PRO-SERIES BIG CLEM BULK BLAST MACHINES
O. M. 31188

DATE OF ISSUE: 08/22
REVISION:

⚠ WARNING

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

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

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

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1.0 INTRODUCTION

1.1 Scope of Manual

1.1.1 This manual covers the setup, operation, maintenance, troubleshooting, and replacement parts for all Pro-Series Big Clem Bulk Blast Machines. In addition to this manual, accessory manuals for equipment used with the blast machine are shown below. Manuals are available on our web site at www.clemcoindustries.com.

- ACE Air Valve 23938
- One of the following control handle manuals:
  - GW Electric RLX Control Handle w/ACS
    - For use with electric remote controls 31340
  - RLX Remote Control Handle
    - For use with pneumatic remote controls 10574
- Multiple-Outlet Hose Kits Instruction Sheet 11337
- One of the following abrasive metering valve manuals:
  - PT Abrasive Metering Valve 29586
  - GritWizard Abrasive Metering Valves 31199

1.1.2 This manual contains important safety information. All operators and personnel involved with the abrasive blasting process must read and understand the contents of these instructions, including the orange cover. It is equally important that the operators are trained and qualified to safely operate the blast machine, 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. The booklet contains important safety information about abrasive blasting that may not be included in equipment operations 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, can result in property damage.

⚠ CAUTION

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

⚠ WARNING

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

⚠ DANGER

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

1.3 Table of Contents

1.4. Components

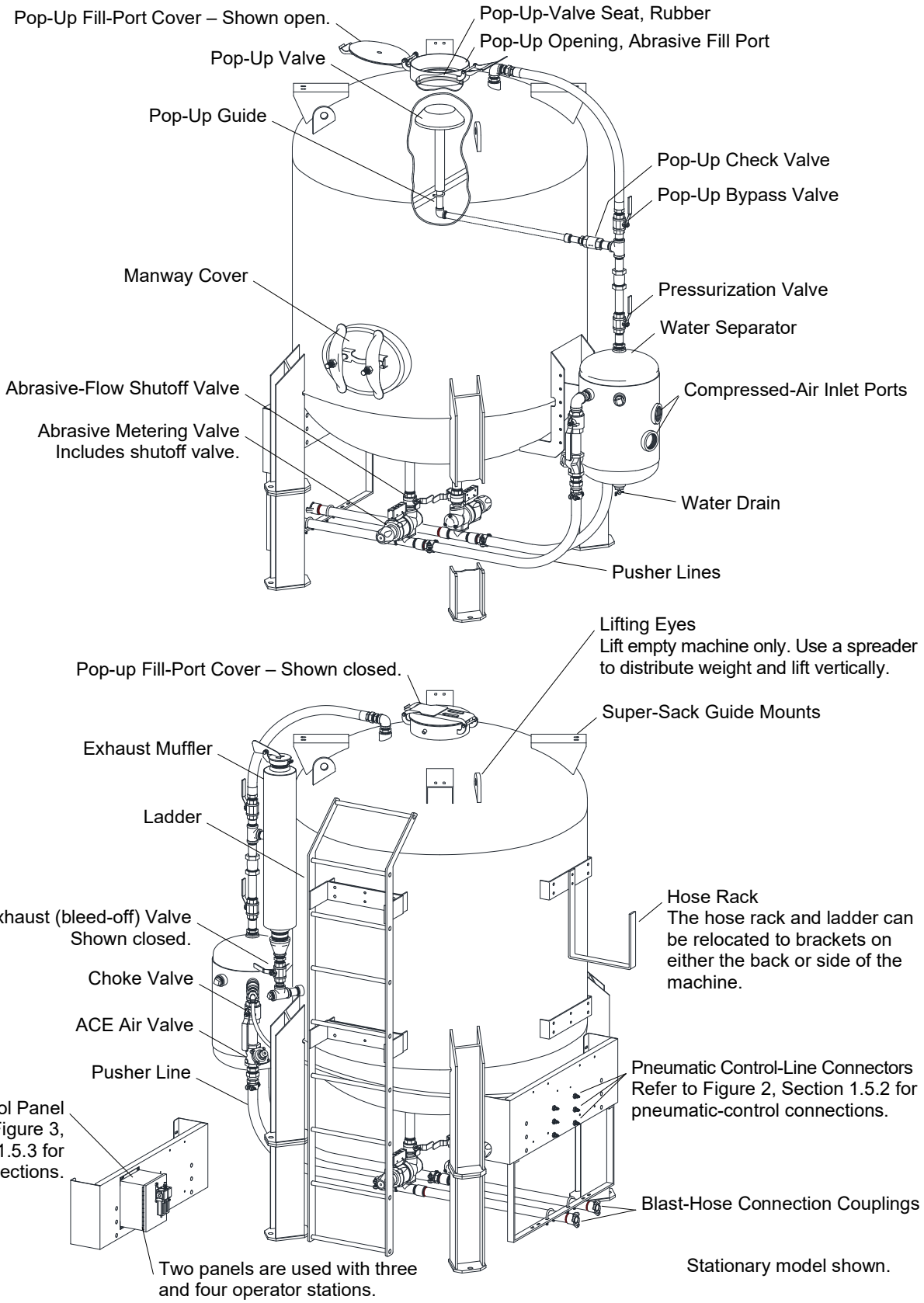
1.4.1 Basic components

1.4.1.1 Key components for Pro-Series Big Clem Bulk Blast Machines are shown in Figure 1. Bulk blast machines come in three sizes: 60, 120 and 160-cuft capacity. Each size is available in a stationary, yard-towable, and highway-towable models. Highway towable models include fenders, lights and electric brakes. Pneumatic remote controls are shown in Figure 2, and electric remote controls are shown in Figure 3.

1.4.1.2 Pro-Series Big Clem blast machines are furnished with manually operated pressurization and exhaust (bleed-off) valves, 1-1/2" piping, a water-separator tank, and two operator stations that are independently operated with pneumatic (or optional electric) pressure-hold remote controls. Pressure-hold remote controls mean pressurization and depressurization of the blast machine abrasive chamber is a separate function from the remote controls, which starts and stops blasting. One or two additional operator stations may be added to 120-cuft and 160-cuft machines at time of purchase, or may be field installed later.

1.4.2 Blast machine and water-separator pressure vessels

1.4.2.1 Clemco certifies that its pressure vessels (Big Clem abrasive chambers and water-separator tanks) conform to the ASME (American Society of Mechanical Engineers) Boiler and Pressure Vessel Code, Section VIII, Division 1. It is the owner's responsibility to maintain the integrity of the vessel in accordance with state regulations. Regulations may include regular inspection and hydrostatic testing as described in National Board inspection code and jurisdictional regulations and/or laws.



Some items may be rotated or removed for clarity

Figure 1

⚠ WARNING

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

1.4.2.2 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.

1.4.2.3 Do not exceed the maximum working pressure rating (PSI) of the blast machine. The maximum pressure rating is stamped into the ASME nameplates, which are welded to the side of the vessels.

⚠ WARNING

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

1.4.2.4 OSHA does not require pressure-relief valves on blast machines when air compressors supplying air to the blast machines are built to American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section VIII, Division 1 and comply with OSHA regulation 29 CFR 1910.169, which 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 with maximum pressure less than or equal to the maximum allowable working pressure (MAWP) stamped on the vessel nameplate.

1.4.3 Using lifting eyes to lift empty vessels

⚠ WARNING

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

1.4.3.1 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.

1.4.4 Remote controls

1.4.4.1 The remote control system is an OSHA-required safety device, and it is required whenever an operator mans the blast nozzle. The control handle, located near the blast nozzle, is the activator of the remote control system. Blasting begins when the operator applies handheld pressure to the control handle lever. Blasting stops when the operator removes pressure from the lever.

1.4.4.2 The remote control system "fails to safe," which means blasting stops when an interruption occurs for any reason in the control-air or electric circuit, such as a break in the line, or should the operator drop the blast hose. When the operator presses the control handle lever, the normally closed (NC) abrasive metering valve and air valve open, which begins the blasting process. 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 positions, stopping air and abrasive flow through the nozzle.

⚠ 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 may occur, which can cause serious injury.

1.5 Operating Principles

1.5.1 Blast machine

1.5.1.1 When compressed air is supplied to the blast machine, air enters the water separator and remote control air circuit, which is used to operate the remote controls. The pusher lines also pressurize up to the normally closed ACE air valves.

1.5.1.2 The operator manually pressurizes and depressurizes the abrasive chamber using hand-operated valves. When the manually operated exhaust (bleed-off) valve is closed and the pressurization valve is opened, air enters the abrasive chamber and automatically seals the pop-up valve, which pressurizes the chamber. Although the machine is under pressure, blasting does not begin because the normally closed (NC) abrasive metering valve shuts off abrasive flow, and the normally closed ACE Air Valve shuts off air flow. Blasting starts when the operator presses the lever on the remote control handle, which opens both valves, Blasting stops when the operator releases the lever. Pressure remains in the abrasive chamber until it is manually depressurized.

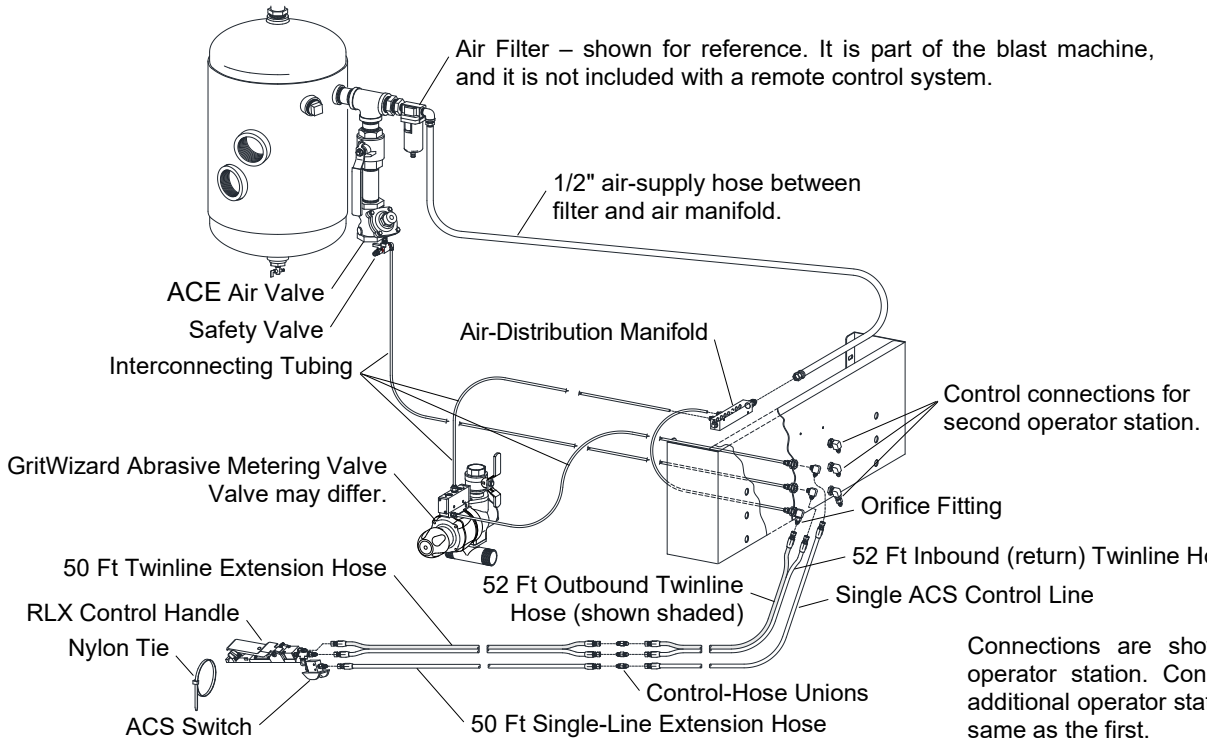
1.5.2 Pneumatic pressure-hold remote controls Figure 2

Refer to Section 1.5.3 for electric remote controls.

1.5.2.1 The principal components of the pneumatic remote control system are shown in Figure 2. The system includes the abrasive metering valve, pneumatically operated air valve, RLX Control Handle with abrasive cutoff (ACS) switch, 52 ft of pneumatic control hoses, and interconnecting control lines. Valves may differ from those shown, but connections and operation are similar. Refer to Section 2.3 to complete pneumatic connections.

1.5.2.2 Pneumatic remote controls are recommended when the nozzle and remote control handle are within 100 feet from the blast machine. Pressure drop with pneumatic systems over longer distances increases actuation time, which can prevent fast, safe operation. Electric controls are recommended when the nozzle and control handle are farther than 100 feet from the blast machine. Refer to Section 1.5.3 for electric controls.

1.5.2.3 The remote controls operate pneumatically, on the return-air principle; refer to Figure 2. A stream of control air travels from the orifice (lower fitting on the operator panel), down the outbound twinline and escapes through an opening located under the RLX control lever (which is the main activator of the system). As long as air escapes through the opening under the handle, the normally closed abrasive metering valve and air valve remain closed. When the operator applies pressure to the control lever, a rubber button seals the opening, returning control air from the outbound twinline through the inbound (return) twinline, opening both the N/C abrasive metering valve and N/C air valve, which begins the blasting process. (On electric remote systems, the pneumatic circuit is completed electrically.) When the operator releases the handle, control air exhausts from the opening, which returns the valves to their normally closed position and stops blasting. Pressure remains in the abrasive chamber until it is manually depressurized.



PNEUMATIC REMOTE CONTROL COMPONENTS

Figure 2

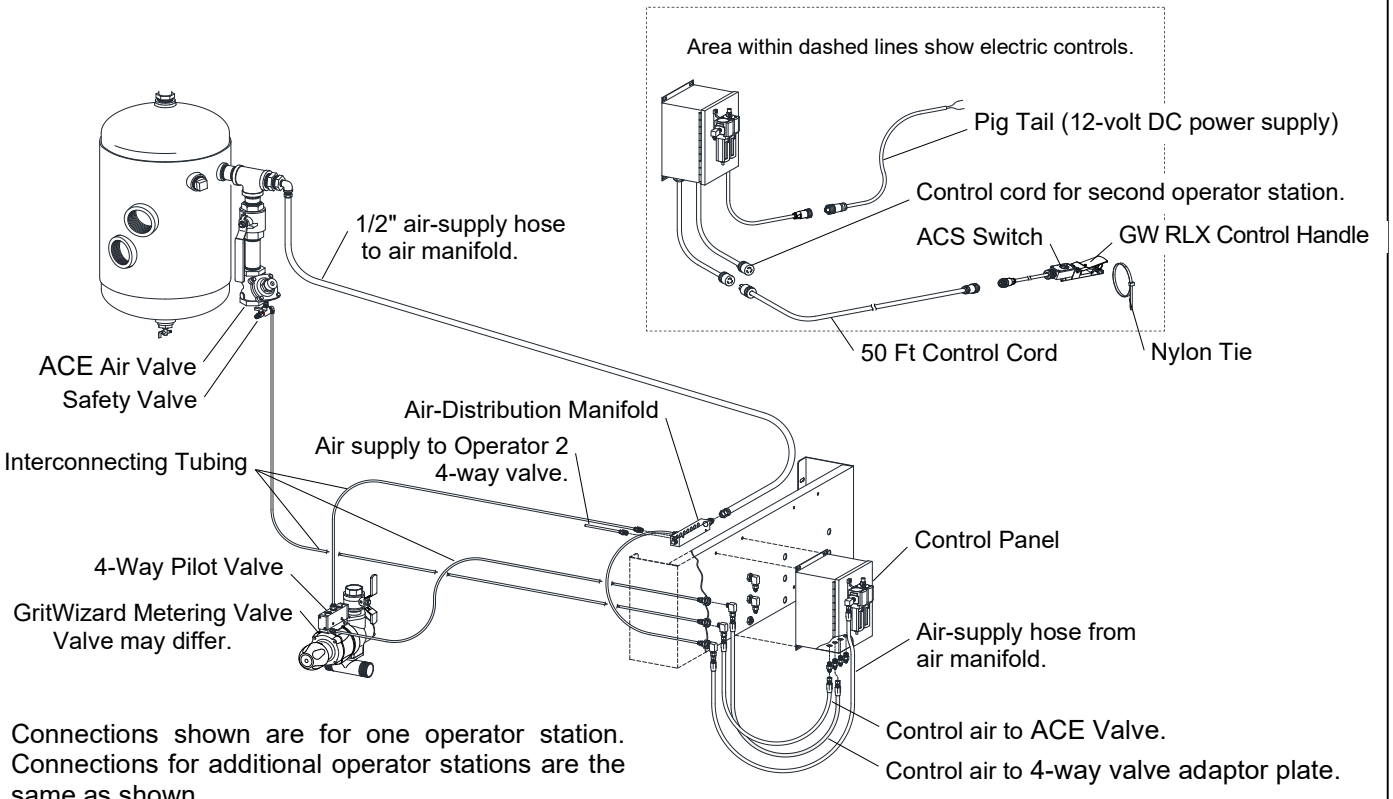
1.5.3 Electric pressure-hold remote controls Figure 3

Refer to Section 1.5.2 for operation of pneumatic remote controls.

1.5.3.1 The principal components of the electric remote control are shown in Figure 3, The systems include the abrasive metering valve, ACE Pneumatically-Operated Air Valve, GW Electric RLX Control Handle with abrasive cutoff (ACS) switch, 50 ft electric control cord, and interconnecting control lines. Valves may differ from those shown, but connections and operation are similar. Refer to Section 2.5 to complete electric controls and blast hose connections.

1.5.3.2 Electric remote controls are recommended when the nozzle and remote control handle are farther than 100 feet from the blast machine. Pressure drop with pneumatic systems over longer distances increases actuation time, which prevents 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. To prevent damp air from freezing, 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 will cause electrical resistance, resulting in remote control malfunctions. If an application requires greater distance, an appropriate cord with larger diameter wire must be provided by the user.

1.5.3.3 Electric remote controls are electric over pneumatic. The air and abrasive valves are pneumatically operated but the air circuit is controlled electrically. Control air travels though the filter and antifreeze injector on the electric panel, and stops at normally closed (NC) electric solenoid air valves within the panel. When the panel is connected to a power supply, one leg of power goes to the electric RLX control handle (which is the main activator of the system). As long as the control lever is up (in the nonblast position), the remote control's abrasive metering valve and air valve remains closed. When the operator presses the control lever, the circuit is completed and the electric solenoid valves within the panel open, sending control air to open both the abrasive metering valve and air valve, which begins the blasting process. Releasing the handle breaks the electric circuit, exhausts control air through the solenoids, and returns the valves to their normally closed position and stops blasting. Pressure remains in the abrasive chamber until it is manually depressurized.



Connections shown are for one operator station. Connections for additional operator stations are the same as shown.

ELECTRIC REMOTE CONTROL COMPONENTS

Figure 3

1.5.4 Abrasive cutoff switch (ACS)

1.5.4.1 An abrasive cutoff switch (ACS) is a standard feature of the pressure-hold remote controls. The operator uses the switch to close the abrasive valve independently of the air valve so that air without abrasive exits the nozzle. This feature is used to clear abrasive from the blast hose and to blowdown the blasted surface.

- Pneumatic ACS: The ACS switch is mounted on the RLX Control Handle, as shown in Figure 2.
- Electric ACS: The ACS switch is wired into the box at the back of the RLX handle, as shown in Figure 3.

Refer to *Section 4.11: Operation of the Abrasive Cutoff Switch*

1.6 Compressed-Air Requirements

1.6.1 Compressed-air requirements depend on the size of nozzle and the number of operating stations used at a given time. Refer to the tables in Figures 4 and 5, which show the approximate compressed air consumed for each recommended nozzle size. It shows cfm consumed when the nozzle is new and when it is considered worn. A nozzle is considered worn when the orifice is 1/16" larger than its original size. Add or multiply the air requirements by the size and number of nozzles used. Refer to a compress-air supplier for the recommend compressor size based on the consumption.

1.7 Abrasives

⚠ WARNING

Abrasives and dust from blasting may contain toxic materials (e.g., lead paint, silica) that are hazardous to workers. Before blasting, obtain a safety data sheet (SDS) for the blast abrasive and identify all substances removed by the blasting process.

- **Silica sand (crystalline) can cause silicosis, lung cancer, and breathing problems in exposed workers.**
- **Slags can contain trace amounts of toxic metals such as arsenic, beryllium, and cadmium and have the potential to cause lung disease.**

NO DUST IS SAFE TO BREATH. DUST PRODUCED FROM ANY ABRASIVE OR FROM THE BLASTING PROCESS CAN CAUSE SERIOUS LUNG DISEASE AND DEATH WHEN INHALED. It is the employer's responsibility to train employees to identify hazardous substances and to provide suitable policies, procedures, monitoring, recordkeeping, and personal protective equipment.

NOTICE

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

1.7.1 Selection of blasting abrasive can play a significant part in worker health risk, job productivity, and maintenance of the blast machine. DO NOT USE abrasives containing more than 1% crystalline (free) silica. Obtain safety data sheets (SDS) for the blasting abrasive prior to blasting, paying particular attention to worker health risks and presence of any hazardous/toxic substances.

1.7.2. 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 mesh sizes 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.

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

1.7.4 Slags: Slag abrasives are compatible with the blast machine and accessories. Obtain a safety data sheets (SDS) to identify hazardous substances.

1.7.5 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. Steel abrasives weigh approximate 250 lbs per cuft. Refer to Section 1.7 and 1.8 for weight capacities of Big Clem Bulk Blasters.

1.7.6 Silicon carbide, aluminum oxide, and garnet: These are the most aggressive of the commonly used abrasives. Although aggressive abrasives such as these are generally not used with bulk blast machines, they may be used, but the service life of any equipment components which come in contact with the abrasive will be reduced. To avoid unscheduled downtime, periodically inspect hoses, nozzles, and abrasive metering valves for abrasive wear. Use nozzles lined with boron carbide with aggressive abrasives.

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

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

1.8 Abrasive Capacity and Load Limits

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

	TARE WEIGHT		
MODEL	**YARD**	**HWY**	**MAX. GVWR**
60 cuft	3,510 lbs	3,830 lbs	10,000 lbs
120 cuft	4,840 lbs	5,160 lbs	16,000 lbs
160 cuft	5,400 lbs	5,720 lbs	20,000 lbs

1.8.1 Portable Pro-Series Big Clem Bulk Machines may be loaded to up to the gross vehicle weight rating (GVWR) with dry 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 rating (GVWR). Loads heavier than the GVWR causes unsafe conditions, affecting brakes and causing damage to the trailer, suspension, or tires.

2.0 INITIAL SETUP

2.1 Setup 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 tow vehicle must be rated for towing the following maximum gross vehicle weight rating GVWR). The GVWR is calculated by adding the abrasive weight to the tare weight of the Big Clem. **Tare weight specific to each machine is shown in Section 1.8.**

MODEL	MAX. GVWR
60 cuft	10,000 lbs
120 cuft	16,000 lbs
160 cuft	20,000 lbs

⚠ WARNING

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

2.1.3 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.

2.1.4 Install an approved hitch, based on the GVWR, onto the tow vehicle. Adjust the height so the hitch and eye match when the trailer is empty and level. Make sure all safety lock 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. Nonapproved hardware or defective installation may produce hazardous conditions that can cause severe injury, death, or property damage.

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

2.1.6 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 Air Connectors

2.2.1 Attach air-supply hose fitting(s) to one or both 3” compressed-air inlet ports 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 Figures 4 and 5 to determine approximate cfm consumption and minimum size air hose.

Nozzle Orifice Size	Number of Nozzles	CFM New	Worn	Minimum Air Line ID
5/16"	1	190 to	265	2"
5/16"	2	380 to	530	2"
5/16"	3	570 to	795	2-1/2"
5/16"	4	760 to	1060	3"
3/8"	1	265 to	355	2"
3/8"	2	530 to	710	2-1/2"
3/8"	3	790 to	1065	3"
3/8"	4	1060 to	1420	3"
7/16"	1	355 to	460	2"
7/16"	2	630 to	920	2-1/2"
7/16"	3	945 to	1380	3"
7/16"	4	1260 to	1840	3"
1/2"	1	460 to	650	2-1/2"
1/2"	2	820 to	1300	3"
1/2"	3	1230 to	1950	3"
1/2"	4	1640 to	2600	One 3" and One 2-1/2"

MINIMUM ID AIR LINE RECOMMENDATIONS BASED ON THE NOZZLE SIZE AND THE NUMBER OF NOZZLES IN USE

Figure 4

2.2.2 CFM shown in Figures 4 is the approximate cfm required with 140 psi nozzle pressure, when the nozzle is new and when worn. A nozzle is considered worn when the orifice is 1/16" larger than its original size. Refer to Figure 5 for the cfm at other pressures.

2.2.3 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 blast machine inlet ports 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.

Compressed-Air and Abrasive Consumption

Nozzle Orifice Size (in.)	Air Pressure at the Nozzle: 80 PSI New	80 PSI Worn	90 PSI New	90 PSI Worn	100 PSI New	100 PSI Worn	125 PSI New	125 PSI Worn	140 PSI New	140 PSI Worn	
No. 5 5/16"	113	161	126	173	137	196	168	237	188	265	Air (cfm)
	6.7	9.6	7.4	10.5	8.1	11.5	9.8	13.9	11.0	15.6	Abrasive (cuft/hr)
	26	36	28	39	31	44	37	52	41	58	Compressor (hp)
No. 6 3/8"	161	217	173	240	196	254	237	314	265	352	Air (cfm)
	9.6	13.1	10.5	14.5	11.5	15.8	13.9	19.3	15.6	21.6	Abrasive (cuft/hr)
	36	49	39	54	44	57	52	69	58	77	Compressor (hp)
No. 7 7/16"	217	280	240	309	254	338	314	409	352	458	Air (cfm)
	13.1	16.8	14.5	18.6	15.8	20.2	19.3	24.6	21.6	27.5	Abrasive (cuft/hr)
	49	63	54	69	57	75	69	90	77	101	Compressor (hp)
No. 8 1/2"	280	452	309	504	338	548	409	598	458	646	Air (cfm)
	16.8	26.9	18.6	29.7	20.2	32.5	24.6	35.2	27.5	38.0	Abrasive (cuft/hr)
	63	101	69	112	75	122	90	133	101	144	Compressor (hp)

- Figures show approximate compressed-air and abrasive consumption when nozzles are new and when worn. Consumption gradually increases as the nozzle wears. A nozzle is considered worn when the orifice is 1/16" larger than its original size.
- Air requirements are under 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.

Figure 5

2.3 Pneumatic Controls and Blast Hose Connections

Refer to Section 2.5 for electric controls and blast hose connections.

⚠ WARNING

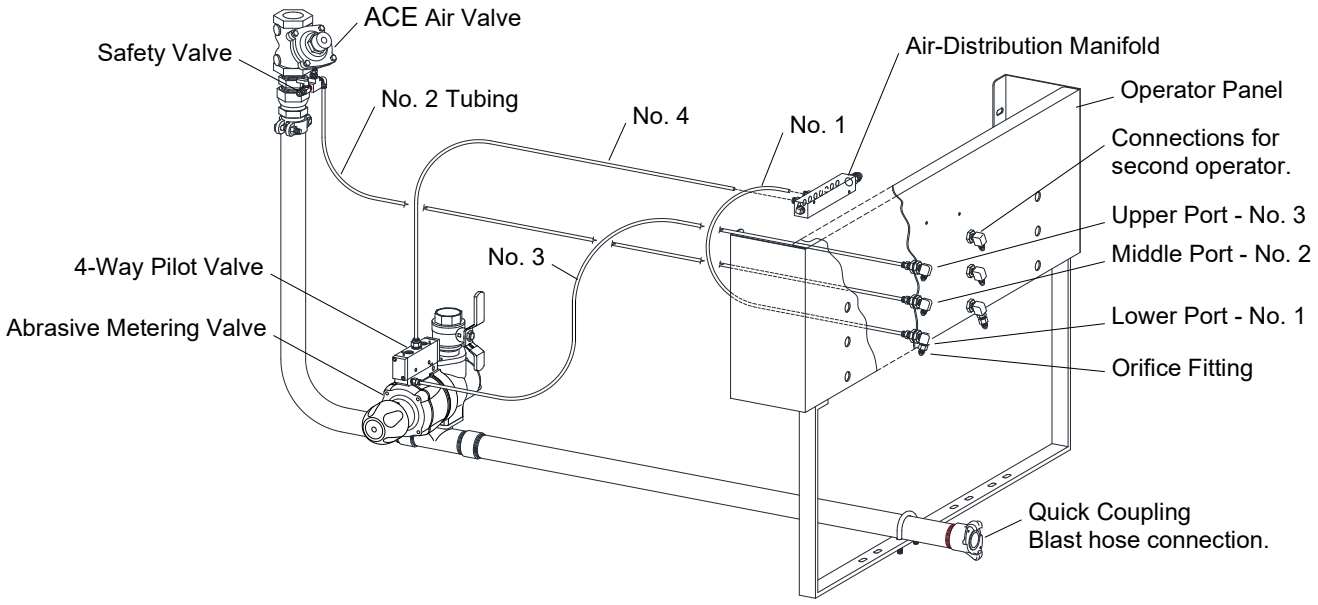
Carefully trace, connect, and mark control lines and blast hoses on multiple-outlet blast machines. Inadvertently switching control lines or blast hoses between operator stations will cause actuation of a blast line not intended for use. Unintentional actuation of a blast hose may lead to injury and property damage. Instructions in Sections 2.3.1 through 2.3.3 must be followed to safeguard against hose switching. Refer to Section 2.4 and 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 6. Refer to Sections 2.5 for electric controls.

2.3.1.1 Control lines on the blast machine are factory installed. Use the illustration in Figure 6 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.

- No. 1 Lower Connection:
  Tubing connects between the air-distribution manifold and the lower inward-fitting on the operator panel.
  Twinline hose attaches between the lower-panel (orifice) fitting and the RLX Control Handle Either side of the hose can be attached to either fitting.
- No. 2 Middle Connection:
  Tubing connects between the ACE Air Valve and the middle inward-fitting on the operator panel.
- No. 3 Upper Connection:
  Tubing connects between the side fitting on the 4-way adaptor plate and the upper inward-fitting on the operator panel.
- No. 4 Tubing:
  Connects between the backside of the air-distribution manifold and the top fitting on the 4-way pilot valve.

2.3.1.2 Gently tug on each tubing to make sure all connections are secure. Leaks will cause the system to malfunction. Refer to Section 7.7 for using tube-lock fittings.



Whether there are two, three, or four operator stations, the first station is always the one at the far left. Connections are shown for one operator station; each additional stations are also connected as shown.

Figure 6

2.3.2 Install pneumatic RLX Control Handle to blast hose – Figure 7

2.3.2.1 Uncoil a coupled length of 52-ft blast hose and lay the 52-ft twinline hose and 52-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.

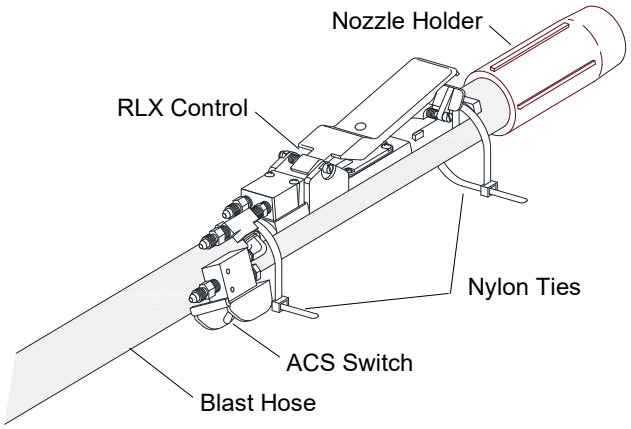


Figure 7

2.3.2.2 Band the control handle to the blast hose at a comfortable location behind the nozzle holder, as shown in Figure 7. Use the two nylon ties provided or similar means to secure the control handle to the hose. Once the 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 52-ft twinline hose to the two fittings on the back of the control handle, as shown in Figure 8. Either side of the hose can be attached to either fitting.

2.3.2.4 Attach the 52-ft single-line control hose to the fitting on the ACS switch mounted on the control handle, as shown.

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

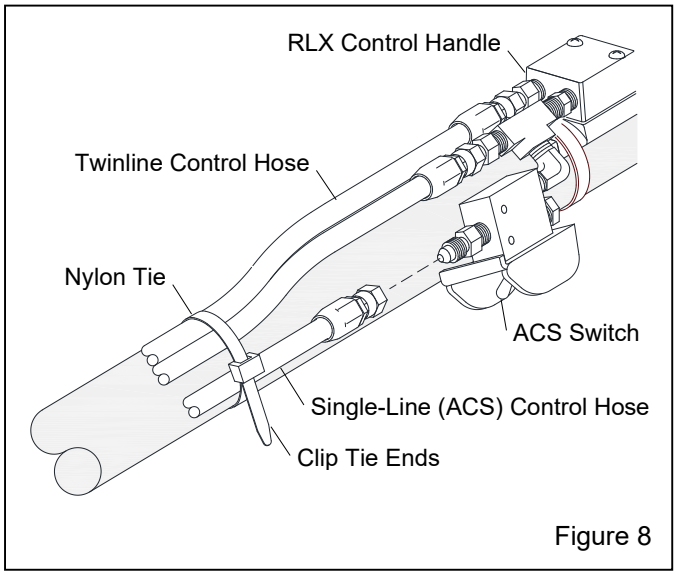


Figure 8

2.3.2.6 Working from the control handle back, band the twinline and single-line hoses to the blast hose, as shown in Figure 8, every 4 to 6 feet and as close to the couplings as possible.

2.3.2.7 Repeat the process for each section of control lines and blast hoses.

2.3.3 Connect the blast hose and control hose to the blast machine – Figure 9

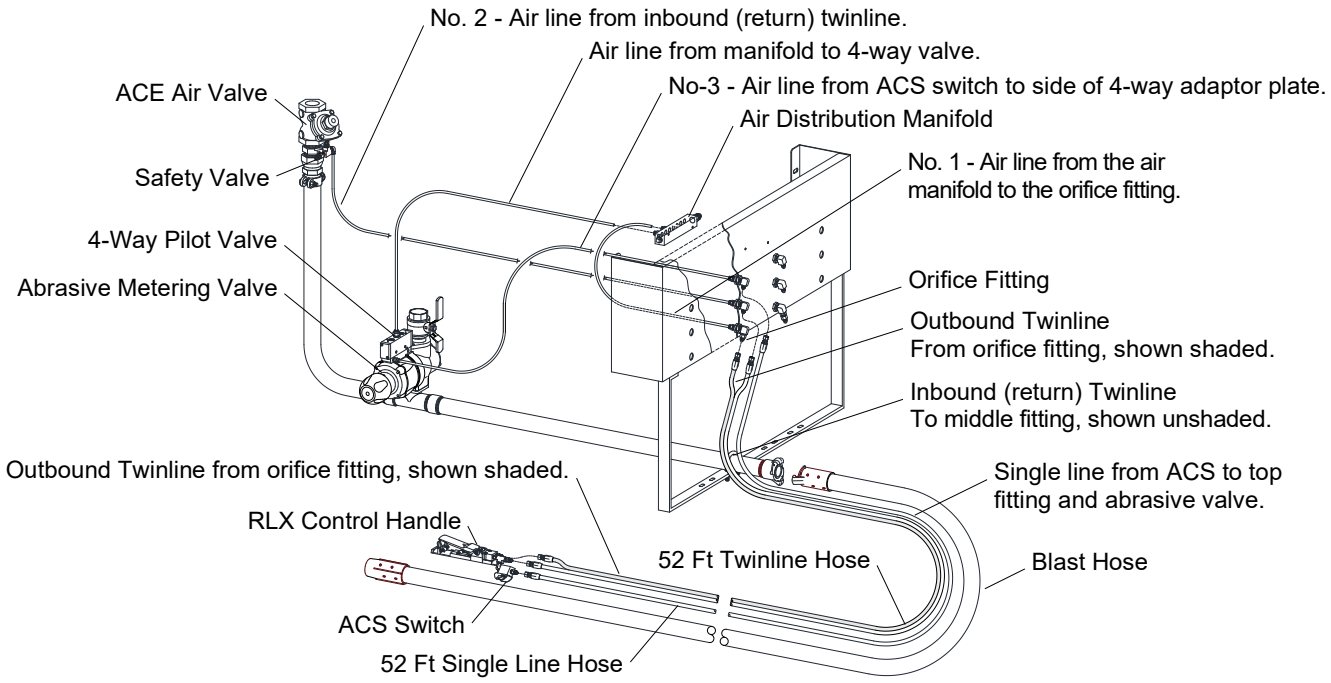
2.3.3.1 Working from left to right, connect the blast hose assembly to the first blast machine quick coupling; use safety lock pins in all couplings. This is Station No. 1. NOTE: Station No. 1 is always the blast hose and set of control fittings farthest to the left on the operator panel (do not count unused ports). If only two operators are installed on a four-outlet machine, Station No. 1 is the second port from the left.

2.3.3.2 Attach the 52-ft single-line control hose to the top fitting, leading to the side of metering valve's 4-way adaptor plate.

2.3.3.3 Attach one side (either side) of the 52-ft twinline hose to the orifice (lower) fitting on the operator panel. This side of the twinline hose becomes the outbound line. Note: Control hoses come with reusable hose ends. Excess hose may be cut-to-fit, and recoupled. Refer to Section 7.6.

2.3.3.4 Attach the remaining side (inbound side) of the 52-ft twinline to the middle fitting, as shown in Figure 9.

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



Band the control hoses to the blast hose every 4 to 6 feet.
Blast hose and control hoses are shown separate for clarity and some items are rotated for clarity.

Figure 9

2.4 Color-Grouping Pneumatic Operator Stations Figure 10

2.4.1 Cross-connecting control lines or blast hoses between operator stations will cause actuation of a blast line not intended for use. The following instructions explain the method of color-grouping each operator station and blast hose assembly to prevent accidental hose switching. Use a different color strap, provided in the hose identification kit, to color-code each operator station. Controls for each operator station must be kept separate. Complete one operator station before starting another, using a different color. Read the instructions packaged with the hose identification kit before making the connections.

2.4.2 Two to four operator stations can be installed on most Pro-Series 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.

2.4.3 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 10.

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

a. Band a large strap to 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 a large strap to the piping just behind the quick coupling.

2. Working with the same color, attach six <u>small</u> straps to the control hose as follows:

d. Band two small straps just behind the hose-end fittings on both legs of the twinline hose.

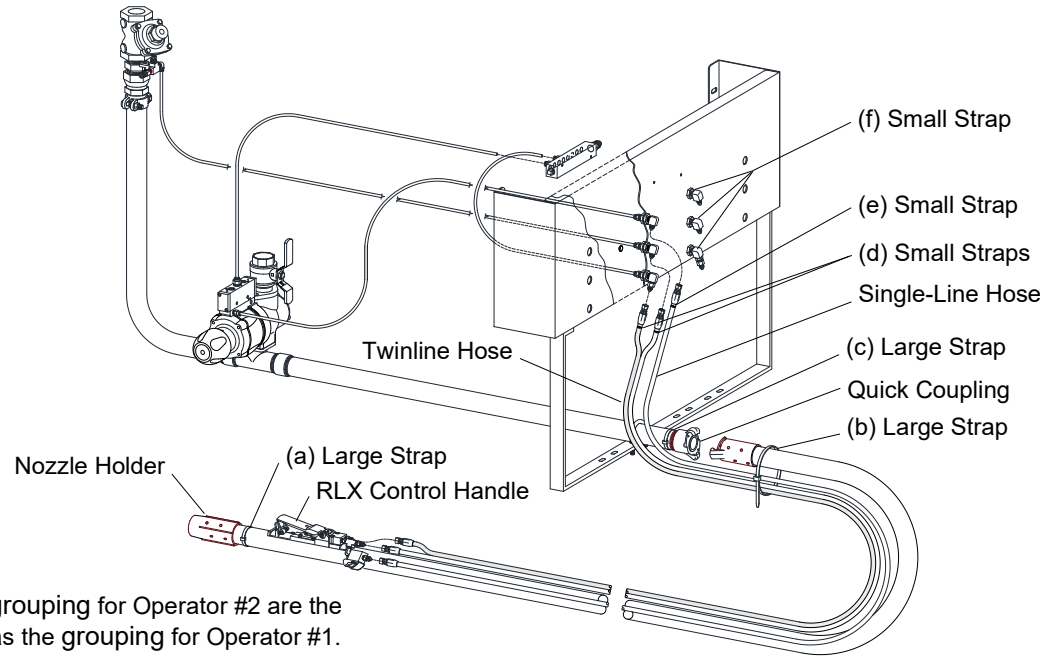
e. Band a small strap just behind the hose-end fitting on the single line hose.

f. Band a strap onto each of the three elbow fittings on the control panel.

2.4.4 Color-grouping blast hose and control hose extensions

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

- 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.
- Attach small straps to each end of the twinline and single-line control hose, just behind each hose fitting.



Color grouping for Operator #2 are the same as the grouping for Operator #1.

Some items are rotated for clarity.

Figure 10

2.5 Electric Controls and Blast Hose Connection

Refer to Section 2.3 for pneumatic controls and blast hose connections.

⚠ WARNING

Dual-operator control panels are used with Pro-Series Big Clem Bulk 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; inadvertently switching connections between/among operator stations will cause actuation of a blast line not intended for use.

2.5.1 Electric control connections – Figure 11

2.5.1.1 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 11 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.

No. 1 Lower Connection:

a. Tubing connects between the air-distribution manifold and the lower inward-fitting on the operator panel.
b. Hose connects between the lower outward-fitting and air-filter inlet on the electric control panel.

No. 2 Middle Connection:

a. Tubing connects between the ACE Air Valve and the middle inward-fitting on the operator panel.
b. Hose connects between the middle outward-fitting on the operator panel and the fitting on the bottom of the electric control panel labeled "Air Valve 1".

No. 3 Upper Connection:

a. Tubing connects between the side fitting on the 4-way adaptor plate and the upper inward-fitting on the operator panel.
b. Hose connects between the upper outward fitting on the operator panel and fitting on the bottom of the electric control panel labeled "Grit Valve 1".

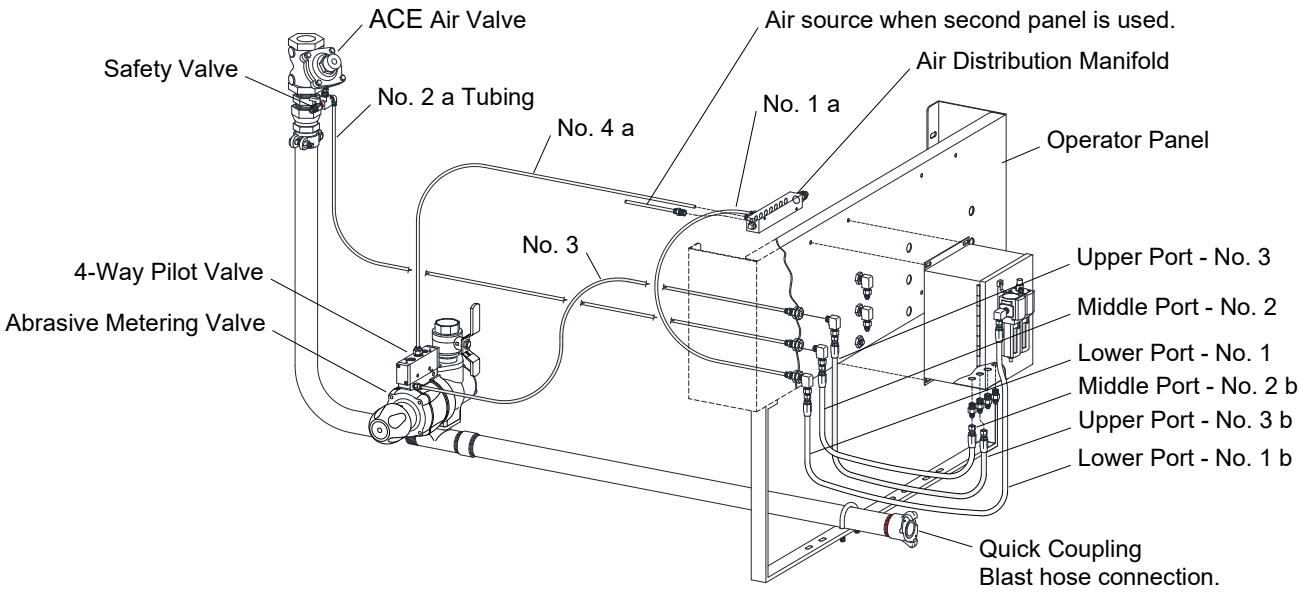
No. 4 Tubing:

Connects between the backside of the air-distribution manifold and the top fitting on the 4-way pilot valve.

No. 5 Tubing:

The port for this tubing is plugged unless there is a second electrical control panel for additional operator stations. When a second panel is used, Tubing No. 5 has the same connections as shown for Tubing No. 1.

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



Whether there are two, three, or four operator stations, the first station is always the one at the far left. Connections are shown for one operator station; each additional operator stations are also connected as shown.

Figure 11

2.5.2 Install GW Electric RLX Control Handle to blast hose – Figure 12

⚠ 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.

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

⚠ WARNING

The maximum recommended total length of control cord is 300 feet. Distances greater than 300 feet will cause 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.

2.5.2.2 Band the electric control handle to the blast hose at a comfortable location behind the nozzle holder, as shown in Figure 12. 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.

⚠ WARNING

Carefully trace, connect, and mark control cord, control lines, and blast hose on multiple-outlet blast machines. Inadvertently switching 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 2.5.1 through 2.5.3 must be followed to safeguard against hose switching. Refer to Section 2.6 and 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.

2.5.2.3 Connect the control cord to the RLX whip cord and wrap the cords once loosely around the blast hose, as shown in Figure 13.

2.5.2.4 Band the cord to the blast hose on both sides of the cord connections, as shown in Figure 13.

2.5.2.5 Repeat the process for each section of blast hose and extension cords. **Note: The initial cord from the control panel comes with a twist-lock on one end and a lo-profile connector on the other end. Extension cords have lo-profile connectors on both end. Refer to Section 9.4 for extension cords.**

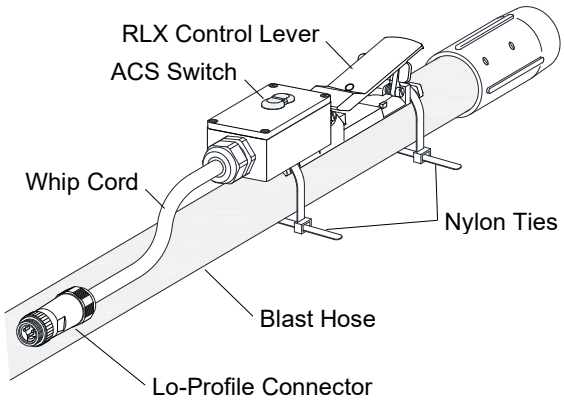


Figure 12

2.5.2.6 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.

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.

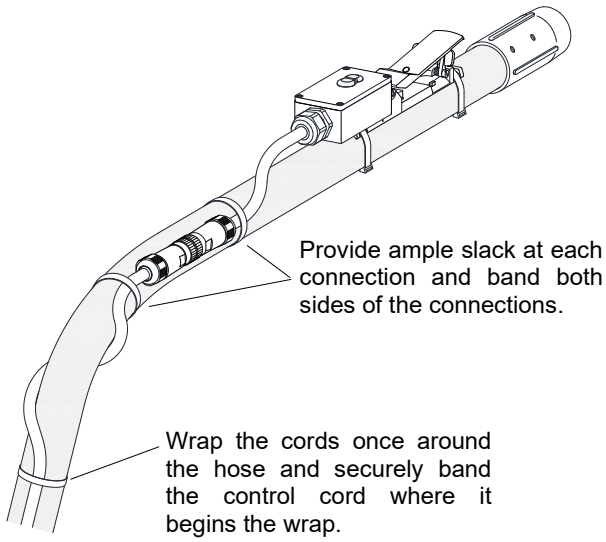


Figure 13

NOTE: 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.

2.5.3 Connect the blast hose to the blast machine Figure 14

2.5.3.1 Working from left to right, connect the blast hose assembly to the first blast machine quick coupling; use safety lock pins in all couplings. This is station No. 1. NOTE: Station No. 1 is always the blast hose and control cord farthest to the left on the operator panel (do not count unused ports). If only two operators are installed on a four-outlet machine, Station No. 1 is the second port from the left.

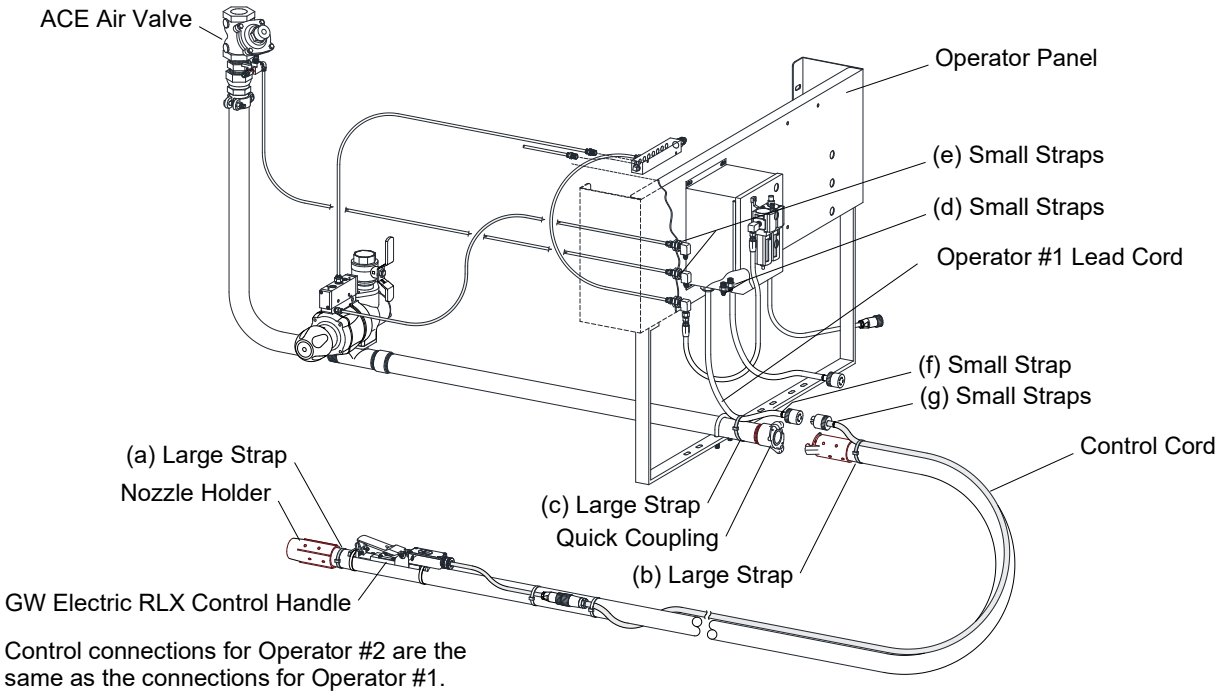
2.6 Color-Grouping Electric Operator Stations Figure 14

2.6.1 The following instructions explain the method of color-grouping each operator station and blast hose assembly connected to the station. Using a different color 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.

2.6.2 Two to four operator stations can be installed on most Pro-Series Big Clem Bulk Blast Machines. The blast hose and control 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.

2.6.3 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 correspond to the letters shown in parenthesis in Figure 14.

1. Working with a single color, attach three <u>large</u> 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 <u>small</u> straps to the control panel, cords, and control hose as follows:
   d. Attach straps to the two fittings on the bottom of the panel marked "Air Valve #1" and "Grit Valve #1".
   e. Attach a strap to each upper and middle fittings on the operator panel that leads to "Air Valve #1" and "Grit Valve #1".



Band the control cord to the blast hose every 4 to 6 feet.

Figure 14

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.

2.6.4 Color-grouping blast hose and control cord extensions

2.6.4.1 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 each end of the control cord, just 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 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 the 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, which are 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 the hitch and remove the tow vehicle.

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

4.0 SETUP and OPERATION

4.1 Setup

4.1.1 Load abrasive, per Section 4.7. **NOTE: Do not load abrasive until the initial test described in Section 4.4 is completed.** If abrasive is loaded onsite, 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 compressed-air inlet port(s). 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, use safety lock pins to lock the couplings together. The spring lock-pins prevent accidental separation of hose couplings during blasting.

⚠ WARNING

Hose disconnection while under pressure can cause serious injury or death. Use safety lock pins or safety wire to lock twist-on (claw-type) couplings together and prevent accidental separation while under pressure, and use safety cables to prevent hose from whipping should separation occur. Lock-pins and safety cables are listed in *Section 9.1*: *Accessories*.

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 panel to an appropriate power supply. The 12-VDC pigtail hooks up to a compressor at the battery or relay. On highway-towable units, the onboard battery that operates the emergency braking system is used as the power source, and it is shop wired if the electric remote controls are factory installed.

4.2 Startup

4.2.1 On the initial startup, close the abrasive metering valve, per Section 5.1.

4.2.2 Make sure that the safety valves, located on the ACE Air Valves, are open. The valves are open when the valve lever is in line with the valve's body, as shown in Figure 15.

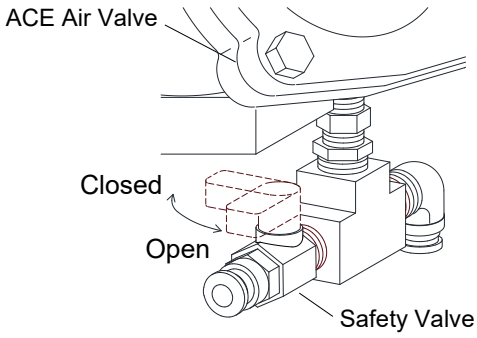
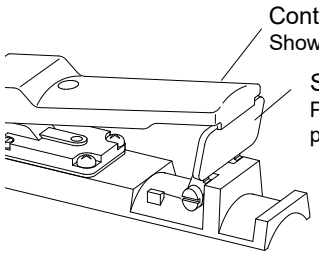


Figure 15

4.2.3 Make sure the control lever is in the up (no blast) position, as shown in Figure 16, and that the control lever and safety lever lock move freely.



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

Figure 16

⚠ WARNING

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

4.2.4 Inspect the control handle; the control lever must not seal the opening on the handle, (or activate the switch on electric handles) unless the safety lever lock is folded down.

⚠ WARNING

Malfunctioning control handles can cause unintentional actuation of a blast machine and also 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 on machines using electric remote controls.

4.2.6 Inspect all quick coupling to be sure safety lock pins are 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 (both shown in Figure 1), located above the metering valve, are open. Open is when the position of the handle is in line with the valve.

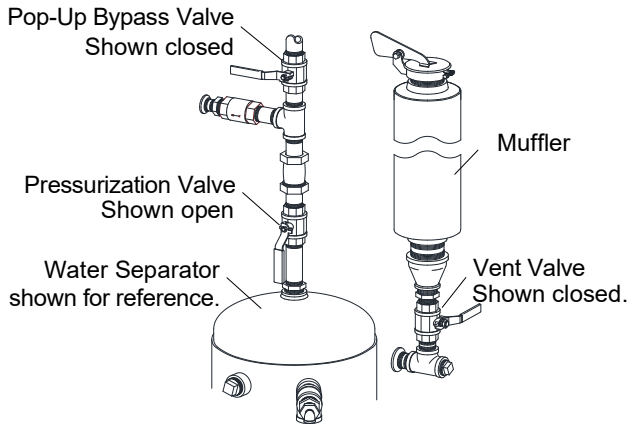
4.2.8 Make sure the pressurization valve is closed. Refer to Figure 17.

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.

4.3 Pressurizing and Depressurizing the Abrasive Chamber – Figure 17

4.3.1 Pressurizing the abrasive chamber: Close the exhaust (bleed-off) valve and open the pressurization valve. Compressed air enters the abrasive chamber and automatically seals the pop-up valve, which pressurizes the chamber. **NOTE: If the pop-up valve does not seal, close the pop-up bypass valve and reopen it as soon as the pop-up seats.**



Some items removed or rotated for clarity.

Figure 17

4.3.2 Depressurizing the abrasive chamber: Close the pressurization valve and open the exhaust valve. The pop-up valve automatically drops when air is expelled from the chamber and pressure equalizes.

4.4 Initial Test (before loading the machine with abrasive)

4.4.1 The machine should be setup for operation, compressed air supply on, and the machine pressurized.

4.4.2 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 valves open.
- Check fittings, hoses, and piping for leaks.

4.4.3 When certain the machine is operational, depressurize the chamber, load abrasive, and prepare the machine for blasting.

4.5 Opening and Closing the Pop-Up Fill-Port Cover – Figure 18

4.5.1 Pull the latch handle up and swing it away to unlock the fill-port cover.

4.5.2 Swing the cover clear of the opening so loading may begin through the filling port, as shown in Figure 18.

4.5.3 Close the cover when required by weather or at the end of the blasting shift to prevent moisture and foreign material from entering the chamber.

4.5.4 To close and seal the cover, close the cover, swing the latch handle over the cover, and press down to secure the latch.

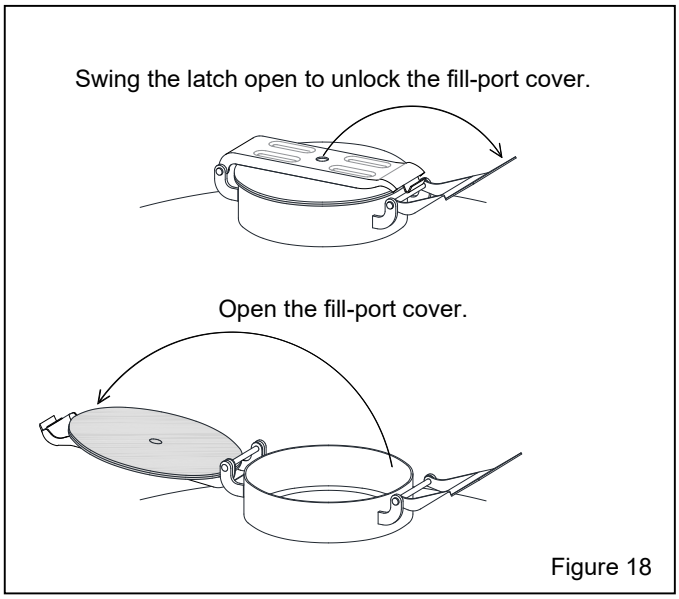


Figure 18

4.5.5 It is not necessary to close the cover when the chamber is full; close the cover when required by weather or at the end of the blasting shift to prevent moisture and foreign material from entering the chamber.

4.6 Optional Super-Sack Rack

4.6.1 Attach super-sack rack guides – Figure 19

The super-sack rack is intended to be loaded at ground level and then raised and set into the rack guide, placing the spout over the fill port.

4.6.1.1 Attach the four rack guides to the guide mounts, as shown in Figure 19. The open side of the guides facing toward the center of the machine. Secure with the fasteners provided.

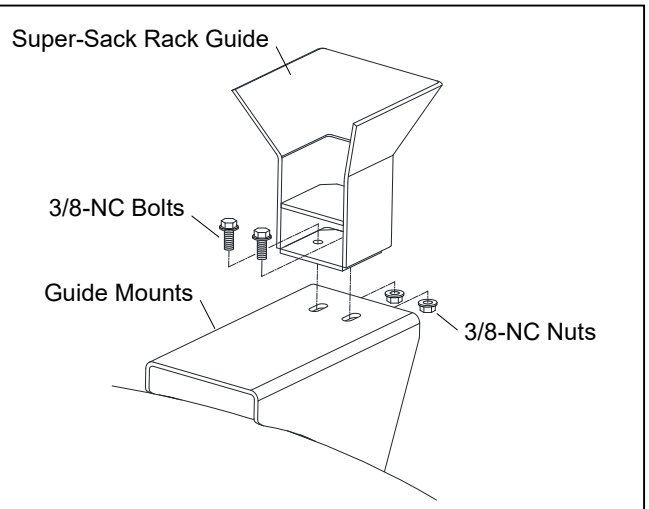


Figure 19

4.6.1.2 The rack is equipped with lifting eyes and fork lift channels: use either to lift the rack and place it into the rack guides.

4.7 Load Abrasive

⚠ WARNING

Obtain a safety data sheet (SDS) for the blast abrasive. Abrasive blasting with sand 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.

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

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

4.7.3 Open the fill-port cover, per Section 4.5.

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

⚠ WARNING

Do not load towable machines in excess of the gross vehicle weight. Refer to Section 1.8 for the gross vehicle weight of each model. Loads heavier than the GVWR limit will cause unsafe conditions, affecting brakes, and causing damage to the trailer, suspension, or tires, which can result in serious injury or death.

4.7.5 It is not necessary to close the cover when the chamber is full; close the cover when required by weather or at the end of the blasting shift to prevent moisture and foreign material from entering the chamber.

4.7.6 To close and seal the cover, close the cover, swing the latch handle over the cover and press down to secure the latch.

4.8 Personal Protective Equipment

⚠ WARNING

All dust is hazardous to breath. 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.

Obtain a safety data sheet (SDS) for the blast abrasive to identify hazardous substances. Silica sand (crystalline) can cause silicosis, lung cancer, and breathing problems in exposed workers. Slag abrasives may contain trace amounts of toxic metals such as arsenic, beryllium, and cadmium. Any abrasive dust has potential to cause lung disease.

Abrasive blasting operations can create high levels of harmful dust and noise. No dust is safe to breathe. Failure to wear NIOSH-approved respirators can result in serious lung disease or death. The respirators must be properly fitted and maintained. Use only NIOSH-approved,

Type-CE supplied-air respirators approved for abrasive blasting.

During abrasive blasting, abrasive and dust particles 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, eye protection, and hearing protection appropriate for the job site hazards.

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

It is the employer's responsibility to train employees to identify hazardous substances and to provide suitable policies, procedures, monitoring, recordkeeping, and personal protective equipment.

4.8.1 Operators and **anyone else exposed to the hazards generated by the blasting process** must wear appropriate protective gear, including abrasive-resistant clothing and gloves, eye and hearing protection, and a NIOSH-approved, Type-CE supplied-air respirator.

4.8.2 Don protective attire outside the blast area in a clean nonhazardous environment, free of contaminants, and where the air is safe to breathe.

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

4.9 Start Blasting

4.9.1 Don all protective blasting attire, per Section 4.8.

4.9.2 Make sure the toggle on the RLX Control Handle ACS switch is pointing away from the nozzle (pneumatic system), or that the ON pushbutton (closest to the nozzle) is pressed on electric RLX Control Handles. Refer to *Section 4.11: Operation of the Abrasive Cutoff Switch.*

4.9.3 When the blast operator is ready to blast, the operator or the machine tender must close the safety valve(s) on the corresponding station. Leave the safety valves open on all stations that are not being used. Closing the valve prepares the machine for remote operation and activation by the control handle.

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

4.9.5 Fold down the safety lever lock and press the remote control handle, as shown in Figure 20. 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 lever.

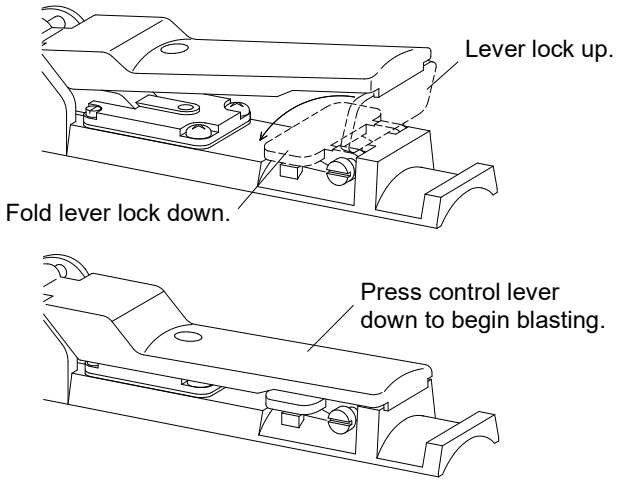


Figure 20

⚠ 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 lever or attempt to bypass any part of the remote control system. Doing so defeats 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)

4.9.6 Adjust abrasive flow, per Section 5.1.

4.10 Operation and Function of Safety Valves and Vent Valves – Figure 21

4.10.1 Safety valves prevent the operation of the blast station when it is not being used, and when necessary, allows the pot tender or supervisor to stop blasting from the machine. The valves are open when the valve lever is in line with the valve's body, as shown in Figure 21.

4.10.2 Main Safety Valve: The main safety valve is located on the ACE Air Valves, as shown in Figure 21. Opening the safety valve prevents accidental operation of the blast machine. Always open safety valves during work breaks, when an operator station is not being used, and at the end of the work shift.

When ready to blast, close the safety valve on the operator station being used. Leave the safety valves open on all stations that are not being used. Closing the valve prepares the machine for remote operation and activation by the control handle.

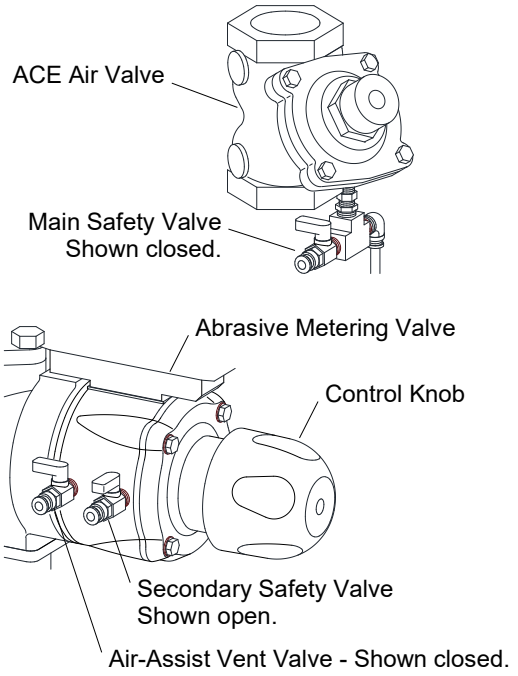


Figure 21

4.10.3 Secondary Safety Valve: The secondary valve is located on the side of the metering valve, closest to the metering knob, as shown. This valve should be open when servicing the metering valve and to test if control air is reaching the valve. The metering valve in normally closed; air in the chamber behind the safety valve opens the valve during blasting.

4.10.4 Air-Assist Vent Valve: Located on the side of the metering valve, farthest from the metering knob, as shown. This valve should be kept closed during operation and opened before servicing the metering valve to make sure compressed air is vented and to test that no air is present during blasting. When not blasting, air pressure in the chamber behind the vent valve assist in closing the valve.

4.11 Operation of the Abrasive Cutoff Switch (ACS)

⚠ WARNING

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

4.11.1 The ACS closes the abrasive metering valve so that air alone without abrasive exits the nozzle. Common uses for this feature are:

- Clearing abrasive from the blast hose when finished blasting. This is helpful in many applications and is necessary when blasting vertically to prevent abrasive from collecting in low spots in the blast hose, eliminating excessive abrasive slugging at startup.
- 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.
- When wet blasting with an injector or wetblast attachment, it is used to assist in blow drying the surface after it is washed down.

4.11.2 Pneumatic controls: The abrasive cutoff switch is situated directly behind the control handle, as shown in Figure 22. The switch may be flipped ON or OFF at any time, but it will not operate the metering valve unless the control handle is pressed.

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

4.11.2.2 Blowdown mode: Moving the ACS toggle to point toward the nozzle, to the OFF position, cuts off control air to the abrasive metering valve to close the valve and stops abrasive flow. This action allows air alone to exit the nozzle, which is useful for clearing the blast hose before shutting down and for blowing abrasive off the blasted surface.

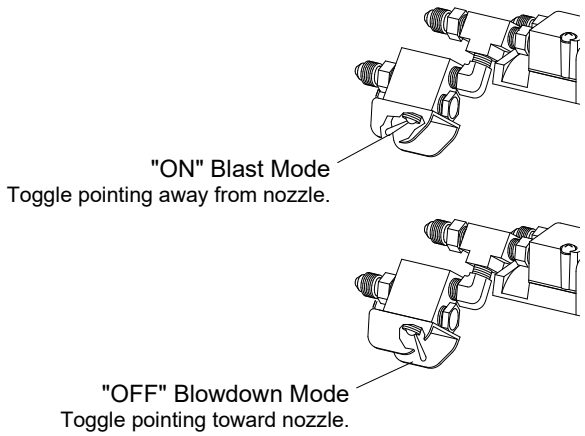


Figure 22

4.11.3 Electric control: The ACS switch is wired into the box at the back of the GW Electric RLX Control Handle, as shown in Figure 23. The switch may be pressed ON or OFF at any time, but will not operate the metering valve unless the control handle is pressed.

4.11.3.1 Blast mode: Abrasive flow is ON when the front pushbutton (closest to the nozzle) is pressed. This action sends control air to the abrasive metering valve and opens the valve, which enables the blast machine to operate normally, with air and abrasive coming out the nozzle.

4.11.3.2 Blowdown mode: The ACS switch is OFF (no abrasive) when the rear pushbutton (farthest from 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 for blowing abrasive off the blasted surface.

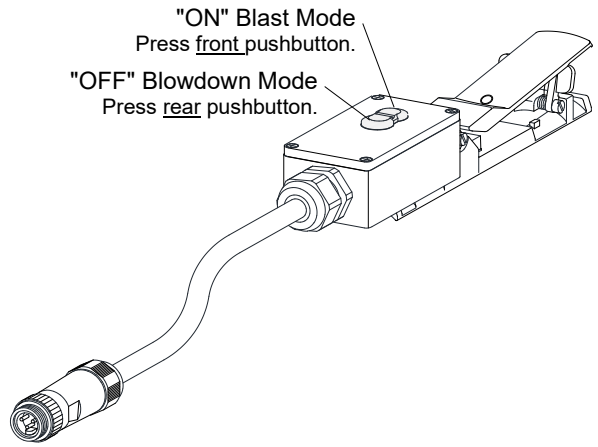


Figure 23

4.12 Operation and Function of the Choke Valve Figure 24

4.12.1 Always blast with the choke valve fully open; open is when the handle is vertical and aligned with the piping, as shown in Figure 24.

4.12.2 Closing the choke valve while blasting lowers pressure in the pusher line from the pressure in the vessel. Closing the valve forces abrasive through the metering valve to clear minor blockages, such as damp abrasive.

4.12.3 To clear minor blockages, while blasting close the choke valve a second or two and then reopen it. Repeat the procedure if necessary.

4.12.4 To rapidly empty abrasive from the machine at the end of the day, while blasting close the choke valve. Be prepared for severe surging and recoil of the hose. Open the choke valve when the machine is empty.

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.

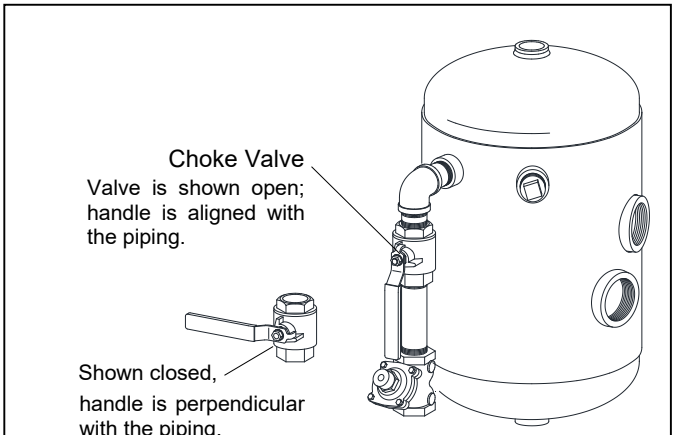


Figure 24

4.13 Stop Blasting

4.13.1 Before releasing the control handle, the operator may use the ACS switch to shut off the abrasive flow to clear abrasive from the blast hose, or blowdown the work piece. Refer to *Section 4.11: Operation of the Abrasive Cutoff Switch.*

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

4.13.3 When the control lever is released, the safety lever lock will return to the full UP position to lock the control lever in the up (nonblast) position. Make sure the safety lever lock is up, to prevent the control lever from engaging.

4.13.4 Always open safety valves during work breaks and at the end of the workday to prevent unintentional blasting.

4.13.5 It is not necessary to depressurize the abrasive chamber between stopping and starting blasting. The metering valve and air valve will close when the control lever is released. Depressurize the chamber, per Section 4.3.2, during work breaks to prevent accidental activation.

4.14 Emptying the Abrasive Chamber

4.14.1 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, when reasonable 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:

4.14.2 With the blast machine OFF, close the choke valve, as shown if Figure 24, and set the abrasive metering valve at full open.

4.14.3 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, which can cause the nozzle to disconnect from the holder, when the nozzle is reinstalled, and blasting begins.

⚠ WARNING

Nozzle or nozzle holder disconnection while under pressure can cause serious injury or death. 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 can cause nozzle thread erosion, resulting in the disconnection from the holder.

4.14.4 Using normal startup procedures, except with the choke valve closed, pressurize the abrasive chamber, per Section 4.3.1.

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

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

4.14.7 When the chamber is empty, release the control lever, open the safety valves, open the choke valve, and depressurize the chamber, per Section 4.3.2.

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

4.15 Shut Down

4.15.1 When shutting down for the day, and when practical, empty the abrasive chamber of abrasive, per Section 4.14. Doing so will eliminate trouble from moist abrasive when starting a new day's blasting.

4.15.2 Open the safety valves on each operator station.

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

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

4.15.5 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.

4.15.6 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.

4.15.7 Shut down the compressor.

4.15.8 At the end of the shift, secure the fill-port cover over the pop-up valve opening, per Section 4.5. 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 Adjust Abrasive Flow – Figure 25

5.1.1 The valve is closed when the knob is fully clockwise. Increase abrasive flow by turning the knob counterclockwise and decrease abrasive flow by turning the knob clockwise, as shown in Figure 25. Begin with the knob set two turns from fully closed. Increase flow by turning the knob no more than 1/4 turn counterclockwise. Check flow before readjusting. Continue adjusting as described until the correct flow is attained.

5.1.2 The indicator label behind the knob shows how far the metering valve is open. When the knob is turned in or out it moves over the label, allowing the operator to reset the valve to the same position when abrasive flow is temporarily changed.

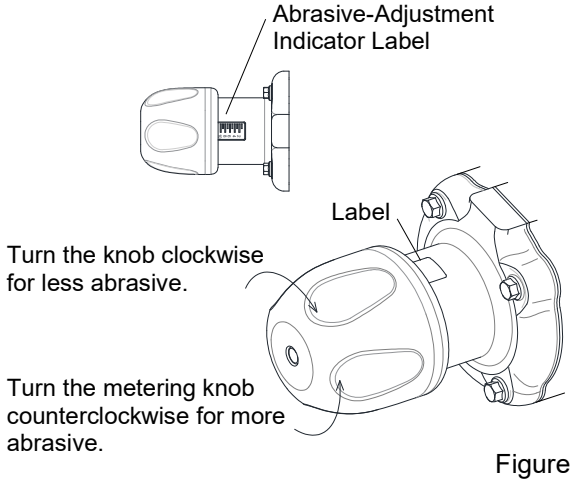


Figure 25

5.1.3 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.

5.2 Antifreeze 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.** A separate manufacturer operating instruction is provided for the operation of the antifreeze injector.

5.2.1 Turn the metering knob fully clockwise to close.

5.2.2 Turn the metering 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. Antifreeze 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.

6.0 PREVENTIVE MAINTENANCE

NOTE: The following preventive maintenance instructions pertain to the blast machine. Refer to operations manuals listed in paragraph 1.1.1 for inspection and maintenance of those components.

6.1 Daily Inspection

To avoid unscheduled downtime and to improve safety, establish a daily inspection schedule. Inspect all parts subjected to abrasive contact, including the blast hose, nozzle, and all items covered in this section.

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

Battery: 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.**

RLX control handle: Refer to the RLX Remote Control Handle operations manual, as listed in Paragraph 1.1.1.

- Make sure the control lever does not seal the exhaust port on pneumatic controls, or that is does not engage the switch on electric controls, unless the safety lever lock is intentionally folded down.
- The **control lever** must return to the UP position when released.
- The **safety lever lock** must return to the UP position when the control lever is released.
- Both the control lever and safety lever lock must move freely with no drag or binding.

⚠ WARNING

Malfunctioning control handles can cause unintentional actuation of a blast machine and also 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. Refer to the RLX operations manual for service instructions.

Blast hose and couplings: Inspect blast hose, couplings, and nozzle holder daily and when making connections.

⚠ WARNING

Worn blast hose can suddenly burst while under blast pressure. Couplings and nozzle holders will not safely grip worn hose and can blow off under pressure. Compressed air and abrasive escaping from a burst hose, or hose whipping from a disconnected coupling or nozzle holder, can cause severe injury.

- Make sure coupling screws are fully seated in the coupling and that none are missing.
- Make sure that safety lock pins are inserted in all couplings.
- Make sure safety cables are attached at all blast hose and air hose connections and that all slack is removed from the cable.

6.1.2 With the vessel under pressure but before blasting, do the following:

- Check the blast machine vessel for leaks. If leaks are found around the pop-up valve, inspection door, or any pipe-fitting ports on the vessel, repair or replace worn parts immediately.

NOTICE

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

- Check for air leaking from the nozzle. If air is felt from the nozzle, close the choke valve on the corresponding pusher line.
  - If the leak stops, the air valve requires service. Refer to the ACE Air Valve operations manual for service instructions.
  - If the leak continues, the abrasive metering valve requires service. Refer to the abrasive metering valve operations manual listed in Paragraph 1.1.1, for service instructions.

6.1.3 During blasting, do the following:

RLX Control Handle: Check the control handle for leaks.

Couplings and nozzle holders: Inspect all couplings, coupling gaskets, 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 can disconnect while under pressure. Impact from nozzles, couplings, hoses, or abrasive, from parts disconnecting can cause severe injury.

Water separator: Before depressurizing the blast machine vessel, 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 after the vessels are depressurized, the drain 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. The first sign of wear is usually along the outside radius where the hose bends just behind the nozzle holder or where the hose is attached to the blast machine. Replace the hose as soon as soft spots are noted.
- Make sure coupling gaskets are in good condition.

⚠ WARNING

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

- Remove the nozzle for inspection. Install a new nozzle if the orifice diameter is worn 1/16″ or more from its original size, or if the nozzle is damaged or if the liner is cracked.
- Make sure the nozzle washer is in good condition and is in place before attaching the nozzle.

⚠ WARNING

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

- Inspect the remote control air filter located at the top of the water separator on pneumatic systems (shown in Figure 1) or on the control panel door on electric controls. Replace dirty filter elements.

6.2.2 During blasting do the following:

- Inspect all control hoses and valves for leaks. If leaks are found, stop blasting and repair.
- Make sure the pop-up valve is seated and that there are no leaks. If the pop-up valve is leaking, depressurize the abrasive chamber and repair the leak.

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 7.4.
- Inspect the rubber pop-up seal and replace at the first sign of wear, drying, or cracking. Refer to Section 7.5.

6.4 Periodic Inspection

6.4.1 The remote control system is a safety device. For safety and to avoid unscheduled downtime, 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 the operations manuals listed in Paragraph 1.1.1 for service instructions of those items.

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

7.0 SERVICE MAINTENANCE

NOTE: Separate manuals are provided for the ACE Air Valve, GritWizard Abrasive Metering Valve, and RLX Control Handles. Refer to the manuals listed in Paragraph 1.1.1 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 abrasive chamber.**
- **Turn OFF the compressed-air supply.**
- **Lockout and tagout the compressed-air supply.**
- **Bleed the air-supply line to the blast machine.**
- **Open the water-separator drain valve.**
- **Open the safety valve(s).**

7.1 Removing Minor Blockage Caused from Damp Abrasive

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

7.1.2 For blockages that are more difficult, proceed as follows:

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 can cause severe injury.

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

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, remove the nozzle and nozzle washer and reattach the blast 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 can cause severe injury. Check the threads for wear, and make sure the nozzle holder securely holds the nozzle. The nozzle washer must also be inspected for wear. When nozzle washers are worn, abrasive can erode nozzle threads.

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

7.1.2.7 Refer to the abrasive metering valve manual listed in Paragraph 1.1.1 to check for obstructions in the metering valve.

7.2 Removing Damp Abrasive from Abrasive Chamber

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

7.2.1 Empty the abrasive chamber, per the instructions in Section 4.14.

7.3 Removing and Installing the Manway Cover – Figure 26

7.3.1 Empty abrasive from the abrasive chamber to a level below the manway, per Section 4.14.

7.3.2 The manway cover is secured with two clamps and bolts; clips on the top of the cover fit over the inside of the manway ring and help hold it in place while removing and installing the clamps. If the cover is pushed inward, the clips will slide off the ring and release the cover. Pull the door outward when removing and installing the clamps but let go and release the cover if it should slip. The cover weighs approximately 20 lbs and can injure an operator's hands if it slips.

⚠ WARNING

Do not try to support the weight of the cover if the support clips should slip while installing or removing the clamps. Severe pinching injury can occur if the cover is not immediately released should the clips slide off the top of the manway ring.

7.3.3 Loosen one clamp bolt at a time until it is loose enough to slide the bolt head from the cover bracket.

7.3.4 Use both hands to push the cover in to release the clips. Be prepared to support the weight of the cover; it weighs approximately 20 pounds.

7.3.5 Inspect the cover gasket and replace it if worn or damaged. Use rubber-based adhesive to help hold the gasket in place during assembly.

7.3.6 To reset the cover, hang the cover clips on the top edge of the ring; use slight pressure to pull the cover outward while installing the clamps and bolts.

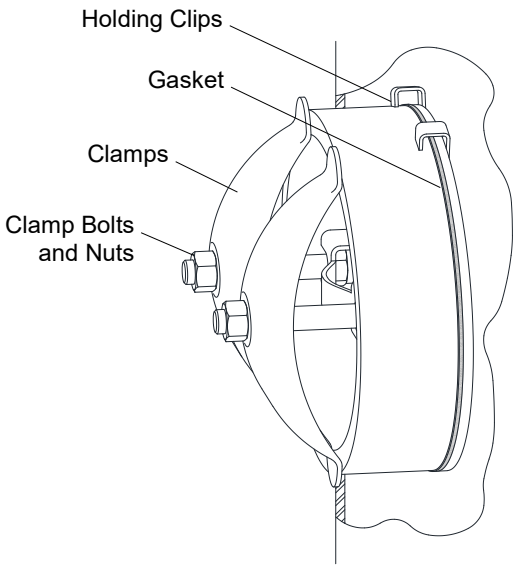


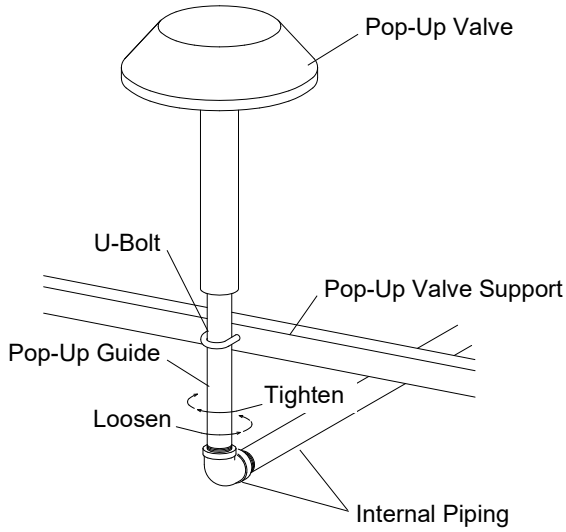
Figure 26

7.4 Replace the Pop-up Valve – Figure 27

7.4.1 Empty abrasive from the abrasive chamber to a level below the manway, per Section 4.14.

7.4.2 Remove the manway cover, per Section 7.3.

7.4.3 Refer to Figure 27 and loosen the U-bolt enough to turn the pop-up guide.



Some items rotated for clarity.

Figure 27

7.4.4 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 valve from the chamber.

7.4.5 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.

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

7.4.7 Check the pop-up seal (rubber ring). Replace if worn, per Section 7.5.

7.4.8 Refer to Figure 28 to check the pop-up height. If the pop-up sits lower than 5 inches, 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. If the pop-up height is outside the recommended range, adjust the height by replacing the guide with one that is longer or shorter.

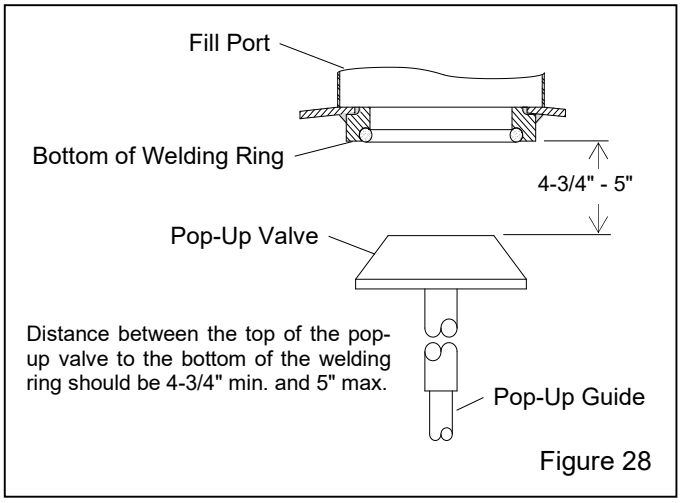


Figure 28

7.4.9 Tighten the U-bolt to secure the guide.

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

7.5 Replace the Pop-up Valve Seal (Rubber Ring) – Figure 29

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

7.5.2 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.

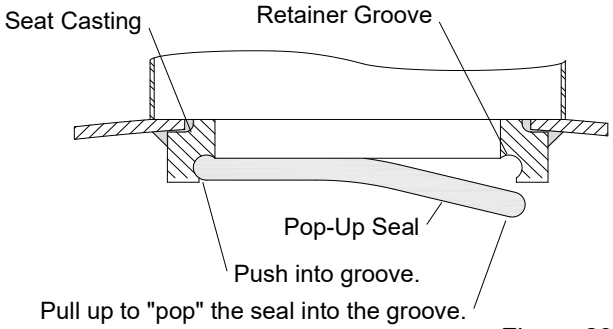


Figure 29

7.6 Cutting Control Hose and Reusing Control-Hose Fittings – Figure 30

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

7.6.1 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.

7.6.2 Turn the sleeve clockwise to remove it from the hose.

7.6.3 Cut hose to the required length.

7.6.4 Turn the sleeve counterclockwise to install it onto the hose. Do not over-tighten the sleeve. Stop tightening as soon as the hose bottoms against the sleeve's internal shoulder. Over-tightening will cause the hose to curl inward and could cause blockage.

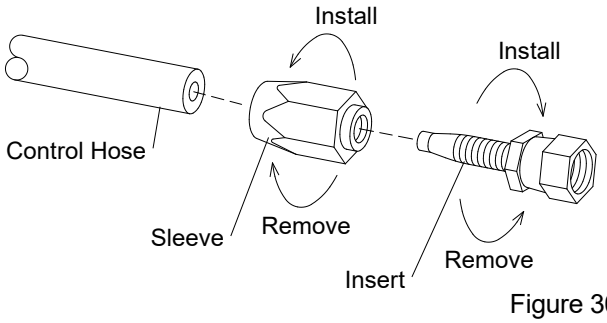


Figure 30

7.6.5 Push the end of the insert into the sleeve and turn it clockwise to tighten until the insert hex is against the sleeve.

7.7 Using Tube-Lock Fittings – Figure 31

⚠ WARNING

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

- **Lockout and tagout the compressed-air supply.**
- **Bleed all compressed air-supply lines.**

7.7.1 To remove the tubing from tube-lock fittings, push the retaining collar toward the fitting, which releases the tubing so it can be easily removed by pulling it out. Do not force it; only a slight pull on the tubing is required if the retaining collar is pushed in correctly.

7.7.2 Reconnect the tubing by inserting it through the collar until it seats. Tug on the tubing to make sure it is tight.

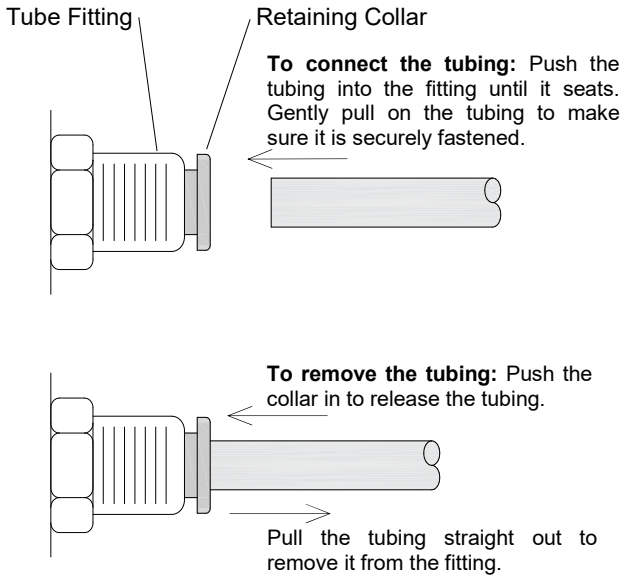


Figure 31

7.8 Replacing Lo-Profile Electrical Connectors Figure 32

Electrical connectors are not used with pneumatic control systems.

7.8.1 Remove old connector

1. Loosen the dome nut and slide it away from the shell.
2. Rotate the front shell until the hole in the shell is aligned with the hole in the head. Insert a 3/32" pin,

screwdriver, hex key, or similar tool through the front shell and into the coupling to prevent it from turning.

3. Turn the back shell counterclockwise to remove. When loose, slide the back shell away from the head.

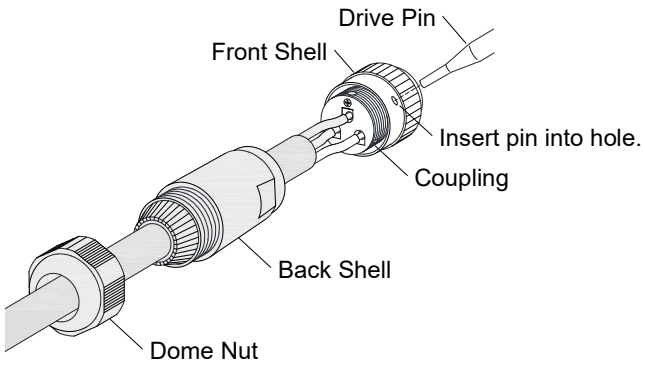


Figure 32

4. Note the positioning of the wires:
   - Black into contact #1
   - Green into contact #2
   - White into contact #3

   Loosen the contact screws and remove the wires.
5. Slide the front and back shells and dome nut from the cord.
6. If the wires are damaged, cut the ends and strip the cord jacket back 1-1/2". Strip 1/4" of insulation from the wires

7.8.2 Install new connector

1. If the wires are damaged, cut the ends and strip the cord jacket back 1-1/2". Strip 1/4" of insulation from the wires.
2. Remove the inner grommet from the outer grommet and discard the inner.
3. Pass the cord through the dome nut, outer grommet, and back shell.
4. Insert the stripped wires into the coupling contacts as noted below:
   - Black into contact #1
   - Green into contact #2
   - White into contact #3
5. Tighten the contact screws to 4.4 lbf.
6. Assemble back shell to the coupling, in reverse order, as noted in Section 7.9.1 and tighten to 20 lbf.

7.9 Replacing 3-Prong Twist-Lock Connector

7.9.1 When replacing twist-lock cord connections, observe the following wire and pole coding:

- Black wire to brass pole
- Green wire to green pole
- White wire to silver pole

7.10 Servicing Parts with Separate Operations Manuals

7.10.1 Separate manuals are provided for the ACE Air Valve, GritWizard Abrasive Metering Valve, and RLX Control Handles. Refer to the manuals listed in Paragraph 1.1.1 to service those individual components.

8.0 TROUBLESHOOTING

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

⚠ WARNING

To avoid serious injury from the sudden release of compressed air, observe the following when troubleshooting the machine and remote controls:

- **Turn OFF the air supply, and lockout and tagout the air supply.**
- **Drain the air-supply line.**
- **When checking, if 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 lever down in the operating position.**

8.1 Pop-Up Valve Will Not Seal

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

8.1.2 Check air-supply line. Undersized air hose will restrict air to the pop-up valve and not have enough force to push the pop-up valve up and seal. Refer to the table in Figure 4 for the recommend air hose size.

8.1.3 Pop-up valve or pop-up seal worn. Check both parts for wear.

8.1.4 Pop-up valve out of alignment. Check alignment; the valve must be centered to the fill port.

8.2 Irregular Abrasive Flow

8.2.1 Check the abrasive metering valve and air valve for air leaks. These are normally closed valves and require air to open; any leak or fluctuation in pressure can 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, per Section 4.12.

8.2.3 Moisture in the blast machine or in the air supply. Drain moisture from the compressor's receiver tank and the blast machine's water separator. If moisture in the air is a recurring problem, a dryer or aftercooler may be required in the air-supply line.

8.2.4 Check control line pressure. Pressure below 55 psi may cause the metering valve to begin to close. Pressure fluctuations causes 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 (no air and no abrasive) when the control handle lever is pressed

NOTE: The easiest way to check a dual-operator system to determine if the problem is in the controls or the valves. is to substitute one control hoses and handle with another that is working,

8.3.1.1 Make sure the abrasive chamber is pressurized.

8.3.1.2 Make sure the safety valves on the ACE Air Valve and abrasive metering valve are closed.

8.3.1.3 Check the nozzle for blockage. Open the safety valve on the ACE Air Valve and make sure the control handle is UP, in the nonblast position. Remove the nozzle and check it for an obstruction. When clear of obstruction, replace the nozzle and close the safety valves.

8.3.1.4 Inspect the rubber button for wear or damage and make sure it seals the exhaust port in the pneumatic adaptor when the handle is pressed.

8.3.1.5 With safety valves closed and the control lever UP, check for air escaping from the opening under the control lever.

- If no or minimal air flows from the opening, the orifice fitting or the outbound line from the orifice to the handle is plugged. Inspect the orifice and hose for blockage.'
- If air does flow from the opening, press the control handle and check for air leaks in the control handle, all control hoses, tubing, fittings, ACE Air Valve, and metering valve. After the control handle is pressed there should be no air leaks anyplace in the air circuit of the station being checked. Any air leak can prevent the controls from operating correctly and must be corrected.

8.3.1.6 Open the safety valve on the ACE Air Valve and press the control lever. Air should come out the safety valve. If it does not, the opening under the lever is not being sealed, the return line between the handle and the ACE Valve is blocked, or the 4-way pilot valve is not operating. Check the operation of the 4-way pilot valve, per Section 8.5.

8.3.2 Blasting does not stop when the control handle lever is released

8.3.2.1 Inspect the pneumatic adaptor gasket for swelling, which restricts air flow through the handle exhaust port.

8.3.2.2 Inspect the exhaust port on the pneumatic adaptor. Make sure it is clear of flashing or foreign obstruction that inhibits air from escaping through the opening.

8.3.2.3 Open the ACE safety valve if blasting stops, check the return lines and fittings from the ACE to the control handle for blockage.

8.3.2.4 Check the operation of the 4-Way pilot valve, per Section 8.5.

8.3.3 Air or abrasive leaks from the nozzle after the control handle lever is released

8.3.3.1 When air or abrasive leaks from the nozzle and the control lever is up, the ACE Air Valve or the abrasive metering valve is not closing.

8.3.3.2 To find out which valve is leaking, close the choke valve.

If the leak stops, the problem is with the ACE Valve or control lines to the ACE Valve.

- The ACE Air Valve may require service.
- There could be a blockage in the control lines between the ACE Air Valve and the control handle.

If the leak continues, the problem is with the abrasive metering valve or controls to the metering valve.

- Make sure the air-assist vent valve (farthest from the metering knob) is closed.
- Open the metering valve's safety valve (closest to the metering knob).
  If air escapes and the metering valve closes, there may be a blockage in the line between the side of the 4-way adaptor plate and control handle.
  If air does not escape and the leak continues, the abrasive metering valve plunger may be worn or damaged. Refer to the applicable metering valve manual listed in Paragraph 1.1.1, and inspect the metering valve.
- The 4-way pilot valve requires service. Refer to Section 8.5.

8.3.4 Heavy abrasive flow

8.3.4.1 Make sure the choke valve is open (handle in-line with the valve and piping, as noted in Section 4.12.

8.3.4.2 Abrasive metering valve may be open too far. Refer to Section 5.1 to adjust the metering valve.

8.3.4.3 Inspect the metering valve for wear. Refer to the metering valve operations manual listed in Paragraph 1.1.1.

8.3.4.4 Check the diaphragm in the ACE Air Valve for damage.

8.3.5 Air flow only – no abrasive

8.3.5.1 Make sure the machine contains abrasive.

8.3.5.2 Make sure the ACS is in the ON position with the ACS toggle pointing away from nozzle. Refer to Section 4.11.2.

8.3.5.3 Check for a leak or blockage in the ACS hose between the control handle to the metering valve.

8.3.5.4 Abrasive metering valve may be closed or needs adjustment. Refer to Section 5.1 to adjust the metering valve.

8.3.5.5 Abrasive may be damp. Refer to Sections 7.1 and 7.2 to clear damp abrasive or minor obstruction in the abrasive metering valve and abrasive chamber.

8.3.5.6 The metering valve may require service. Refer to the metering valve operations manual listed in Paragraph 1.1.1.

8.3.5.7 Check the operation of the 4-way pilot valve, per Section 8.5.

8.3.6 Abrasive flow continues after the control handle lever is released

8.3.6.1 Control air may not be fully exhausting from the control handle. Check the following: Refer to the RLX Control Handle Operations Manual, listed in Paragraph 1.1.1.

- Inspect the pneumatic adaptor gasket for swelling, which restricts air flow through the handle exhaust port.
- Inspect the exhaust port on the pneumatic adaptor; make sure it is clear of flashing or foreign obstruction that inhibits air from escaping through the opening.

8.3.6.2 Control air may not be fully exhausting from the metering valve. With the control lever UP, open the metering valve's safety valve (closest to the metering knob). If air vents and abrasive flow stops, there may be a blockage in the line between the side of the 4-way adaptor plate and control handle.

8.3.6.3 Open the air-assist vent valve (farthest from the abrasive metering knob), if air does not escape, Check operation of the 4-way pilot valve, per Section 8.5

8.3.6.4 Inspect the metering valve plunger and seat for wear. Refer to the metering valve operations manual.

8.3.7 Abrasive flow continues after ACS toggle is switched OFF

NOTE: The ACS will not function unless the control handle is pressed.

8.3.7.1 Brass exhaust filter on ACS switch may be clogged. Remove the filter and inspect it for blockage.

8.3.7.2 Follow the steps in Section 8.3.6.

8.4 Troubleshooting Electric Remote Controls

Refer to Section 8.3 for Pneumatic Controls.

8.4.1 Blasting does not start (no air and no abrasive) when the 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 and valves.

8.4.1.1 Make sure the abrasive chamber is pressurized.

8.4.1.2 Make sure the safety valves on the ACE Air Valve and abrasive metering valve are closed.

8.4.1.3 Check the nozzle for blockage: Open the safety valve on the ACE Air Valve and make sure the control handle is UP, in the nonblast position. Remove the nozzle and check it for an obstruction. When clear of obstruction, replace the nozzle and close the safety valves.

8.4.1.4 With safety valves closed, press the control handle and check for air leaks in all control hoses, tubing, fittings, control panel, ACE Air Valve, and metering valve. After the control handle is pressed there should be no air leaks anyplace in the air circuit of the station being checked. Any air leak can prevent the control from operating correctly and must be corrected.

8.4.1.5 Listen to the control panel to determine if the solenoids click when the control handle is pressed and released.

If it does click, the fault is probably not electrical and in the pneumatic circuit or 4-way pilot valve.

If it does not click, check the operation of the RLX Control Handle per Section 8.4.1.6, control panel per Section 8.4.1.7, and control cords, per Section 8.4.1.8. Check the operation of the 4-way pilot valve, per Section 8.5.

8.4.1.6 Check operation of the RLX Control Handle: The easiest way to check the control handle is to substitute it with one that is functioning properly. If that is not possible, turn off the compressed-air supply, disconnect the control handle at the initial control cord and check continuity as follows:

1. Press the ON front pushbutton (closest to the control lever). Press the control lever and check continuity across pins No. 1 and 3 in the lo-profile connector, as shown in Figure 33, and again across pins No. 1 and 2. If either pin fails the continuity test, the switch is faulty, and the control handle must be replaced.
1. Press the OFF pushbutton (farthest from the control lever), and repeat the tests. There should be continuity across pins No. 1 and 3 in the lo-profile connector, and no continuity across pins No. 1 and 2. If either pin fails the continuity test, the control handle is faulty and must be replaced.
2. If the control handle passes both tests, the handle is good.

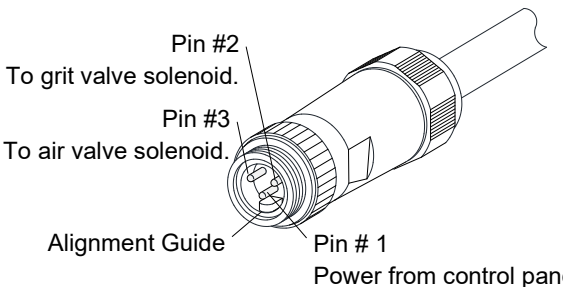


Figure 33

8.4.1.7 Check operation of the control panel – Figure 34

1. Remove the 50 ft control cord from the operator 5 ft lead cord coming from the panel. Hold the lead cord socket so the angled slot is facing up, as shown in

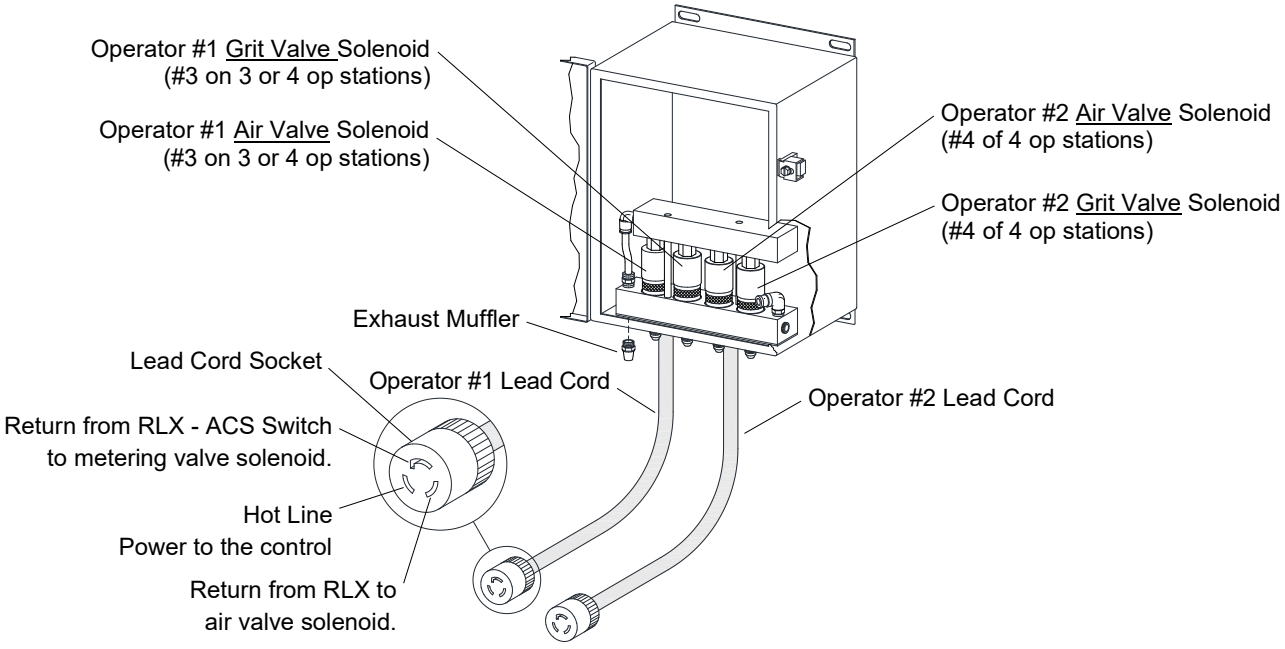


Figure 34

Figure 34. 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 control handle.

2. Jump between the hot line and the angled slot (metering valve solenoid), and listen for a click from second from the left or far right solenoid (depending on which operator station is being checked). Then jump between the hot line and the slot to the right (air valve solenoid) of the angled slot, and listen for a click from the far left or third from the left solenoid (depending on which operator station is being checked). If both valves click, check the control RLX control handle, per Section 8.4.1.6 and electric control cord, per Section 8.4.1.8. 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.

4.1.8 Check control cords: The easiest way to check a control cord is to substitute it with one that is functioning properly. If that is not possible, turn off the compressed-air supply, disconnect the control handle at the initial control cord and check continuity as follows:

1. First make sure the panel is operational, per Section 8.4.1.7.
2. Connect each cord one at a time to the panel and jump across the lo-profile pins, as explained in Section 8.4.1.6. If the solenoids do not click, check the connections in both (male and female) lo-profile connectors, refer to Section 7.9.

Check all extension cords in like manner.

8.4.1.9 Check the operation of the 4-way pilot valve:

1. Open the air-assist vent valve and safety valve on the side of the abrasive metering valve.
2. Open the safety valve on the ACE Air Valve, press the front button on the ACS box, and press the control handle. Air should come out the valve. If air does not escape from the valve:
   - Check for blockage or leak between the ACE Air Valve and the corresponding "Air Valve" fitting at the bottom of the control panel.
   - Check the operation of the 4-way pilot valve, per Section 8.5.
3. Open the safety valve closest to the cleanout on the abrasive metering valve, press the front button on the ACS box, and press the control handle. If air does not escape from the valves:
   - Check for blockage or leak between the metering valve and corresponding "Grit Valve" fitting at the bottom of the control panel.
   - Check the operation of the 4-way pilot valve, per Section 8.5.

8.4.2 Blasting does not stop when the control handle lever is released

8.4.2.1 Remove the exhaust muffler on the bottom of the control panel. If blasting stops, the muffler is blocked and must be replaced.

8.4.2.2 Open the ACE Safety Valve:
- If blasting stops, check the return lines and fittings from the ACE Valve to the control panel for blockage.
- If air flows and continues to flow, one or more solenoids is stuck. Remove the air lines from the bottom of the panels. Any leak indicates a stuck solenoid or a short in the electrical circuit.

8.4.2.3 Check the operation of the 4-Way pilot valve, per Section 8.5.

8.4.3 Air or abrasive continues to leak from the nozzle after the control handle lever is released

8.4.3.1 When air or abrasive leaks from the nozzle and the control lever is up, the ACE Air Valve or the abrasive metering valve is not closing.

8.4.3.2 To find out which valve is leaking, close the choke valve:

If the leak stops, the problem is with the ACE Valve or controls to the ACE Valve.
- The ACE Air Valve may require service.
- There could be a blockage in the control line between the air valve and control panel.
- The air valve solenoid (refer to Figure 34) is stuck.

If the leak continues, the problem is with the abrasive metering valve or controls to the metering valve.
- Make sure the air-assist vent valve (farthest from the metering knob) is closed.
- Open the metering valve's safety valve (closest to the metering knob).

  If air escapes and the metering valve closes, there may be a blockage in the line between the side of the 4-way adaptor plate and the control panel.

  If air does not escape and the leak continues, the abrasive metering valve plunger may be worn or damaged. Refer to the operations manuals listed in Paragraph 1.1.1, and inspect the metering valve.

The 4-way pilot valve requires service; refer to Section 8.5.
- The metering valve solenoid (refer to Figure 34) is stuck.

8.4.4 Heavy abrasive flow

8.4.4.1 Make sure the choke valve is open (handle in-line with the valve and piping, as noted in Section 4.12.

8.4.4.2 Abrasive metering valve may be open too far. Refer to Section 5.1 to adjust the metering valve.

8.4.4.3 Inspect the metering valve for wear. Refer to the metering valve operations manual for service instructions.

8.4.4.4 Check the diaphragm in the ACE Air Valve for damage.

8.4.4.5 Loosen the corresponding "Air Valve" fitting (far left or third from the left, depending on which operator station is being checked) at the bottom of the control panel. With air to the panel, press the control handle; air should bleed from the fitting when the handle is pressed and stop when it is released. Inspect the following if it does not function as noted:
- Check the RLX Control Handle, per Section 8.4.1.6.
- Check the control panel, per Section 8.4.1.7.
- Check the control cords, per Section 8.4.1.8.
- Check the 4-way pilot valve, per Section 8.5.

8.4.5 Air flow only – no abrasive

8.4.5.1 Make sure the machine contains abrasive.

8.4.5.2 Make sure the front ACS switch button is pressed. Refer to Section 4.11.3.

8.4.5.3 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.

8.4.5.4 Abrasive metering valve may be closed or needs adjustment. Refer to the abrasive metering valve manual.

8.4.5.5 Abrasive may be damp. Refer to Section 7.1 and 7.2 to clear damp abrasive or minor obstruction in the abrasive metering valve and abrasive chamber.

8.4.5.6 The metering valve may require service. Refer to the metering valve operations manual.

8.4.5.7 Loosen the corresponding "Grit Valve" fitting (second from the left or right, depending on which operator station is being checked) at the bottom of the control panel. With air to the panel, press the control handle (make sure the front ACS pushbutton is pressed); air should bleed from the fitting when the handle is pressed and stop when it is released. If it does not function as noted:
- Check the RLX Control Handle, per Section 8.4.1.6.
- Check the control panel, per Section 8.4.1.7.
- Check the control cords, per Section 8.4.1.8.
- Check operation of the 4-way pilot valve, per Section 8.5.

8.4.6 Abrasive flow continues after the control handle lever is released

8.4.6.1 There could be a short in the electrical circuit in the RLX Control Handle, control panel, or control cord. The easiest way to find which item is at fault is to switch one item with another that is known to be working:
- Check the RLX Control Handle, per Section 8.4.1.6.
- Check the control panel, per Section 8.4.1.7.
- Check the control cords, per Section 8.4.1.8.

8.4.6.2 Remove the exhaust muffler on the bottom of the control panel. If the flow stops, the muffler is blocked and must be replaced.

8.4.6.3 Control air may not be fully exhausting from the metering valve:
- Make sure the air-assist vent valve (farthest from the metering knob) is closed.
- Open the metering valve's safety valve (closest to the metering knob).

If air escapes and the metering valve closes, there may be a blockage in the line between the side of the 4-way adaptor plate and corresponding "Grit Valve" fitting at the bottom of the panel.
If air does not escape and the leak continues, the abrasive metering valve plunger may be worn or damaged. Inspect the metering valve, per operations manual 31199.

8.4.6.4 Check operation of the 4-way valve, per Section 8.5.

8.4.7 Abrasive flow continues after ACS button is switched OFF

NOTE: The ACS will not function unless the control handle is pressed.

8.4.7.1 Check the exhaust port on the bottom of the panel, air should momentarily exhaust from the port when the ACS switch is turned off. If it does not, check the following:
- Exhaust filter may be clogged. Remove the filter and inspect it for blockage.

- Obstruction in the line between the abrasive metering valve and the ″GRIT VALVE″ connection on the panel. Check for blockage.
- Faulty ACS switch. Check the RLX Control Handle, per Section 8.4.1.6.
- Faulty solenoid. Check the control panel, per Section 8.4.1.7.
- Fault in a control cord. Check control cords, per Section 8.4.1.8.

8.4.7.2 Follow the steps in Section 8.4.6.

8.4.7.3 Worn plunger or plunger seat, or an obstruction between the plunger and seat. Refer to the metering valve operations manual listed in Paragraph to service the metering valve.

8.5 Check the Operation of the 4-Way Pilot Valve – Figure 35

NOTE: To avoid blasting from the nozzle, the following tests should be done with the vessel depressurized but with all blasting controls operational.

8.5.1 With air to the control circuit and the control handle UP, in the nonblast position, gradually open the air-assist vent valve until air is barely noticeable coming from the valve.

8.5.2 Press the control handle lever. A short burst of air should come from (Port 3) the air-assist exhaust muffler, shown in Figure 35. Before releasing the control handle, gradually open the secondary safety valve until air is barely noticeable coming from the valve.

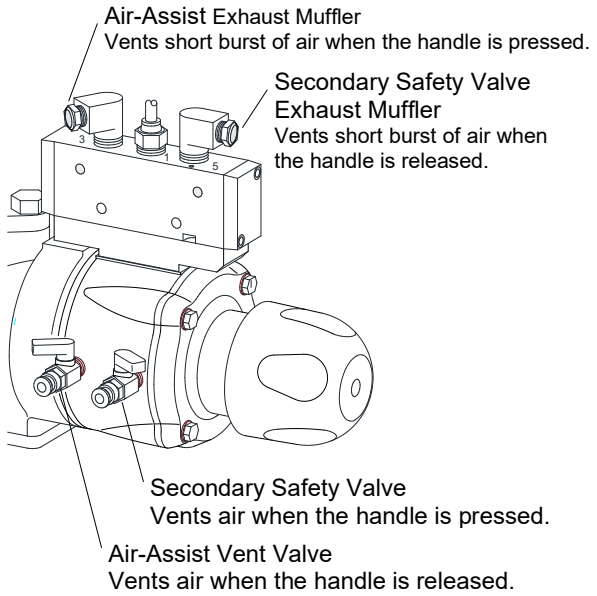


Figure 35

8.5.3 Release the control handle lever. A short burst of air should come from (Port 5) the secondary safety valve exhaust muffler, and air should now come from the air-assist vent valve.

8.5.4 Summary

When the control handle is pressed, air should come from the secondary safety valve and vent a short burst of air from the air-assist muffler.

When the control handle is released, air should come from the air-assist valve and vent a short burst of air from the secondary safety valve muffler.

Replace the 4-way valve if it does not operate as noted.

9.0 ACCESSORIES and REPLACEMENT PARTS

Refer to the operations manuals listed in Section 1.1.1, for replacement parts for those accessories.

9.1 Accessories

NOTE: Two lock pins are used when connecting two metal couplings together.

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

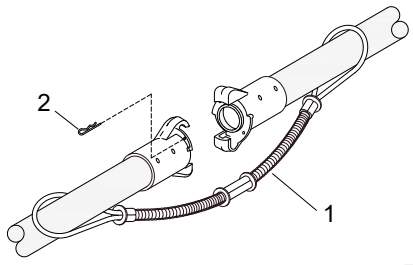


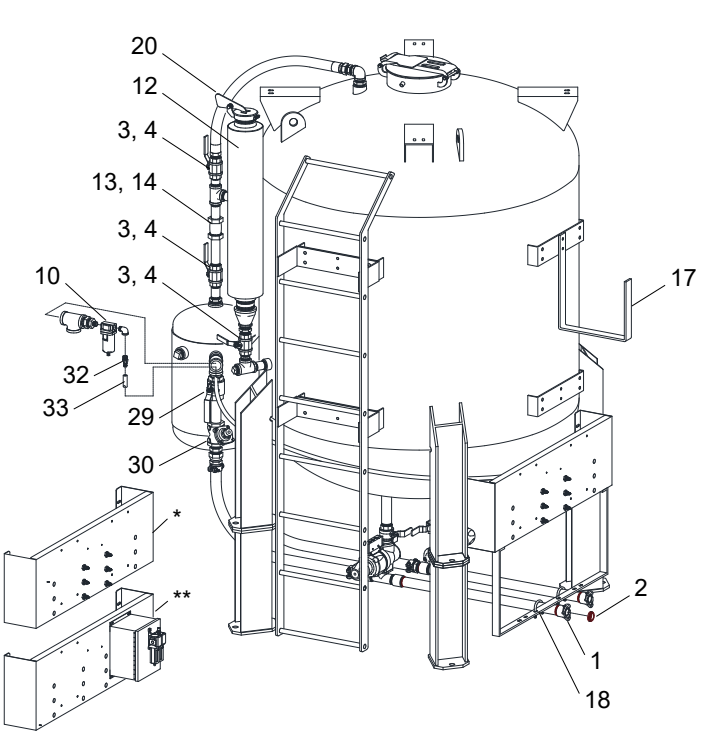
Figure 36

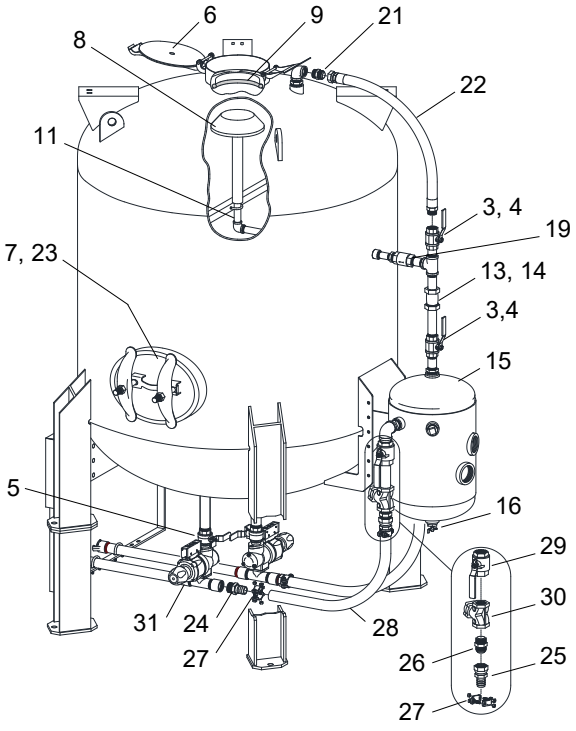
Multiple-outlet hose identification kits, two-outlet 15890
Multiple-outlet hose identification kits, four-outlet .. 15891

Super-sack rack with installation guides
Holds abrasive super sacks. Fits 60 cuft, 120 cuft, and 160 cuft bulk blast machines with guide mounts, as shown in Section 4.6..... 28720

9.2 Blast Machine – Figure 37
Units are each unless otherwise noted

Item	Description	Stock No.
1.	Coupling, CF-2 1-1/2" thread	00553
2.	Gasket, coupling (package of 10)	00850
3.	Ball valve with handle, 1-1/4"	02430
4.	Handle, 1-1/4" ball valve	22532
5.	Ball valve, 1-1/2" flanged	31134
6.	Gasket, fill-port cover	30969
7.	Gasket, manway door	30971
8.	Pop-up valve, 8" with 15" stem	30627
9.	Seal, 8" pop-up	05641
10.	Air filter, 1/2" manual drain	01308
11.	U-bolt, 5/16-18 x 1-3/4" inside width	03276
12.	Muffler, exhaust	30956
13.	Compression coupling, 1-1/4"	01857
14.	Gasket, 1-1/4" compression coupling	01886
15.	Water-separator tank, 16"	30503
16.	Valve, 1/4" drain	01993
17.	Hanger, hose	05158
18.	U-bolt, 1/4-20 x 2" inside width	13854
19.	Check valve, 1-1/4"	02088
20.	Rain cap	30957
21.	Adaptor, 1-1/4" NPT male x male JIC	22529
22.	Hose assembly, 1-1/4" ID	
	40" long, for 60 cuft machine	31196
	48" long for 120 cuft machine	31197
	60" long for 160 cuft machine	31198
23.	Door only, 14" x 18" manway	30636
24.	Fitting, 1-1/2" MNPT x 1-1/2" hose barb	25284
25.	Fitting, fem JIC swivel x 1-1/2" hose barb	25283
26	Adaptor, 1-1/2" NPT male x male JIC	25285
27.	Clamp, 1-3/4" to 2-3/64" dia. bolt-on	25286
28.	Hose 1-1/2" air, specify ft required	25282
29.	Valve, 1-1/2" ball	07596
30.	ACE, 1-1/2" air valve	
	valve only, without fittings	25288
	valve assembly with fittings	31010
31.	GritWizard 1-1/2" abrasive metering valve with flanged ball valve	31158
32.	Fitting, 1/2" NPT male x 1/2" hose barb	01745
33.	Hose, 1/2" ID air, specify feet required	04905





* Pneumatic Operator Panel
For pneumatic remote controls parts, refer to Section 9.3.

** Electric Operator Panel - Single panel for two operators shown.
For electric remote controls parts, refer to Section 9.4.

Some items rotated for clarity

Figure 37

9.3 Pneumatic Remote Controls – Figure 38
Units are each unless otherwise noted

Item	Description	Stock No.
1.	GritWizard 1-1/2" abrasive metering valve with flanged ball valve	31158
2.	ACE 1-1/2" air valve valve only, without fittings valve assembly with fittings	25288 31010
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, 52 ft coupled twinline, first hose	28569
7.	Hose, 52 ft coupled single-line, first hose	28570
8.	Hose, 50 ft coupled twinline, extension	01951
9.	Hose, 50 ft coupled single-line, extension	03087
10.	Tubing, 1/4" OD Poly, specify ft required	12480
11.	Fitting, 1/4" NPT female bulkhead	05605
12.	Fitting, 1/4" MNPT x 1/4" OD tube	11737
13.	Elbow, 1/4" brass street	02027
14.	Adaptor, straight 1/4" NPT x 1/4" MJIC	02494
15.	Manifold, 8 station control air	30961
16.	Bushing, 1/4" NPT x 1/8" NPT	02010
17.	Air filter, 1/2" manual drain	01308
18.	Fitting, 1/2" NPT male x 1/2" hose barb	01745
19.	Hose, 1/2" ID air, specify feet required	04905
20	Fitting, 1/2" fem JIC swivel x 1/2" hose barb	15002
21.	Adaptor, straight 3/8" NPT x 1/2" MJIC	11726
22.	Nylon tie	02195

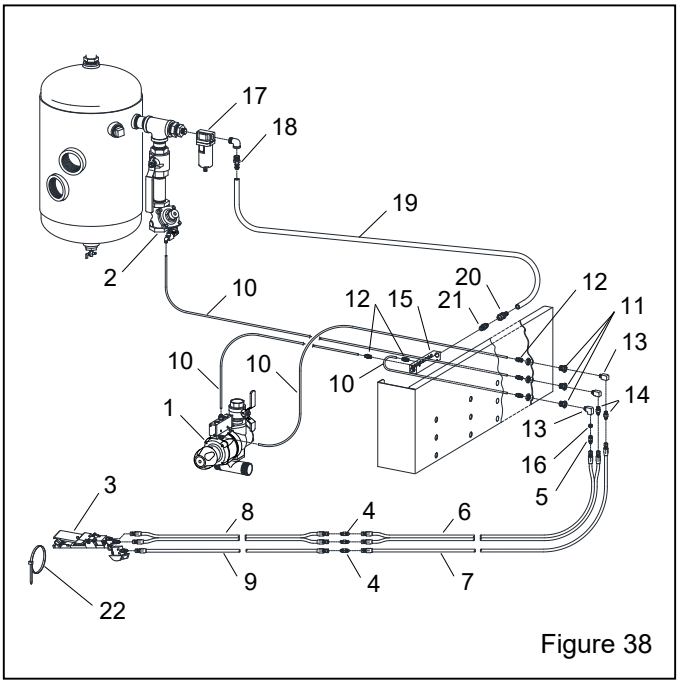


Figure 38

9.4 Electric Remote Controls – Figure 39
Units are each unless otherwise noted

Item	Description	Stock No.
1.	GritWizard 1-1/2" abrasive metering valve with flanged ball valve	31158
2.	ACE 1-1/2" air valve valve only, without fittings valve assembly with fittings	25288 31010
3.	RLX electric control handle with ACS	31167
4.	Control panel, dual operator 12 volt, DC	30963
5.	Adaptor, straight 1/4" NPT x 1/4" MJIC	02494
6.	Cord, 50 ft. initial control, from panel with lo-profile and twist-lock connectors	31168
7.	Extension cord, 50 ft., ACS with lo-profile connectors on both ends	31148
8.	Extension cord, 100 ft., ACS with lo-profile connectors on both ends	31149
9.	Hose, 3/16" x 18" long coupled	02454
10.	Manifold, control air	30961
11.	Nylon tie	02195
12.	Tubing, 1/4" OD Poly, specify ft required	12480
13.	Fitting, 1/4" NPT female bulkhead	05605
14.	Fitting, 1/4" MNPT x 1/4" OD tube	11737
15.	Elbow, 1/4" brass street	02027
16.	Fitting, 1/2" NPT male x 1/2" hose barb	01745
17.	Hose, 1/2" ID air, specify feet required	04905
18	Fitting, 1/2" fem JIC swivel x 1/2" hose barb	15002
19.	Adaptor, straight 3/8" NPT x 1/2" MJIC	11726

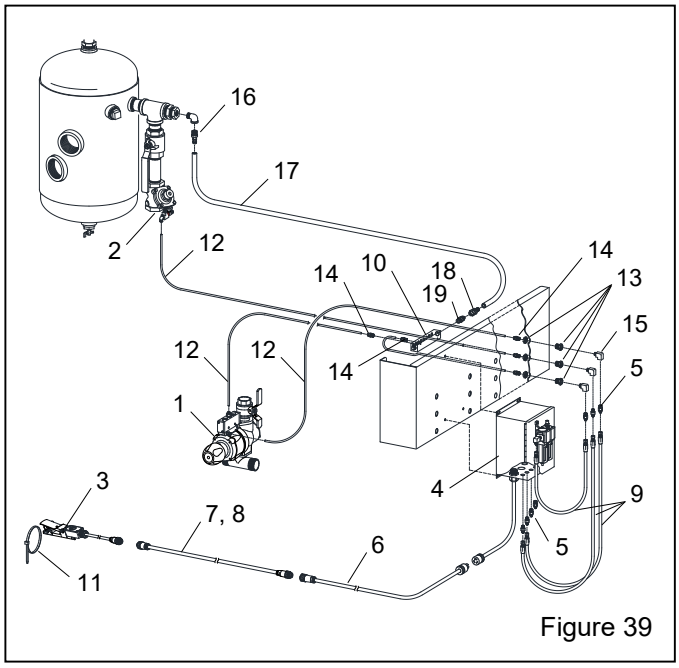


Figure 39

9.5 Electric Control Panel – Figure 40
Units are each unless otherwise noted

Item	Description	Stock No.
(-)	Control panel assembly, dual operator	30963
1.	Supply cord pigtail, 12 volt, incl. item 13	31169
2.	Adaptor, straight 1/4" NPT x 1/4" MJIC	02494
3.	Tubing, 1/4" OD Poly, per foot specify ft required	12480
4.	Fitting, 1/4" NPT female bulkhead	05605
5.	Filter-antifreeze injector assembly	31093
6.	Nipple, 1/4-NPT brass hex	02808
7.	Elbow, 1/4" brass street	02027
8.	Fitting, 1/4" MNPT x 1/4" OD tube, straight	11737
9.	Valve bank assembly, 4 solenoid	31096
10.	Gasket, valve bank assembly manifold	31095
11.	Solenoid, individual replacement, each Includes O-rings	31218
12.	Connector, Lo-Profile male	31147
13.	Connector, Lo-Profile female	31146
14.	Control cord, 5 ft., includes item 16	07675
15.	Supply cord, includes item 12	31215
16.	Connector, 3-prong female twist-lock	06327
17.	Strain relief, 3/4" NPT	30399
18.	Strain relief, 1/2" NPT	30398
19	Muffler/filter, 1/8" NPT	31347
20.	Filter, 1/4" NPT, manually rotating drain	31349
21.	Filter cartridge replacement, 40 µm filter	31350
22.	Lubricator, (antifreeze injector) , 1/4" NPT	31351
23.	Mount, filter/lubricator	31352
24.	Elbow adaptor, 1/4" NPT x 1/4" MJIC	02513
25	Elbow, 1/8" x 1/4" OD tube swivel	31353
26.	Fitting, 1/8" x 1/4" OD tube	31157

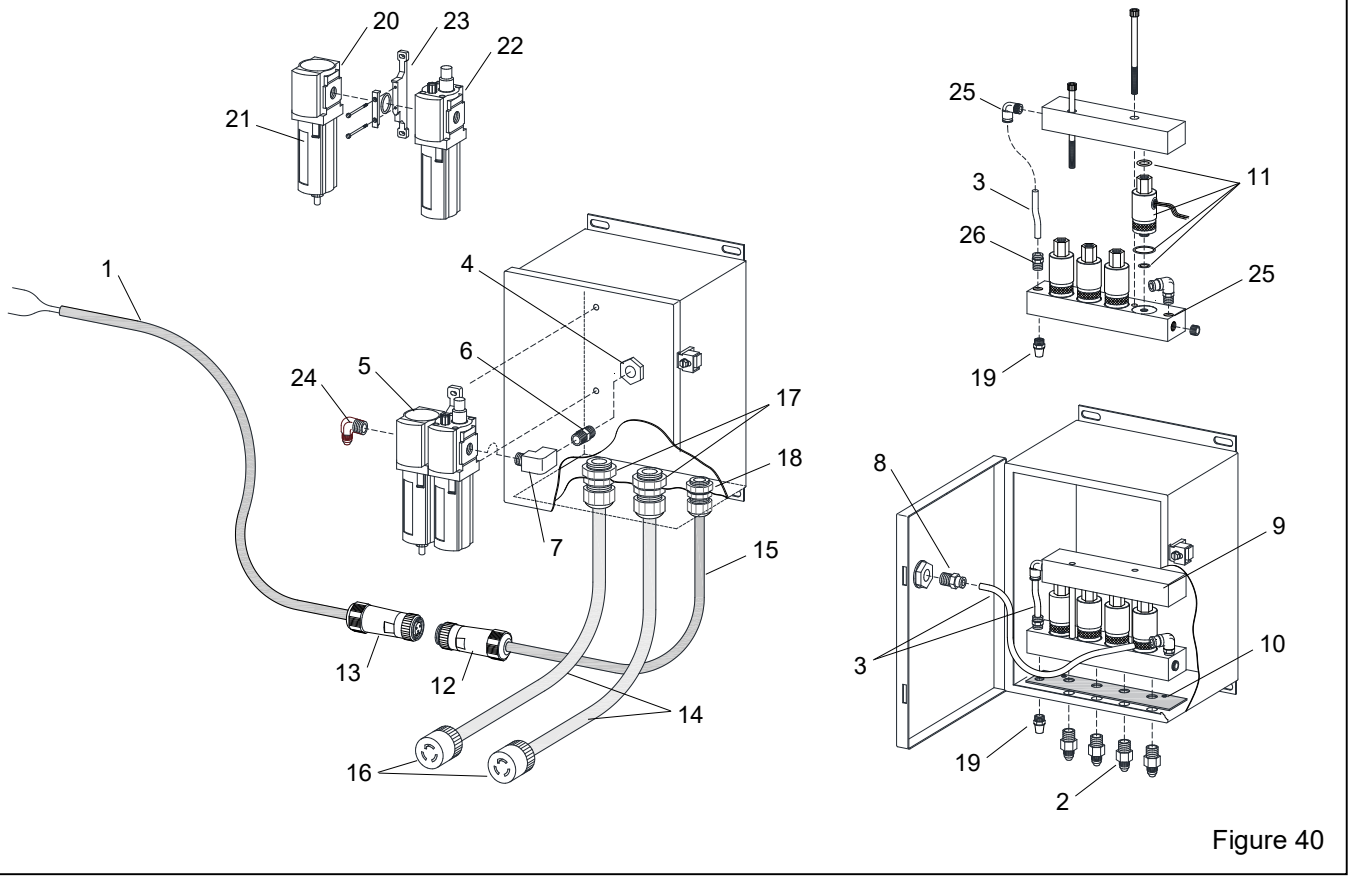


Figure 40