

**SENTINEL ELECTRIC
REMOTE CONTROL SYSTEM
O. M. 21018**

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 **WARNING**

Do not proceed with these instructions until you have READ the preface of this MANUAL and YOU UNDERSTAND its contents. * These WARNINGS are included for the health and safety of the operator and those in the immediate vicinity. Keep this manual for future reference.

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⚠ WARNING

- Read and follow ALL instructions before using this equipment.
- Failure to comply with ALL instructions can result in serious injury or death.
- In the event that the user, or any assistants of the user of this equipment cannot read or cannot completely understand the warnings and information contained in these instructions, the employer of the user and his assistants must thoroughly educate and train them on the proper operation and safety procedures of this equipment.

NOTICE TO PURCHASERS AND USERS OF OUR PRODUCTS AND THIS INFORMATIONAL MATERIAL

The products described in this material, and the information relating to those products, is intended for knowledgeable, experienced users of abrasive blasting equipment.

No representation is intended or made as to the suitability of the products described herein for any particular purpose or application. No representations are intended or made as to the efficiency, production rate, or the useful life of the products described herein. Any estimate regarding production rates or production finishes are the responsibility of the user and must be derived solely from the user's experience and expertise, and must not be based on information in this material.

The products described in this material may be combined by the user in a variety of ways for purposes determined solely by the user. No representations are intended or made as to the suitability or engineering balance of the combination of products determined by the user in his selection, nor as to the compliance with regulations or standard practice of such combinations of components or products.

Abrasive Blast Equipment is only a component of the range of equipment used in an abrasive blasting job. Other products may include an air compressor, abrasive, scaffolding, hydraulic work platforms or booms, paint spray equipment, dehumidification equipment, air filters and receivers, lights, ventilation equipment, parts handling equipment, specialized respirators, or equipment that while offered by Clemco may have been supplied by others. Each manufacturer and supplier of the other products used in the abrasive blasting job must be contacted for information, training, instruction and warnings with regard to the proper and safe use of their equipment in the particular application for which the equipment is being used. The information provided by Clemco is intended to provide instruction only on Clemco products. All operators must be trained in the proper, safe, use of this equipment. It is the responsibility of the users to familiarize themselves with, and comply with, all appropriate laws, regulations, and safe practices that apply to the use of these products. Consult with your employer about training programs and materials that are available.

Our company is proud to provide a variety of products to the abrasive blasting industry, and we have confidence that the professionals in our industry will utilize their knowledge and expertise in the safe efficient use of these products.

GENERAL INSTRUCTIONS

Described herein are some, **BUT NOT ALL**, of the major requirements for safe and productive use of blast machines, remote control systems, operator respirator assemblies, and related accessories. Completely read **ALL** instruction manuals prior to using equipment.

The user's work environment may include certain **HAZARDS** related to the abrasive blasting operation. Proper protection for the blaster, as well as anyone else that may be **EXPOSED** to the hazards generated by the blasting process, is the responsibility of the user and/or the employer. Operators **MUST** consult with their employer about what hazards may be present in the work environment including, but not limited to, exposure to dust that may contain **TOXIC MATERIALS** due to the presence of silica, cyanide, arsenic or other toxins in the abrasive, or materials present in the surface to be blasted such as lead or heavy metals in coatings. The environment may also include fumes that may be present from adjacent coatings application, contaminated water, engine exhaust, chemicals, and asbestos. The work area may include **PHYSICAL HAZARDS** such as an uneven work surface, poor visibility, excess noise, and electrical hazards. The operator **MUST** consult with his employer on the identification of potential hazards, and the appropriate measures that **MUST** be taken to protect the blaster and others that might be exposed to these hazards.

ALL machines, components and accessories **MUST** be installed, tested, operated and maintained only by trained, knowledgeable, experienced users.

DO NOT modify or substitute any Clemco parts with other types or brands of equipment. Unauthorized modification and parts substitution on supplied air respirators is a violation of OSHA regulations and voids the NIOSH approval.

OPERATIONAL INSTRUCTIONS

OPERATOR SAFETY EQUIPMENT

⚠ WARNING

- Blast operators and others working in the vicinity of abrasive blasting must always wear properly-maintained, NIOSH-approved, respiratory protection appropriate for the job site hazards.
- **DO NOT USE** abrasives containing more than one percent crystalline (free) silica. Ref. NIOSH Alert #92-102
- Inhalation of toxic dust (crystalline silica, asbestos, lead paint and other toxins) can lead to serious or fatal disease (silicosis, asbestosis, lead or other poisoning).

- **ALWAYS** wear NIOSH-approved supplied-air respirators as required by OSHA, in the presence of any dust including, but not limited to, handling or loading abrasive; blasting or working in the vicinity of blast jobs; and cleanup of expended abrasive. Prior to removing respirator, an air monitoring

instrument should be used to determine when surrounding atmosphere is clear of dust and safe to breathe.

- NIOSH-approved, supplied-air respirators are to be worn ONLY in atmospheres:
 - NOT IMMEDIATELY dangerous to life or health and,
 - from which a user can escape WITHOUT using the respirator.
- Clemco supplied-air respirators **DO NOT REMOVE OR PROTECT AGAINST CARBON MONOXIDE (CO) OR ANY OTHER TOXIC GAS**. Carbon monoxide and toxic gas removal and/or monitoring device must be used in conjunction with respirator to insure safe breathing air.
- Air supplied to respirator **MUST BE AT LEAST GRADE D QUALITY** as described in Compressed Gas Association Commodity Specification G-7.1, and as specified by OSHA Regulation 1910.139 (d).
- ALWAYS locate compressors to prevent contaminated air (such as CO from engine exhaust) from entering the air intake system. A suitable in-line air purifying sorbent bed and filter or CO Monitor should be installed to assure breathing air quality.
- ALWAYS use a NIOSH-approved breathing air hose to connect an appropriate air filter to the respirator. Use of a non-approved air hose can subject the operator to illness caused by the release of chemical agents used in the manufacture of non-approved breathing air hose.
- ALWAYS check to make sure air filter and respirator system hoses are NOT CONNECTED to in-plant lines that contain nitrogen, acetylene or any other non-breathable gas. NEVER use oxygen with air line respirators. NEVER modify air line connections to accommodate air filter/respirator breathing hose WITHOUT FIRST testing content of the air line. **FAILURE TO TEST THE AIR LINE MAY RESULT IN DEATH TO THE RESPIRATOR USER.**
- Respirator lenses are designed to protect against rebounding abrasive. They do not protect against flying objects, glare, liquids, radiation or high speed heavy materials. Substitute lenses from sources other than the original respirator manufacturer will void NIOSH-approval of this respirator.

BLAST MACHINES AND REMOTE CONTROLS

⚠ WARNING

- ALWAYS equip abrasive blast machines with remote controls.
- Abrasive blast machine operators must wear NIOSH-approved supplied-air respirators (ref: OSHA regulations 1910.94, 1910.132, 1910.139 and 1910.244).

- NEVER modify OR substitute remote control parts. Parts from different manufacturers are NOT compatible with Clemco

equipment. If controls are altered, involuntary activation, which may cause serious injury, can occur.

- Inspect the air control orifice DAILY for cleanliness. NEVER use welding hose in place of twinline control hose. The internal diameter and rubber composition are UNSAFE for remote control use.
- UNLESS OTHERWISE SPECIFIED, maximum working pressure of blast machines and related components MUST NOT exceed National Board approved 125 psig (8.5 BAR).
- NEVER weld on blast machine. Welding may affect dimensional integrity of steel wall and WILL VOID National Board approval.
- Point nozzle ONLY at structure being blasted. High velocity abrasive particles WILL inflict serious injury. Keep unprotected workers OUT of blast area.
- NEVER attempt to manually move blast machine when it contains abrasive. EMPTY machines, up to 6 cu. ft.(270kg) capacity, are designed to be moved:
 - on flat, smooth surfaces by AT LEAST two people;
 - with the Clemco "Mule"; or
 - with other specially designed machine moving devices.
- Larger empty blast machines or ANY blast machine containing abrasive MUST be transported by mechanical lifting equipment.

AIR HOSE, BLAST HOSE, COUPLINGS, AND NOZZLE HOLDERS

- Air hose, air hose fittings and connectors at compressors and blast machines MUST be FOUR times the size of the nozzle orifice. Air hose lengths MUST be kept as short as possible AND in a straight line. Inspect DAILY and repair leakage IMMEDIATELY.
- Blast hose inside diameter MUST be THREE to FOUR times the size of the nozzle orifice. AVOID sharp bends that wear out hose rapidly. Use SHORTEST hose lengths possible to reduce pressure loss. Check blast hose DAILY for soft spots. Repair or replace IMMEDIATELY.
- ALWAYS cut loose hose ends square when installing hose couplings and nozzle holders to allow uniform fit of hose to coupling shoulder. NEVER install couplings or nozzle holders that DO NOT provide a TIGHT fit on hose. ALWAYS use manufacturers recommended coupling screws.
- Replace coupling gaskets FREQUENTLY to prevent leakage. Abrasive leakage can result in dangerous coupling failure. ALL gaskets MUST be checked SEVERAL times during a working day for wear, distortion and softness.
- Install safety pins at EVERY coupling connection to prevent accidental disengagement during hose movement.
- ALWAYS attach safety cables at ALL air hose AND blast hose coupling connections. Cables relieve tension on hose and control whipping action in the event of a coupling blow-out.

MAINTENANCE

- ALWAYS shut off compressor and depressurize blast machine BEFORE doing ANY maintenance.
- Always check and clean ALL filters, screens and alarm systems when doing any maintenance.
- ALWAYS cage springs BEFORE disassembling valves IF spring-loaded abrasive control valves are used.
- ALWAYS completely follow owner's manual instructions and maintain equipment at RECOMMENDED intervals.

ADDITIONAL ASSISTANCE

- Training and Educational Programs. Clemco Industries Corp. offers a booklet, Blast-Off 2, developed to educate personnel on abrasive blast equipment function and surface preparation techniques. Readers will learn safe and productive use of machines, components and various accessories, including selection of abrasive materials for specific surface profiles and degrees of cleanliness.
- The Society for Protective Coatings (SSPC) offers a video training series on protective coatings including one entitled "Surface Preparation." For loan or purchase information, contact SSPC at the address shown below.

TECHNICAL DATA AND RESEARCH COMMITTEES

- The following associations offer information, materials and videos relating to abrasive blasting and safe operating practices.

The Society for Protective Coatings (SSPC)

40 24th Street, Pittsburgh PA 15222-4643
 Phone: (412) 281-2331 • FAX (412) 281-9992
 Email: research@sspc.org • Website: www.sspc.org

National Association of Corrosion Engineers (NACE)

1440 South Creek Drive, Houston TX 77084
 Phone: (281) 228-6200 • FAX (281) 228-6300
 Email: msd@mail.nace.org • Website: www.nace.org

American Society for Testing and Materials (ASTM)

100 Barr Harbor Dr., West Conshohocken, PA 19428
 Phone (610) 832-9500 • FAX (610) 832-9555
 Email: service@astm.org • Website: www.astm.org

NOTICE

This equipment is not intended to be used in an area that might be considered a hazardous location as described in the National Electric Code NFPA 70 1996, article 500.

WARRANTY

The following is in lieu of all warranties express, implied or statutory and in no event shall seller or its agents, successors, nominees or assignees, or either, be liable for special or consequential damage arising out of a breach of warranty. This warranty does not apply to any damage or defect resulting from negligent or improper assembly or use of any item by the buyer or its agent or from alteration or attempted repair by any person other than an authorized agent of seller. All used, repaired, modified or altered items are purchased "as is" and with all faults. In no event shall seller be liable for consequential or incidental damages. The sole and exclusive remedy of buyer for breach of warranty by seller shall be repair or replacement of defective parts or, at seller's option, refund of the purchase

price, as set forth below:

1. Seller makes no warranty with respect to products used other than in accordance hereunder.
2. On products seller manufactures, seller warrants that all products are to be free from defects in workmanship and materials for a period of one year from date of shipment to buyer, but no warranty is made that the products are fit for a particular purpose.
3. On products which seller buys and resells pursuant to this order, seller warrants that the products shall carry the then standard warranties of the manufacturers thereof, a copy of which shall be made available to customer upon request.
4. The use of any sample or model in connection with this order is for illustrative purposes only and is not to be construed as a warranty that the product will conform to the sample or model.
5. Seller makes no warranty that the products are delivered free of the rightful claim of any third party by way of patent infringement or the like.
6. This warranty is conditioned upon seller's receipt within ten (10) days after a buyer's discovery of a defect, of a written notice stating in what specific material respects the product failed to meet this warranty. If such notice is timely given, seller will, at its option, either modify the product or part to correct the defect, replace the product or part with complying products or parts, or refund the amount paid for the defective product, any one of which will constitute the sole liability of seller and a full settlement of all claims. No allowance will be made for alterations or repairs made by other than those authorized by seller without the prior written consent of seller. Buyer shall afford seller prompt and reasonable opportunity to inspect the products for which any claim is made as above stated.

Except as expressly set forth above, all warranties, express, implied or statutory, including implied warranty of merchantability, are hereby disclaimed.

DAILY SET-UP CHECK LIST

▲ WARNING

- ALL piping, fittings and hoses MUST be checked DAILY for tightness and leakage.
- ALL equipment and components MUST be thoroughly checked for wear.
- ALL worn or suspicious parts MUST be replaced.
- ALL blast operators MUST be properly trained to operate equipment.
- ALL blast operators MUST be properly outfitted with abrasive resistant clothing, safety shoes, leather gloves and ear protection.
- BEFORE blasting ALWAYS use the following check list.

1. PROPERLY MAINTAINED AIR COMPRESSOR sized to provide sufficient volume (cfm) for nozzle and other tools PLUS a 50% reserve to allow for nozzle wear. Use large compressor outlet and large air hose (4 times the nozzle orifice size). FOLLOW MANUFACTURERS MAINTENANCE INSTRUCTIONS.

2. BREATHING AIR COMPRESSOR (oil-less air pump) capable of providing Grade D Quality air located in a dust free, contaminant free area. If oil-lubricated air compressor is used to supply respirator, it should have high temperature monitor and CO monitor or both. If CO monitor is not used, air MUST

PREFACE

be tested FREQUENTLY to ensure proper air quality.

3. Clean, properly maintained NIOSH-APPROVED SUPPLIED-AIR RESPIRATOR. ALL components should ALWAYS be present. NEVER operate without inner lens in place. Thoroughly inspect ALL components DAILY for cleanliness and wear. ANY substitution of parts voids NIOSH approval i.e. cape, lenses, breathing hose, breathing air supply hose, air control valve, cool air or climate control devices.

4. OSHA required BREATHING AIR FILTER for removal of moisture and particulate matter from breathing air supply. THIS DEVICE DOES NOT REMOVE OR DETECT CARBON MONOXIDE (CO). ALWAYS USE CO MONITOR ALARM.

5. ASME CODED BLAST MACHINE sized to hold 1/2 hour abrasive supply. ALWAYS ground machine to eliminate static electricity hazard. Examine pop up valve for alignment. Blast machine MUST be fitted with a screen to keep out foreign objects and a cover to prevent entry of moisture overnight.

6. AIR LINE FILTER installed AS CLOSE AS POSSIBLE to machine inlet. Sized to match inlet piping or larger air supply line. Clean filter DAILY. Drain OFTEN.

7. REMOTE CONTROLS MUST be in PERFECT operating condition. ONLY use APPROVED spare parts, including twin-line hose. DAILY: test system operation and check button bumper and spring action of lever and lever lock. DO NOT USE WELDING HOSE.

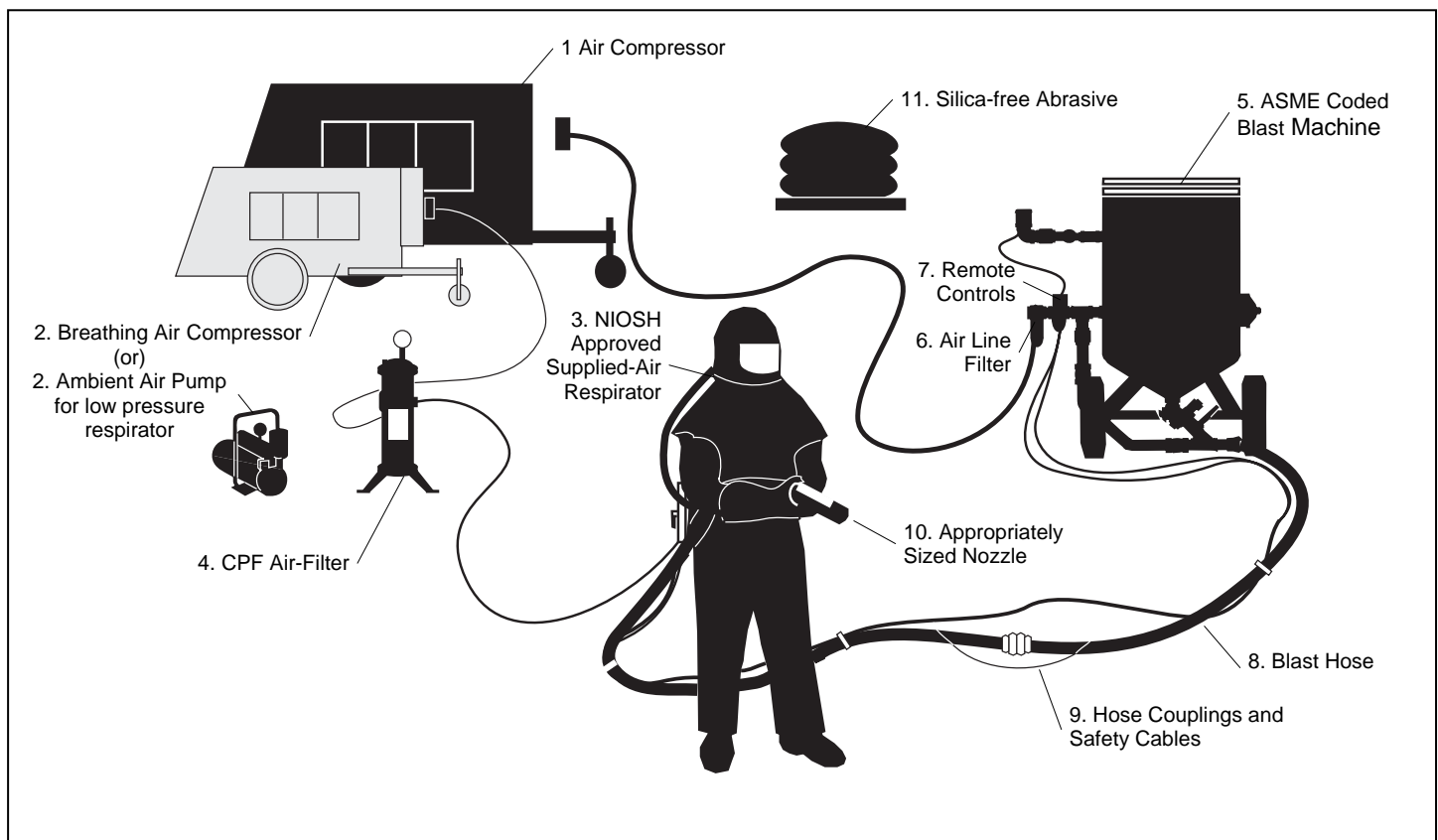
8. BLAST HOSE with ID 3 to 4 times the nozzle orifice. Lines MUST be run AS STRAIGHT AS POSSIBLE from machine to work area with NO sharp bends. Check DAILY for internal wear and external damage.

9. HOSE COUPLINGS, NOZZLE HOLDERS fitted SNUGLY to hose end and installed using PROPER coupling screws. Coupling lugs MUST be snapped FIRMLY into locking position. Gasket MUST form positive seal with safety pins inserted through pin holes. Check gaskets and replace if ANY sign of wear, softness or distortion. ALWAYS install safety cables at every connection to prevent disengagement. Check nozzle holder for worn threads. NEVER MIX DIFFERENT BRANDS OF COMPONENTS. Check each of these components DAILY.

10. Inspect NOZZLE and GASKET DAILY for wear. Replace nozzle when 1/16" larger than original size or if liner appears cracked. Check nozzle threads for wear.

11. Use abrasive that is properly sized and free of harmful substances; such as, free silica, cyanide, arsenic or lead. Check material data sheet for presence of toxic or harmful substances.

12. Test surface to be blasted for toxic substances. Take appropriate, and NIOSH required, protective measures for operator and bystanders which pertain to substances found on the surface to be blasted.



1.0 INTRODUCTION

1.1 Scope

1.1.1 This manual covers the installation, operation, maintenance, troubleshooting, and replacement parts for Clemco Sentinel Electric Pressure-Hold Remote Control Systems. The following manuals may be used in conjunction with the Sentinel system manual. They are available upon request from Clemco Industries Corp., or at our web site at www.clemcoindustries.com.

Single Chamber Blast MachineManual No. 06160
 Dual Chamber Blast MachineManual No. 06154
 ACE Air ValveManual No. 23938
 RLX Control Handle..... Manual No. 10574
 Sentinel Media Metering ValveManual No. 20951

1.1.2 These instructions also contain important information required for safe operation of the blast machine. All blast operator(s) and machine (pot) tenders must be trained in the safe operation of the blast machine, remote control system, and all blasting accessories. Before using the machine, all personnel involved with the blast machine operation must read this entire manual, including the orange cover, and all accessory manuals.

1.1.3 All personnel involved with the abrasive blasting process must be made aware of the hazards associated with abrasive blasting. The Clemco booklet "Abrasive Blasting Safety Practices" is included with every blast machine, and contains important safety information about abrasive blasting that may not be included in equipment operation manuals. Additional copies are available from Clemco Industries.

1.2 Safety Alerts

1.2.1 Clemco uses safety alert signal words, based on ANSI Z535.4-1998, 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 the user of this equipment of potential personal injury hazards.

Obey all safety messages that follow this symbol to avoid possible injury or death.

CAUTION

Caution used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

CAUTION

Caution indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

WARNING

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

DANGER

Danger indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

1.3 General Description

1.3.1 The components of the Sentinel Electric remote control system are shown in Figure 1. They include the Sentinel abrasive metering valve, ACE air valve, RLX electric control handle, electric panel assembly, 50-foot control cord with abrasive cut-off switch (ACS), all interconnecting control hoses, and all necessary fittings.

1.3.2 The remote control system is an OSHA-required safety device. The control handle, located near the blast nozzle, is the activator for the remote control system. When the operator intentionally or unintentionally removes hand-held pressure from the remote control handle, the abrasive metering valve and air valve close, stopping air and abrasive flow through the nozzle. The remote control system "fails to safe", which means any interruption in the control-air circuit for reasons, such as a break in the line, the compressor stops running, or the operator drops the blast hose, the remote controls stops the blasting.

WARNING

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

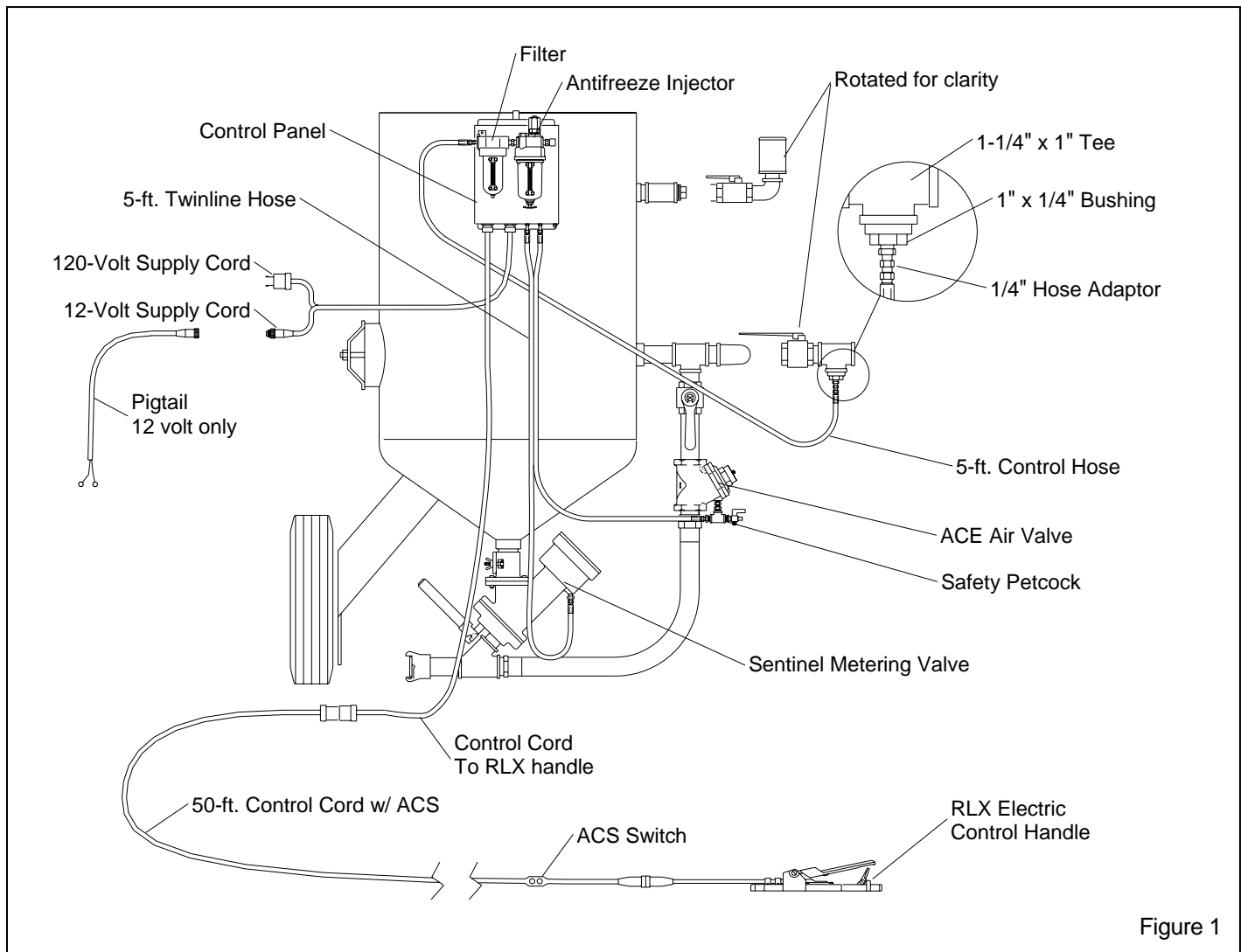


Figure 1

1.3.3 Sentinel Remote Controls are pressure hold systems. Which means pressurization and depressurization of the blast machine is a separate function from the remote controls. Using hand operated inlet and outlet valves, the operator manually pressurizes and depressurizes the blast machine. Although the machine is under pressure, neither air nor abrasive comes out the nozzle because the normally closed (NC) Sentinel Valve shuts off abrasive flow, and the ACE Air Valve stops air flow. Blasting will not start until the operator activates the control handle. Pressure remains in the blast machine until it is manually depressurized.

1.4 Operating Principles

1.4.1 Compressed air enters the blast machine through the inlet piping, and is split into three streams. One stream goes directly into the blast machine, the second stream goes into the pusher-line, and the third stream is the control air used to operate the remote controls.

1.4.2 Sentinel electric remote controls (electric over pneumatic) operate pneumatically (See Figure 1). When the machine is manually pressurized, control air travels through the filter and antifreeze injector, and into the control panel. If the electric control handle lever (which is the main activator of the system) is in the up (no blast) position, air stops at the control panel and the media and air valves remain closed. Pressing the electric control handle lever allows air to pass through the panel to open the media and air valves, which starts the blasting process. When the control handle is released, control air exhausts at the panel, the valves close and blasting stops.

1.4.3 An abrasive cut-off switch (ACS) is a standard feature of the Sentinel remote control. The cut-off switch is mounted on the control cord behind the control handle. The operator uses the switch to close the Sentinel Valve independently of the air valve, thus air without abrasive exits the nozzle to clear the blast hose, or for blow-down.

1.4.4 Electric remote controls are required when the nozzle is farther than 100 feet from the blast machine. At that distance, pressure loss and actuation time of pneumatic systems may be too great to ensure fast, safe operation. Electric systems are also used in cold weather, when moisture in the air supply of pneumatic systems may freeze and cause the remote controls to fail. 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 offer electrical resistance, and may cause the controls to malfunction. If an application requires greater distance, an appropriate cord with larger diameter wire must be provided by the user.

2.0 INSTALLATION

2.1 Factory Installation: If the remote control system was factory installed, skip Section 2.2 and make the connections described in Section 2.3.

2.2 Field Installation: Refer to Figure 2.

2.2.1 Empty the blast machine of abrasive. Depressurize the machine, shut down the compressed air source, disconnect the air supply line, and lockout and tagout the air supply.

⚠ WARNING

Depressurize the blast machine, lock out and tag out the compressed air supply, and bleed the air circuit before performing any maintenance on the machine or pneumatic accessories. Failure to do so could cause severe injury or death from the sudden release of trapped compressed air.

2.2.2 Remove the existing abrasive metering valve and all external piping from the blast machine.

NOTE: The following describes installation of the Sentinel valve on a machine with minimal rotation clearance. If the valve assembly will freely rotate beneath the blast machine, it may be installed as a unit.

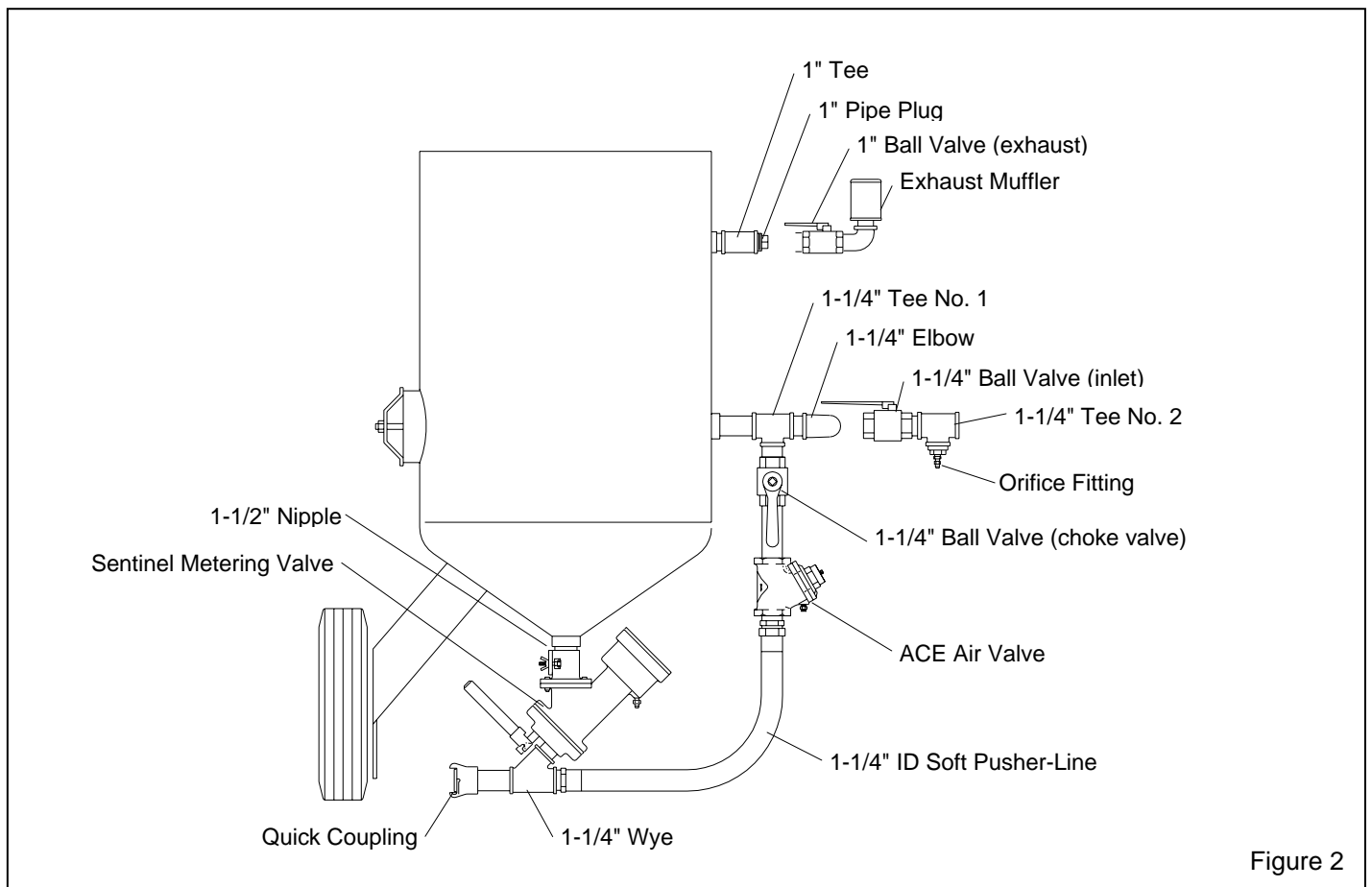


Figure 2

2.2.3 Remove the four cap screws holding the flanged adaptor to the sentinel valve assembly.

2.2.4 Use a 1-1/2" x close, schedule 80 pipe nipple to connect the flanged adaptor to the outlet at the bottom of the blast machine. If the adaptor has an inspection plate, position the plate toward the blast hose connection. If an adaptor without an inspection plate is used, align the bolt holes fore and aft, with the wide gap toward the blast hose connection.

2.2.5 Position the adaptor gasket between the flanged adaptor and valve assembly, and bolt the parts together.

2.2.6 Install a 1-1/4" pipe tee (tee #1) at the blast machine inlet as shown in Figure 2.

2.2.7 Assemble a pusher-line between the Sentinel Valve and the tee-fitting using standard pipe fittings. Starting at the Sentinel Valve and working upstream, this line must include the ACE Air Valve and a manual choke valve, in that order.

2.2.8 Connect the manual inlet valve and a second tee (tee #2) to the blast machine as shown. NOTE: The second tee and all fittings necessary to complete the assembly shown in the detail circle in Figure 1 are included with the remote system.

2.2.9 Refer to the detail circle in Figure 1, and install the bushings and 1/4" hose adaptor.

2.2.10 Assemble a manual outlet valve assembly, and install it as shown. NOTE: Clemco supplies an exhaust muffler with all blast machines 1.5 cubic feet and larger. The muffler reduces exhaust noise and directs the exhaust downward, which prevents abrasive from exhausting into the air. When the blast machine is depressurized, the muffler body will pop up and diffuse the escaping air and abrasive. When the machine is fully depressurized, the muffler body will drop, permitting trapped abrasive to empty. For the muffler to work properly, it must be installed with the body facing up, as shown in Figure 1.

2.3 Blast Hose and Control Hose Connections Refer to Figure 1.

NOTE: The following instructions explain the connections on a single operator blast machine and remote control system. Connections for dual operator machines are the same except the connections must be made twice; once for operator #1 and again for operator #2. Controls for operator #1 and #2 must be kept separate. Read the following warning before making the connections.

WARNING

Carefully trace, connect, and mark control lines and blast hose on multiple-outlet blast machines, or where two or more blast machines are used. Switching control lines or blast hose, could lead to injury and property damage from unintentional actuation of a blast machine. To reduce the possibility of hose switching, blast hose and control cord should be of equal lengths. Hose identification kits, part no. 15890 for two outlets, or part no. 15891 for four outlets, are available and should be used where multiple blast hose and control lines are in use.

2.3.1 Use the panel mounting bracket to hang the panel on the blast machine rim. If preferred, for stationary blast machines the panel may be wall mounted.

2.3.2 Connect the 5-ft. x 3/16" hose between the 1/4" hose adaptor fitting at the inlet tee and the fitting on the air filter mounted on the front of the control panel.

2.3.3 Connect one leg of the 5-ft. twinline hose between the panel outlet fitting marked "GRIT VALVE" and the fitting on the Sentinel Valve.

2.3.4 Complete the control hose connections by attaching the remaining leg of the 5-ft. twinline hose between the panel outlet fitting marked "AIR VALVE" and the fitting on the ACE Air Valve.

2.3.5 Uncoil the blast hose and lay the 50-ft. control cord alongside it. Note: The control cord has the ACS switch wired into it. Place the switch end of the cord at the nozzle end of the blast hose.

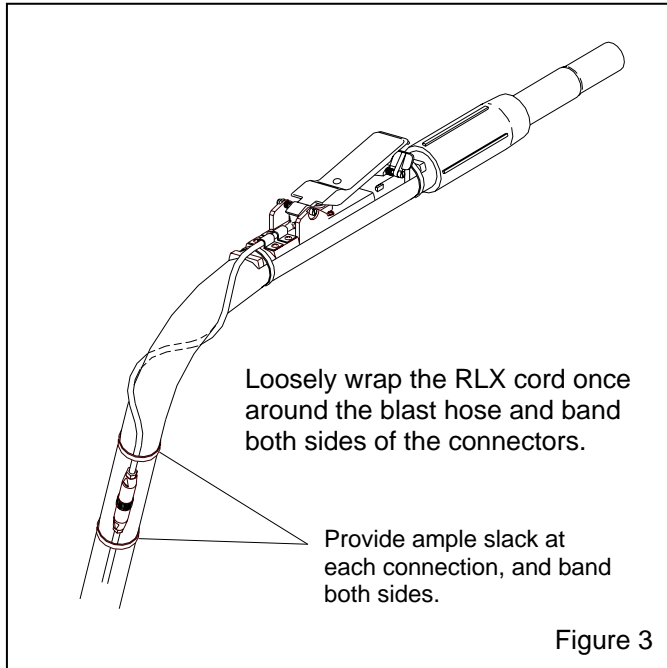
2.3.6 Band the electric control handle to the blast hose at a suitable, comfortable position behind the nozzle holder, using the two nylon ties provided. The tie ends should be clipped so they will not snag the operator's clothing or interfere with the operation of the control handle.

2.3.7 Loosely wrap the whip cord from the electric control handle once around the blast hose as shown in Figure 3, and then connect it to the control cord. 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.

CAUTION

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.

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



2.3.9 Band the cord to the blast hose every 4 to 6 feet. When attaching control cord extensions, band the cord on both sides of each electrical connection.

2.3.10 Attach the blast hose to the blast machine. Use safety wires to securely lock the couplings.

2.3.11 Connect the control cord to the control panel, lead cord marked "OPERATOR".

2.3.12 Plug the power cord into an appropriate power source, 120-volt AC or 12-volt DC. 12-volt units are furnished with a pigtail with ring terminals to connect to a battery.

WARNING

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

3.0 OPERATION

3.1 Start-Up

3.1.1 Make sure the control handle is in the up (no-blast) position and that it moves freely. Make sure it will not engage unless the safety lock is pulled down.

WARNING

Defective control handles could cause unintentional actuation of a blast machine, or prevent a machine from deactivating upon release. Defective control handles must be taken out of service immediately and repaired or replaced.

3.1.2 Make sure that all hose and cord connections are secure. Install safety lock pins on all quick coupling. Use lock pins and safety cables on all quick coupling connections to help prevent accidental separation of hoses.

3.1.3 Connect the blast machine to an adequate air supply. The compressor should be located upwind from the blasting operation to prevent dust from entering the compressor intake.

3.1.4 Make sure the safety petcocks on the Sentinel metering valve and ACE air valve, are open. The ACS feature requires two separate control lines, one for the Sentinel and one for the ACE valve. To prevent actuation of either valve, both safety petcocks must be open.

WARNING

To prevent severe injury or death from accidental activation of the blast machine, open both safety petcocks when the blast machine is not in use. The control handle will not activate the machine when the petcocks are open.

3.1.5 Start the compressor, and bring it up to operating temperature and pressure. The pressure must be more than 70 pounds per square inch (psi) but not more than the pressure rating of the blast machine.

3.1.6 Close the outlet valve, and open the inlet valve. The machine will pressurize.

3.1.7 Close the safety petcocks. There should not be any air escaping from any place in the blast system.

3.2 Blasting Attire

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

WARNING

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

No dust is safe to breathe. Abrasive blasting produces harmful dust. Failure to wear approved respirators could result in serious lung disease or death. Blast operators must wear properly fitted and maintained NIOSH-approved, type-CE supplied-air respirators approved for abrasive blasting.

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

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

3.3 Start Blasting

3.3.1 Press the ACS button farthest from the nozzle. (See Operation of ACS in Section 3.6)

3.3.2 Hold the blast hose securely and point the nozzle only at objects intended to be blast cleaned.

3.3.3 Pull back the safety lever lock and depress the remote control handle. Be prepared as blasting will begin within a few seconds.

CAUTION

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

WARNING

OSHA requires remote controls on all blast machines. Do not tie down the control handle or attempt to bypass any part of the remote control system. Doing so will defeat the purpose of the fail-to-safe feature of the remote control. Severe injury or death can result from uncontrolled blasting.

3.3.4 Adjust Abrasive flow per Section 4.1.

3.4 Stop Blasting

3.4.1 Before releasing the control handle, the operator may use the ACS to shut off the abrasive flow to clear the blast hose, or blow-down the blast surface. See Section 3.6.

3.4.2 To stop blasting, release the control handle lever. The control handle safety lever will flip up to lock the handle lever in the up (no blast) position to prevent accidental activation of the blast machine.

3.4.3 Open the safety petcocks located on the Sentinel metering valve and ACE air valve. Always open the safety petcocks during work breaks to prevent unintentional blasting.

3.4.4 It is not necessary to depressurize the machine between short blasting pauses. The media valve and air valve close when the control handle lever is released. To prevent accidental activation, depressurize the blast machine before any work break.

3.5 Depressurize the Blast Machine

3.5.1 Close the manual inlet valve and open the manual outlet valve. The machine will depressurize and the pop-up valve will open.

3.6 Operation of Abrasive Cut-Off Switch

3.6.1 The abrasive cut-off switch is wired into the control cord behind the control handle. By pressing the front (closest to the nozzle) "off" button, the air supply to the abrasive metering valve is cut off, closing the valve and stopping the abrasive flow. This allows the operator to have air alone coming from the nozzle, which can be used to clear the blast hose before shut-down, and to blow abrasive off the blasted surface. Pressing the rear pushbutton (farthest from the nozzle) returns control air to the metering valve, this opens the valve, and starts abrasive flow. The switch can be opened or closed at any time, but will not activate the metering valve unless the control handle is pressed.

NOTE: The purpose of the ACS is to clear the blast hose and to blow abrasive off the blasted surface at the blasting area. Small amounts of abrasive may come out the nozzle with the air. Residual abrasive may remain that will have to be removed outside the blast area prior to painting.

WARNING

People and the environment tolerate only a limited amount of toxic materials. OSHA limits these exposure levels. Airborne dust could increase the exposure levels beyond permissible limits. OSHA prohibits blowing with compressed air as a cleaning method for lead based paint dust or other hazardous dust, unless the compressed air is used in conjunction with a ventilation system designed to capture the airborne dust created by the compressed air, 29 CFR 1926 (h). The ACS is for blowing off abrasive from a blasted surface, NOT as a general area clean-up tool.

4.0 ADJUSTMENTS

4.1 Abrasive Metering

4.1.1 The abrasive flow is adjusted at the metering handle. The valve is closed when the handle is fully right. To adjust, close the valve and slowly move the handle to the left to increase media flow. Use as little abrasive as possible to do the job while maintaining the best cleaning rate. Generally, with the correct mixture, abrasive can be seen as light discoloration as it exits the nozzle. The valve is fully open when the handle is fully left.

4.2 Antifreeze Injector

NOTE: It is not necessary to use the injector unless temperatures fall to freezing. Close the injector when it is not required.

4.2.1 A separate manual is supplied for the operation of the antifreeze injector. Refer to the manual for operation and adjustment of the injector.

5.0 PREVENTIVE MAINTENANCE

NOTE: These preventive maintenance instructions pertain to the remote controls only. Read the owners' manuals for the blast machine and all blast accessories,

for inspection and maintenance schedules of those items.

5.1 Daily

5.1.1 With the air off, before beginning blasting, inspect the following:

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

WARNING

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

5.2 Weekly

5.2.1 While blasting, inspect all control hoses, and valves for leaks. If leaks are found, stop blasting and repair.

5.3 Periodic Inspection

NOTE: Periodic inspection of the following items will help avoid unscheduled down-time.

5.3.1 The remote control system is a safety device. To be safe and to avoid unscheduled down-time, inspect the internal parts of the Sentinel valve and ACE air valve. Inspect them for wear and lubrication of O-rings, pistons, springs, seals, and castings. Refer to the individual owners' manuals for equipment listed in Section 6.

5.3.2 The control handle is the actuator of the remote control system. Periodically clean around the springs, handle lever, and safety lever lock to ensure that the unit is free of abrasive and debris that could cause the handle lever or safety lever lock to bind. See the RLX Owner's Manual for service instructions.

6.0 SERVICE MAINTENANCE

WARNING

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

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

6.1 Sentinel Metering Valve

Refer to the Sentinel valve owner's manual for service instructions for the Sentinel metering valve.

6.2 ACE Air Valve

Refer to the ACE air valve owner's manual for service instructions for the air valve.

6.3 RLX Control Handle

Refer to the RLX control handle owner's manual for service instructions for the control handle.

7.0 TROUBLESHOOTING

7.1 Blasting Does Not Start When the Control Handle Lever is Pressed.

NOTE: The easiest way to check a dual panel is to substitute one control cord and handle with another until the fault is found.

7.1.1 Listen to the control panel to determine if it clicks when the control handle is pressed and released. If it does, the fault may not be electrical, go to Section 7.1.5 for pneumatic checks.

7.1.2 Check for fault in the control panel by removing the 50-ft. control cord from the 5 ft. lead cord coming from the panel. Hold the lead cord socket so the angled slot is facing up. The slot to the left (counter-clockwise of the angled slot) carries the power from the panel (hot line). Jump between the hot line and the angled slot (media valve solenoid), and listen for a click from the lower solenoid valve. Then jump between the hot line and the slot to the right (air valve solenoid) of the angled slot. The upper solenoid valve should click. If both valves click, check the control cord and electric RLX control handle per

Section 7.1.3 and 7.1.4. 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 faulty fuse or loose connections in the control panel.
- Check for inadequate power to the control panel.
- Check continuity of all panel wiring and solenoids.
- Check for faulty transformer (120-volt systems only).

7.1.3 Check each control cord extension, by connecting them one at a time to the panel, and jump across the extension cord socket as explained in Section 7.1.2. Continue to check all extension cords in like manner.

7.1.4 Check the end control cord (with ACS Switch) by jumping across terminals No. 1 and 3 on the lo-profile connector. The upper solenoid (air valve solenoid) should click. With the jump in place, move the ACS Switch on and off. Moving the ACS switch should cause the lower (media valve solenoid) solenoid to click. If the panel does not click, the cord, connectors or switch are faulty and should be repaired or replaced. If the panel does click, the remote control handle is the probable cause and should be repaired. Refer to the RLX Control Handle Owner's Manual.

7.1.5 Make sure the blast machine is pressurized.

7.1.6 Make sure the safety petcocks are closed.

7.1.7 Check for air leaks in Sentinel valve, ACE air valve, connecting hose, and tube fittings inside the panel.

7.1.8 Inspect the air filter and 3/16" supply hose for blockage, clean if necessary.

7.1.9 Open the petcock on the ACE air valve and press the control handle. If air does not come out the petcock, check for blockage in the control lines.

7.2 Air Continues to Leak From the Nozzle After the Control Handle Lever is Released.

7.2.1 Close the choke valve. If the leak stops, the problem is in the ACE air valve or a blockage in the control line between the air valve and panel. If the leak continues, the Sentinel requires service, or there is a blockage in the control line between the Sentinel and the panel.

7.3 Heavy Abrasive Flow.

7.3.1 Make sure the choke valve is open.

7.3.2 Inspect the metering plate in the Sentinel valve for wear. Refer to the Sentinel valve owner's manual for service instruction for the Sentinel Metering Valve.

7.3.3 Check the solenoid operating the air valve (upper solenoid).

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

7.4 Abrasive Flow Does Not Stop When the ACS "Off" (forward) Button is Pressed.

7.4.1 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:

- Obstruction in the line between the Sentinel Valve and the "GRIT VALVE" connection on the panel.
- Faulty ACS switch.
- Faulty solenoid.

7.5 Air Flow, but No Abrasive.

7.5.1 Make sure the Sentinel Valve is not closed. Closed is when the metering handle is fully right.

7.5.2 Make sure the ACS switch is in the "ON" position. See Section 3.6.1.

7.5.3 Check for leaks or blockage in the hose or fittings from the control panel to the Sentinel Valve, and for leaks inside the panel.

7.5.4 Check the solenoid operating the Sentinel valve (lower solenoid).

7.5.5 Make sure the machine contains abrasive.

7.5.6 Use the following methods to check for obstruction in the Sentinel valve.

7.5.6.1 Fully open the metering valve. The valve is open when the metering handle is fully left. While blasting, close the choke valve to force out small obstructions or wet abrasive.

WARNING

Depressurize the blast machine, and lockout and tagout the air supply before continuing.

7.5.6.2 For large obstructions, shut the machine down to examine the Sentinel valve. Remove the inspection plate from the flanged adaptor and clear obstruction.

WARNING

Do not stick fingers into the piston area of the inspection opening. The piston is under spring pressure, and could suddenly close when the obstruction is cleared.

7.5.7 The Sentinel valve may require service. Refer to the Sentinel Valve Owner's Manual.

7.6 Abrasive Flow Does Not Stop After the Control Handle Lever is Released.

7.6.1 Inspect Sentinel valve seat for wear or obstruction. Refer to the Sentinel Valve Owner's Manual.

7.6.2 Inspect Sentinel valve shut-off piston for wear.

7.7 Sentinel Metering Handle Will Not Move.

7.7.1 Damp or hardened abrasive has packed around Sentinel valve metering plate. Disassemble valve to clean.

7.8 Air Leaks Through Relief Hole in Sentinel Valve Cylinder Cap.

7.8.1 Replace worn piston cup. Refer to the Sentinel Valve Owner's Manual.

7.9 Abrasive in Sentinel Valve Spring Chamber.

7.9.1 Replace worn seal and wiper. Refer to the Sentinel Valve Owner's Manual.

8.0 REPLACEMENT PARTS

8.1 Remote Control Systems

Item	Description	Stock No.
	120-volt Single-operator system	20991
	12-volt Single-operator system	20999
	120-volt Dual-operator system	21007
	12-volt Dual-operator system	21015

8.2 Sentinel Remote Control System, Figure 4

Item	Description	Stock No.
1.	Panel, single-operator control 12-volt DC	05621
	120-volt AC	07650
2.	Panel, dual-operator control 12-volt DC	05622
	120-volt AC	07651
3.	Media metering valve, Sentinel Standard, 50-mesh and coarser media .	20608
	Fine-mesh, finer than 50-mesh media ...	21439
4.	Air valve, ACE w/ fittings.....	24044
5.	RLX electric control handle	10840
6.	Cord, 50-ft. control w/ACS switch	10847
7.	Extension cord, 50' for ACS, w/twist lock	15138
8.	Extension cord, 100' for ACS, w/twist lock ..	19528

9.	Hose, 5-ft. coupled	03083
10.	Hose, 5-ft. twinline, coupled	01952
11.	Tee, 1-1/4" x 1" pipe	01811
12.	Bushing, 1" x 1/4"	02023
13.	Adaptor, 1/4" NPT	02494
14.	Pigtail, for 12-volt DC only, with lo-profile connector	10831
15.	Nylon tie	02195

8.3 Valve Replacement Parts

NOTE: Refer to the following manuals for replacement parts for the Sentinel Valve, ACE Air Valve, and RLX Control Handle.
Sentinel Media Metering Valve, Manual No. 20951
ACE Air Valve, Manual No. 23938
RLX Control Handle, Manual No. 10574

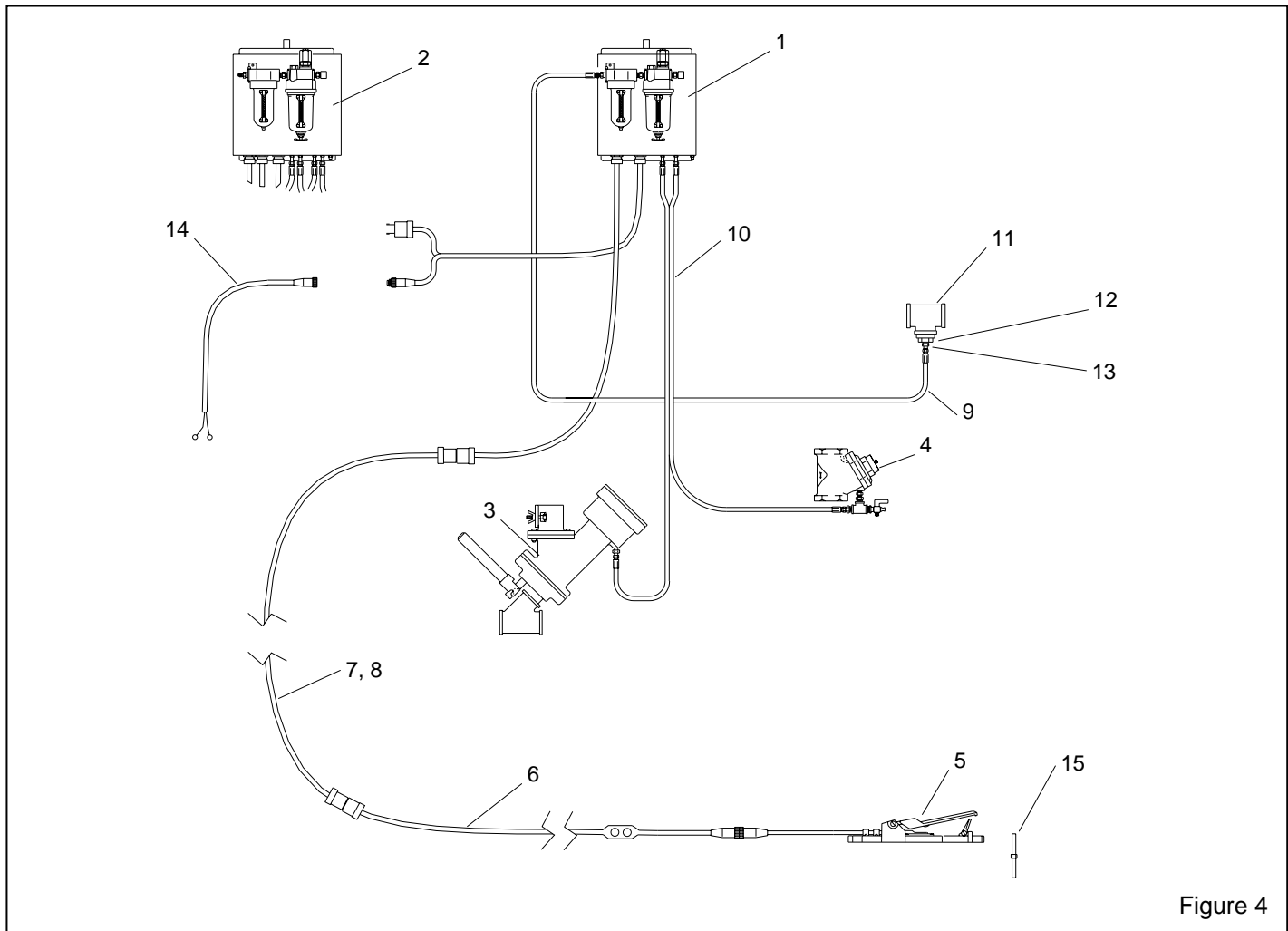


Figure 4

8.4 Control Panel, Figure 5

Item	Description	Stock No.
(-)	Control panel, single operator	
	12-volt	05621
	120-volt	07650
(-)	Control panel, dual operator	
	12-volt	05622
	120-volt	07651
1.	Air filter, 1/4"	05617
2.	Antifreeze injector, 1/4"	05616
3.	Valve, 3-way, 12-volt DC (for 12-volt panel)	07664
	12-volt AC (for 120-volt panel)	07662
4.	Terminal block, 5 pole	02268
5.	Adaptor, 1/4" NPT	02494
6.	Hex nipple, 1/4" NPT	02808
7.	Elbow, 1/4" brass street	02027
8.	Coupling, 1/4" female bulkhead	05605
9.	Bushing, 1/4 x 1/8, exhaust	02010
10.	Adaptor, 1/4" female bulkhead	03432
11.	Supply cord, 5-foot 12-volt, with lo-profile connector	10833
	120-volt, with twist-lock connector.....	02216
12.	Cord, control whip	07675
13.	Connector, 1/2" strain relief	02213
14.	Locknut, 1/2" conduit	02925
15.	Elbow, male 1/4" NPT x 1/4" tube	03428
16.	Tee, 1/4" tube	03351
17.	Connector, 1/8" NPT x 1/4" tube	03430
18.	Tubing, 1/4" white, specify feet required	03427
19.	Tubing, 1/4" red, specify feet required	05612
20.	Tubing, 1/4" blue, specify feet required	05613
21.	Tubing, 1/4" green, specify feet required	05614
22.	Tubing, 1/4" orange, specify feet required	05615
23.	Bracket, panel mount	04188
24.	Fuse, 2-amp 1/4" x 1-1/4", 120-volt only	03039
25.	Fuse block, 120-volt only	03040
26.	Transformer, 12.6-volt	02198

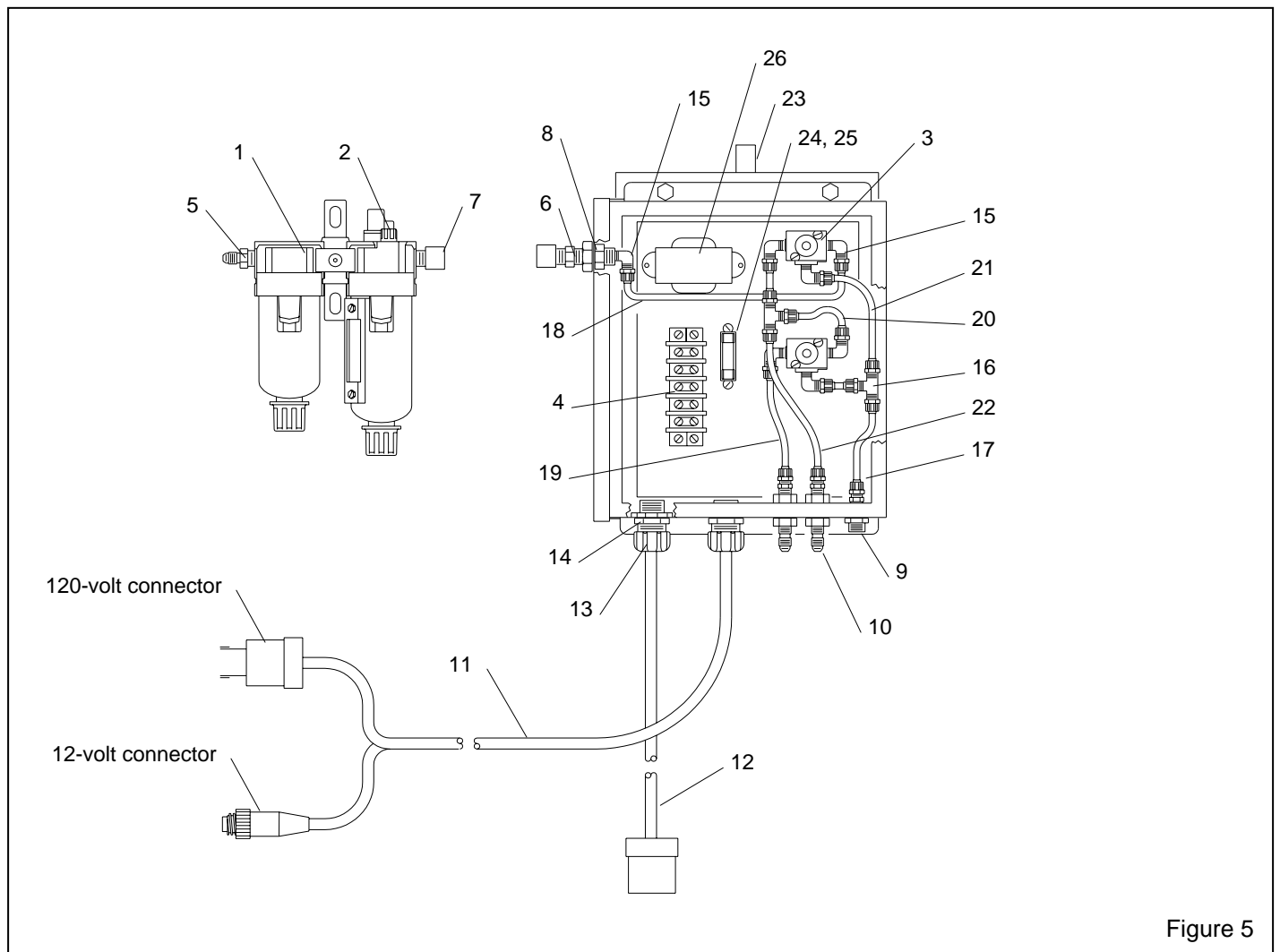


Figure 5