

**CLEM-COOL
AIR CONDITIONER
O. M. 23837**

MC FILE NUMBER: 2326-0407
DATE OF ISSUE: 05-07-07
REVISION: A, 03-08

 **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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1.0 INTRODUCTION

1.1 Scope

1.1.1 This manual covers the preparation, operation, maintenance, troubleshooting, and replacement parts for Clemco's Clem-Cool Air Conditioner. The conditioner is used to cool compressed respirable air supplying an Apollo supplied-air respirator or Comfort Vest. Read this manual and the appropriate Apollo HP (high pressure) respirator manual and/or Comfort Vest manual before using the Clem-Cool air conditioner.

1.1.2 The National Institute for Occupational Safety and Health (NIOSH) approval and Occupational Safety & Health Administration (OSHA) regulations cited within this manual apply when the air conditioner is used to provide air to a supplied-air respirator. The regulations do not apply if the air conditioner is used with a Comfort Vest alone. When a vest is used with a respirator having a cape that extends over the vest, air from the vest could be inhaled by the user. For that reason, Grade D air or higher quality, as defined in Section 2.1 of this manual, must be provided to both the respirator and vest.

1.2 Safety Alerts

1.2.1 Clemco uses safety alert signal words, based on ANSI Z535.4-1998, to alert the user of a potentially hazardous situation that may be encountered while operating this equipment. ANSI's definitions of the signal words are as follows:



This is the safety alert symbol. It is used to alert the user of this equipment of potential personal injury hazards.

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

CAUTION

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

CAUTION

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

WARNING

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

DANGER

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

1.3 NIOSH Approval

1.3.1 The Clem-Cool Air Conditioner is approved by NIOSH to use with Clemco Apollo respirators.

1.3.2 The NIOSH label shown below lists the Apollo respirator approval numbers. An X on the approval line indicates which components are approved for the specific respirator. Do not use any non-approved components with the respirator.

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TYPE C AND CE CONTINUOUS FLOW SUPPLIED-AIR RESPIRATOR IS APPROVED ONLY IN THE FOLLOWING CONFIGURATIONS:

TC#	Protection ¹	Part No.	Model	Respirator Components										Cautions and Limitations ²			
				Helmets		Alternate Regulators				Hose Air Lines							
				Apollo 60	Apollo 600	CAT	CCT	Clem-Cool A/C	CFC/High Pressure	CFC/Low Pressure	ACV	Yellow 3/8" x 25 Ft.	Yellow 3/8" x 50 Ft.		Yellow 3/8" x 100 Ft.	Black 1/2" x 100 Ft.	Black 1/2" x 50 Ft.
19C-338	CF/SA																BCDEJM NOS
19C-339	CF/SA																BCDEJM NOS
19C-130	CF/SA																BCDEJM NOS
19C-358	CF/SA																BCDEJM NOS

1 PROTECTION
CF - Continuous Flow SA - Supplied-air

2 CAUTIONS AND LIMITATIONS

B- Not for use in atmospheres immediately dangerous to life or health.
 C- Do not exceed maximum use concentrations established by regulatory standards.
 D- Air-line respirators can be used only when the respirators are supplied with respirable air meeting the requirements of CGA G-7.1 Grade D or higher quality.
 E- Use only the pressure ranges and hose lengths specified in the user's instructions.
 J- Failure to properly use and maintain this product could result in injury or death.
 M- All approved respirators shall be selected, fitted, used, and maintained in accordance with MSHA, OSHA, and other applicable regulations.
 N- Never substitute, modify, add, or omit parts. Use only exact replacement parts in the configuration as specified by the manufacturer.
 O- Refer to users instructions, and/or maintenance manuals for information on use and maintenance of these respirators.
 S-Special or critical users instructions, and/or specific use limitations apply. Refer to instruction manual before donning.

⚠ WARNING

NIOSH approval applies to items shown on the label when used as a complete system. Do not make any non-approved modification, deletion, or substitution. Non-approved components void the NIOSH approval and may permit ingress of toxic and hazardous dust, resulting in toxic poisoning and respiratory disease.

1.4 OSHA Regulations

1.4.1 OSHA Regulation 29 CFR 1910.134 for respiratory protection in General Industry is referenced throughout this document. Respiratory protection standards for Construction 29 CFR 1926.103 and for Maritime 29 CFR-1915.154, 1917, and 1918 refer to 1910.134. The complete regulation is available through the U.S. Dept. of Labor web site at www.osha.gov.

1.4.2 OSHA Regulations 29 CFR 1910.134(a) and (c) require the employer to establish and maintain a comprehensive, written, respiratory protection program administered by a suitably-trained program administrator. The program must include, but is not limited to the following:

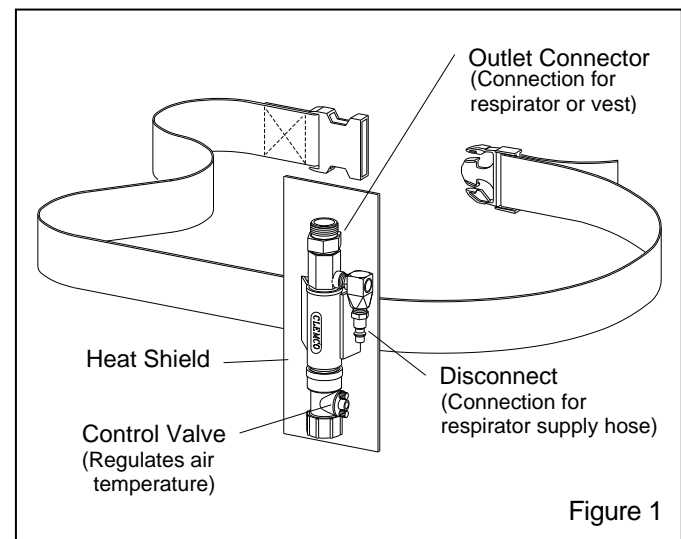
1. Procedures for selecting NIOSH-certified respirators.
2. Medical evaluations of employees required to use respirators.
3. Fit testing procedures.
4. Procedures for proper use of respirator in routine and foreseeable emergency situations.
5. Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding and otherwise maintaining respirators.
6. Procedures to ensure adequate air quality, quantity and flow of breathing air for atmosphere-supplying respirators.
7. Training of employees in the respiratory hazards to which they are potentially exposed during routine and emergency situations.
8. Training of employees in the proper use of the respirators, including putting on and removing them, any limitations on their use, and their maintenance.
9. Procedures for regularly evaluating the effectiveness of the program.

1.4.3 It is essential that the user be properly instructed in the use and maintenance of the respirator. The respirator manual and this manual for the air conditioner must be made available to all users of the respirator, and the users must demonstrate their understanding of its subject matter. Read the entire manual before installing or operating the equipment.

1.4.4 The air conditioner must be supplied with respirable air meeting requirements described herein. It is the responsibility of the employer to provide quality breathing-air to the respirator, and to establish a program to ensure that the respirator and accessories are properly used and maintained.

1.5 Description

1.5.1 The Clem-Cool Air Conditioner is an approved alternate air control device, which provides the user with a source of cool air when used in conjunction with a Clemco supplied-air respirator or Comfort Vest. The illustration in Figure 1 shows components and controls for the Clem-Cool air conditioner.



2.0 AIR SUPPLY

2.1 Air Quality

⚠ DANGER

Never connect a breathing air line to an air source that has not been tested for gas and particulate contamination. The presence of unacceptable levels of carbon monoxide (CO) or other gases, or oxygen deficiency in breathing air will cause death to the user.

2.1.1 The employer is responsible for ensuring that breathing air shall meet the requirements for Grade D or higher quality, as described in Compressed Gas Association Commodity Specification pamphlet G-7.1., titled Commodity Specification For Air, published by Compressed Gas Association Inc., Chantilly, VA. Website: www.cganet.com, (29 CFR 1910.134 (i)).

2.1.2 Limiting characteristics of Grade D air, as of the publication of this manual is as follows:

Carbon Dioxide	maximum of 1000 ppm
Carbon Monoxide	maximum of 10 ppm
Odor	*No pronounced odor
Oil (hydrocarbons)	maximum of 5 mg/m ³
Oxygen	between 19.5 - 23.5%

* Specific measurement of odor in gaseous air is impractical. Air may have a slight odor but the presence of a pronounced odor renders the air unsatisfactory.

2.1.2 Special care must be taken to avoid accidental connection to any lines other than compressed air, such as, oxygen, acetylene, or nitrogen.

2.1.3 When the air conditioner is used for breathing air, the quality of air supplied to the air conditioner is extremely critical to the safety of the user.

2.1.4 Any air inhaled from the air conditioner must meet the requirement for respirable air as stated herein. If the air conditioner supplies air to a vest that is used with a hooded respirator, air supplied to the vest must also be respirable air meeting the requirements for Grade D or better.

2.1.6 Prior to using the respirator, read the owner's manual and all instructions, labels, and warnings relating to the compressed air source. Take special care to abide by all warnings from the compressor manufacturer regarding compressor use, and from the cylinder and air supplier, for breathing air cylinders and their use.

2.1.7 A Clemco CPF filter may be installed and regularly maintained to remove objectionable odors, oil mist, water, pipe scale, and other particulate matter.

2.2 Breathing-Air from Cylinders

DANGER

Operators must never use or operate breathing air cylinders, without proper pressure reducing devices, and training on their use. Breathing cylinders are under extremely high air pressure. Improper use could cause cylinders or accessories to rupture, resulting in severe injury or death.

2.2.1 Using cylinders (high-pressure air bottles) requires special knowledge of their use and compliance with OSHA Regulations. Refer to 29 CFR 1910.134(h) and (i) and 49 CFR part 173, and part 178.

2.2.2 The employer shall ensure that cylinders used to supply breathing air to respirators meet all requirements which may include, but are not limited to, their testing and maintenance, a certificate of analysis for air quality and moisture.

2.2.3 Cylinders must be equipped with a properly maintained pressure-reducing valve that reduces pressure to the approved pressure range as shown in Section 2.4.3.

2.3 Breathing-Air from Compressors

2.3.1 The employer shall ensure that air from compressors used to supply breathing air to respirators meets the requirements in 29 CFR 1910.134.(i)(5).

2.3.2 Precautions must be taken to prevent contaminants from entering the compressor intake: Ref. 29 CFR 1910.134.(i)(5)(i). The compressor inlet must be located away from all sources of toxic contaminants including carbon monoxide, which is found in engine exhaust (including the exhaust from the compressor's engine), and in any form of combustion. No vehicles should be allowed near the compressor intake. Contaminants can enter respiratory equipment through the compressor air inlet. This inlet must not be located near any exhaust system outlet, ventilation flue, or source of fumes or particles of any kind.

2.3.3 The compressed-air supply system must be equipped with suitable in-line air-purifying sorbent beds and filters, and be maintained to further ensure breathing air quality: 29 CFR 1910.134 (iii).

2.3.4 If the breathing-air supply is from a non-oil-lubricated compressor, the employer shall ensure that the carbon monoxide levels in the breathing air do not exceed 10 ppm: 29 CFR 1910.134 (i)(6).

2.3.5 If an oil-lubricated compressor is used, the employer shall use a high-temperature alarm or carbon monoxide (CO) 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: 29 CFR 1910.134 (i)(7).

2.4 Operating Pressure

2.4.1 Air pressure at the point of attachment (the point of attachment is where the respirator supply hose is connected to the respirable air source) must be maintained at pressures between 90 to 100 psi (pounds per square inch), as shown in the table in Section 2.4.3. Maintaining the correct operating pressure at the point of attachment ensures the correct air flow to the respirator.

2.4.2 The Clemco CPF Inline Particulate Filter with regulator meets this requirement for a regulator and gauge, provided inlet pressure does not exceed 150 psi.

⚠ DANGER

Do not connect the air conditioner, CPF Filter, or any other regulator or filter, to bottled air that does not have a pressure reducing valve that reduces pressure to the maximum operating pressure of the respirator or filter it services. Failure to comply with this warning will cause devices rated at lower pressures to rupture under the high pressure of bottled air, which could cause severe injury or death.

2.4.3 Use the following table to determine the minimum pressure setting and maximum respirator hose length that may be used with the air conditioner. Adjust the pressure with the respirator hose and respirator attached. If the regulator is adjusted with static pressure (no air flow), pressure may drop below the required pressure when the respirator is connected, and may result in low air flow. Setting the pressure as shown provides a minimum of 7 cfm (cubic feet per minute) to the respirator. The maximum allowable pressure for use with the air conditioner is 100 psi.

Minimum Pressure	Overall hose length measured in feet							
	25	50	75	100	125	150	175	200
90 psi	x	x	x					
95 psi				x	x	x	x	x

The maximum overall hose length used with the air conditioner is 200 feet when providing air to a respirator.

2.5 Air Volume

2.5.1 The air conditioner must be supplied with 20 cfm of Grade D breathing air at 90 to 100 psi.

⚠ WARNING

The compressor must provide adequate output and the plumbing between the compressor and the point of attaching the respirator hose must have sufficient capacity to supply the volume of air at the pressure required. Restricted 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.

3.0 SET-UP and ADJUSTMENTS

3.1 Attach Breathing Tube Assembly

⚠ CAUTION

Note the directional flow arrows on the labels at both ends of the breathing tube. The flow arrows indicate the direction of air flow to the helmet. Flow arrows must point toward the helmet. Failure to properly attach the breathing tube may damage the tube's acoustical foam, which will block air flow, or it may increase noise levels beyond OSHA limits.

3.1.1 The breathing tube has a clamped-on end and a molded-on end. Attach the molded-on swivel connector to the air conditioner's outlet as shown in Figure 2.

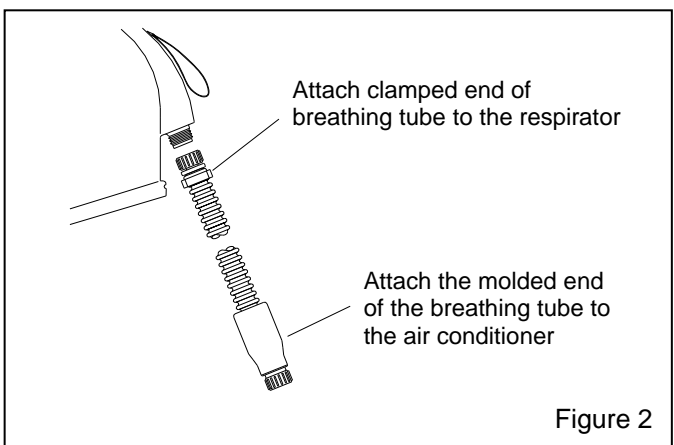


Figure 2

3.1.2 Attach the clamped-on end to the threaded air inlet fitting at the back of the helmet as shown in Figure 2. Do not over-tighten; hand-tight is sufficient.

3.1.3 Attach an approved Clemco respirator hose to the quick-disconnect nipple.

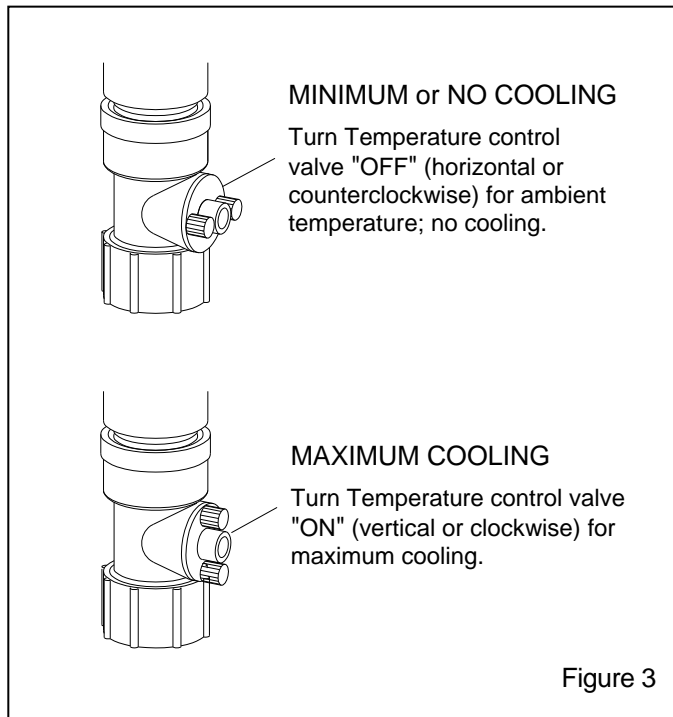
3.2 Air Supply and Pressure

3.2.1 Initiate the air supply and regulate air pressure between 90 and 100 psi, as shown in Section 2.4.3.

3.3 After donning the respirator, securely attach the belt and air conditioner around the waist. Adjust the belt size as required.

3.4 Adjust Air Temperature

3.4.1 To adjust air temperature, rotate the temperature control valve (shown in Figure 3) located on the lower part of the air conditioner, toward "OFF" for ambient temperature or toward "ON" for maximum cooling. The valve may be positioned anywhere in between to attain the most comfortable temperature setting.



4.0 PREVENTIVE MAINTENANCE

There are no serviceable parts within the conditioner.

4.1 Air Filter Screen

4.1.1 Inspect and clean the air filter screen monthly. If inadequate air flow is experienced, stop using the air conditioner and inspect the screen for blockage.

CAUTION

Debris or abrasion on the screen is one indication of dirty air. Dirty air will cause rapid erosion of critical parts of the air conditioner, which will decrease efficiency and life of the conditioner.

4.1.2 To clean the air filter screen, unscrew the quick disconnect nipple from the inlet elbow. Turn the elbow upside down and tap it on a solid surface to remove loose debris. The screen can be removed by tapping the elbow described above. If the screen is wedged in place it may be necessary to destroy it in order to remove it. Replace the screen before reassembly.

5.0 TROUBLESHOOTING

5.1 Inadequate Air Flow

5.1.1 Check filter screen for debris.

5.1.2 Make sure supply air pressure is between 90 and 100 psi. A pressure regulator and gauge must be installed at the point of attachment (where the respirator supply hose is connected to the respirable air source).

5.2 Poor Cooling Performance

5.2.1 Inadequate air flow affects cooling performance. Refer to Paragraph 5.1.

5.2.2 The temperature of the compressed air has an effect on the air conditioner's discharge temperature. Make sure that none of the lines that supply compressed air to the conditioner is routed near any source of heat, such as a steam radiator, furnace, etc. When possible avoid exposure to direct sunlight.

5.2.3 Erosion of internal parts: Compressed air moving through the air conditioner will eventually wear critical components. Dirty air accelerates wear of internal parts. There are no replaceable parts within the conditioner.

6.0 REPLACEMENT PARTS, FIGURE 3

Item	Description	Stock No.
(-)	Clem-Cool Air Conditioner Assembly with belt	23825

1.	Belt, 2" web	04430
2.	Disconnect, 1/4" NPT male	00015
3.	Elbow, 1/4" NPT swivel	23829
4.	Screen	08973
5.	Heat shield	08981

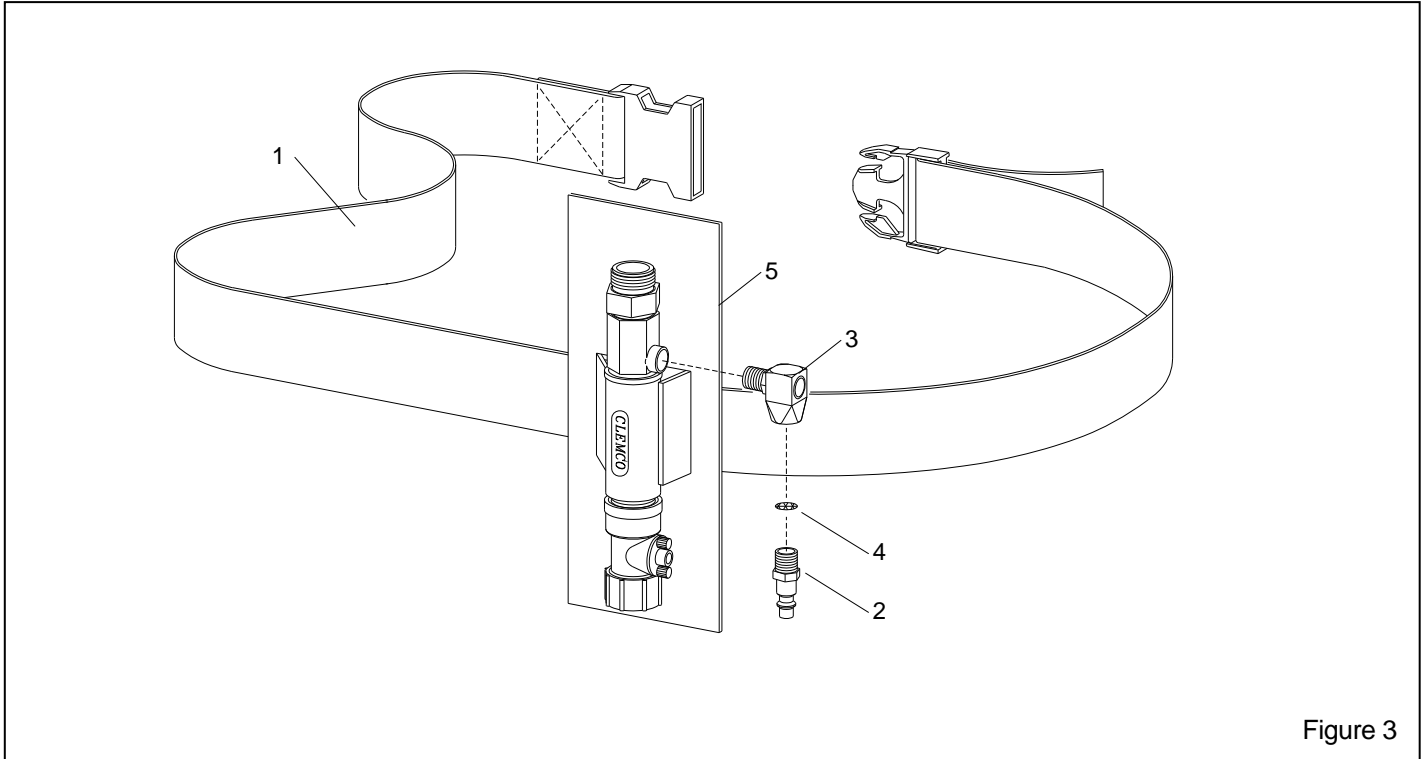


Figure 3