage. Instructions in Sections 2.3.1 through 2.3.5 must be followed to safeguard against hose switching. Always install color coded hose identification marking kits, Stock no. 15890, two outlet kit, or Stock no. 15891, four outlet kit. Always recode hoses when replacing blast hose or control hoses.

2.3.1 Pneumatic Control Connections, Figure 4. Refer to Sections 2.4 for electric controls.

2.3.1.1 Control hoses on the blast machine are factory installed. Use the illustration in Figure 4 to check each station's hose connections. Check one station at a time, working from left to right to make sure no control lines are switched between one station and another.

- Hose No. 1 attaches to the orifice fitting and is strapped to the piping at the quick coupling.
- Hose No. 2 connects between the air valve and the inward fitting on the safety petcock.
- Hose No. 3 attaches to the metering valve and is strapped to the piping at the quick coupling.

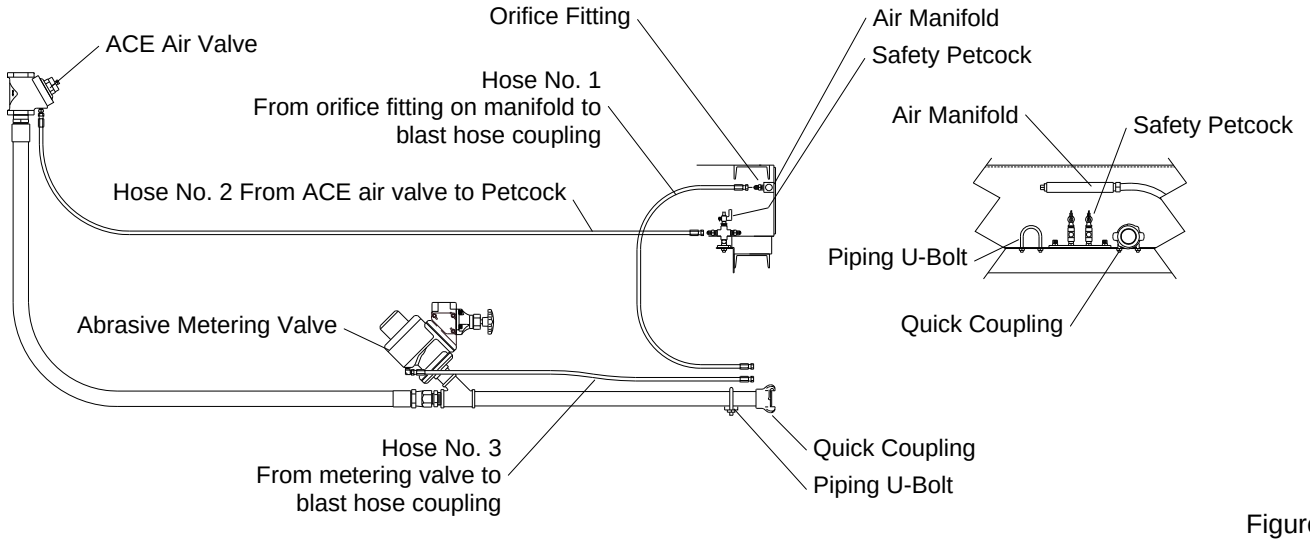


Figure 4

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

2.3.2 Installing Pneumatic Controls to Blast Hose Refer to Figure 5.

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

⚠ WARNING

To reduce the chance of hose switching, blast hose and control hoses should be of equal length and banded together as close to the couplings as possible.

2.3.2.2 Band the control handle to the blast hose close to the nozzle holder as shown in Figure 5. Use the two nylon ties provided or similar means to secure the control handle to the hose. Once the control is firmly attached, clip the tie ends so they do not snag the operator's clothing or interfere with the operation of the control handle.

2.3.2.3 Attach the 50-ft. twinline hose to the two fittings on the back of the control handle as shown in Figure 6. Either side of the hose can be attached to either fitting.

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

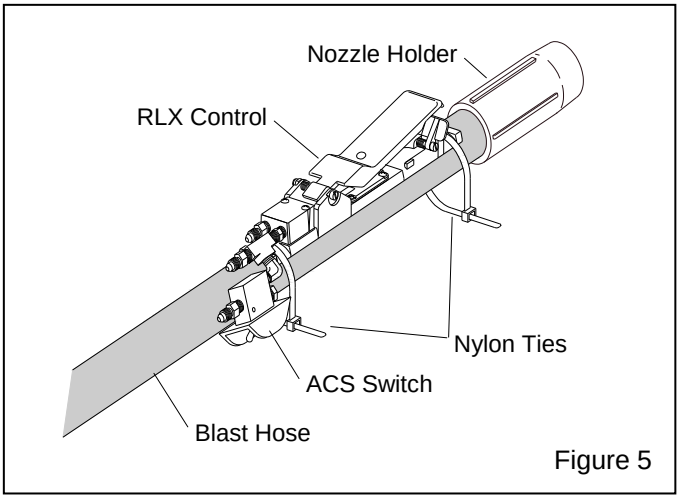


Figure 5

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

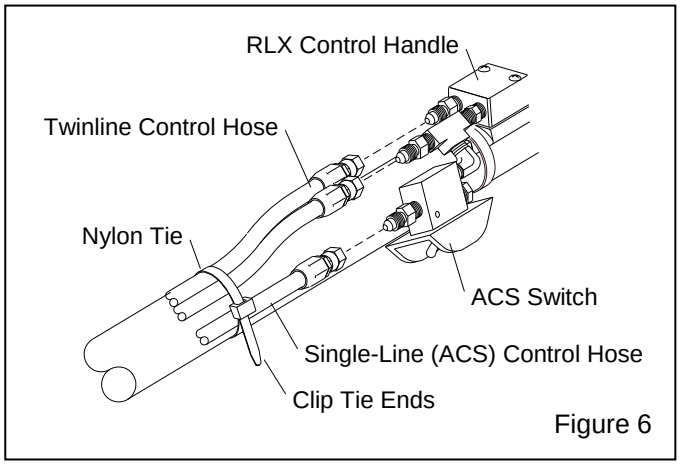


Figure 6

2.3.2.6 Working from the control handle back, band the twinline and single-line hoses to the blast hose every four to six feet, as shown in Figure 6, and as close to the couplings as possible.

2.3.3 INSTALL BLAST HOSE and CONTROL HOSE to BLAST MACHINE, Refer to Figure 7

2.3.3.1 Working from left to right, connect the blast hose assembly to the first blast machine quick coupling. This is operator station #1.

2.3.3.2 Connect two hose unions to the fittings on the control hoses strapped to the piping behind the quick coupling. Refer to Figure 7.

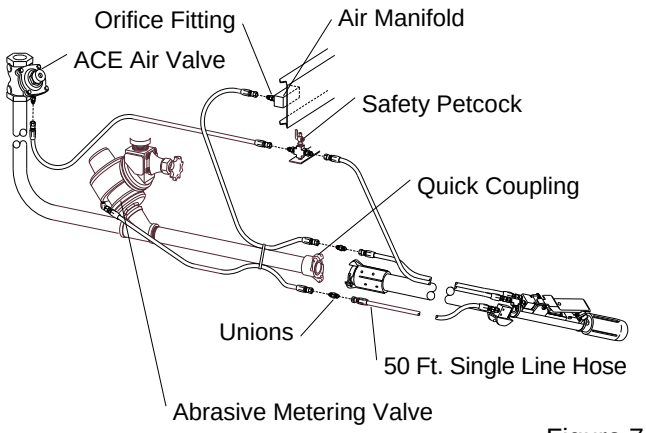


Figure 7

2.3.3.3 Attach the 50-ft. single-line control hose to the hose leading to the abrasive metering valve.

2.3.3.4 Attach one side (either side) of the 50-ft. twinline hose, to the hose leading to the orifice fitting on the air manifold. Note: Control hoses come with reusable hose ends. Excess hose may be cut-to-fit, and recoupled, refer to Section 7.5.

2.3.3.5 Attach the remaining side of the 50-ft. twinline to the outward fitting on the safety petcock, as shown in Figure 7.

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

2.3.4 Color-Coding Pneumatic Operator Stations, Refer to Figure 8

2.3.4.1 The following instructions explain the method of color-coding each operator station and blast hose assembly connected to the station. Using a different colored strap, duplicate the connections for all operator stations. Controls for each operator station must be kept separate. Complete one operator station before starting another. Read the instructions packaged with the hose identification kit before making the connections.

2.3.4.2 Two to four operator stations can be installed on most Big Clems. The blast hose and the control hoses on each station must be color-coded into operating sets. Use the colored straps provided in the hose identification kit to color-code each set.

2.3.4.3 The hose identification kit contains sets of colored straps. Use straps of the same color to color-code the blast hose and control hoses for each operator station. Use red and blue with two operator stations, use green and yellow for operator stations three and four. The letters correspond to the letters shown in parentheses in Figure 8.

1. Working with a single color, attach three large straps as follows:

   a. Band the blast hose directly behind the nozzle holder.

   b. Band the control hoses and blast hose together as close as practical to the blast hose coupling connecting the hose to the Big Clem.

   c. Band the interconnecting control hoses to the piping just behind the quick coupling.

2. Working with the same color as above, attach six small straps to the control hose as follows:

   d. Attach straps behind the fittings on both legs of the twinline and single-line hoses on the blast machine end of the blast hose assembly.

   e. Attach straps in the same manner to the two control hoses strapped to the blast machine piping.

   f. Attach a strap to the petcock/cross assembly.

2.3.5 Extension Hose Installation.

2.3.5.1 One additional hose identification kit is required for each additional length of blast hose. Attach as follows.

1. Attach one large strap to each end of the blast hose assembly banding the blast hose and control hose together as close to the couplings as possible. Make sure matching colors are used.
2. Attach small straps to the twinline and single-line control hose behind each hose fitting.

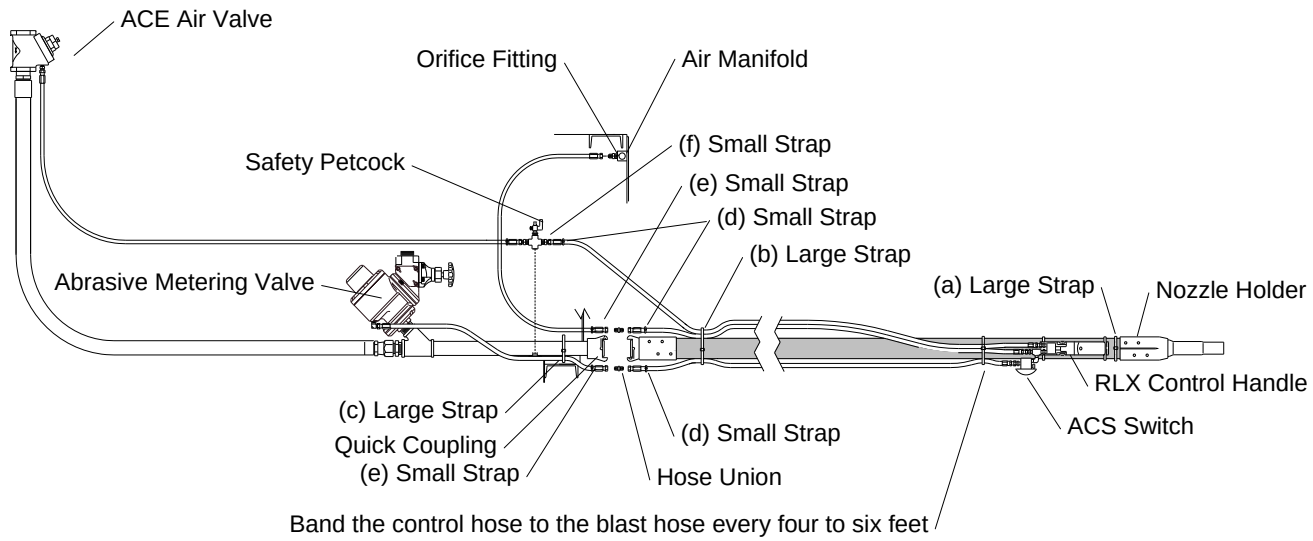


Figure 8

2.4 Electric Control Cord and Blast Hose Connections. Refer to Section 2.3 for pneumatic controls.

⚠ WARNING

Carefully trace, connect, and mark, control cord, control lines and blast hose on multiple-outlet blast machines. Inadvertent switching of control cords, control lines or blast hoses between operator stations will cause actuation of a blast line not intended for use. Unintentional actuation of a blast hose may lead to injury and property damage. Instructions in Sections 2.4.1 through 2.4.5 must be followed to safeguard against hose switching. Always install color coded hose identification marking kits, Stock No. 15890, two outlet kit, or Stock No. 15891, four outlet kit. Always recode when replacing blast hose or control cords.

⚠ WARNING

Dual-operator control panels are used with Big Clem blast machines. Three and four outlet machines are furnished with two control panels. All connections must be made at least twice, once for each operator station. Controls must be kept separate; inadvertent switching of connections between/among operator stations will cause actuation of a blast line not intended for use.

2.4.1 Electric Control Connections, Figure 9.

2.4.1.1 Some control hoses are factory installed and in other instances the control panels are packaged in a separate carton. Install the control panel(s) and use the illustration in Figure 9 to check each station's hose connection. Check one station at a time, working from left to right to make sure no control lines are crossed between one station and another.

- Hose No. 1 connects between the air manifold and the air filter located on the control panel cover.
- Hose No. 2 connects between the air valve and the fitting on the bottom of the control panel marked "Air Valve #1".
- Hose No. 3 connects between the metering valve and the fitting on the bottom of the control panel marked "Grit Valve #1".

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

2.4.2 Installing Electric Controls to Blast Hose. Refer to Figure 10.

⚠ WARNING

To reduce the chance of hose switching, blast hose and control cord should be of equal length and banded together as close to the couplings as possible.

2.4.2.1 Uncoil a coupled length of 50-ft. blast hose, and lay the 50-ft. control cord alongside it. 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.

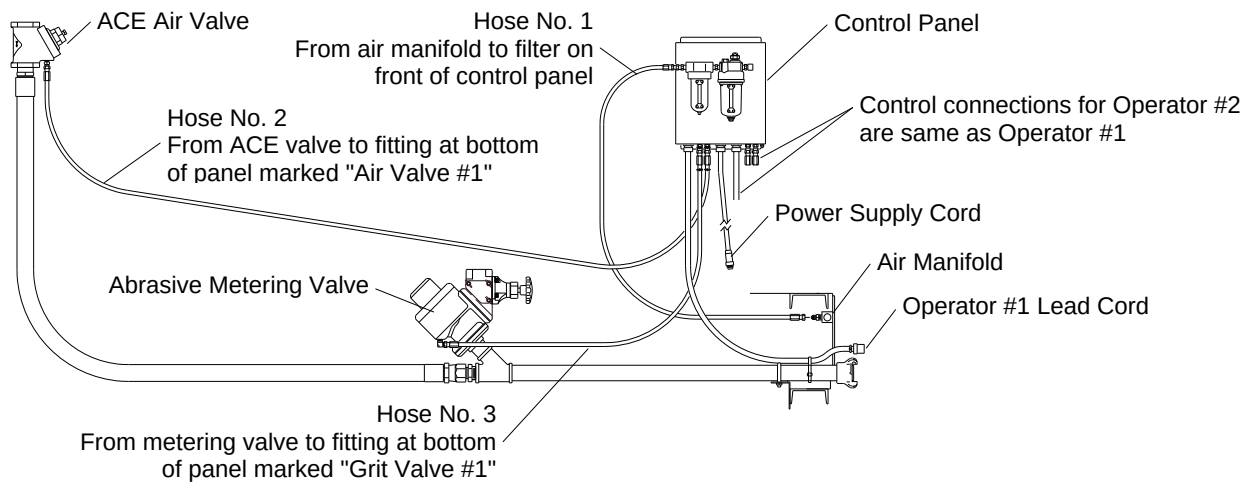


Figure 9

⚠ WARNING

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

2.4.2.2 Band the electric 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.

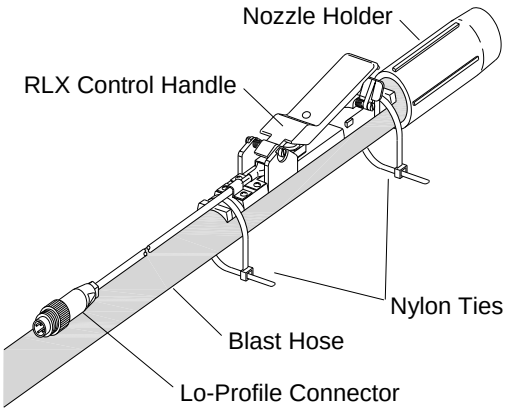


Figure 10

2.4.2.3 Wrap the whip cord from the electric control handle once loosely around the blast hose as shown in Figure 11, and then connect it to the control cord. Wrapping the cord provides slack; if the cord is not wrapped and securely banded as described, excessive strain will cause the wires to pull out of the connectors or electric switch when the hose is bent or pulled.

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. Securely band the cord to the blast hose on both sides of all connections.

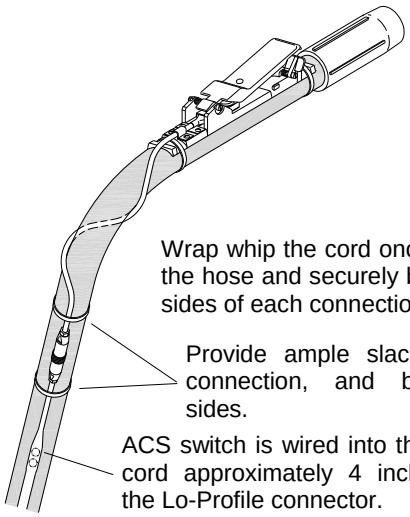


Figure 11

2.4.2.4 Band the cord to the hose on both sides of the cord connections as shown in Figure 11.

2.4.2.5 Working from the control handle back, band the cord to the blast hose every 4 to 6 feet. Also, band the cord on both sides of each electrical connection.

2.4.3 Install Blast Hose and Control Cord to Blast Machine. Refer to Figure 12

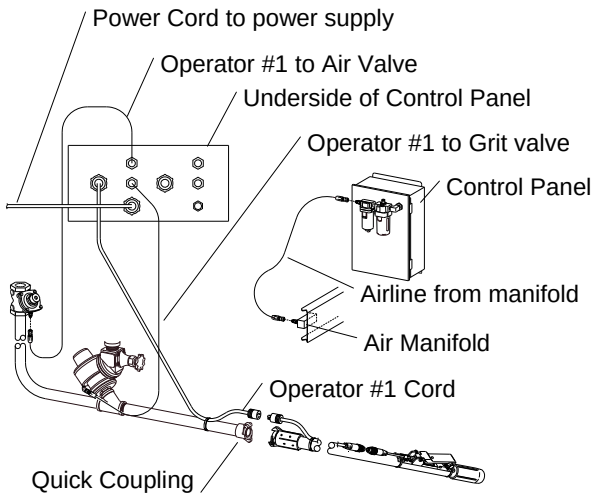


Figure 12

2.4.3.1 Connect the air supply hose between the air manifold on the blast machine frame to the filter on the control panel cover.

2.4.3.2 Working from left to right, connect the blast hose assembly to the first blast machine quick coupling. This is operator station #1.

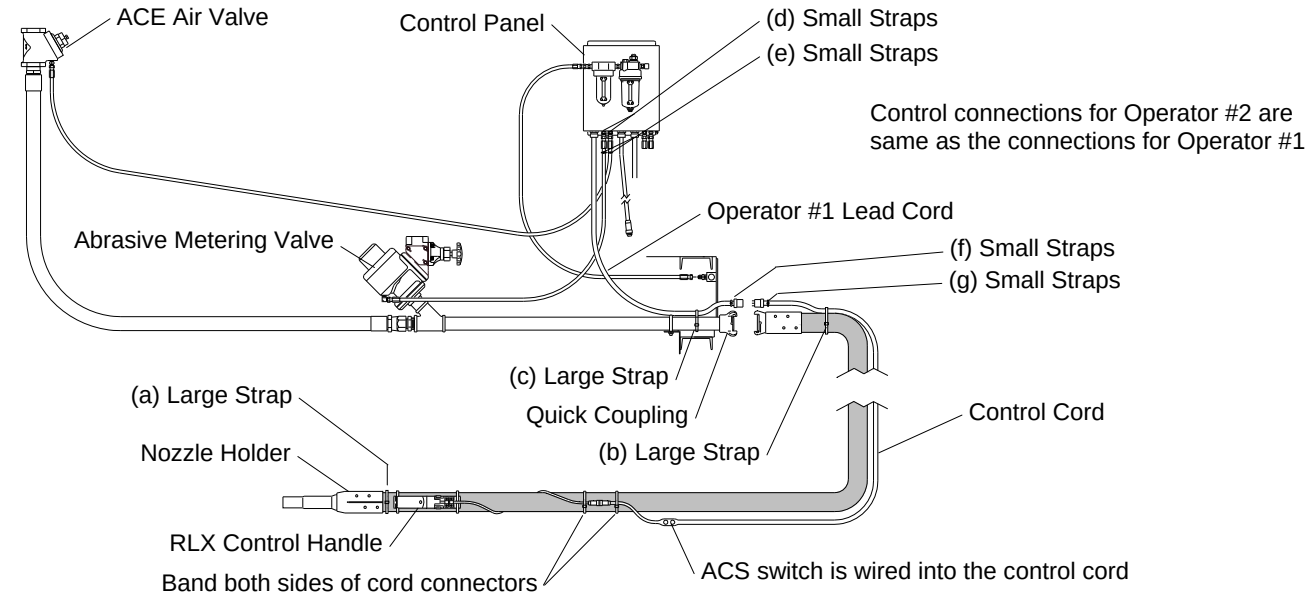
2.4.3.3 Band the control panel cord marked "Operator # 1" to the piping just behind the quick coupling for the blast hose.

2.4.4 Color-Coding Electric Operator Stations, Figure 13

2.4.4.1 The following instructions explain the method of color-coding each operator station and blast hose assembly connected to the station. Using a different colored strap, duplicate the connections for all operator stations. Controls for each operator must be kept separate. Complete one operator station before starting another. Read the instruction in the hose identification kit before making the connections.

2.4.4.2 Two to four operator stations can be installed on most Big Clems. The blast hose and the control hoses and cords on each station must be color-coded into operating sets. Use the colored straps provided in the hose identification kit to color-code each set.

2.4.4.3 The hose identification kit contains sets of colored straps. Use straps of the same color to color-code the blast hose, control hoses and cords for each operator station. Use red and blue with two operator stations, use green and yellow for operator stations three and four. The letters corresponds to the letters shown in parenthesis in Figure 13.



Band the control cord to the blast hose every four to six feet

Figure 13

1. Working with a single color, attach three large straps as follows:

   a. Band the blast hose directly behind the nozzle holder.

   b. Band the control cord and blast hose together as close as practical to the blast hose coupling connecting the hose to the Big Clem.

   c. Band the lead cord (Operator #1 on the bottom of the control panel) to the blast machine piping just behind the quick coupling.

2. Working with the same color, attach six small straps to the control panel and control hose as follows:

   d. Attach a strap to the two fittings on the bottom of the panel marked "Air Valve #1" and "Grit Valve #1".

   e. Attach a strap to each control hose connected to the fittings marked "Air Valve #1" and "Grit Valve #1".

   f. Attach a strap to the lead cord for "Operator #1" just behind the connector (the cord should be strapped to the blast machine piping).

   g. Attach a strap to the 50-ft. control cord directly behind the connector on the blast machine end of the blast hose assembly.

2.4.5 Extension Hose Installation.

2.4.5.1 One additional hose identification kit is required for each additional length of blast hose. Attach as follows.

1. Attach one large strap to each end of the blast hose assembly banding the blast hose and control cord together as close to the couplings as possible. Make sure matching colors are used.
2. Attach small straps to the control cord, behind each connector.

3.0 TOWING

3.1 Prepare for Towing

3.1.1 Refer to all alerts and information in Section 2.1 regarding towing.

3.1.2 Depressurize the abrasive chamber by closing the air inlet valve and opening the exhaust (vent) valve.

3.1.3 Close the compressor's air-supply valve. Bleed the air line by draining the water separator tank. Shut-down the compressor and disconnect the air hose.

3.1.4 Disconnect blast hoses and control lines. Coil and store them in the tow vehicle. Hoses may be coiled and hung on the hose racks while moving the machine that remains within a yard, when hoses are adequately secured. NOTE: Do not hang hose on hose racks for long periods. When the machine is in storage, hose should be coiled and laid flat.

⚠ WARNING

Hoses must be stored and secured in the towing vehicle when transporting the machine on public roads.

3.1.5 Hitch the trailer to the tow vehicle. A tongue jack is provided to adjust hitch height.

⚠ WARNING

The tongue jack is for making minor adjustments in hitch height while hitching and unhitching the Big Clem trailer from tow vehicle. Do not use the jack to raise the trailer for any type of mechanical service. The jack may collapse under the weight of the trailer and severely injure anyone working under it.

3.1.6 Make sure the emergency braking battery is fully charged.

⚠ WARNING

The battery operates the emergency braking system. It must carry a full charge at all times. A weak battery will not engage the electric brakes, intended to stop the unit if it should separate from the tow vehicle.

3.1.7 Remove blocks or jack stands.

3.1.8 Raise the jack and swing it to horizontal position.

3.1.9 Connect the safety chain to the tow vehicle.

3.1.10 Attach the breakaway switch chain directly to the tow vehicle frame, not to the hitch. The chain must be attached so if the trailer separates from the tow vehicle, it will pull out the breakaway switch, before the safety chain becomes taut.

3.1.11 Connect the electrical plug on the trailer to the socket on the tow vehicle.

3.1.12 Check operation of all lights and brakes.

3.1.13 Compare tire pressure with the rating on the tires.

3.1.14 Remove wheel chocks from around wheels.

3.1.15 Observe maximum tow speed of 45 miles per hour.

⚠ WARNING

Do not tow yard models on public roads. Yard trailers do not have brakes, fenders or lights that are required on public roads.

3.2 Disconnect Big Clem from Tow Vehicle

3.2.1 Place the machine as close to the blast site as possible.

3.2.2 Set wheel chocks on both sides of the trailer.

3.2.3 Use the tongue jack to raise hitch height to clear the tow vehicle.

⚠ WARNING

The tongue jack is for making minor adjustments in hitch height while hitching and unhitching the Big Clem trailer from tow vehicle. Do not use the jack to raise the trailer for any type of mechanical service. The jack may collapse under the weight of the trailer and severely injure anyone working under it.

3.2.4 Disconnect the safety chain from the tow vehicle.

3.2.5 Disconnect the breakaway chain from the tow vehicle.

3.2.6 Disconnect hitch, and remove tow vehicle.

3.2.7 Place blocks or jack stands under the tongue, and raise the jack.

4.0 SET-UP AND OPERATION

4.1 Set-up

4.1.1 Load abrasive per Section 4.8. **NOTE: Do not load abrasive until the initial test described in Section 4.3 is completed.** If abrasive is loaded on-site, loading may be done at any convenient time after the initial tests have been completed.

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

4.1.3 Connect an air line(s) from the compressor's air-supply valve to the air inlet. Refer to Section 2.2.

4.1.4 Make sure that all compressed-air supply hose connections are secured with safety lock-pins and safety cables to prevent accidental separation or disconnection. Safety cables are listed in Section 9.1 of this manual.

4.1.5 Make sure the coupling gaskets are in place (and in good condition) before connecting the color-coded blast hose and control hoses to the quick coupling and connections with the corresponding color. When connecting hose with nylon couplings, make sure the coupling spring lock-pins are at 180 degrees (pins should enter the hole of the adjoining coupling). The spring lock-pins prevent accidental separation of hose couplings during blasting.

⚠ WARNING

To help prevent hose couplings from disconnecting while under pressure, use safety lock-pins and safety cables on all blast hose coupling connection. Lock-pins and safety cables are listed under replacement parts in Section 9.1.

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

4.1.7 If using electric remote controls, connect the control box to an appropriate power supply. The 120 VAC model (usually used on stationary Big Clems) plugs into a standard NEMA 15 amp, three-wire twist-lock receptacle. The 12 VDC model has a separate cord with ring terminals to hook up to a compressor at the battery, or relay. On highway towable units, the on-board battery that operates the emergency braking system is used as the power source, and is shop wired if the electric remote controls are factory installed.

4.2 Start-up

4.2.1 On the initial start-up, close the abrasive metering valve.

4.2.2 Make sure that the safety petcocks, located on the frame and metering valve on pneumatic controls

(metering valve and air valve on electric controls), are open. The petcocks are open when the petcock lever is in line with the petcock, as shown in Figure 14.

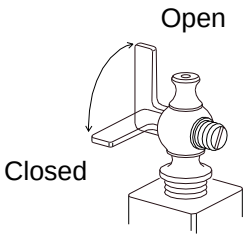


Figure 14

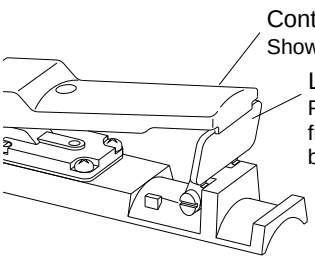
⚠ WARNING

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

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

⚠ WARNING

A separate manual is supplied with the remote control handle. Do not operate the machine before first reading the remote control handle owner's manual.



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

Figure 15

4.2.4 Make sure the handle lever will not seal the opening on the control handle, unless the safety lever lock is folded 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.

4.2.5 Make sure all hose and electrical connections are secure.

4.2.6 Make sure all quick coupling have safety lock-pins in place. Also, use lock-pins and safety cables when connecting blast hoses together.

4.2.7 Make sure the choke valve, and abrasive flow shutoff valve located above the metering valve are open. Open is when the position of the handle is in line with the valve.

4.2.8 Make sure the pressurization valve is closed. Refer to Figure 16.

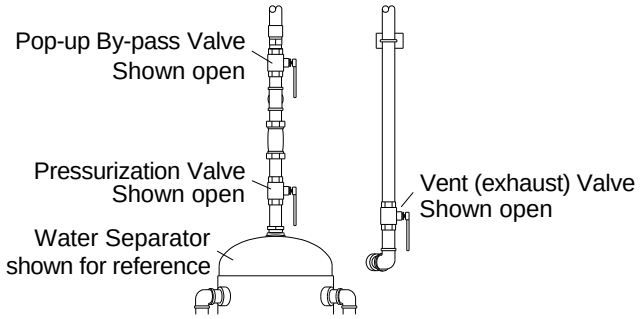


Figure 16

4.2.9 Start the compressor and bring it to operating temperature and pressure. Pressure at the machine must be more than 80 pounds per square inch (psi) but MUST NOT exceed the pressure rating of the water separator and blast machine abrasive chamber.

4.2.10 Open the compressed-air supply-valve to the blast machine. The air-supply line, water separator tank, and remote circuit will pressurize. Listen for any open lines or leaks.

4.2.11 Close the vent (exhaust) valve, and open the pressurization valve. The abrasive chamber will pressurize. **NOTE: If the pop-up valve does not seal, close the pop-up by-pass valve and reopen it as soon as the pop-up seats.**

4.2.12 Close the safety petcocks on the stations that are to be used. Doing so prepares the machine for remote operation, and activation from the control handle. **DO NOT CLOSE THE SAFETY PETCOCKS ON STATIONS THAT ARE NOT TO BE USED**. Air should be heard escaping from the orifice under the control handle levers but nowhere else. **NOTE: Air does not bleed from electric control handles.**

4.3 Initial Test

4.3.1 Check operation of the machine, each operator station, and control systems with air only (no abrasive) prior to blasting. Read this entire manual before performing the test.

- Make sure that each control handle operates the station it is meant to control.
- Make sure that blasting starts when the control handle is pressed and stops when it is released.
- Make sure the operator stations will not operate with the safety petcocks open.
- Check fittings, hoses, and piping for leaks.

4.4 Blasting Attire

⚠ WARNING

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

No dust is safe to breathe. 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.

4.4.1 Operators and anyone else 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.

4.4.2 Don protective blasting attire outside the blast area, in a clean non-hazardous environment, free of contaminants, where the air is safe to breathe.

4.5 Start Blasting

4.5.1 Don all protective blasting attire per Section 4.4.

4.5.2 Make sure the toggle on the ACS switch is pointing away from the nozzle (pneumatic system), or that the ON pushbutton (farthest from the nozzle) is pressed on electric systems. See Operation of ACS in Section 4.6.

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

4.5.4 Fold down the safety lever lock and press the remote control handle as shown in Figure 17. Be prepared for blasting to start within a few seconds.

⚠ WARNING

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

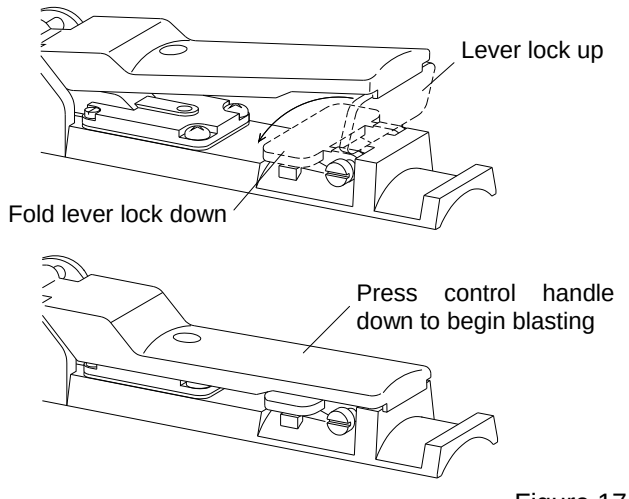


Figure 17

⚠ WARNING

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

4.5.5 Adjust abrasive flow per Section 5.1.

4.6 Operation of Abrasive Cut-Off Switch (ACS)

⚠ 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 abrasive off a blasted surface, NOT as a general area clean-up tool.

4.6.1 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 vertically, to prevent abrasive from collecting in low spots in the blast hose, eliminating excessive abrasive slugging at startup.
2. Blowing abrasive off the blasted surface. NOTE: Small amounts of residual abrasive may exit the nozzle with the air, requiring additional blowing off or otherwise cleaning the surface outside the blasting area prior to painting.

4.6.2 Pneumatic Controls: The abrasive cut-off switch is mounted on the control handle. The switch may be flipped ON or OFF at any time, but will not operate the metering valve unless the control handle is pressed.

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

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

4.6.3 Electric Control: The ACS switch is wired into the control cord approximately 8″ to 10″ from the connector for the control handle. The switch may be pressed ON or OFF at any, but will not operate the metering valve unless the control handle is pressed.

4.6.3.1 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.

4.6.3.2 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.

4.7 Stop Blasting

4.7.1 Before releasing the control handle, the operator may use the ACS to shut off the abrasive flow to clear abrasive from the blast hose, or blow-down the work piece. See Section 4.6.

4.7.2 To stop blasting release the control handle lever. Blasting stops when the control handle is released, regardless of the position of the ACS. Blasting can also be stopped at the machine, by opening the safety petcocks on the corresponding station.

4.7.3 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.

4.7.4 Always open safety petcocks during work breaks and at the end of the work day to prevent unintentional blasting.

4.7.5 It is not necessary to depressurize the machine between stopping and starting blasting. The metering valve and air valve will close when the control handle lever is released. Depressurize the abrasive chamber during work breaks to prevent accidental activation.

4.8 Load 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 NIOSH recommends, do not use abrasives containing more than trace amounts (more than one percent) free silica.

4.8.1 Depressurize the abrasive chamber by closing the pressurization valve and opening the vent valve. The pop-up valve automatically drops when air is expelled from the chamber and pressure equalizes.

4.8.2 If the machine must be towed to an abrasive loading site, prepare the machine for towing per Section 3.1.

4.8.3 Swing the pop-up cover clear of the opening so loading may begin through the filling port.

⚠ WARNING

Never place any object or limb between the pop-up valve and o-ring seat. Injury or damage may occur when the pop-up valve comes up under force against the seat.

4.8.4 The chamber is full when abrasive reaches the rubber on the pop-up valve. All Big Clems may be loaded to full capacity with dry abrasive with a relative density of 100 lbs. per cu ft. or less. Never load portable Big Clems to full capacity with steel grit or other metallic abrasive. Typical relative density of these abrasives is 250 lbs. per cubic ft.

⚠ WARNING

Do not load towable machines in excess of the gross vehicle weight. Refer to Section 2.1.3 for the gross vehicle weight of each model. Loads heavier than the g.v.w. limit will cause unsafe conditions, affecting brakes, cause damage to the trailer, suspension or tires, which could result in serious injury or death.

4.9 Emptying the Abrasive Chamber

4.9.1 When working in environments subject to extreme temperature changes, or very humid conditions, condensation may develop inside the abrasive chamber. Condensation dampens abrasive and causes flow problems. To prevent abrasive flow problems, empty the chamber of all abrasive when shutting down for the day. Doing so 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 chamber must be purged of abrasive, do the following.

NOTE: To empty as much abrasive as possible repeat the following process for each operator station.

4.9.2 With the blast machine OFF, close the choke valve and set the abrasive metering valve at full open.

4.9.3 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 eventually erode the thread area of the nozzle holder causing a hazardous condition when the nozzle is reinstalled.

⚠ WARNING

The threads on the nozzle and nozzle holder must be inspected each time the nozzle is secured to the holder. Check the threads for wear, and make sure the nozzle holder securely grips the nozzle. The nozzle washer must also be inspected for wear. Worn nozzle washers could cause nozzle thread erosion.

4.9.4 Using normal start-up procedures, except with the choke valve closed, pressurize the blast machine.

4.9.5 Point the nozzle into a drum or suitable storage or disposal container or in the directional the abrasive is to be disposed.

4.9.6 Hold the hose securely and press the control handle. Be prepared for severe surging and recoil of the hose.

4.9.7 When the chamber is empty, release the control handle lever, open the safety petcocks, open the choke valve, and depressurize the machine.

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

4.10 Shut Down

4.10.1 Empty the abrasive chamber of abrasive per Section 4.9 when shutting down for the day. Doing so will eliminate trouble from moist abrasive when starting a new day's blasting.

4.10.2 Open all safety petcocks.

4.10.3 Depressurize the chamber by closing the inlet valve and opening the vent valve. The pop-up valve automatically drops when air is expelled from the chamber and pressure equalizes.

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

4.10.5 Bleed the air-supply hose by opening the drain valve on the water separator tank to drain accumulated water, and then open the pressurization valve.

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

4.10.7 Shut down the compressor.

4.10.8 At the end of the shift, secure the rain cover over the pop-up valve opening. The cover will help keep moisture out of the abrasive chamber. Cover the chamber top with a tarp during rainy periods, and during storage.

5.0 ADJUSTMENTS

5.1 Abrasive Metering

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

5.2 Anti-Freeze Injector (Standard with electric controls only)

NOTE: It is not necessary to use the injector unless temperatures fall below freezing. Close the injector when it is not required. Fill the injector with automotive-type antifreeze (ethylene glycol or methyl alcohol). **Do not use air system antifreeze, as it may damage the plastic sight dome.**

5.2.1 Turn adjusting knob fully clockwise to close.

5.2.2 Turn the adjusting knob counterclockwise to start the flow. Observe the antifreeze flow through the drip rate sight glass. All the antifreeze seen in the glass enters into the air stream. Flow rate depends on air flow, temperature range, and relative humidity in which the unit is operated. Keep in mind that air flow to the pneumatic portion of the system is very low. Trial and error will be necessary to determine the minimum antifreeze delivery to prevent the remote control system from freezing. Anti-freeze dripping from the exhaust port on the panel is an indication that the flow rate should be decreased.

5.2.3 Increase the antifreeze delivery by rotating the adjustment knob counterclockwise. To decrease the delivery rate, rotate the knob clockwise.

5.2.4 A separate manual is supplied for the operation of the antifreeze injector.

6.0 PREVENTIVE MAINTENANCE

NOTE: The following preventive maintenance instructions pertain to the blast machine. Refer to owner's manuals listed in paragraph 1.1.1 for maintenance of those components.

6.1 Daily Inspection

6.1.1 With the air OFF, before blasting, do the following:

- For units equipped with an onboard battery, check the battery charge. **The battery operates the emergency braking system. It must carry a full charge at all times.**
- Check to make sure that couplings are secure and lock pins and safety cables are in place.
    - Inspect the RLX control handle for the following:
        - The lever must not seal the opening on the control handle unless the **safety lever lock** is intentionally folded 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 could result from unintentional blasting.

6.1.2 During blasting, do the following:

- 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 repair or replace worn parts.

⚠ 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 don't 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.

- Each time the machine is shut down, open the drain cock on the bottom of the water separator tank. If no air escapes when the drain cock is opened, the drain cock may be plugged, and should be cleaned.

6.2 Weekly Inspection

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

- Inspect the blast hose for wear; squeeze the hose every three to four feet, looking 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. Install a new nozzle if the orifice diameter is worn 1/16″ or more, or if the liner is cracked.
- Make sure the nozzle washer is not worn and is in place.

⚠ 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 remote control circuit air filter (shown in Figure 2) weekly. Replace dirty filter elements.

6.3 Monthly Inspection

6.3.1 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. Refer to Section 7.3.
- Inspect the rubber pop-up seal, and replace at the first sign of wear, drying, or cracking. See Section 7.4.

6.4 Periodic Inspection

6.4.1 The remote control system is a safety device. For safety and to avoid unscheduled down-time, periodically inspect the internal parts of the air and metering valves. Inspect for wear and lubrication of o-rings, pistons, springs, seals, and castings. Refer to Quantum and ACE valve owner's manuals for service instructions.

6.4.2 The control handle is the actuator of the remote control system. Periodically clean around the springs, handle lever, and safety lever lock to ensure that the unit is free of abrasive and debris that may cause the handle lever or safety lever lock to bind. Refer to the RLX owner's manual for service instructions.

7.0 SERVICE MAINTENANCE

NOTE: Separate manuals are provided for the ACE air valve, abrasive metering valve, and RLX control handle. Refer to the manuals for service of those components.

⚠ WARNING

To avoid serious injury from the sudden release of compressed air, observe the following before performing any maintenance.

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

7.1 Removing Minor Blockage Caused by Damp Abrasive.

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

7.1.2 For blockages that are more difficult, proceed as follows: Refer to the abrasive metering valve manual to check for obstructions in the metering valve.

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

7.1.2.2 Position 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.

7.1.2.3 Close the choke valve and fully open the abrasive metering valve. Pressurize the machine.

7.1.2.4 Press the control handle for the corresponding station to force out damp abrasive.

7.1.2.5 When the obstruction has been removed, depressurize the machine. Remove the nozzle and nozzle washer, and reattach the hose. Open the choke valve and close the abrasive metering valve. Press the control handle to activate the station and to clear the hose. When the hose is cleared, release the handle 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.

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

7.2 Removing Damp Abrasive from Abrasive Chamber

NOTE: If moisture in compressed air is the cause of damp abrasive, an after cooler or air dryer may be required.

7.2.1 To empty the abrasive chamber, follow the instructions in Section 4.9.

7.3 Pop-up Valve Replacement, Refer to Figure 18

7.3.1 Empty abrasive from the abrasive chamber to a level below the manway per Section 4.9.

7.3.2 To gain access to the pop-up valve, remove the manway door assembly.

7.3.3 Loosen the u-bolt enough to turn the pop-up guide.

7.3.4 Use a pipe wrench to unscrew the pop-up guide by turning it counterclockwise and to remove it from the elbow. Remove the pop-up valve from the guide, and remove the pop-up from the chamber.

7.3.5 Slide the new pop-up valve over the guide, and then screw the guide (with the pop-up valve on it) into

position. Tighten the guide wrench-snug, but not wrench-tight. Over-tightening the guide will make it difficult to remove the next time the pop-up valve needs replacement.

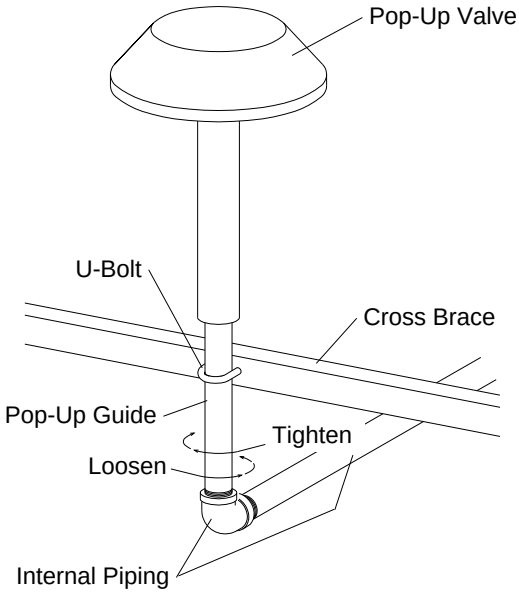


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Figure 18

7.3.6 Check alignment; the pop-up valve should be centered in the opening.

7.3.7 Check the pop-up seat (rubber ring). Replace if worn.

7.3.8 Tighten the u-bolt to secure the guide.

7.3.9 Put a new gasket on the manway door assembly before bolting the door back onto the machine.

7.4 Replacing Pop-up Seat (Rubber Ring)

7.4.1 Remove the old ring by using fingers, screwdriver, or similar object to work the ring out of the retainer groove.

7.4.2 Push the new rubber ring all the way through the port and then fit it into the retainer groove. For the last few inches, pull up on the rubber ring to "pop" it into position.

7.5 Remove and Install Reusable Control Hose Ends

NOTE: Control hoses may be shortened and cut to length as follows, ref. Figure 19:

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 tighten as soon as the hose bottoms 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.

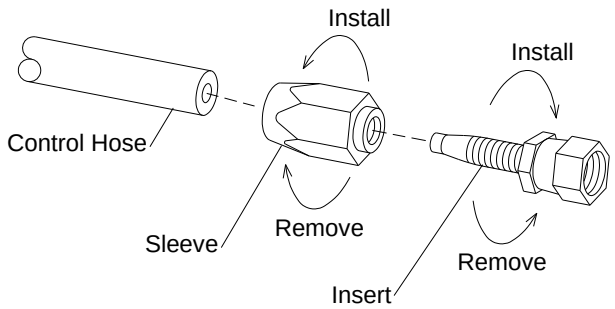

Figure 19

8.0 TROUBLESHOOTING

NOTE: This section only identifies conditions and problems in the blast machine and remote control system. Always refer to the appropriate section of this manual, or manuals listed in Section 1.1.1 for accessory equipment, before servicing the equipment.

⚠ WARNING

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

- **Turn OFF the air, and lockout and tagout the air supply.**
- **When checking the controls requires air, always enlist the aid of another person to operate the control handle, hold the nozzle securely and point it in a safe direction.**
- **Never strap the remote control handle lever down in the operating position.**

8.1 Pop-up valve will not seal

8.1.1 Close the pop-up by-pass valve to force all incoming air into the pop-up piping. Open the by-pass valve as soon as pop-up seals.

8.1.2 Check air-supply line; undersized air hose will restrict air to pop-up valve.

8.2 Irregular abrasive flow

8.2.1 Check the metering valve and air valve for air leaks. These are normally-closed valves. Any leak could cause the valves to close or partially close.

8.2.2 Damp abrasive; to clear minor blockage close and opening the choke valve several times.

8.2.3 Check control line pressure. Pressure below 80 psi will cause the metering valve to begin to close. Pressure fluctuations will cause the metering valve to partially close and reopen.

8.3 Troubleshooting Pneumatic Remote Controls. Refer to Section 8.4 for Electric Controls.

8.3.1 Blasting does not start when the control handle lever is pressed

8.3.1.1 Make sure the blast machine is pressurized.

8.3.1.2 Make sure the corresponding safety petcock is closed.

8.3.1.3 With the control handle pressed, check for air leaks in the handle, and in all the control lines and fittings. There should be no air leaks any place after the control handle is pressed. Any air leak is a sign of a problem and must be corrected.

8.3.1.4 Check for air escaping from the opening under the control handle. If no air is escaping, the orifice fitting or the line from the orifice to the handle is plugged.

8.3.1.5 Open the corresponding safety petcock, and press the control handle lever. Air should come out the petcock. If it does not, the opening under the lever is not being sealed, or the line between the handle and the petcock is blocked.

8.3.2 Air and/or abrasive continues to leak from the nozzle after the control handle lever is released

8.3.2.1 Close the choke valve. If the leak stops, the ACE air valve requires service, or there is blockage in the control line between the air valve and control handle. If the leak continues, the abrasive metering valve requires service, or there is blockage in the control line between the metering valve and control handle.

8.3.3 Heavy abrasive flow

8.3.3.1 Check to make sure the choke valve is open.

8.3.3.2 Inspect the metering valve for wear. Refer to the metering valve owner's manual for service instructions.

8.3.3.3 Check the diaphragm in the ACE air valve for damage.

8.3.4 Air flow only, no abrasive

8.3.4.1 Make sure the ACS is in the ON position (toggle pointing away from nozzle) Refer to Section 4.6.1.

8.3.4.2 Make sure the petcock on the metering valve is fully closed.

8.3.4.3 Check for a leak or blockage in the hose and fittings from the control handle to the metering valve.

8.3.4.4 Make sure the metering valve is not closed. Refer to the abrasive metering valve manual.

8.3.4.5 Make sure the machine contains abrasive.

8.3.4.6 Obstruction in the abrasive metering valve, refer to Section 7.1.

8.3.4.7 The metering valve may require service. Refer to the metering valve owner's manual.

8.3.5 Abrasive flow does not stop after the control handle lever is released

8.3.5.1 The control air may not be exhausting from the metering valve or control handle. Refer to the control handle manual.

8.3.5.2 Inspect the metering valve seat for wear. Refer to the metering valve owner's manual.

8.4 Troubleshooting Electric Remote Controls, Refer to Section 8.3 for Pneumatic Controls.

8.4.1 Blasting does not start when control handle lever is pressed

NOTE: The easiest way to check a dual system is to substitute one control cord and handle with another to determine if the problem is in the controls or the panel.

8.4.1.1 Make sure the blast machine is pressurized.

8.4.1.2 Make sure the safety petcocks on the air and metering valves are closed.

8.4.1.3 Listen to the control panel to determine if it clicks when the control handle is pressed and released. If it does, the fault may not be electrical, go to Section 8.3 for pneumatic checks.

8.4.1.4 Check for fault in the control panel by removing the 50-ft. control cord from the 5 ft. lead cord coming from the panel. Hold the lead cord socket so the angled slot is facing up, as shown in Figure 20. The slot to the left (counter-clockwise of the angled slot) is the hot line, which carries the power from the panel to the RLX. Jump between the hot line and the angled slot (metering valve solenoid), and listen for a 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 Section 8.4.1.5 and 8.4.1.6. If one solenoid does not click, it is most likely faulty. If neither solenoid clicks, the problem may be in both solenoids, but more likely one of the following:

- Check for loose connections in the control panel.
- Check for inadequate power to the control panel.
- Check voltage and continuity of all panel wiring and solenoids.

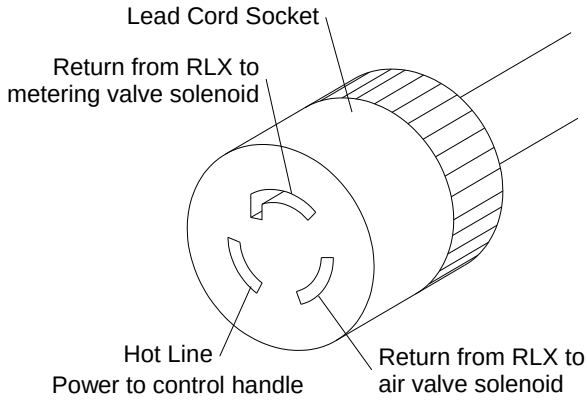

Figure 20

8.4.1.5 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 8.4.1.4. Check all extension cords in like manner.

8.4.1.6 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 solenoid) should click. With the jump in place, move the ACS switch ON and OFF. Moving the ACS switch should cause the lower (metering valve solenoid) solenoid to click. If the panel does not click, the cord, connectors or switch are faulty and should be repaired or replaced. If the panel does click, the remote control handle is the probable cause and should be repaired. Refer to the RLX Control Handle Owner's Manual.

8.4.1.7 Check for air leaks in the abrasive metering valve actuator, ACE air valve, connecting hose, and tube fittings inside the panel.

8.4.1.8 Open the petcocks on the ACE air valve and metering valve. Press the control handle. If air does not escape from the petcocks, check for blockage in the control lines.

8.4.2 Air and/or abrasive continues to leak from the nozzle after the control handle lever is released

8.4.2.1 Close the choke valve.

If the leak stops:
- The ACE air valve may require service.
- There is blockage in the control line between the air valve and panel.
- The air valve solenoid (upper solenoid) is stuck.

If the leak continues:
- The abrasive metering valve may require service.
- There is blockage in the control line between the metering valve and panel.
- The metering valve solenoid (lower solenoid) is stuck.

8.4.3 Heavy abrasive flow

8.4.3.1 Check to make sure the choke valve is open (handle in-line with the valve and piping.

8.4.3.2 Inspect the metering valve for wear. Refer to the metering valve owner's manual for service instructions.

8.4.3.3 Inspect the diaphragm in the ACE air valve for damage.

8.4.3.4 Inspect the solenoid operating the air valve (upper solenoid). It should open when the control handle is pressed.

8.4.4 Air flow, but no abrasive

8.4.4.1 Make sure the ACS switch is in the ON position. Refer to Section 4.6.2.

8.4.4.2 Make sure the petcock on the abrasive metering valve is fully closed.

8.4.4.3 Check for leaks or blockage in the hose or fittings from the control panel to the metering valve, and for leaks and kinked tubing inside the panel.

8.4.4.4 The metering valve may require service. Refer to the metering valve owner's manual.

8.4.4.5 Make sure the machine contains abrasive.

8.4.4.6 Check the solenoid operating the metering valve (lower solenoid). It should open when the control handle is pressed.

8.4.4.7 To check for minor obstructions in the abrasive metering valve, fully open the metering valve, while blasting, close the choke valve to force out small obstructions or wet abrasive. Readjust the metering valve and open the choke valve when obstruction is cleared.

8.4.5 Abrasive flow does not stop after the control handle lever is released

8.4.5.1 The metering valve (lower) solenoid may be stuck in the open position and not be exhausting control air from the metering valve. Inspect the metering valve solenoid.

8.4.5.2 The metering valve may require service. Refer to the metering valve owner's manual.

9.0 REPLACEMENT PARTS

Refer to the owner's manuals listed below for replacement parts for those accessories.

ACE air valve owner's manual 23938
RLX control handle owner's manual 10574
One of the following metering valve manuals:
Quantum abrasive metering valves 22565
Sentinel abrasive metering valve 20951
Multiple-outlet hose kits instruction sheet 11337

9.1 Accessories

Description	Stock No.
Lock-pin, coupling (package of 25)	11203
Safety cable, 1-1/2" to 3" OD hose	15013
Safety cable, 1-1/2" to 4" OD hose	27405
Hose ID kit, two outlet	15890
Hose ID kit, four outlet	15891

Rack, super sack, to hold abrasive super sacks
Note these racks will work only with machine that where ordered with installation guides welded to the top head.

60 cu ft. 28440
120 cu ft. 28442
160 cu ft. 28220

Add-on Operator Stations, Pneumatic:

One additional on 120 cubic ft. unit 05362
Two additional on 120 cubic ft. unit 05275
One additional on 160 cubic ft. unit 05361
Two additional on 160 cubic ft. unit 05276

Add-on Operator Stations, Electric:

One additional on 120 cubic ft. unit 10824
Two additional on 120 cubic ft. unit 10825
One additional on 160 cubic ft. unit 10826
Two additional on 160 cubic ft. unit 10827

9.2 Blast Machine, Figure 21

Item	Description	Stock No.
1.	Coupling, 1-1/4" thread	00551
2.	Gasket, coupling (package of 10)	00850
3.	Ball valve w/ handle, 1-1/4"	02397
4.	Handle, 1-1/4" ball valve	22532
5.	Union/ball valve, 1-1/4"	25783
6.	Cover, pop-up fill port	05644
7.	Screen, pop-up fill port	05645
8.	Gasket, manway door	20184
9.	Pop-up valve w/stem, 8"	05643
10.	Seal, 8" pop-up seat	05641
11.	Air filter, 1/2"	03987
12.	Element, 1/2" filter	03986
13.	Compression coupling, 1-1/4"	01857
14.	Gasket, 1-1/4" compression coupling	01886
15.	Water separator tank, 16"	25753
16.	Petcock, 1/4"	01993
17.	Hanger, hose	05158
18.	U-bolt 5/16"	03276
19.	Check valve, 1-1/4"	02088
20.	Rain cap	20829
21.	Adaptor, 1-1/4" NPT male x male JIC	22529
22.	Fitting, 1-1/4" NPT male x 1-1/4" barb	22777
23.	Fitting, female JIC swivel x 1-1/4" barb	22778
24.	Clamp, 1-3/4 to 2-3/64 dia. bolt-on	25286
25.	Hose assembly (pusher line and air line) Includes: 84-in. long 1-1/4”ID air hose coupled with a male fitting (item 22) on one end, Items 23 and 24 are shipped loose	25728

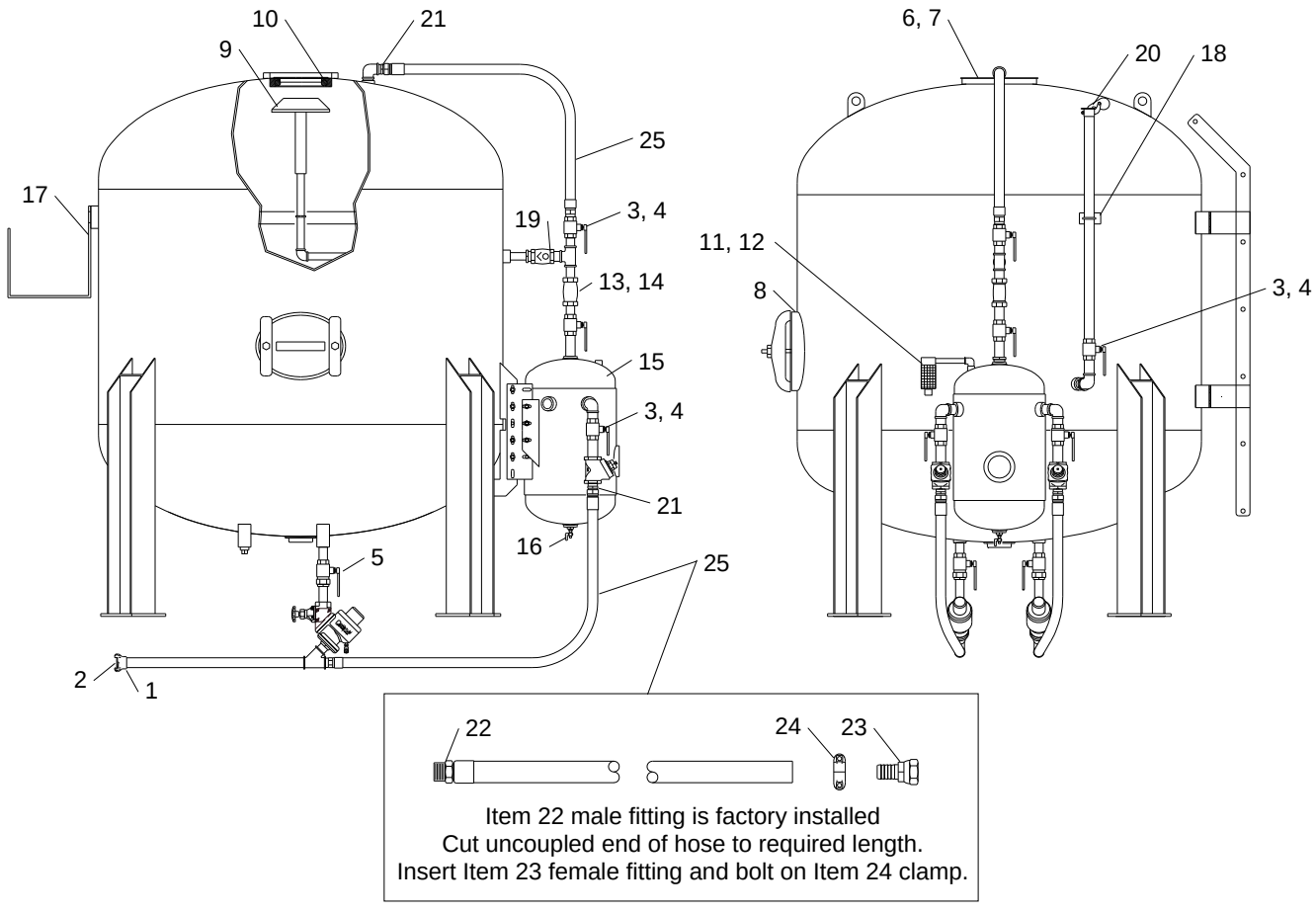

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Figure 21

9.3 Pneumatic Remote Controls, Figure 22

Item	Description	Stock No.
1.	Auto-Quantum metering valve	
	with wye, pipe nipples and fittings	24447
	without wye, pipe nipples and fittings	22760
2.	ACE air valve assembly with fittings	24044
3.	RLX control handle assembly,	
	complete with ACS	07625
4.	Union, twinline hose	01944
5.	Adaptor, 1/8" NPT w/ 1/16" orifice	01945
6.	Hose, twinline 3/16 in. x 50 ft. coupled	01951
7.	Hose, single-line, 3/16 in. x 50 ft., cpld.	03087
8.	Hose, single-line interconnecting	
	3/16 in. x 3 ft. coupled	02498
	3/16 in. x 5 ft. coupled	03083
*	3/16-in x 12-ft. coupled on one end coupling for other end shipped loose	28627
10.	Adaptor, straight 1/4" NPT x 1/4" MJIC	02494
11.	Petcock, 1/4"	01993
12.	Cross, 1/4" brass	02193
13.	Manifold, control air	25880
14.	Bushing, 1/4" NPT x 1/8" NPT	02010
15.	Nylon tie	02195

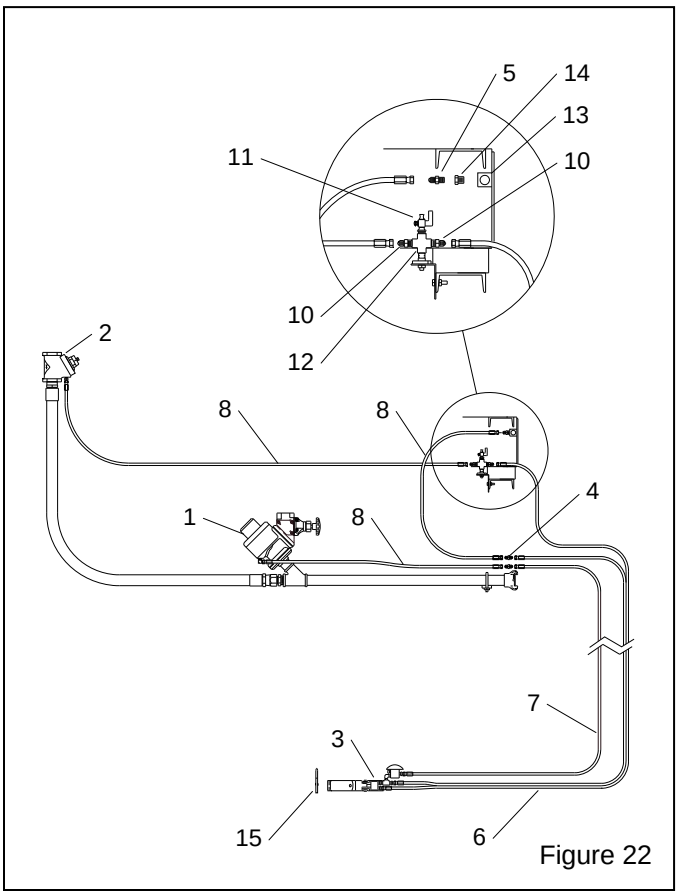

Figure 22

9.4 Electric Remote Controls, Figure 23

Item	Description	Stock No.
1.	Auto-Quantum metering valve	
	with wye, pipe nipples and fittings	24447
	less wye, pipe nipples and fittings	22760
2.	ACE air valve	
	valve assembly with fittings	24044
	valve only, without fittings	24074
3.	RLX electric control handle	10840
4.	Control panel, dual operator	
	12 volt, DC	05622
	120 volt, AC	07651
5.	Adaptor, straight 1/4" NPT x 1/4" MJIC	02494
6.	Cord, 50 ft. control w/ACS switch	10847
7.	Extension cord, 50 ft. for ACS	15138
8.	Extension cord, 100 ft. for ACS	19528
9.	Hose, single-line interconnecting	
	3/16 in. x 3 ft. coupled	02498
	3/16 in. x 5 ft. coupled	03083
*	3/16-in x 12-ft. coupled on one end coupling for other end shipped loose	28627
10.	Pigtail, for 12 volt DC only, with lo-profile connector	10831
11.	Manifold, control air	25880
12.	Nylon tie	02195

Note: Ref Factory Installed Electric Controls:
The air source for the manifold (Item 11) comes from the air filter (Figure 21, Item 11).

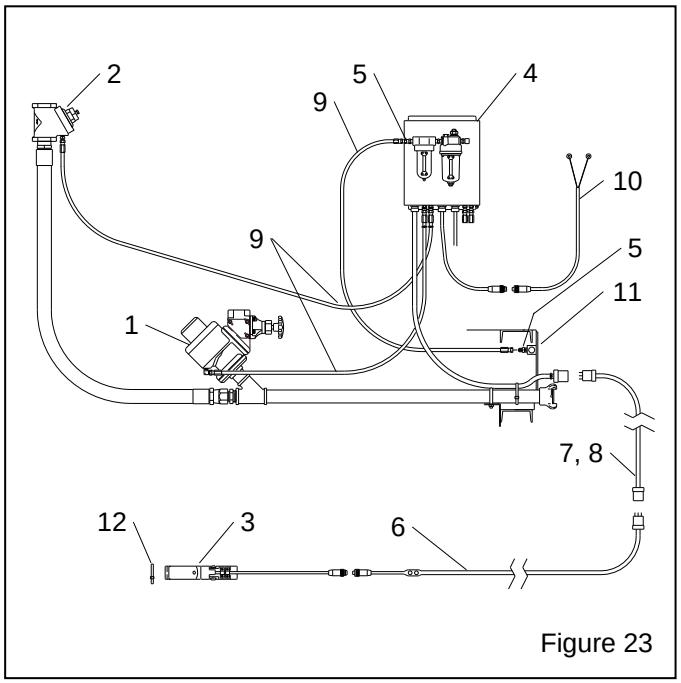

Figure 23

* Hose end installed on one end, hose end fitting for other end is supplied but shipped loose. Cut hose to length and install hose end per Section 7.5

9.5 Control Panel, Figure 24

Item	Description	Stock No.
(-)	Control panel, dual operator	
	12-volt DC	05622
	120-volt AC	07651
1.	Air filter, 1/4"	05617
2.	Antifreeze injector, 1/4"	05616
3.	Valve, 3-way,	
	12-volt DC (for 12-volt panel)	07664
	12-volt AC (for 120-volt panel)	07662
4.	Terminal block, 5 pole	02268
5.	Adaptor, straight 1/4" NPT x 1/4" MJIC	02494
6.	Hex nipple, 1/4" NPT	02808
7.	Elbow, 1/4" brass street	02027
8.	Coupling, 1/4" female bulkhead	05605
9.	Adaptor, 1/4" MJIC x 1/8" NPT bulkhead	03432
10.	Supply cord, 5-ft.	
	12-volt, with lo-profile connector	10833
	120-volt, with twist-lock connector	02216
11.	Cord, control whip	07675
12.	Connector, 1/2" strain relief	02213
13.	Locknut, 1/2" conduit	02925
14.	Elbow, male 1/4" NPT x 1/4" tube	03428
15.	Tee, 1/4" tube	03351
16.	Connector, 1/8" NPT x 1/4" tube	03430
17.	Manifold, 5-outlet tubing	05619
18.	Tubing, 1/4" white, specify ft. required	03427
19.	Tubing, 1/4" red, specify ft. required	05612
20.	Tubing, 1/4" blue, specify ft. required	05613
21.	Tubing, 1/4" green, specify ft. required	05614
22.	Tubing, 1/4" orange, specify ft. required	05615
23.	Bracket, panel mount	04188
24.	Bushing, 1/4-NPT x 1/8 (exhaust port)	02010
25.	Fuse, 2-amp 1/4" x 1-1/4", 120-volt only	03039
26.	Fuse block, 120-volt only	03040
27.	Transformer, 12.6-volt, 120-volt only	02198

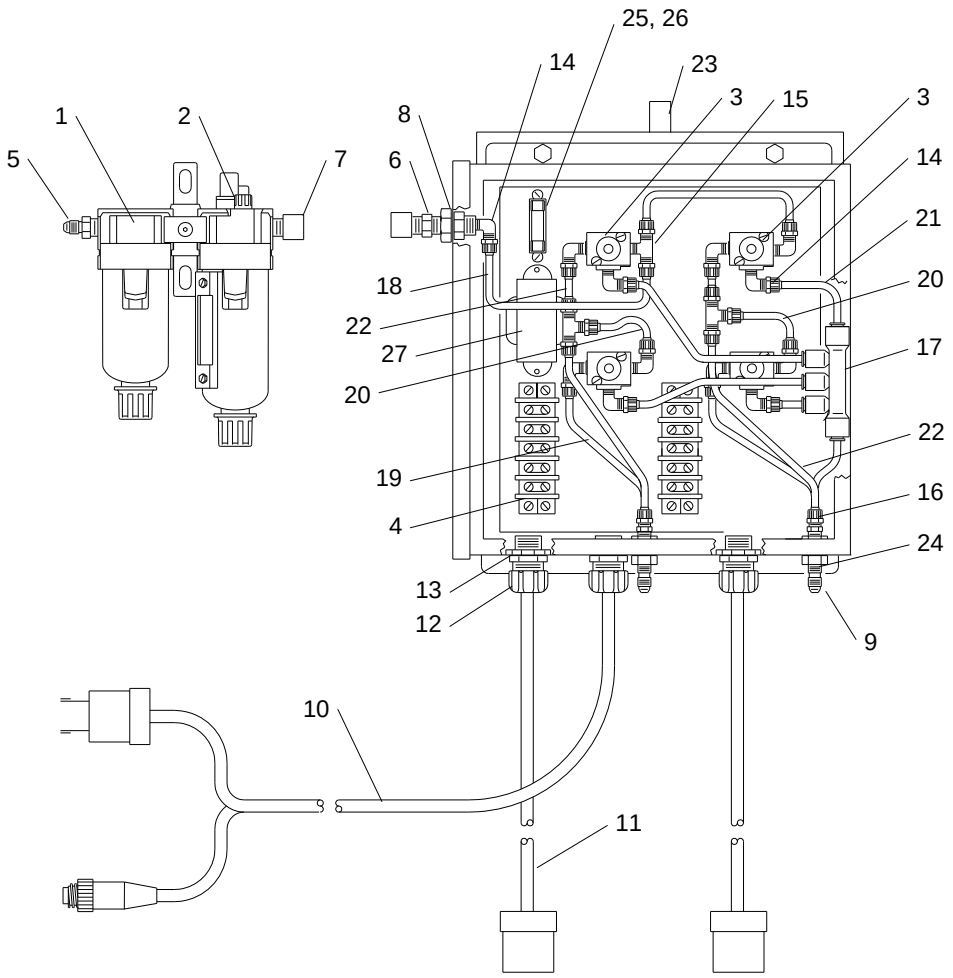

Figure 24