

# WETBLAST INJECTOR SYSTEM

O. M. 05539

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## **WARNING**

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

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

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

**Electronic files include a Preface containing important information.**

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## **WARNING**

- Employers are responsible for identifying all job site hazards, educating and training all persons who will operate and maintain these products, and ensuring that all blast operators and their assistants understand the warnings and information contained in these instructions relating to safe and proper operation and maintenance of this equipment.
- Serious injury or death can result from failure to comply with all Occupational Safety and Health Administration (OSHA) regulations and all manufacturer's instructions.
- This equipment is not intended for use in any area considered hazardous per National Electric Code NFPA 70 2011, Article 500.
- Read this document and follow all instructions before using this equipment.

OSHA regulations relating to abrasive blasting are contained in the Code of Federal Regulations, Title 29 (29 CFR 1910 General Industry; 1915 Maritime; 1926 Construction). The most pertinent include: 1910.94 Ventilation, 1910.95 Occupational Noise Exposure, 1910.132 Personal Protective Equipment, 1910.133 Eye and Face Protection, 1910.134 Respiratory Protection, 1910.135 Head Protection, 1910.244 (b) Remote Controls. Consult [www.osha.gov](http://www.osha.gov) for complete information.

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

Clemco proudly provides products for the abrasive blast industry and is confident that industry professionals will use their knowledge and expertise for the safe and efficient use of these products.

The products described in this material, and the information relating to these products, are intended for knowledgeable, experienced users.

No representation is intended or made as to: the suitability of the products described here for any purpose or application, or to the efficiency, production rate, or useful life of these products. All estimates regarding production rates or finishes are the responsibility of the user and must be derived solely from the user's experience and expertise, not from information contained in this material.

It is possible that the products described in this material may be combined with other products by the user for purposes determined solely by the user. No representations are intended or made as to the suitability of or engineering balance of or compliance with regulations or standard practice of any such combination of products or components the user may employ.

Abrasive blast equipment is only one component of an abrasive blasting job. Other products, such as air compressors, air filters and receivers, abrasives, scaffolding, hydraulic work platforms or booms, equipment for lighting, painting, ventilating, dehumidifying, parts handling, or specialized respirators or other equipment, even if offered by Clemco, may have been manufactured or supplied by others. The information Clemco provides is intended to support the products Clemco manufactures. Users must contact each manufacturer and supplier of products used in the blast job for warnings, information, training, and instruction relating to the proper and safe use of their equipment.

### **GENERAL INSTRUCTIONS**

This material describes some, but not all, of the major requirements for safe and productive use of blast machines, remote controls, respirator systems, and related accessories. All equipment and accessories must be installed, tested, operated and maintained only by trained, knowledgeable, experienced users.

The blast operator and all workers in the vicinity must be properly protected from all job site hazards including those hazards generated by blasting.

Work environments involving abrasive blasting present numerous hazards. Hazards relate to the blast process from many sources that include, but are not limited to, dust generated by blasting or from material present on the surface being blasted. The hazards from toxic materials may include, but are not limited to, silica, cyanide, arsenic, or other toxins in the abrasives or in the coatings, such as lead or heavy metals. Other hazards from toxins include, but are not limited to, fumes from coating application, carbon monoxide from engine exhaust, contaminated water, chemicals or asbestos. In addition, physical hazards that may be present include, but are not limited to, uneven work surfaces, poor visibility, excessive noise, and electricity. Employers must identify all job site hazards and protect workers in accordance with OSHA regulations.

Never modify Clemco equipment or components or substitute parts from other manufacturers for any Clemco components or parts. Any unauthorized modification or substitution of supplied-air respirator parts violates OSHA regulations and voids the NIOSH approval.

### **IMPORTANT**

Contact Clemco for free booklets:

*Blast Off 2 – Guide to Safe, Productive, and Efficient Abrasive Blasting, and Abrasive Blasting Safety Practices – Guide to Safe Abrasive Blasting.*

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# OPERATIONAL INSTRUCTIONS

### *OPERATOR SAFETY EQUIPMENT*

## **WARNING**

- OSHA regulation 1910.134 requires appropriate respiratory protection for blast operators and workers in the vicinity of blasting. These workers must wear properly-fitted, properly-maintained, NIOSH-approved, respiratory protection that is suitable for the job site hazards. Blast respirators are to be worn only in atmospheres not immediately dangerous to life or health from which wearers can escape without use of the respirator.
- The employer must develop and implement a written respiratory protection program with required worksite- specific procedures and elements for required respirator use. The employer must provide effective training to employees who are required to use respirators. The training must be comprehensive, understandable, and recur annually, and more often if necessary.
- NEVER use abrasives containing more than one percent crystalline silica. Fatal diseases, such as silicosis, asbestosis, lead or other poisoning, can result from inhalation of toxic dusts, which include, but are not limited to, crystalline silica, asbestos, and lead paint. Refer to NIOSH Alert 92-102; and OSHA CPL 03-00-007: “National Emphasis Program – Crystalline Silica”, in which OSHA describes policies and procedures for implementing a national emphasis program to identify and reduce or eliminate health hazards from exposure to crystalline silica. Numerous topics associated with the hazards of crystalline silica in silica blasting sand can be found on [http:// osha.gov/](http://osha.gov/). Clemco urges users of silica blasting sand to visit this website, and read and heed the information it contains.
- Always make sure the breathing air supply (respirator hose) is not connected to plant lines that supply gases that include, but are not limited to, oxygen, nitrogen, acetylene, or other non-breathable gas. Never modify or change respirator air line connections without first testing the content of the line for safe breathing air. Failure to test the line may result in death to the respirator user.

- Breathing air quality must be at least Grade D, as defined by the Compressed Gas Association specification G-7.1, per OSHA Regulation 29 CFR 1910.134. When compressed air is the breathing air source, a Clemco CPF (suitable sorbent bed filter) should be used. Respirator hose connecting the respirator to the filter must be NIOSH approved. Non- approved hose can cause illness from chemicals employed to manufacture the hose.

- All workers must always wear NIOSH-approved respirators when any dust is present. Exposure to dust can occur when handling or loading abrasive, blasting, cleaning up abrasive, or working in the vicinity of blasting. Before removing the respirator, test the air with a monitoring device to ensure it is safe to breathe.

- Clemco respirators DO NOT remove or protect against carbon monoxide or any other toxic gas. Monitoring devices must be used in conjunction with the respirator to ensure safe breathing air. Always locate compressors and ambient air pumps where contaminated air will not enter the air intake.

- Always use Clemco lenses with Clemco respirators; installing non-approved lenses voids the NIOSH approval. Respirator lenses are designed to protect the wearer from rebounding abrasive; they do not protect against flying objects, heavy high-speed materials, glare, liquids, or radiation.

### *INDUSTRY ORGANIZATIONS*

For additional information, consult:

Occupational Safety and Health Administration (OSHA) - [www.osha.gov](http://www.osha.gov)

Compressed Gas Association (CGA) - [www.cganet.com](http://www.cganet.com)

The Society for Protective Coatings (SSPC) - [www.sspc.org](http://www.sspc.org)

National Association of Corrosion Engineers (NACE) - [www.nace.org](http://www.nace.org)

American Society for Testing and Materials (ASTM) - [www.astm.org](http://www.astm.org)

National Institute of Occupational Safety and Health (NIOSH) - [www.niosh.gov](http://www.niosh.gov)

American National Standards Institute (ANSI) - [www.ansi.org](http://www.ansi.org)

# PREFACE

## ***BLAST MACHINES AND REMOTE CONTROLS***

### **⚠ WARNING**

OSHA regulation 1910.169 describes 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.

OSHA regulation 1910.244(b) requires the use of remote controls on blast machines.

Serious injury or death can result from many sources, among them:

- Involuntary activation of the remote controls. Never modify or substitute remote control parts; parts are not compatible among different manufacturers. Welding hose is not suitable for remote control hose. Its ID and material composition make it unsafe for remote control use.
- Exceeding the maximum working pressure. Clemco blast machines are built to ASME-code and carry a 'U' or 'UM' stamp, and National Board/serial number. Every machine is marked with its maximum working pressure. Never exceed the maximum working pressure limits of the blast machine.
- Uncontrolled blast stream. High-velocity abrasive particles will inflict serious injury. Always point the blast nozzle in the direction of the blast surface only. Keep unprotected workers out of the blast area.
- Welding on the blast machine. Never weld on the blast machine; welding voids the National Board approval and may affect the dimensional integrity of the vessel.
- Moving the blast machine. Never manually move a blast machine containing abrasive, any machine containing abrasive must be moved with appropriate mechanical lifting equipment.

## ***HOSES, COUPLINGS, AND NOZZLE HOLDERS***

- The inside diameter (ID) of air hoses, fittings, and connections should be at least four times larger than the nozzle orifice size. Blast hose ID should be three to four times the size of the nozzle orifice. Example: a #6 nozzle (3/8" diameter orifice) calls for 1-1/2" ID blast hose and 1-1/2" ID or larger compressor hose. All hose runs should be kept as short as possible and run in as straight a line as possible to reduce pressure loss.
- To install, squarely cut the end of the hose so that it fits snugly against the coupling or hose end shoulder. Always use the screws recommended by the manufacturer ensuring that they do not penetrate the inner wall. Make sure the couplings tightly fit the hose. Install cotter pins at every connection or use couplings with built-in lock-springs to prevent disengagement. Install safety cables at all connections to prevent whipping if hoses disengage or blow out.

## ***MAINTENANCE AND REPAIR***

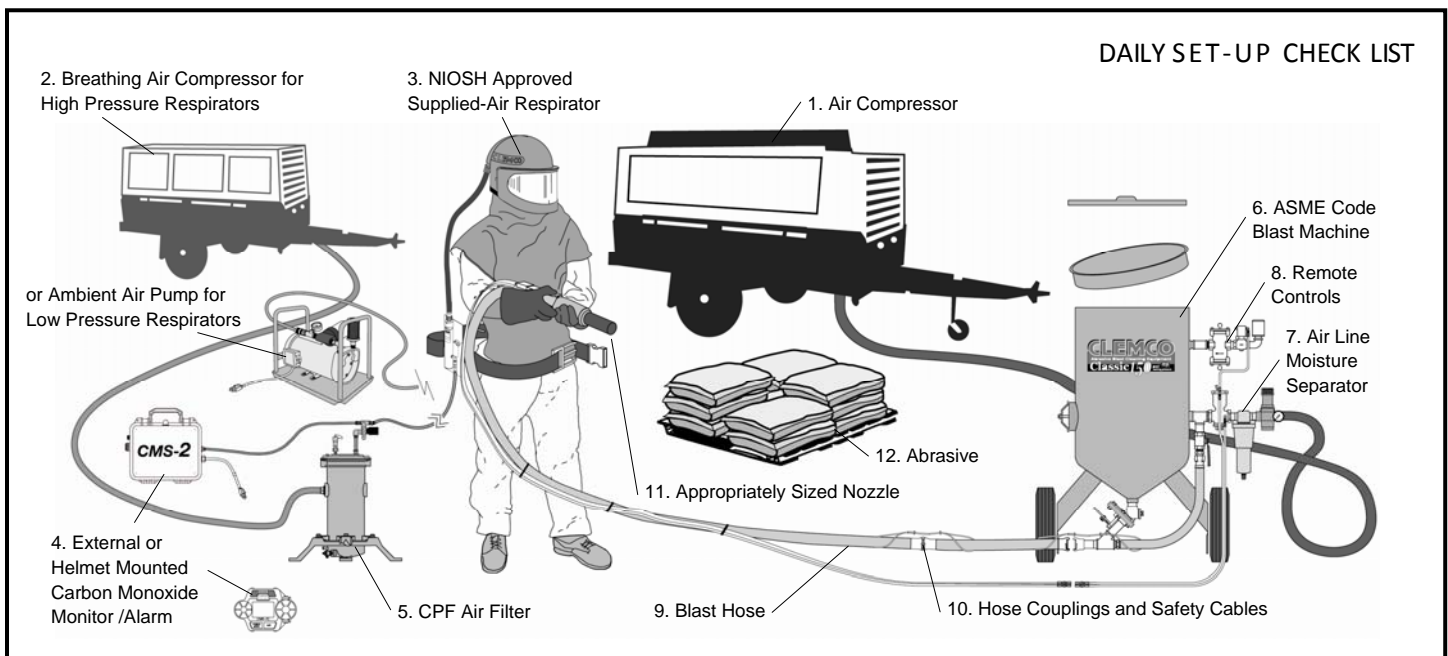
- Completely read and follow all service instructions and recommended maintenance intervals. Always shut off compressor and depressurize blast machine before performing any maintenance. At every service interval, clean all filters, screens, and alarm systems. If spring-loaded abrasive valves are used, always cage spring before disassembly.

## ***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 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 the 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 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 the 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 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.

# PREFACE



DAILY SET-UP CHECK LIST

Make sure all blast operators are properly trained and suitably attired with a blast suit, safety boots, leather gloves, respiratory and hearing protection. Every day before start up, check all equipment components, including piping, fittings, and hoses, and valves, for leaks, tightness, and wear. Repair or replace as needed. Use the following checklist.

- 1. PROPERLY-MAINTAINED AIR COMPRESSOR** sized to provide sufficient volume (cfm) at given pressure for nozzle and other tools. ADD 50% volume (cfm) reserve to allow for nozzle wear. Use large compressor outlet and air hose (at least 4 times the nozzle orifice diameter). For oil-lubricated compressors, the employer shall use a high- temperature or carbon monoxide alarm, or both, to monitor carbon monoxide levels. If only high-temperature alarms are used, the air supply shall be monitored at intervals sufficient to prevent carbon monoxide in the breathing air from exceeding 10 ppm. Follow the manufacturer's checklist and maintenance instructions.
- 2. BREATHING-AIR COMPRESSOR** (or oil-less ambient air pump) capable of providing Grade D quality air, located in a dust free area. Read # 1 above.
- 3. CLEAN, PROPERLY-MAINTAINED NIOSH-APPROVED SUPPLIED-AIR RESPIRATOR** worn by blast operators, and other workers exposed to blast dust. Make sure all respirator components are in place — all lenses, inner collar, and cape. Thoroughly inspect all components for wear. The NIOSH approval (approval number is listed in the owner's manual) is for a complete assembly from point of attachment on the CPF (sorbet bed) filter to the complete respirator. Substitution of any part voids the NIOSH approval.
- 4. CARBON MONOXIDE MONITOR/ALARM** installed at the CPF filter or inside the supplied-air respirator for monitoring for the presence of deadly CO gas and warning the operator(s) when the CO level reaches an unacceptable level. When an ambient air pump is used for breathing air, a CO monitor provides a measure of safety. Read # 1 above.
- 5. BREATHING-AIR FILTER (OSHA-REQUIRED sorbet bed filter)** for removal of moisture and particulate matter in the compressed air breathing-air supply. Monitor the condition of the cartridge and replace when odor is detected or at 3 month intervals, whichever comes sooner. The breathing air filter does NOT detect or remove carbon monoxide (CO). Always install a CO monitor/alarm.
- 6. BLAST MACHINE** (bearing U or UM stamp, National Board Number, and Maximum Working Pressure) sized to hold a 30-minute abrasive supply. Examine pop-up valve for alignment. Check piping, fittings, screens, valves for tightness, leaks, and wear. Always ground the machine to eliminate hazard of static shock. Install a blast machine screen to keep out foreign objects. Use a blast machine cover if left outdoors overnight. Never exceed the maximum working pressure of the vessel.
- 7. AIR LINE FILTER** (moisture separator) installed as close as possible to the blast machine inlet and sized to match the size of the inlet piping or larger air supply line. Clean filter and drain often. Damp abrasive causes operational problems.
- 8. REMOTE CONTROLS** are required by OSHA and must be in perfect operating condition. Test and check all components to ensure all parts are present and fully functional. Use genuine replacement parts. NEVER mix parts from different manufacturers. Never use welding hose for remote control hose.
- 9. BLAST HOSE** should have an inside diameter sized to suit the blast nozzle. The ID should be three to four times the size of the nozzle orifice diameter. Blast hose should be arranged in as straight a line as possible from the blast machine to the work area, avoiding sharp bends.
- 10. COUPLINGS AND NOZZLE HOLDERS** should fit snugly on the hose and be installed with manufacturer recommended screws. Coupling lugs must snap firmly into locking position. Gasket must always be used to form a positive seal, and cotter pins must be installed. Replace gasket when wear, softness or distortion is detected. Check nozzle holder for thread wear; replace at any sign of wear. Install safety cables at all connections.
- 11. NOZZLE** orifice size should be checked and nozzle replaced when worn 1/16" from original size. (No. 5 nozzle has 5/16" orifice diameter; replace when it measures 3/8"). Threads should be inspected daily for wear and nozzle should be replaced when wear is detected. Always use a nozzle washer.
- 12. ABRASIVE** must be a material specifically manufactured for blasting. It should be properly sized for the job. Check material safety data sheet for free-silica, cyanide, arsenic, lead and other toxins and avoid use when these toxic, harmful substances are present.
- SURFACE TO BE BLASTED** should be examined for hazardous substances. Take appropriate protective measures as required by OSHA to ensure the blast operator, other workers in the vicinity, and any bystanders are properly protected.

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## 1.0 INTRODUCTION

### 1.1 Scope of manual

1.1.1 These instructions cover the set-up, operation, maintenance, troubleshooting, and replacement parts for Clemco's water-injection system.

1.1.2 Read this manual, plus the manual for the operation and maintenance of the pump. This manual does not contain important, safety information regarding the use abrasive blasting equipment and the application with which the injector system is used. All operators and personnel involved with the abrasive blast process must read and understand the contents of these instructions, including the orange cover and appropriate owner manuals for operation of the blast machine and accessories used with the injector system. Manuals which contain operation and important information for Clemco abrasive blasting equipment are available on our web site, [www.clemcoindustries.com](http://www.clemcoindustries.com),

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

### 1.2 Safety Alerts

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



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

## NOTICE

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

## CAUTION

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

## WARNING

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

## DANGER

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

### 1.3 Components

1.3.1 The components of the Wetblast Injector System with typical water set-ups are shown in Figure 1, and include:

Pump Module, consisting of:

- Air filter/pressure regulator combination, adjust air pressure to the water pump (maximum of 100 psi).
- Oil lubricator, automatically lubricates the water pump.
- 10:1 Air-driven water pump.

50 Ft. hydraulic (water) hose assembly.

Wetblast nozzle injector-adaptor assembly, one of the following options to match the configuration of the nozzle holder and nozzle.

- 50 mm contractor nozzle threads with 1-1/4" entry.
- 50 mm contractor nozzle threads with 1" entry.
- 1-1/4 nozzle threads with 1" entry.

1.3.2 External inlet connections are located on the left side on the module. They include the compressed air supply connection and water supply strainer and connection.

1.3.3 External outlet connections are located on the right side of the module and include the exhaust muffler and water-outlet tee. The water-outlet tee is the attachment for the hydraulic water hose, the other end of the hose connects to the injector-adaptor assembly located at the nozzle.

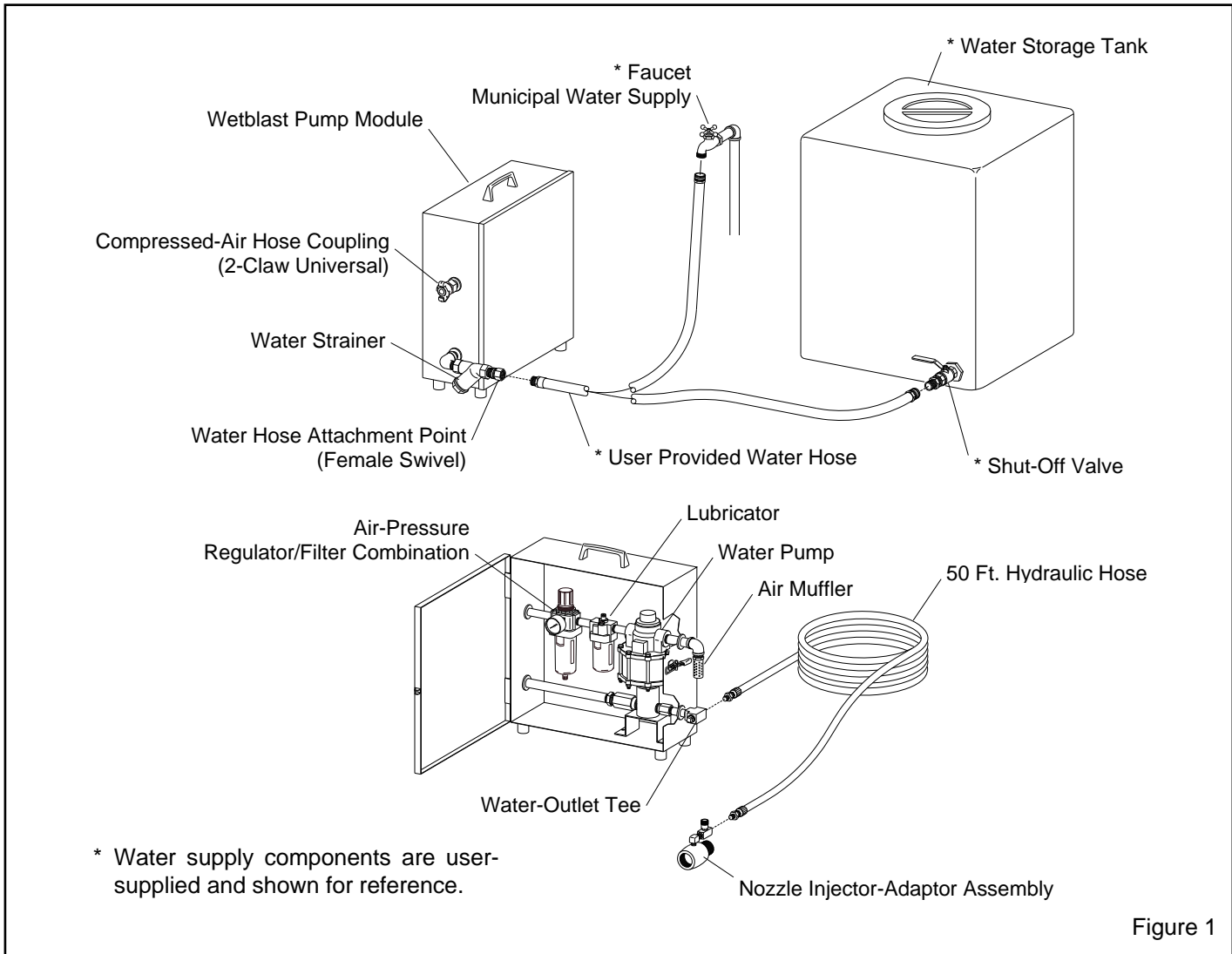


Figure 1

## 1.4 Operating Principles

**1.4.1** The wetblast water-injector is a stand-alone system that provides water injection capability to any dry abrasive-blast machine. The unique water-injection design, combined with precise abrasive and water metering, reduces or eliminates dust normally found with dry blasting operations. The illustration in Figure 2 shows a typical set up with a blast machine.

**1.4.2** When an air line and water source are connected, incoming air is adjusted at the regulator /filter to a suitable pressure and filtered through the air filter segment. Compressed air then passes through an oil lubricator which automatically injects lubricant into the air stream before entering the pump.

**1.4.3** Compressed air operates the pump, which pressurizes water at a 10:1 ratio, meaning water outlet pressure is ten times that of incoming air pressure.

Maximum operating air pressure to the pump is 100 psi. Refer to Section 4.2 to adjust pump pressure.

**1.4.4** When the blast machine and wetblast injector are set up, and the nozzle adaptor is attached at the end of the blast hose between the nozzle holder and nozzle, the system is ready for operation. The operator will dry blast long enough to get the correct air abrasive mixture. When ready, the operator opens the water-flow-control valve on the adaptor, which injects water into the air/abrasive stream through an array of jets within the adaptor. Water entering the blast stream is combined with air and abrasive and accelerated through the nozzle. Each abrasive particle is thoroughly engulfed in moisture before it impacts the blast surface and shatters. The process drastically reduces or eliminates dust in the atmosphere.

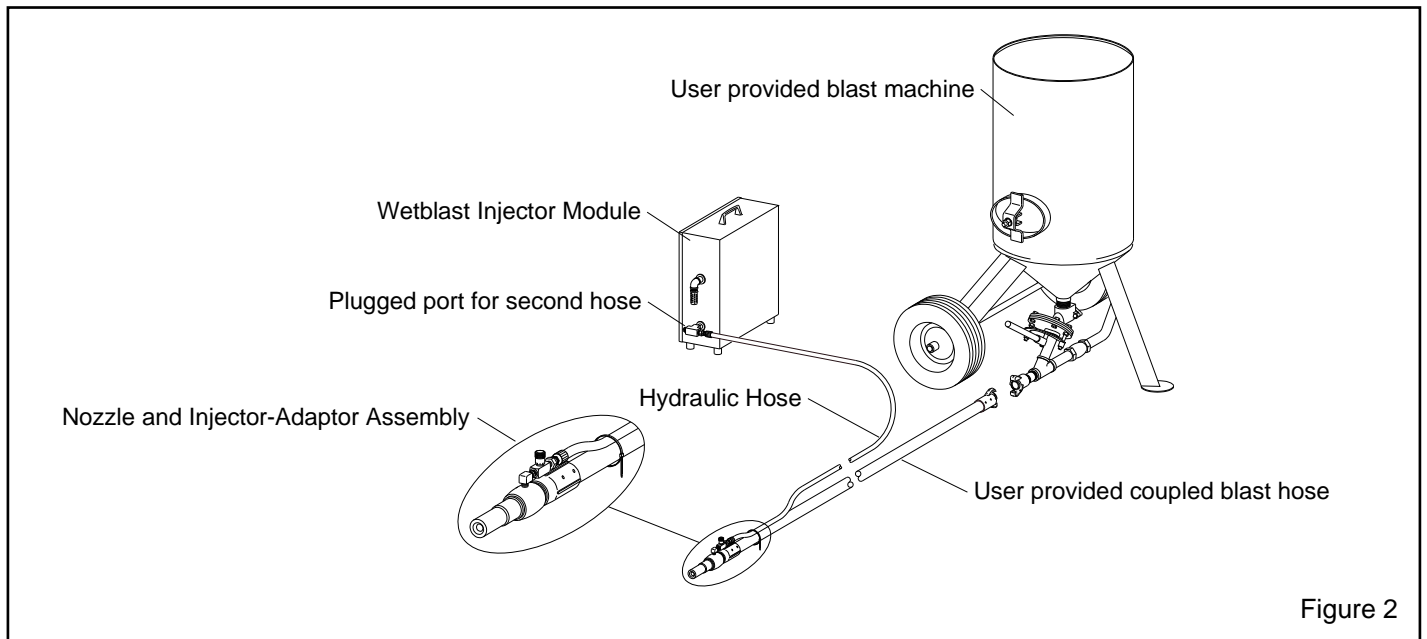


Figure 2

**1.4.5** When set up with any standard blast machine, the operator has the ability to switch between dry blasting and wet blasting from the nozzle.

When set up with a blast machine that has a pneumatically-operated abrasive metering valve, the operator can control abrasive, air, and water, or any combination of the three, isolating the four following functions.

- Dry blasting, with air and abrasive only
- Wet blasting, with air, abrasive, and water.
- Wash-down, with air and water only.
- Dry-off (air drying), with air alone

Wash-down and drying can be done with a blast machine having a manually-operated abrasive control valve by manually closing the valve at the machine.

**1.4.6** The system can be used by two operators simultaneously by adding a second hydraulic hose and nozzle adaptor. The plugged port on the unused leg of the water-outlet tee is for a second nozzle injector (for use with a separate, additional blast machine), remove the plug and attach another hydraulic hose. Refer to Sections 2.4 and 2.5.

## 1.5 Compressed Air Requirements

**1.5.1** The pump consumes a maximum of 21 cfm. The cfm consumption is based on operating at a maximum of 100 psi, which is the maximum operating pressure for the pump. Pump pressure is typically set between 35 to 40 psi. Refer to Section 4.2 to adjust pump pressure.

## 1.6 Water Requirements

**1.6.1** The water supply to the injector can be from a prefilled water storage tank or pressurized water from a faucet. Refer to Section 2.3 for water connections.

## 1.7 Rust Inhibitors and Additives

**1.7.1** Additives may be used in a storage tank when premixed with water at the recommended dilution. NOTE: Always check with the coating manufacturer prior to use to ensure the additive is compatible with the coating to be applied.

## 2.0 SET UP

### **⚠ CAUTION**

**Do not connect the injector to any water supply except through the pump module. Using the injector without the pump, such as connecting it directly to a faucet could cause pressure in the blast hose to backup into the water system and cause extensive damage, and in certain conditions may result in injury.**

## 2.1 Blast Machine and Accessories

**2.1.1** Set up the blast machine, operator safety equipment and all accessory equipment following manufacturer's instructions.



NOTE: Unless noted otherwise, the sequence of assembly in Section 2 may be done in any order that is best suited for the application. To protect the brittle nozzle liner from damage, it is suggested that the user-supplied nozzle be placed in the injector after all other connections are made.

## 2.2 Connect Air Hose, Figure 3

**2.2.1** Attach a 1/2" ID or larger air hose to the 2-claw coupling as shown in Figure 3. NOTE: If the user-supplied air supply hose has a different type of coupling, replace the coupling on the injector with one that is compatible with the hose. Make sure there are no reducers or restrictions that reduce the volume of air (21 cfm at 100 psi) required for the pump.

## **⚠ WARNING**

**If twist-on (claw-type) air hose couplings are used, they must be secured with safety lock pins or wires to prevent accidental disconnection while under pressure. Use safety cables to prevent hose whipping should a separation occur. Hose disconnection while under pressure could cause serious injury.**

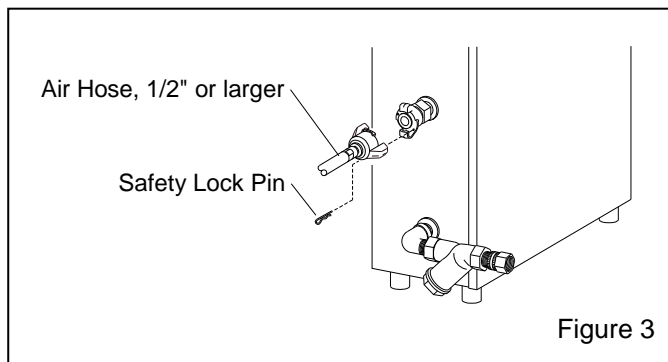


Figure 3

## 2.3 Connect Water Supply Hose, Figure 4

**2.3.1** Attach a water hose to the 3/4" garden hose swivel connector on the strainer. The water source may be from a faucet or storage tank as shown in Figure 4.

**2.3.2** The pump is easily primed when water supply is from a pressurized faucet. Water pressure pushes water through the pump, eliminating air pockets.

**2.3.3** When water is supplied from a storage tank, make sure the tank outlet is elevated higher than the module's water connection inlet. If there is difficulty in priming the pump, install a small air valve (facing up) at the inlet to burp air trapped in the supply line.

## **NOTICE**

**When using water from a tank, make sure the connection at the injector is lower than the outlet of the tank. The pump is self-priming, but it may not prime if the injector inlet is higher than the storage tank outlet. Refer to Section 3.1.7 to prime the pump.**

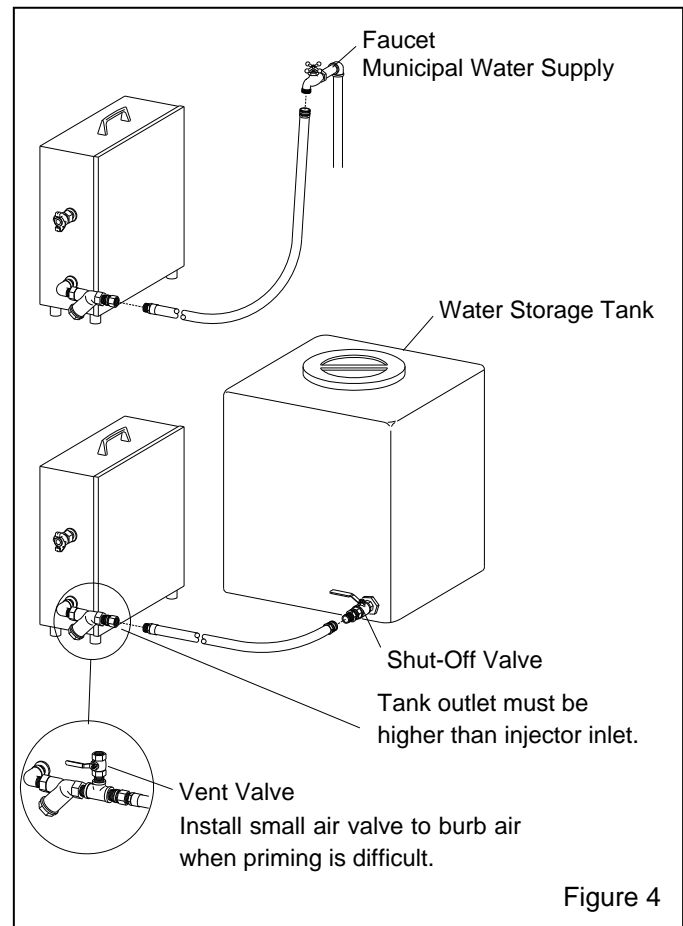


Figure 4

## 2.4 Attach Injector to User-Supplied Blast Hose, Figure 5

**2.4.1** Place the nozzle washer provided with the injector into the nozzle holder, and thread the adaptor assembly into the holder, as shown in Figure 5. Thread the injector into the nozzle holder to firmly compress the washer between the injector and holder. NOTE: Rotate the flow-control valve, positioning the knob so the operator with a gloved hand can turn the knob to regulate water flow.

**2.4.2** After all blast hose and water hose connections are made and just before blasting, place the nozzle washer into the injector-adaptor assembly and screw the nozzle firmly into adaptor.

**NOTICE**

The nozzle washers must be firmly compressed to create an air-tight seal between the blast hose, injector, and nozzle. Air leaks will erode the threads or otherwise damage these items.

**2.5 Connect Hydraulic Hose Between the Injector and Pump Module, Figures 5 and 6**

When the blast hose from a separate blast machine is used with the injector, remove the plug on the outlet tee and connect an additional hydraulic hose and injector by following the instructions for setting up the initial hose and injector.

**2.5.1** Apply thread sealant to the male threads only, on one end of the 50-ft. hydraulic hose and connect it to the injector-adaptor as shown in Figure 5. The male connectors on both ends of the hydraulic hose swivel to facilitate the connections to the injector and pump module.

**2.5.2** Apply thread sealant to the male threads on the other end of the 50-ft. hydraulic hose and connect it to the tee located on the side of the module as shown in Figure 6.

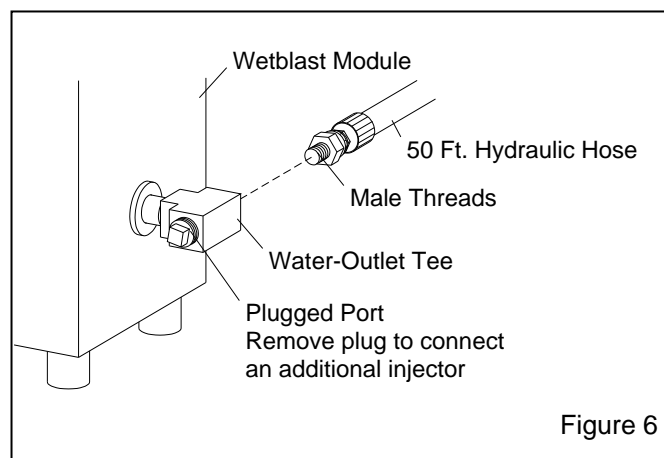


Figure 6

NOTE: When a hydraulic hose extension is needed, connect hoses together using hose coupling 02162, shown in Section 8.2, Figure 11.

**2.6 Fill Lubricator with Approved Lubricant**

**2.6.1** Make sure the water pump lubricator is filled with approved lubricant such as a Castrol Brayco Micronic 783, AeroShell Fluid 71 or equivalent. A good quality oil specifically manufactured for air tools may be used if the recommended lubricants are not available. Refer to Section 4.1 to fill and adjust the lubricator.

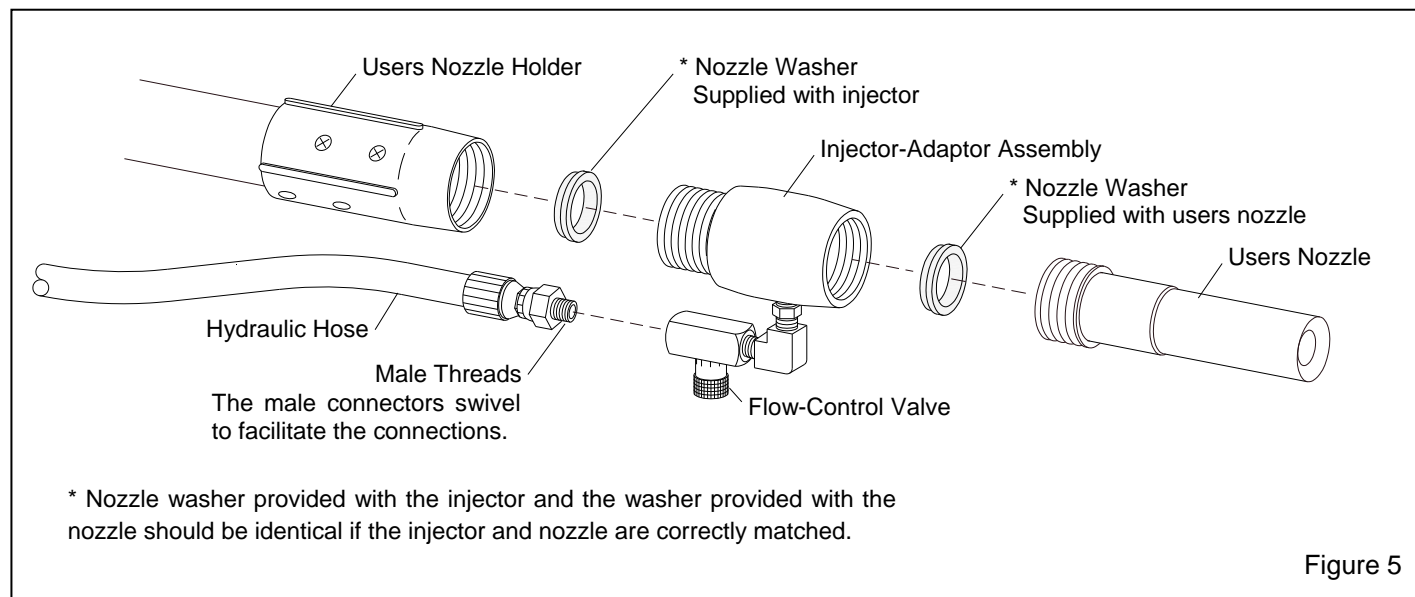


Figure 5

### 3.0 OPERATION

#### 3.1 Pre-Blast Inspection and Settings

**3.1.1** Make sure the blast machine and operator safety equipment are set up per instructions in the applicable manual.

**3.1.2** Make sure air hose connections are secure and wired with safety lock pins.

**3.1.3** Make sure water supply hose is connected to an adequate water source.

**3.1.4** Make sure the water pump lubricator is filled with approved lubricant.

**3.1.5** Make sure the water-flow-control valve is closed (knob turned fully-clockwise) as shown in Figure 9.

**3.1.6** Turn the pressure regulator control knob counterclockwise to "0" psi. Refer to Section 4.2 to regulate pressure.

#### 3.1.7 Prime pump

**3.1.7.1** Pressurize the air supply line to the module.

**3.1.7.2** Open the water supply valve.

**3.1.7.3** Slowly increase the pump air pressure to 10 - 15 psi per Section 4.2. The pump should begin to stroke rapidly as soon as air is supplied.

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

---

## **NOTICE**

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

---

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

**3.1.7.6** Close the flow-control valve.

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

pressurized water is not available, install a small valve as noted in Section 2.3.3 and Figure 4.

#### 3.2 Blasting Attire

**3.2.1** Don all protective, blasting attire per applicable owner manuals.

**3.2.2** Do not allow anyone near the blast machine except machine tenders, who are appropriately attired in approved protective equipment.

#### 3.3 Start Blasting

**3.3.1** Pressurize blast machine and begin dry blasting.

**3.3.2** Adjust abrasive flow.

#### 3.4 Adjust Water Flow

**3.4.1** Slowly open the flow-control valve to begin water flow, adjust flow per Section 4.3

#### 3.5 Abrasive, Air, and Water Flow Options

**3.5.1 Dry blasting:** When the water-flow-control valve is closed, dry abrasive blasting is done by following the instructions provided with the blast machine.

---

## **NOTICE**

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**To avoid unnecessary wear to the injector, remove it when wet blasting is not required.**

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**3.5.2 Wet Abrasive Blasting:** Open or close the water-flow-control valve anytime during dry blasting to start and stop wet blasting.

**3.5.3 Wash-Down:** While wet blasting, close the abrasive metering valve; air and water continue to exit the nozzle. The pot tender can manually close the metering valve or, when a pneumatically-operated metering valve such as a Clemco Auto-Quantum is used, abrasive shut-off can be done from the nozzle while blasting when using the optional abrasive cut-off switch (ACS).

**3.5.4 Air Drying:** When water and abrasive flow are shut off (both operations can be performed at the nozzle with a pneumatically-operated metering valve such as a Clemco Auto-Quantum and ACS option), air alone exits the nozzle to blow dry the surface.

#### 3.6 Stop Blasting

**3.6.1** Turn the water shut-off valve OFF before stopping blasting per instructions provided with the blast machine and accessories.

### 3.7 Shutdown

**3.7.1** Empty the blast machine of abrasive and shutdown the blast machine following the manufacturer's instructions.

**3.7.2** Close the compressed-air supply valve at the compressor.

**3.7.3** Close the water supply valve.

**3.7.4** Open the water-flow-control valve to drain water from the pump and hydraulic hose and to drain air from the air supply line.

**3.7.5** Disconnect the water supply hose.

## NOTICE

**If there is any chance that the injector components will be subject to freezing temperatures, drain all water from the pump and open the pressure-water supply valve. Failure to drain water from the system could permanently damage the pump and water connections.**

**3.7.6** Elevate the module or lay the blast hose and hydraulic hose on the ground to continue to drain water from the pump module and hose.

**3.7.7** Check the gauge on the pressure regulator/filter to make sure all air is bled from the supply line, and disconnect the air supply hose.

**3.7.8** When blasting is finished, disconnect all hoses and store the injector module inside protected from freezing conditions.

## 4.0 ADJUSTMENTS

### 4.1 Water Pump Lubricator, Figure 7

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

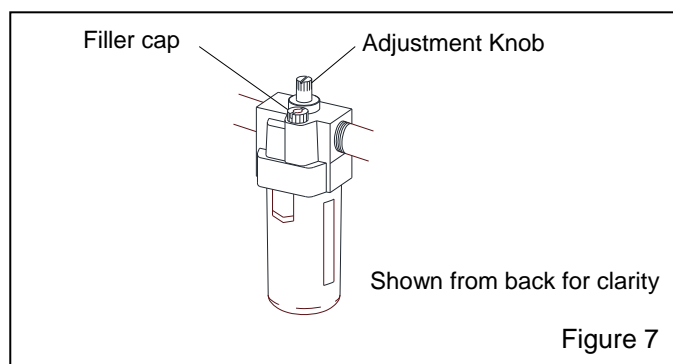
## WARNING

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

**4.1.2** Make sure the pump-module air-supply valve is closed and the line is bled.

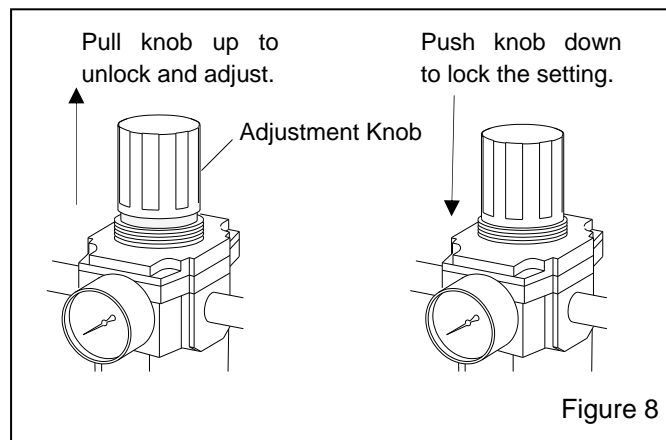
**4.1.3** Remove the filler cap and fill the lubricator with a good grade of petroleum-based lubricating oil such as Castrol Brayco Micronic 783, AeroShell Fluid 71, or equivalent. A good quality oil specifically manufactured for air tools may be used if the recommended lubricants are not available.

**4.1.4** Turn the adjustment knob to provide one drop of oil for every twenty strokes of the pump. If excessive amounts of oil appear to be flowing through the pump during operation, as noted at the modules exhaust muffler, reduce the rate of lubrication.



### 4.2 Pump Pressure (Water Pressure), Figure 8

**4.2.1** Water pressure is controlled with the pressure regulator/filter combination located within the pump module. The pump air-to-water ratio is 10 to 1, meaning water pressure is ten times air inlet pressure. For example, if the air regulator is set at 30 psi, water outlet pressure will be 300 psi. Operating air pressure is usually set between 30 and 40 psi. Maximum operating pressure for the pump is 100 psi.

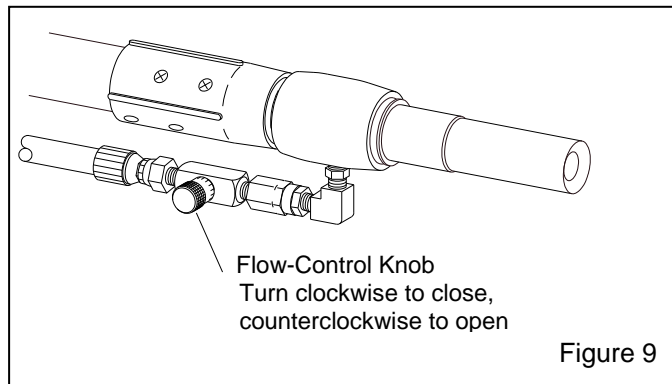


**4.2.3** To adjust, grip the upper part of the regulator control knob and pull the knob up to unlock it, turn it

clockwise to increase pressure or counter-clockwise to decrease pressure. Once operating pressure is set, push in on the knob to lock it and maintain the setting.

### 4.3 Water Flow

**4.3.1** Adjust water flow by turning the flow-control-valve knob. The valve is closed when the knob is turned fully-clockwise as shown in Figure 9.



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

## 5.0 PREVENTIVE MAINTENANCE

### 5.1 Water Pump Lubricator

**5.1.1** Fill the lubricator with a good grade of petroleum-based lubricating oil such as Castrol Brayco Micronic 783, AeroShell Fluid 71, or equivalent.

### 5.2 Daily Inspection

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

- Make sure the lubricator is filled with recommended lubricating oil.
- Make sure air pressure is set to the correct operating pressure.
- Check to make sure that couplings are secure and lock pins and safety cables are in place.
- Make daily inspection of the blast machine and accessories as noted in the manufacturer's owner's manuals.

### 5.3 Weekly Inspection

**5.3.1** With the air off, before blasting, do the following:

- Remove the nozzle and injector-adaptor, and inspect injector sleeve, nozzle, and washers for wear.
- Inspect the regulator/filter bowl and element; clean as necessary.
- Make weekly inspection of the blast machine and accessories as noted in the manufacturer's owner's manuals.

## **! WARNING**

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

### 5.4 Periodically Inspection

**5.4.1** Remove the water inlet strainer cap and remove the screen for inspection, clean as needed.

### 5.5 When Operating in Freezing or Near Freezing Conditions

**5.5.1** Water freezes and expands at 32° F. When shutting down, be sure to drain all water from the pump module by removing the plug on the inlet strainer.

## **NOTICE**

If there is any chance that the injector components will be subject to freezing temperatures, drain all water from the pump and open the pressure-water supply valve. Failure to drain water from the system could permanently damage the pump and water connections.

**5.5.2** Avoid storing the module where it will subject to freezing or near freezing temperatures.



**6.0 SERVICE MAINTENANCE**

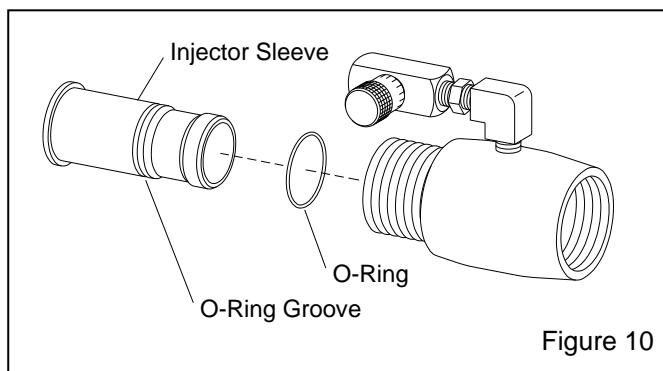
**6.1 Replacing Injector Sleeve, Figure 10**

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

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

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

**6.1.4** Place a new O-ring into the O-ring groove.



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

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

**6.1.7** Reattach the hydraulic hose.

**6.2 Water Pump**

Refer to the water pump manual to service the pump.

**7.0 TROUBLESHOOTING**

**7.1 No water from the injector**

**7.1.1** Observe pump stroke. If pump rapidly strokes, pump is not properly primed. Refer to Section 3.1.7 to prime pump. Also refer to Section 7.2.

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

**7.1.3** Air supply (isolation) valve to pump module closed. Make sure the air supply line is pressurized.

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

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

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

**7.1.7** Pump requires service. Refer to the pump operations manual.

**7.2 Pump does not prime, pump rapidly strokes, but does not pump water**

**7.2.1** Make sure all air is bled from water supply, refer to Sections 3.1.7 and 2.3.3.

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

**7.2.3** Inspect the needle valve and check valve for blockage.

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

**8.0 ACCESSORIES and REPLACEMENT PARTS**

**8.1 Wetblast Injector Systems**

Description	Stock No.
Wetblast injector system for one operator Includes pump module, 50-ft hydraulic hose, and one the following injector-adaptor assembly as shown in Section 8.3, Figure 12	
05540 w/1-1/4 threads and 1" ID sleeve .....	05500
05541 w/cont'r threads and 1" ID sleeve .....	07750
05598 w/cont'r threads and 1-1/4" ID sleeve .....	07752

Wetblast injector system for two operators Includes pump module, two 50-ft hydraulic hoses, and two of the following injector-adaptor assemblies as shown in Section 8.3, Figure 12	
05540 w/1-1/4 threads and 1" ID sleeve .....	05501
05541 w/cont'r threads and 1" ID sleeve .....	07751
05598 w/cont'r threads and 1-1/4" ID sleeve .....	07753

8.2 Pump Module and Water Tank, Figure 11

Item	Description	Stock No.
1.	Pressure regulator/filter, 1/2" .....	05530
2.	Lubricator, 1/2-NPT .....	05531
3.	Pump, water injector .....	05532
4.	Muffler, 3/4-NPT air .....	05529
5.	Grommet, 7/8" ID rubber .....	00183
6.	Grommet, 1" ID rubber .....	00184
7.	Foot, cabinet enclosure, each .....	05525
8.	Adaptor, 3/4-FPT x fem water swivel .....	05524
9.	Strainer, 3/4-NPT water, 100 mesh .....	15011
10.	Hose, Hydraulic, 50-ft. x 3/8" ID .....	05527
11.	Coupling, 1/2-FPT 2-claw .....	00594
12.	Gauge, 1/8-NPT CBM, replacement .....	01908
13.	Handle, cabinet enclosure .....	05526
14.	Elbow, galvanized 3/4-NPT 90° St. ....	10935
15.	Elbow, 3/4-NPT 90° .....	01729
16.	Nipple, 3/4-NPT galvanized .....	01746
17.	Tee, 1/2-NPT, brass .....	03990
18.	Bushing 1/2-NPT x 1/4 NPT, brass .....	02706
19.	Plug, 1/4-NPT .....	01950
20.	Lock pin, coupling (package of 25) .....	11203
21.	* Connector, 1/4-FNP hydraulic hose .....	02162
22.	* Service kit, injector pump, includes air motor kit and hydraulic kit .....	05484

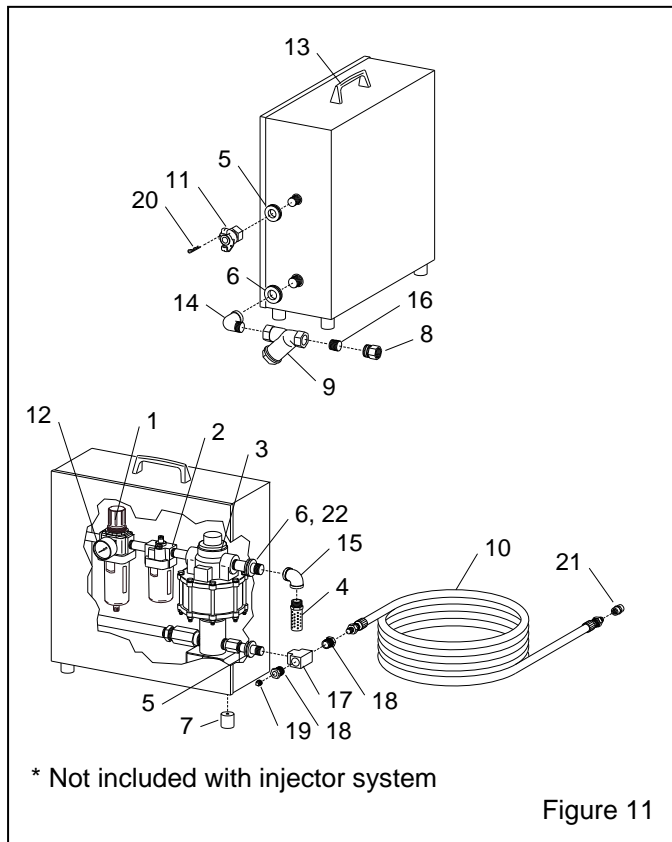


Figure 11

8.3 Injector-Adaptor Assemblies, Figure 12

Item	Description	Stock No.
1.	Injector-adaptor assembly 1-1/4" nozzle thread, 1" ID sleeve .....	05540
2.	Injector-adaptor assembly cont'r nozzle thread, 1" ID sleeve .....	05541
3.	Injector-adaptor assembly cont'r nozzle thread, 1-1/4" ID sleeve .....	05598
4.	Body, 1-1/4" threaded adaptor .....	05506
5.	Body, contractor threaded adaptor .....	05507
6.	Injector sleeve assembly, 1" ID for 5540 includes items 9, 13, and 14 .....	05536
7.	Injector sleeve assembly, 1" ID for 5541 includes items 10, 12, and 15 .....	05534
8.	Injector sleeve assembly, 1-1/4" ID for 5598 includes items 11, 12, and 16 .....	05535
9.	Sleeve, 1" ID injector, for 1-1/4" body .....	05508
10.	Sleeve, 1" ID injector for cont'r body .....	05509
11.	Sleeve, 1-1/4" ID injector for cont'r body .....	05510
12.	O-ring, 1-3/8 ID .....	05516
13.	O-ring, 1-1/4" ID .....	05523
14.	Washer, NW-4 nozzle, pack of 10 .....	00869
15.	Washer, NW-25 nozzle, pack of 10 .....	91024
16.	Washer, NW-32 nozzle, pack of 10 .....	91026
17.	Elbow, 1/4-NPT 90° st. ....	02027
18.	Nipple, 1/4-NPT hex .....	02808
19.	Valve, 1/4-NPT flow control .....	05528

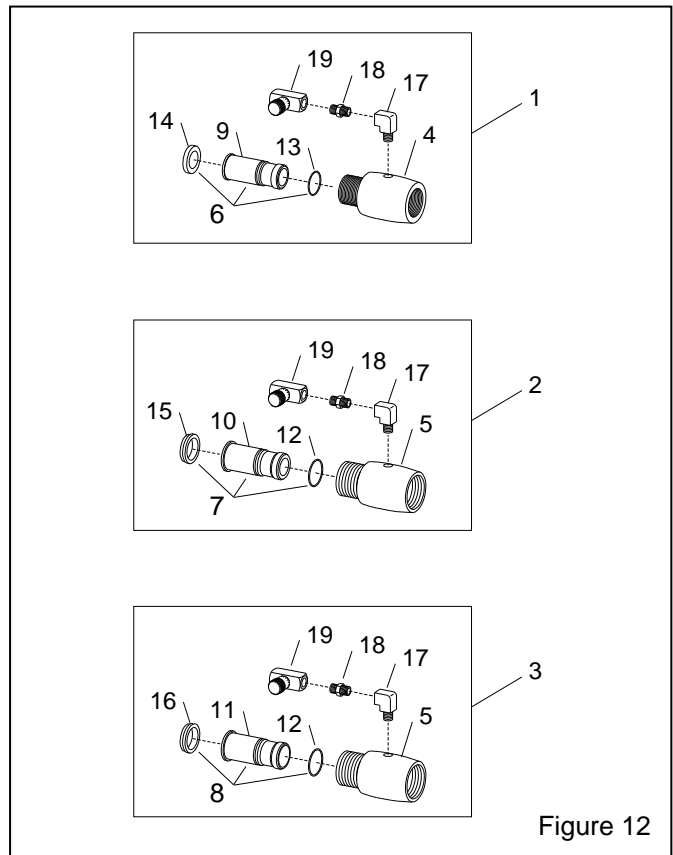


Figure 12