

**AMBIENT AIR PUMP
MODEL CAP-4
O. M. 22480**

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 **WARNING**

Do not proceed with these instructions until you have READ the orange cover 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.

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

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

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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 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

Compressed Gas Association (CGA) - www.cganet.com

The Society for Protective Coatings (SSPC) - www.sspc.org

National Association of Corrosion Engineers (NACE) - www.nace.org

American Society for Testing and Materials (ASTM) - www.astm.org

National Institute of Occupational Safety and Health (NIOSH) - www.niosh.gov

American National Standards Institute (ANSI) - 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

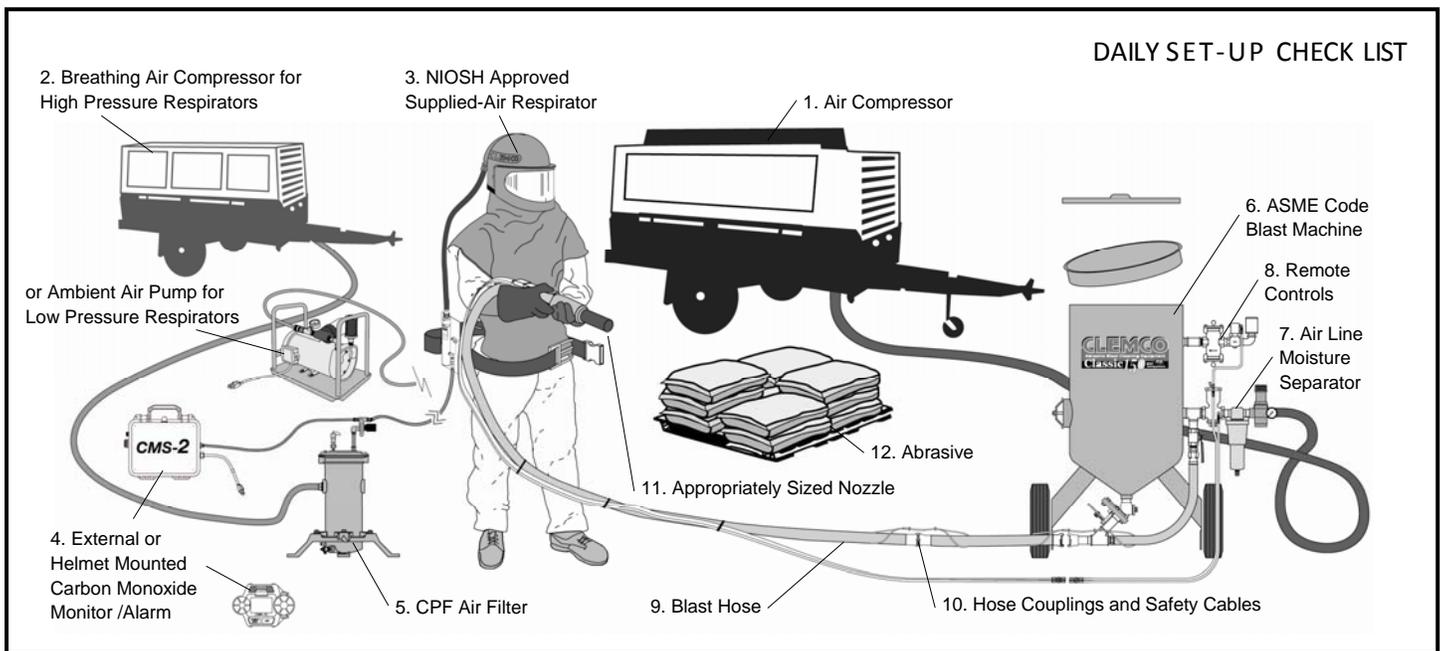
- Completely read and follow all service instructions and recommended maintenance intervals. Always shut off compressor and depressurize blast machine before performing any maintenance. At every service interval, clean all filters, screens, and alarm systems. If spring-loaded abrasive valves are used, 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 (sorbent 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 sorbent 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 This manual covers set up, operation, maintenance, troubleshooting, replacement parts, and important warnings required for safe operation of the Clemco CAP-4 Compressed-Air-Driven Ambient Air Pump. Read the entire manual before attempting operation of the pump. Manufacturer's manuals for the air motor and pump are included. If repairs beyond those described in this manual are required, refer to the air motor and pump manuals for parts, and for the name of an authorized service agent.

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 General Description

1.3.1 The CAP-4 Ambient Air Pump assembly is shown in Figure 1. The primary components are:

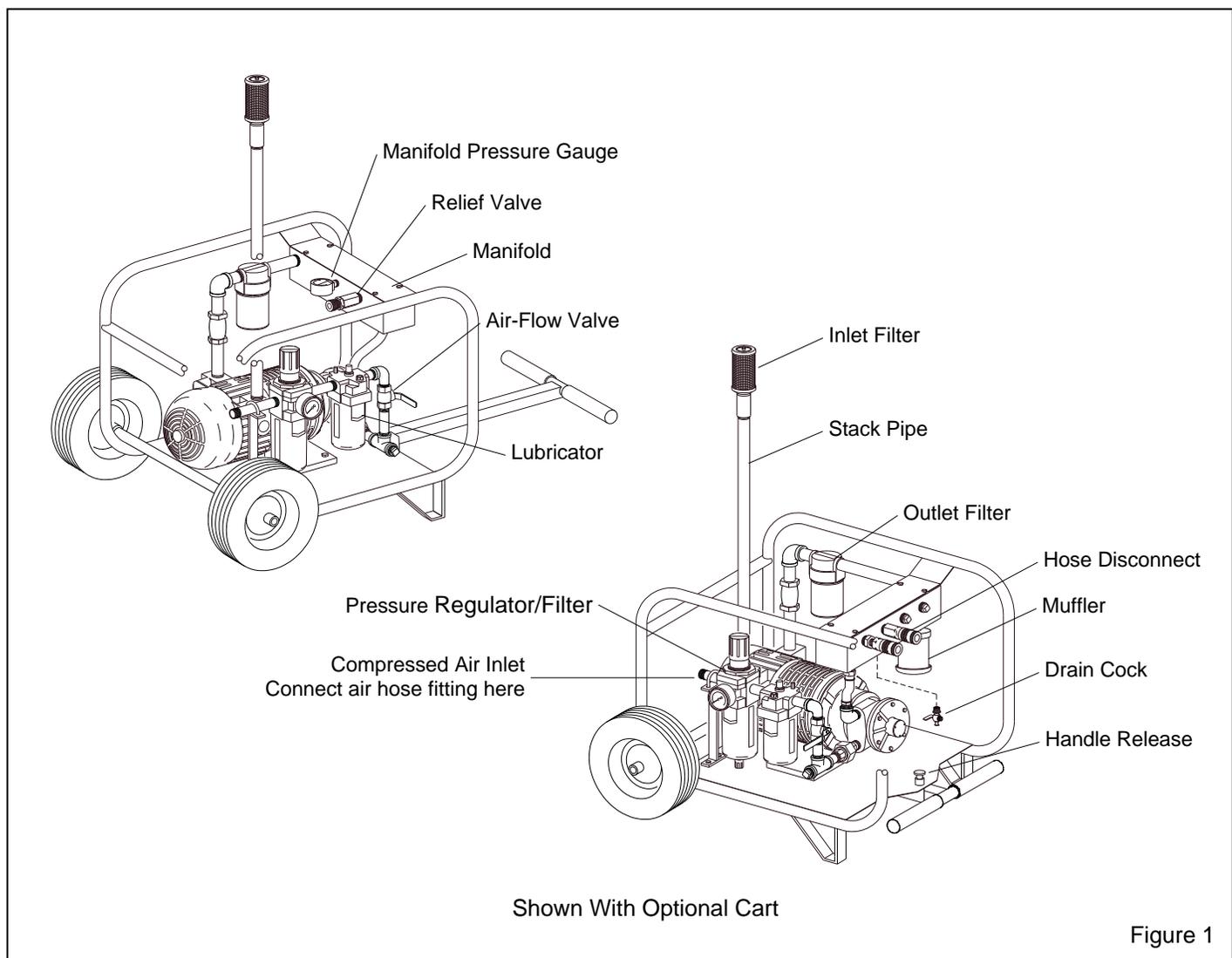
1. Air Motor: Do not confuse the air motor with the air pump. The air motor is a compressed air powered, oil lubricated air motor which drives the pump. The air pump is described below.
2. Air Pump: The air pump is an oil-less, rotary vane pump, which pushes respirable air to the respirator.
3. Inlet Filter: Removes particulates from air before entering the pump.
4. Stack Pipe Extension: Elevates the inlet filter; draws air from an area away from the air motor exhaust.
5. Pressure Regulator/Filter: Adjusts air pressure and filters compressed air used to drive the air motor. The gauge on the regulator registers drive pressure. The filter removes excess water, compressor oil, and particles from the compressed air.
6. Lubricator: Meters and injects 10 wt. oil into the compressed air stream, to lubricate the air motor.
7. Air-Flow Valve: Controls the speed of the air motor, which ultimately controls outlet pressure. Outlet pressure is the pressure required for the respirator(s).
8. Manifold: The manifold is a heat exchanger, which reduces outlet temperature, and is an air manifold for respirator hose connections (quick disconnects).
9. Hose Disconnects: The disconnects are the attachment point for the respirator hoses. The manifold is furnished with two hose disconnects. The disconnect on the extreme left is an open type; attach the hose of the first respirator in use to that disconnect. The disconnect next to it is a closed type, for use with the second respirator. Ports for a third and fourth connection are plugged. If additional respirators are needed, remove the plugs and attached approved connectors.
10. Relief Valve: An adjustable valve designed to release outlet pressure, preventing pressure from exceeding that of the respirators approval.
11. Manifold Pressure Gauge: Registers manifold pressure. Manifold pressure must be within the pressure range of the respirators approval.
12. Outlet Filter: Located on the outlet end of the pump, the outlet filter is the final air filtering media.
13. Cart/Frame: All model pumps are furnished with a protective frame. An optional two-wheeled cart with a retractable T handle makes one-man maneuvering over irregular surfaces easy.

1.3.2 The pump is driven by a compressed air powered air motor. Inlet pressure (psi) is adjustable from 85 psi to a maximum of 100 psi. The inlet pressure determines the horsepower of the air motor, which determines the pump's outlet air pressure and air volume (cfm). The performance table in Figure 2 shows the minimum outlet pressure to ensure adequate volume for the type and quantity of respirators used.

1.3.3 The pump is an oil-less air pump designed to convey respirable ambient air, to up to four, low pressure, continuous-flow, supplied-air, hood-style respirators, or up to six mask-style respirators. Respirators must be approved by NIOSH to operate within the pressure range and air volume range as shown in Figure 2. The pump is a compatible air source for up to four Clemco Apollo LP Respirators.

⚠ WARNING

Compliance with all OSHA, NIOSH requirements and limits for supplied-air respirators are necessary while operating this air pump. To insure safe operation and compatibility with the respirator being used, read the owner's manuals and all instructions, labels, and warnings relating to the pump and respirator. Compare the air demand of the respirator(s) with the output of the pump, and the table in Figure 2, prior to using the pump.



⚠ WARNING

Respirator(s) must be supplied with at least Grade "D" quality respirable air, containing no less than 19.5 volume-percent of oxygen. Breathing air requirements are described in Compressed Gas Association, G-7.1., Commodity Specification For Air, published by Compressed Gas Association Inc., Chantilly, VA. The pump filters are particulate filters. They do not remove carbon monoxide or other toxic gases. Air supplied to the pump intake must be at least Grade "D" quality. If air quality is unknown, consult a safety professional and/or industrial hygienist. Poor quality air will cause serious respiratory injury or death to the user.

Pump Output Performance Based On 85 PSI Air Motor Drive Pressure

Pump Output Air Pressure psig	Pump Output Air Volume cfm	Maximum Mask Respirators (based on 4 cfm)	Maximum Hood Respirators (based on 6 cfm)
5	24.0	Five	Three
10	18.0	Three	Two
15	14.0	Two	One
18	11.0	Two	One
20	8.5	One	One

Pump Output Performance Based On 95 PSI Air Motor Drive Pressure

Pump Output Air Pressure psig	Pump Output Air Volume cfm	Maximum Mask Respirators (based on 4 cfm)	Maximum Hood Respirators (based on 6 cfm)
5	31.0	Six	Four
10	26.5	Five	Three
15	21.5	Four	Three
18	18.5	Three	Two
20	16.5	Three	Two

The information in the above tables is based on the assumption that all of the pump's output air is directed to the respirators (no leaks, and relief valve remains closed), and air motor drive pressure is maintained at the pressure shown. The maximum number of respirators shown is conservative, allowing for higher cfm to the respirator, and therefore providing greater protection to the operator.

Figure 2

1.4 Specifications

1.4.1 Compressed air requirement: Refer to the table in Figure 3 to determine the compressed air cfm requirements. The cfm requirements are based on the inlet pressure of 85 psi. When the inlet pressure is set at 95 psi, cfm requirements will be slightly higher.

1.4.2 Maximum psi output: The maximum continuous outlet pressure is 20 psi. Do not use this pump to supply any respirator that requires more than 20 psi. The pump does not provide the pressure required to operate air volume control valves or temperature control valves that require more than 20 psi.

CFM TABLE BASED ON 85 PSI INLET PRESSURE

Breathing Air Pressure (manifold pressure)							
5 psi		10 psi		15 psi		20 psi	
outlet cfm *	supply cfm **	outlet cfm *	supply cfm **	outlet cfm *	supply cfm **	outlet cfm *	supply cfm **
5	11	5	25	5	31	5	47
10	25	10	31	10	48	6.5	51
15	32	15	52	14	55	-	-
20	59	18	70	-	-	-	-

* Outlet cfm is the cfm of the pump outlet (respirator).

** Supply cfm is the compressed air cfm requirement to operate the air motor.

Figure 3

1.4.3 Maximum cfm output: The maximum cfm output of the pump is 30 cfm at 5 psi or less, when compressed air at the air motor inlet is maintained at a minimum of 95 psi.

1.5 Construction

1.5.1 The air motor and pump assembly are cast iron and steel. Consequently, any moisture that accumulates in the air motor or pump will corrode the interior, especially if it stands idle for a long period in a humid environment.

2.0 SET-UP

2.1 Assembly

2.1.1 Install an air supply hose connector to the air motor inlet pipe that is compatible with the compressed air supply hose. See Section 2.4.

2.1.2 Connect the stack pipe and inlet filter to the pump's inlet port, as shown in Figure 1.

2.2 Initial Check

2.2.1 Check to ensure that all fittings are tight.

2.2.2 Check the cap on the inlet filter to ensure it is snug against the felt filter media. Do not over-tighten; hand tight is adequate.

2.2.3 Unscrew the metal bowl on the outlet filter. Verify that the cartridge cap is snug against the cartridge. Do not over-tighten.

WARNING

The outlet filter is the final air filtering media. Do not operate the pump without the filter cartridge being in place and fully seated.

2.2.4 Before reattaching the metal bowl, verify that the bowl gasket is in place in the filter body.

2.3 Placement

2.3.1 Take precautions to prevent contaminants from entering the air pump's inlet. Locate the air pump inlet away from all sources of contaminants in an area that ensures the following conditions are continuously met.

- The area must be free of harmful vapors and gases, including carbon monoxide, which is found in engine exhaust, and in any form of combustion.
- The area must be free of airborne contaminants such as silica dust, generated from sandblasting, and dust from lead or other heavy metals, produced from the removal or application of coatings containing toxic elements.
- Locate the pump away from any exhaust system outlet, ventilation flue, vehicle traffic, or source of fumes or particles of any kind.

DANGER

DO NOT operate the pump in a flammable or explosive atmosphere. An arc from static electricity will ignite flammable or explosive gases.

- Locate the pump to ensure the compressed air exhaust from the air motor cannot enter the pump intake.
- Locate the pump away from any source of heat, so that cool air can circulate around the pump. During operation, the pump becomes hot. Do not operate when ambient temperature exceeds 104° F (40° C).

- If the ambient air pump cannot be placed in an area where clean, respirable air is guaranteed at all times, use the optional air intake hose(s). A 50 ft. air intake hose and an additional 50 ft. extension (for a total maximum length of 100 ft.) hose may be attached to the pump inlet, to draw air from an area where clean respirable air is ensured.

WARNING

Clemco provides intake hose and hose extensions as optional accessories. Do not substitute with homemade hose or hard pipe. Any inlet restrictions will cause rapid wear to the pump and motor, and restrict air flow to the respirator. Reduced air flow may result in ingress of hazardous dust, fumes or gases, exposing the user to immediate health risk and subsequent respiratory disease and possible death.

2.3.2 The use of an ambient-air, carbon monoxide monitor is recommended to safeguard against accidental transfer of CO from engine exhaust or other sources that can contaminate ambient air.

2.4 Compressed Air Supply

WARNING

The compressor must provide adequate output, and the hose or plumbing between the compressor and the air motor inlet, must have sufficient capacity to supply the cfm at the psi shown in the table in Figure 3. Inlet pressure (measured at the pressure regulator gauge) lower than that shown in the table will reduce air flow to the respirators. Reduced air flow will cause discomfort to the user, and may result in ingress of hazardous and toxic dust, subjecting the user to health and life threatening toxic poisoning and long term respiratory disease and death.

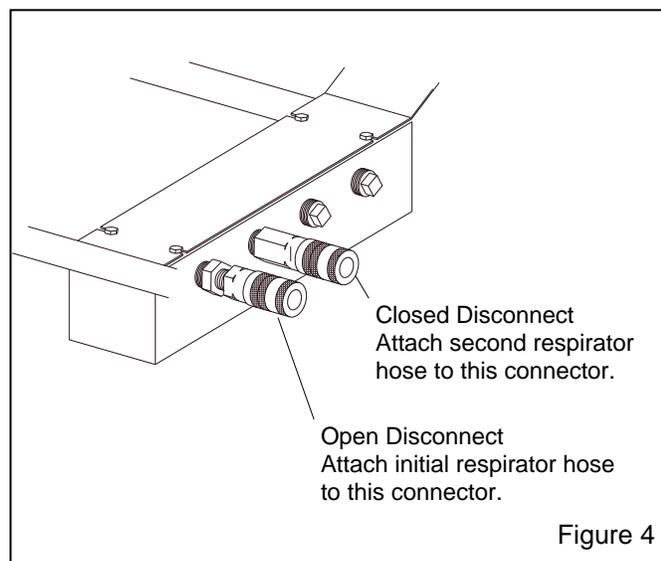
2.4.1 The compressor must have the capacity to supply at least the cfm at the pressure shown in the table in Figure 3.

2.4.2 Attach a 3/4" ID x or larger air hose from the compressed air source to the inlet connector. Conditions that require larger ID hose are: The use of multiple respirators, bends in the air hose, or long lengths of air hose. If the minimum psi (as shown in the

table in Figure 2) cannot be maintained at the air motor, check for air restrictions in the supply hose, and check compressor rating. An isolation valve should be installed at the air source to enable depressurization.

2.5 Respirator Hose

NOTE: The manifold is furnished with two quick disconnect hose connections. The disconnect on the extreme left, ref. Figure 4, is not equipped with a shut-off, and is to be used with the initial respirator. Any coupling added to that port to enable the use of other approved hose, should not have a shut-off valve. The reason the coupling is not equipped with a shut-off valve, is to prevent excessive pressure build-up should the respirator hose be removed from the pump before it is shut-down. The second disconnect is a closed disconnect, for use with a second respirator. Ports for additional respirators are plugged. If third or fourth respirators are used, replace the plugs with couplings that are approved for use with the respirator(s).



2.5.1 Attach NIOSH-approved respirator air supply hose(s) (and coupling if required, See preceding notice, and Section 2.5.2 and 2.5.3) to the disconnects on the manifold.

2.5.2 If the disconnect connectors are not compatible with that of the approved respirator hose, remove the disconnect, and attach a compatible coupling to the 1/2" threads on the manifold body.

⚠ WARNING

Outlet couplings (the point of attachment) and respirator hose must be NIOSH-approved for use with the respirator. Use of non-approved couplings and hose will void the NIOSH approval of the respirator, and could restrict air flow. Do not use any bushings or reducers that reduce the internal diameter of the plumbing. Reduced air flow may result in ingress of hazardous dust, fumes or gases, exposing the user to immediate health risk and subsequent respiratory disease and possible death.

2.5.3 In some cases (see table if Figure 2) the pump can supply up to six, mask-type respirators. If the air demand of the respirators permits the use of more than four respirators, one or two of the manifold ports may be split, to supply two respirators. If the port is split, do not reduce or restrict the piping size, and use only connectors that are approved by the respirator manufacturer. Do not operate more than two respirators off one port. Do not exceed more than six respirators (that are approved to operate at a minimum of 4 cfm) total. This pump cannot provide enough air for more than four hood (requiring minimum of 6 cfm) type respirators.

3.0 OPERATION

⚠ WARNING

Do not use this pump to supply air to any respirator used in atmospheres immediately dangerous to life or health, or from which the user cannot escape without the use of the respirator.

⚠ WARNING

Do not use this pump to supply air to any respirator if the air demand of the respirator is unknown. Do not use with a single respirator that has an approved minimum pressure exceeding 20 psi. Do not use with multiple respirators that have a combined approved minimum flow greater than 30 cfm at 5 psi. This pump may not provide sufficient air volume to those respirators. Do not use respirators that are not NIOSH-approved.

NOTICE

The maximum recommended continuous operating pressure for this pump is 20 psi. Do not operate above 20 psi. To do so will damage the motor and pump unit.

3.1 Set-up

3.1.1 Fill the lubricator with 10 wt. automotive engine oil by removing the filler port plug, slowly releasing the pressure in the bowl. A long spout or funnel can then be inserted into the filler port. While filling, observe the fluid level on the sight glass. Do not fill above the sight glass.

3.1.2 Attach the air supply hose to the compressed air inlet connector.

3.1.3 If twist-on type hose connectors are used, make sure that all connections are secured with safety locks and safety cables to prevent accidental separation or disconnection.

WARNING

Hose disconnection while under pressure could cause serious injury. Use safety lock-pins and safety cables on all coupling connections to help prevent hose couplings from accidental disconnection while under pressure.

3.2 Start-Up

WARNING

This pump assembly will produce more than 85 dB(A) sound level at some operating loads and speeds. Wear approved hearing protection when in close proximity to the pump assembly.

NOTICE

Do not operate in ambient air temperatures in excess of 104 degrees Fahrenheit (40 degrees C).

3.2.1 Close Air-Flow Valve.

3.2.2 Connect respirator supply hoses to the connectors located on the manifold. NOTE: Attach initial hose to the disconnect at the extreme left.

3.2.3 Open compressed air supply isolation valve, to pressurize the air supply hose.

3.2.4 Adjust the regulator to 85-95 psi, as shown in the table in Figure 2.

3.2.5 Open the Air-Flow valve until outlet pressure is 8 to 10 psi. Run the pump for several minutes to expel hose odor and condensation from the hose.

3.2.6 Adjust lubricator drip rate, to approximately one drop per minute, as instructed in Section 4.4.

3.2.7 Connect the hose(s) to the respirator(s).

3.2.8 Adjust the Air-Flow valve per Section 4.2.

WARNING

The outlet pressure of the pump must be maintained above the minimum pressure for which the respirators are approved.

3.2.9 Adjust the relief valve as described in Section 4.3, to the pressure requirement of the respirators.

3.2.10 Open the manifold drain cock to drain condensation. Close it when all the water is expelled.

3.2.11 Check respirator hose and connections for tightness and leaks.

3.2.12 Don the respirator in a clean non-hazardous environment, free of contaminants, where the air is safe to breathe.

3.2.13 Enter the work area only after the respirator is correctly fitted and in place, air is supplied to the respirator, and all conditions specified by the respirator manufacturer are met.

3.3 During Operation

3.3.1 Periodically check the lubricator drip rate and oil level. Close the compressed air supply isolation valve and bleed air pressure before refilling the lubricator.

3.3.2 During operation, it is normal for the pump to become hot. Some of the heat is transferred to the air, causing it to become warmer than ambient. To prevent

excessive heat build-up in the respirator hose, stretch-out the hose and keep it in shaded areas when possible. Do not place the hose in direct sunlight, on hot surfaces, or near any other source of heat.

WARNING

The pump assembly may become hot enough during operation to burn skin. Do not touch any parts until the pump has been turned off and allowed to cool.

3.3.3 If the air inside the respirator becomes uncomfortably hot, coil the respirator hose in the bottom of a large, covered container filled with water and ice.

3.4 Shut-down

3.4.1 After removing the respirator in a clean environment, close the compressed air supply isolation valve.

WARNING

Do not don the respirator, or store it, in a blast contaminated environment. Never remove the respirator in a contaminated environment except during emergency evacuation when the use of the respirator hinders escape.

3.4.2 Stop the pump when the respirator is not in use as follows:

3.4.2.1 Short term break: Stop the pump by closing the Air-Flow valve.

3.4.2.2 Extended break or shutdown:

- Open the manifold drain cock to drain condensation.
- Close the Air-Flow valve.
- Close the compressed air isolation valve.
- Open the drain valve on the filter/regulator.

3.4.3 If the pump is used outdoors, move it indoors when not in use.

3.5 Storage

3.5.1 The pump is made of material that is subject to corrosion if left idle for a period of time, especially under humid conditions.

3.5.2 Before storing the pump for an extended period, disconnect the inlet filter and outlet plumbing, and allow the pump to run open for at least 5 minutes before shutting down.

3.5.3 Plug the inlet and outlet ports to prevent dirt and other contaminants from entering the pump assembly.

3.5.4 Remove the inlet and outlet plumbing from the air motor.

3.5.5 Squirt 10 wt. oil into the chamber. Rotate the motor shaft (or pump) several times. The easiest way to rotate the motor is by turning the fan on the end of the pump.

3.5.6 Plug the inlet and outlet ports to prevent dirt and other contaminants from entering the air motor.

3.5.7 Store the pump assembly in a clean, dry environment.

4.0 ADJUSTMENTS

4.1 Pressure Regulator

4.1.1 The pressure regulator is located in the air motor inlet piping. See Figure 1.

4.1.2 The pressure regulator enables the user to adjust air motor drive pressure to that shown in the table in Figure 2, between 85 to 95 psi.

NOTICE

Do not exceed 100 psi as damage could occur to the air motor.

4.1.3 To adjust pressure: pull the knob out, and turn clockwise to increase pressure or counter-clockwise to decrease. Pressure will register on the gauge. **Adjust only when the respirators are connected.** Once operating pressure is set, push the knob in to lock

4.2 Air-Flow Valve

4.2.1 The Air-Flow valve controls the speed of the air motor, which ultimately controls outlet pressure. Outlet pressure is the pressure required for the respirator(s).

⚠ WARNING

The outlet pressure, measured at the manifold pressure gauge, must be maintained above the minimum pressure setting for which the respirator is approved. Lower pressure will reduce air flow to the respirators. Reduced air flow will cause discomfort to the user, and may result in ingress of hazardous and toxic dust, subjecting the user to health and life threatening toxic poisoning and long term respiratory disease and death.

4.2.2 Set the pressure only with the respirators connected. Begin with the valve closed. Closed is when the handle is perpendicular to the valve as shown in Figure 5. Slowly open the valve until the outlet pressure as shown on the manifold gauge is within the respirator's approved pressure range. The respirators approved pressure range may be found in the respirator's instruction manual.

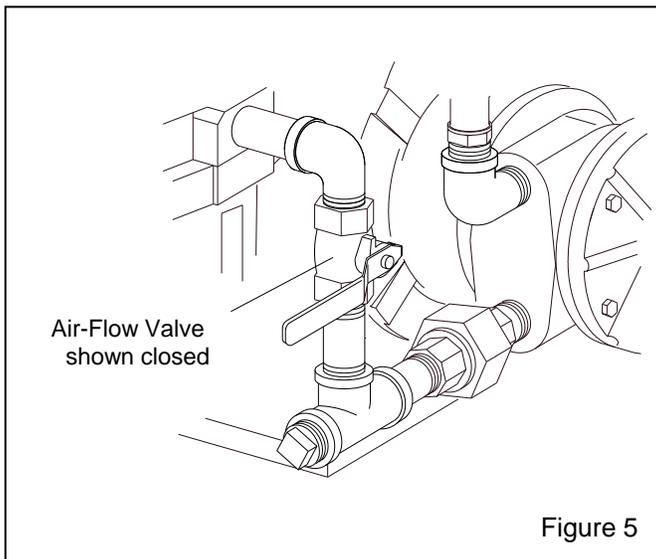


Figure 5

4.3 Relief Valve, Ref. Figure 6

4.3.1 Adjust the relief valve with the regulator set at the required inlet pressure and the Air-Flow valve adjusted to provide pressure slightly higher than the required outlet pressure, which is determined by the respirator.

4.3.2 Disconnect all respirator supply hoses except the initial hose at the extreme left. Pinch-off the remaining hose to create back pressure.

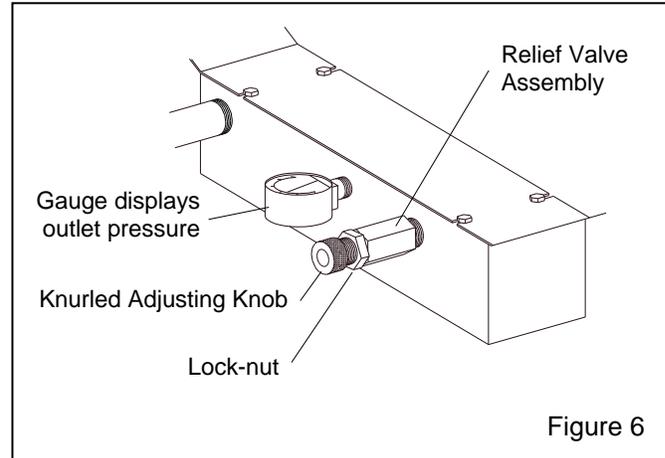


Figure 6

4.3.3 Loosen the relief valve lock-nut, and turn the knurled knob until the relief valve vents at a pressure that is 1 or 2 psi above the maximum pressure that is required for the respirators.

4.3.4 Adjust the Air-Flow valve to the correct pressure, and check that the relief valve does not vent.

4.3.5 Once the correct setting is attained, tighten the lock-nut to preserve the setting.

4.4 Lubricator

4.4.1 Turn adjusting knob fully clockwise to close. Adjust antifreeze drip rate only when there is constant flow of air through the lubricator (while the air motor is in operation).

4.4.2 Turn the adjusting knob counterclockwise to start the oil flow. Observe the drip rate through the sight glass. Adjust drip rate, to approximately one drop per minute.

5.0 MAINTENANCE

⚠ WARNING

Failure to observe the following before performing any maintenance could cause serious injury.

- **Lock out and tag out the compressed air supply.**
- **Bleed the air supply hose, and disconnect the hose from the air motor inlet.**
- **Make sure all rotating components are at a standstill before servicing.**

⚠ WARNING

All of the pump surfaces become hot enough during operation to burn skin. Do not touch these parts until the pump has been turned off and allowed to cool.

NOTICE

Only the air motor requires lubrication, never lubricate the oil-less air pump. The carbon vanes and grease packed motor bearings require no oil. The service life of the vanes will be reduced by use of petroleum or hydrocarbon products.

5.1 Compressed Air Regulator/Filter

5.1.1 The filter removes excess water and oil, and particles from the compressed air. Open the drain valve daily at shut-down to drain. Drain more often as required if water accumulates.

5.1.2 Remove the bowl occasionally and remove sediment.

5.1.3 Remove the filter element periodically and clean or replace to prevent clogging. A dirty filter element will restrict air flow.

5.2 Lubricator

5.2.1 Check oil level several times daily. Refill lubricator with 10 wt. automotive engine oil, by removing the filler port plug, slowly releasing the pressure in the bowl. A long spout or funnel can then be inserted into the filler port. While filling, observe the fluid level on the sight glass. Do not fill above the sight glass.

5.3 Flushing Air Motor, Figure 7

⚠ WARNING

Use Gast Flushing Solvent No. AH255D available from Gast distributors. DO NOT use kerosene, petroleum-based solvents, or ANY other combustible solvent. These solvents are flammable, and may contaminate the pump with harmful vapors.

5.3.1 Should the motor become sluggish or freeze-up, there may be a build-up of material in the vane slots.

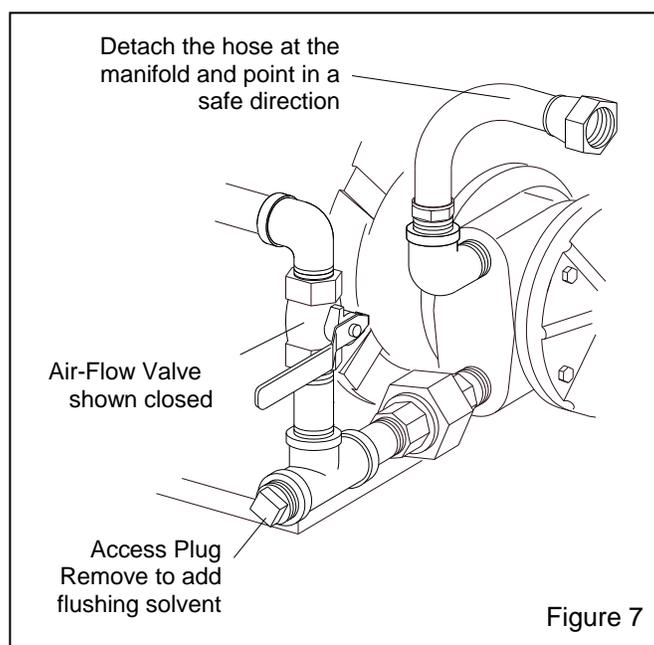
If the unit is unused for a period of time, surface-rust may develop in the motor and cause the same condition. Flushing the motor should remove these materials.

5.3.2 Shut-down the compressed air supply as described in the warning at the beginning of this section.

5.3.3 Close the Air-Flow valve.

5.3.4 Remove the 1/2" access plug, ref. Figure 7. Tilt the unit and pour approximately 2 tablespoons of solvent into the opening.

5.3.5 Replace the plug and rotate the motor several times in either direction. The easiest way to rotate the motor is by turning the fan on the end of the pump.



5.3.6 Detach the air hose at the manifold inlet.

5.3.7 Connect the compressed air supply hose and pressurize the line.

⚠ WARNING

Flushing solvent will exit the loose end of the hose. Wear eye protection and flush in a well ventilated area away from sparks and open flames. Do not inhale solvent fumes.

5.3.8 Point the hose outlet in a safe direction, away from any objects.

5.3.9 Slowly open the Air-Flow valve and allow the motor to run until there are no traces of solvent in the exhaust air.

5.3.10 If necessary, repeat the flushing procedure. If flushing has freed-up the vanes, continue with this section. If flushing does not remedy the situation, service may be required. See Section 5.8.

5.3.11 Connect the hose to the manifold.

5.3.12 Shut-down the compressed air supply, and remove the 1/2" access plug.

5.3.13 Lubricate the air motor with a squirt of oil into the chamber.

5.3.14 Replace the plug, and restart the motor using normal start-up procedures.

5.4 Compressed Air Outlet Muffler

5.4.1 Remove the outlet muffler periodically and clean or replace the element to prevent clogging. A dirty element will restrict air flow.

5.4.2 Shut-down the compressed air supply as described in the warning at the beginning of this section.

5.4.3 Unscrew the muffler assembly from the manifold.

5.4.4 Remove the three screws securing the assembly.

5.4.5 Clean or replace the white element as needed. If the element is plugged, replace it.

5.4.6 Reassemble in reverse order.

5.5 Inlet filter, Air Pump, Ref. Figure 8

5.5.1 The inlet filter ensures that no foreign particles, such as dirt or chips, are allowed to enter the pump inlet. Dirty filters restrict air flow, and if not corrected could lead to poor performance and early pump failure.

5.5.2 Check the inlet filter for contamination every 100 hours of operation. To remove the filter media, unscrew the cover plate and remove the filter media and screen assembly.

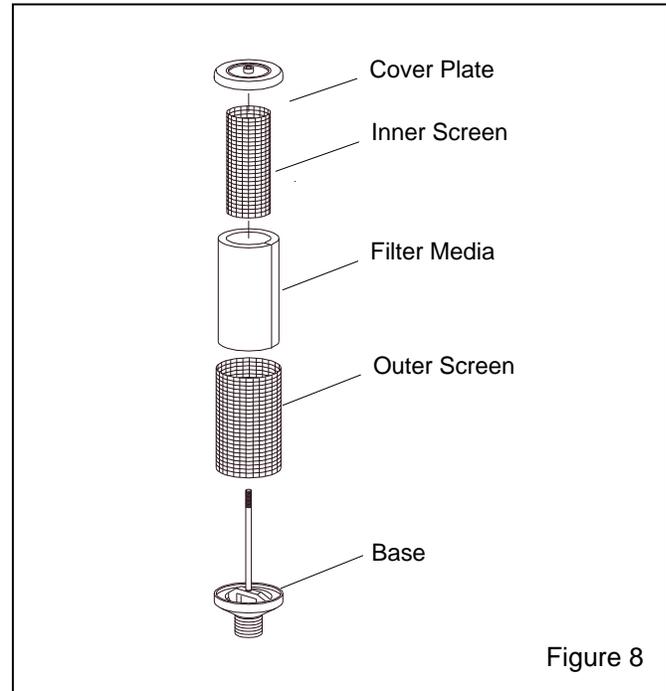


Figure 8

5.5.3 Remove the inner and outer screens from the filter media.

5.5.4 Place the cleaned or new filter media between the inner and outer screens. Replace the media at least every 500 hours of operation. The ends of the filter media must protrude past the screens. This assures a tight seal against the cover plate and base.

5.5.5 Place the filter assembly on the base and tighten the cover plate snugly against the filter. Do not over-tighten.

NOTICE

Over-tightening the cover plate will damage the screens.

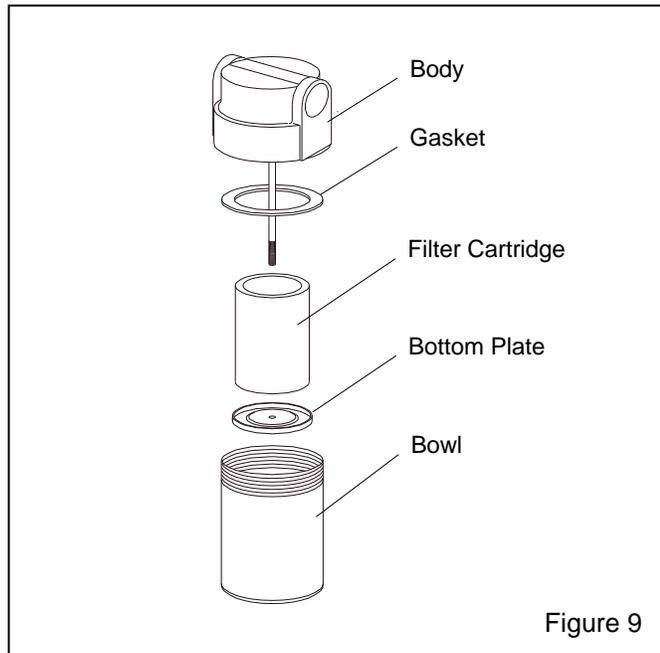
5.6 Outlet Filter, Air Pump, Ref. Figure 9

5.6.1 Check the filter regularly to insure that the cartridge is not blocked and causing an air restriction.

5.6.2 Replace the cartridge at least every 200 hours of operation, sooner if a decrease of air is noted at the respirator, if pressure increases above normal at the gauge, or if the relief valve activates.

5.6.3 To remove the filter cartridge, unscrew the bowl and bottom plate.

5.6.4 Inspect the gasket, replace if damaged.



5.7 Flushing, Air Pump, Ref. Figure 10

⚠ WARNING

Use Gast Flushing Solvent No. AH255D or equivalent to flush the pump. DO NOT use kerosene, petroleum-based solvents, or ANY other combustible solvent. These solvents are flammable, and may contaminate the pump with harmful vapors.

5.7.1 Should excessive dirt, foreign particles, moisture, or oil be permitted to enter the pump, the vanes will act sluggish or break. If the pump is unused for a period of time, surface-rust may develop in the pump and cause the pump to freeze-up. Flushing the pump should remove these materials.

5.7.2 Remove the stack pipe, ref. Figure 10.

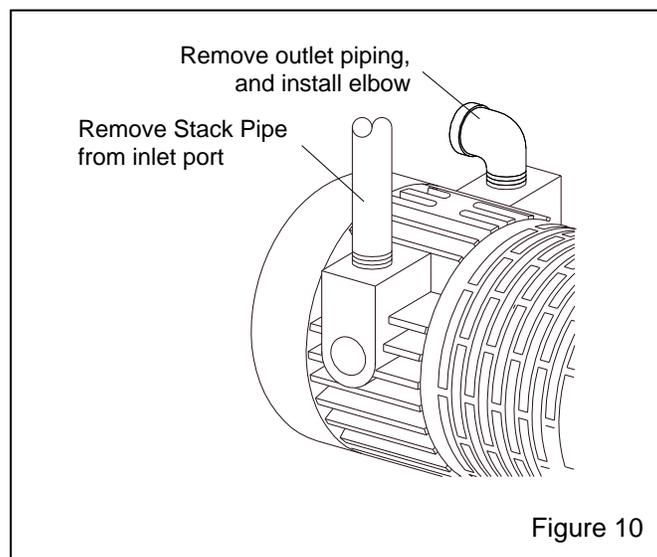
5.7.3 To prevent the flushing solvent from entering the outlet filter and breathing air channel, loosening or remove the outlet piping compression coupling, and remove the pipe from the pump housing.

5.7.4 Connect an elbow (hand tight) to the outlet port. Rotate the elbow so the outlet points in a safe direction, away from any objects.

5.7.5 With the pump running, pour about two tablespoons of flushing solvent into the inlet port.

⚠ WARNING

Flushing solvent will exit the pump at the outlet pipe. Wear eye protection and flush in a well ventilated area away from sparks and open flames. Do not inhale solvent fumes.



5.7.6 If necessary, repeat the flushing procedure. If flushing has freed-up the vanes, continue with this section. If flushing does not remedy the situation, service may be required. See Section 5.8.

5.7.7 Allow the pump to run until all traces of solvent odor have disappeared. **DO NOT REASSEMBLE UNTIL DISCHARGE AIR IS FREE OF SOLVENT ODOR.**

5.7.8 Reassemble air outlet assembly and respirator hose.

5.8 Air Motor and Pump Service

5.8.1 Refer to the manufactures manuals as noted in Section 1.1.1, for replacement parts and service, pertaining to the air motor and pump.

6.0 TROUBLESHOOTING

6.1 Low outlet pressure at pump

6.1.1 Air motor not running at full RPM. Check inlet pressure, or adjust Air-Flow valve to increase rpm. See Section 4.2.

6.1.2 Make sure that the outlet filter bowl gasket is in place, not worn, and the bowl is tight against the gasket.

6.1.3 Check the outlet plumbing for leaks.

6.1.4 Check to make sure the manifold drain cock is closed.

6.1.5 Inlet filter media dirty. Remove and clean, or replace.

6.1.6 Outlet filter cartridge dirty. Replace.

6.1.7 Relief valve set too low. See Section 4.3.

6.1.8 Optional intake hose blocked or collapsed. Check that the intake hose is unobstructed.

6.1.9 Vanes sticking, or dust in pump. Flush.

6.1.10 Vanes worn. Refer to manufactures manual.

6.1.11 Make sure the pressure range of the respirator is compatible with the pump.

6.1.12 Make sure respirator hose and respirator are connected when taking pressure reading.

6.1.13 Check that the pressure gauge is operational. Replace if faulty.

6.2 High pressure at pump

6.2.1 Air motor running too fast. Check inlet pressure, or adjust Air-Flow valve to decrease rpm. Refer to Section 4.2.

6.2.2 Make sure the pressure range of the respirator is compatible with the pump.

6.2.3 Restriction (such as a pinch or kink) in respirator hose. Check hose.

6.2.4 Relief valve set too high. See Section 4.3.

6.3 Low pressure at the respirator

6.3.1 Blockage, kink, or break in respirator hose. Check hose.

6.3.2 Low pressure at pump. See Section 6.1.

6.4 Pump overheating

6.4.1 Dirty inlet and/or outlet filter. Clean or replace.

6.4.2 Optional intake hose blocked or collapsed. Check that the intake hose is unobstructed.

6.4.3 Pump running at too high RPM. Check air motor inlet pressure, Air-Flow valve adjustment, and relief valve adjustment.

6.4.4 Dust in pump. Flush.

6.5 Air motor overheating

6.5.1 Motor not lubricated. Check lubricator oil level and drip rate.

7.0 Warranty

7.1 The air motor and pump are warranted to be free from defects in material and workmanship by the manufacturer for a period of one year from the original date of shipment from Clemco Industries Corp. This warranty does not apply to any damage or defect resulting from negligent or improper assembly or use of the product, or from any alterations or attempted repair by any persons other than an authorized agent. The warranties are extended to the air motor and pump only, and do not include any add-on accessories such as filters and fittings. All warranty claims should be made by calling the manufacturer for the address of the nearest service facility. Return the pump prepaid, and include a written explanation of the failure and return shipping information.

Contact:
Gast Manufacturing Corp.
2300 Highway M-139
Benton Harbor, MI 49023
Tel: (269) 926-6171 FAX: (269) 927-0808

8.0 REPLACEMENT PARTS

Never substitute, modify, add, or omit parts. Use only genuine replacement parts in the configuration as specified by the manufacturer.

8.1 Optional Accessories and Service Kits

Item	Description	Stock No.
(-)	Intake hose kit, 50 ft.	21837
(-)	Extension kit, intake hose, 50 ft.	21838
(-)	Service kit for pump	25444
(-)	Service kit for air motor	25445

8.2 Replacement parts, Figure 11

Item	Description	Stock No.
(-)	CAP-4C Ambient Air Pump w/ Cart	22384
(-)	CAP-4 Ambient Air Pump w/ Frame	22530
1.	Filter media, inlet filter	21830
2.	Filter cartridge, outlet filter	15030
3.	Gasket, outlet filter bowl	21831
4.	Gauge, 1/4" pressure, 0 - 30 psi	21832
5.	Relief valve	22434
6.	Disconnect, 3/8" open type	21834
7.	Disconnect, 1/2" closed type	22438
8.	Inlet filter assembly	22452
9.	Filter/Regulator, 1/2"	05530
10.	Lubricator, 1/2"	05531
11.	Element, exhaust muffler	05065
12.	Outlet filter assembly, less cartridge	22433
13.	Petcock, drain	01993
14.	Flow valve, 1/2" ball with handle	01241

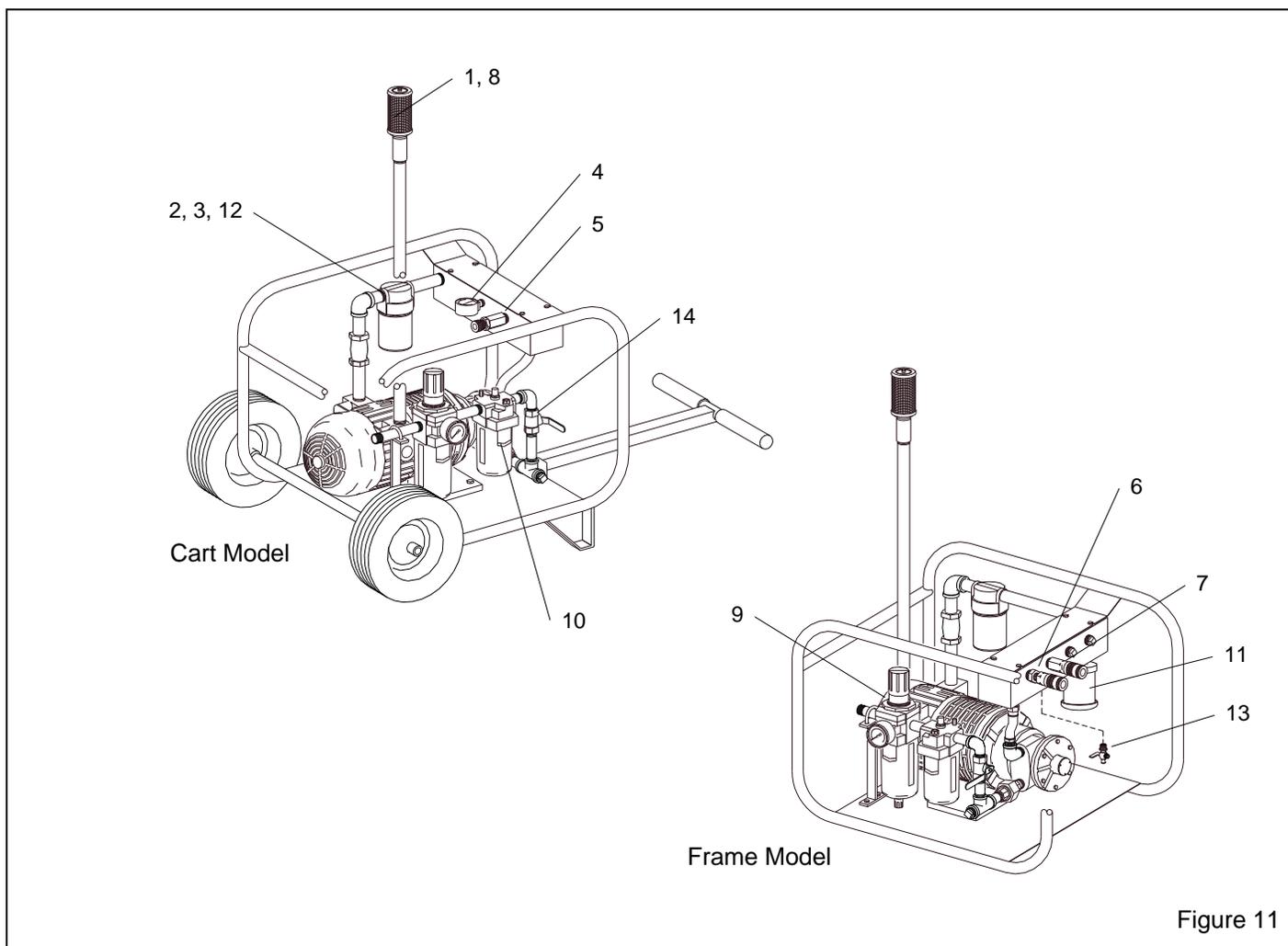


Figure 11