



# **OPERATION, PREVENTIVE MAINTENANCE AND PARTS SUPPORT MANUAL**

**FOR**

## **MULTIFORCE® AIR LIFTING BAG SYSTEM**

**27 JUNE 2023**

**PN 22-890MFB**

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**I – VALIDATION**

Except as stated in II, the technical manual identified above has been satisfactorily validated in accordance with all requirements of the applicable contract. The technical manual is hereby certified to be accurate and complete, and the information, instruction, text, and illustration conform in all respects to the applicable general and detailed specifications.

**II – EXCEPTIONS****EXCEPTIONS**

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1	12 May 2106	Added Multiforce Basic and Compact models. Revised BOM and Images for the Remote Placement model. Changed insertion height to 4.5 inches (11.43 centimeters). Removed reference to tonnage labeling on the yellow stripes. Added Saddlebag Control Kits.	SIGNATURE ON FILE
2	19 April 2017	Added note: • The Remote Placement Base will provide stabilization of the bag, during placement. Do not rely on it for stabilization during the lift and always use independent stabilization devises such as Paratech Rescue Struts or cribbing.	SIGNATURE ON FILE
3	14 MARCH 2023	Updated control equipment to G3	SIGNATURE ON FILE
4	27 JUNE 2023	Revised storage requirements	SIGNATURE ON FILE



## FOREWORD

This technical manual conforms to Military Specifications MIL-M-38784 General Style and Format Requirements, MIL-M-7298 Commercial Equipment Technical Manual and MIL-M-15071 Equipment and Systems Content Requirements for Technical Manuals. The manual contains description, operating instructions, theory of operation, scheduled maintenance recommendations and parts lists for MULTIFORCE® Air Lifting Bag Systems manufactured by Paratech Incorporated, 1025 Lambrecht Road, Frankfort, Illinois 60423-7000.

All pertinent data relative to MULTIFORCE® Air Lifting Bag Systems is contained herein without specific reference to other publications. Refer to the table of contents for the arrangement of the contents within this publication.

This manual consists of one volume arranged in four chapters as follows:

Chapter 1 - General Information and Safety Precautions

Chapter 2 - Operation

Chapter 3 - Scheduled Maintenance

Chapter 4 - Parts List





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# SAFETY FIRST

Personnel safety and the prevention of equipment damage were primary considerations during the design and expected utilization of MULTIFORCE® Air Lifting Bag Systems. When MULTIFORCE® Air Lifting Bag Systems are properly used in combination with good common sense, an extremely safe method of applying force is realized.

Although the following safety first list is quite extensive, the majority of the precautions are just good common sense for any personnel qualified in the use of lift bags. However, some of the precautions are not obvious and Paratech strongly recommends that all operating/assisting/maintenance personnel read and understand the complete safety first procedures in order to ensure personnel and equipment safety.

Since there are four distinct operational phases of lift bag use: Prior to Inflation, During Inflation and While Inflated, During Deflation, and After Removal, the safety first list is charted to reflect these applications. As shown in the following table, during each operational phase, each safety procedure may be required Always (A), If Time Permits (ITP), or Depending Upon Application (DUA).

SAFETY FIRST PROCEDURE	PRIOR TO INFLATION	DURING INFLATION AND WHILE INFLATED	DURING DEFLATION	AFTER REMOVAL
Regardless of the condition of lift bag use, SAFETY FIRST is primary to prevent injury or death and/or equipment damage.	A	A	A	A
All personnel at the immediate lift bag site must be trained and qualified.		A	A	
All personnel at the immediate lift bag site must be properly suited up (protective clothing, helmet, eye protection, gloves, footwear, etc.) at all times	ITP	A	A	
Never exceed the maximum inflation pressure marked on the lift bag. (150 psi/10.3 bar)		A		
Do not handle hoses or lift bags while the system is pressurized.		A	A	
Do not connect or disconnect system components when the system is pressurized. The only exception is disconnection of a safety in-line relief valve from a controller.		A	A	

Observance of the following safety first procedures will assure the safe and efficient utilization of the MULTIFORCE® Air Lifting Bag System

<b>SAFETY FIRST PROCEDURE</b>	<b>PRIOR TO INFLATION</b>	<b>DURING INFLATION AND WHILE INFLATED</b>	<b>DURING DEFLATION</b>	<b>AFTER REMOVAL</b>
Always be on the opposite side of any expected movement.	<b>A</b>	<b>DUA</b>	<b>A</b>	
Always stand clear of a load that is only supported by lift bag(s). Never be below a lift bag supported load that has no blocking or cribbing for positive support. Always <b>“Lift and inch, crib an inch”</b>	<b>A</b>	<b>A</b>	<b>A</b>	
Use blocking, shoring and cribbing where ever possible to support and sustain loads.	<b>A</b>	<b>A</b>	<b>A</b>	
Use locking rings on couplings to prevent release of air pressure due to accidental disengagement of system components.	<b>A</b>	<b>A</b>	<b>A</b>	
Always center load on lift bag or it may be violently ejected from under load during pressurization.	<b>DUA</b>	<b>A</b>	<b>A</b>	
Be extremely careful to stabilize, as much as possible, unstable (off-center) loads.	<b>A</b>	<b>A</b>	<b>A</b>	
Be careful that hoses are not kinked.	<b>A</b>	<b>A</b>	<b>A</b>	<b>A</b>
Check visually that equipment is not damaged (scuffs, kinks, tears, ply separation, etc.) and audibly for the leakage of air.	<b>ITP</b>			<b>A</b>
Never stack two lift bags on each other during operation.	<b>A</b>	<b>A</b>	<b>A</b>	
Use proper sized lift bag(s) for the load conditions encountered.	<b>A</b>			
During transport of lift bags, protect the bag and remote placement base to prevent damage such as cuts, nicks, and scraping.	<b>A</b>			<b>A</b>
Protect bag with thermal blanket, plywood, etc. whenever a lift bag will contact a surface in excess of 150°F (65°C).	<b>ITP</b>			<b>A (storage)</b>
Never use a lift bag where contact temperatures are in excess of 220°F (105°C).	<b>A</b>			<b>A (storage)</b>

<b>SAFETY FIRST PROCEDURE</b>	<b>PRIOR TO INFLATION</b>	<b>DURING INFLATION AND WHILE INFLATED</b>	<b>DURING DEFLATION</b>	<b>AFTER REMOVAL</b>
Never work in the dark. Use flash lights or flood lights to provide shadow-free illumination of work area.	<b>ITP</b>	<b>ITP</b>	<b>ITP</b>	
Inflate only enough to achieve desired lift.		<b>A</b>		
If force must be applied to a small diameter or small area object, always use plywood, rubber mud flaps, etc. between the lift bag and the object to distribute the load more evenly over the lift bag surface. Otherwise safe maximum lifting force cannot be applied.		<b>A</b>		
Always evaluate the condition prior to execution in order to determine where to apply it to achieve the desired result.	<b>ITP</b>			
Always inflate a lift bag slowly to prevent possible shifting of load. Stop if load begins to shift, stabilize and block load before continuing.		<b>A</b>		
Be sure all valves between air source and lift bag(s) are in a closed position before turning on air source to system. This will prevent an uncontrolled lift. Also open air supply source slowly to prevent damage to regulator.	<b>A</b>			
Never lift with a lift bag directly in contact with sharp or pointed objects that may puncture, abrade or otherwise damage the lift bag.	<b>DUA</b>			
Always have 3 points of contact to ensure a stable foundation when lifting unsecured loads.	<b>DUA</b>			
Undue haste could result in injury to personnel and damage/render the lift bag system useless.	<b>A</b>	<b>A</b>	<b>A</b>	<b>A</b>
Keep as far away as possible from lift bag(s). Hose length governs this safety first procedure.		<b>A</b>	<b>A</b>	
Never inflate a lift bag over 30 psi (2 bar) when not under load.				<b>A (maintenance)</b>

- The Remote Placement Base will provide stabilization of the bag, during placement. Do not rely on it for stabilization during the lift and always use independent stabilization devices such as Paratech Rescue Struts or cribbing.

## **CHAPTER 1**

### **GENERAL INFORMATION**

#### **1-1 SAFETY PRECAUTIONS**

Refer to the Safety First procedures Chapter 1, General Information and Safety Precautions for the procedures to be observed to assure safe and efficient utilization of MULTIFORCE® Air Lifting Bag Systems.

#### **1-2 SCOPE OF MANUAL**

This technical manual provides instructions for the operation, preventive maintenance and parts support for MULTIFORCE® Air Lifting Bag Systems manufactured by Paratech Incorporated, 1025 Lambrecht Rd, Frankfort, Illinois 60423-7000.

#### **1-3 ARRANGEMENT**

Refer to the Table of Contents for arrangement of the subject matter in this manual.

#### **1-4 EQUIPMENT FUNCTION**

1-4.1 MULTIFORCE® Air Lifting Bag Systems are multi-application, portable inflation systems used for lift and displacement of heavy objects, up to 62,000 lbs (28,123 kilograms), while requiring less than 4.5 inches (11.43 centimeters) of insertion clearance. Total capable lift is 26 inches (66 centimeters). Inflation may be obtained from any air source (self-contained compressed air cylinder, air compressor, truck air brake system, building compressed air system, foot pump, etc.) capable of supplying 150 psi (10.3 bar) pressure.

1-4.2 MULTIFORCE® Air Lifting Bag Systems are designed for use in emergency situations such as building collapse, structural containment, vehicular extrications, industrial entrapment, and excavation collapse and

containment.

1-4.3 In addition to use during emergency situations, MULTIFORCE® Air Lifting Bag Systems are also used effectively used for:

a. Preventive and/or corrective maintenance procedures where positioning and aligning heavy equipment and machinery in mills, manufacturing facilities and maintenance shops is required such as removing wheels, pulleys and gears from large machinery.

b. Lifting or shifting pipelines requiring welding and maintenance.

c. Breaking out granite and marble blocks and slabs in quarrying operations.

d. Re-railing railroad and mining cars, pre-stressing support columns, general maintenance requiring lifting in rail, mining, underground and subway work.

e. Lifting operations underwater or on unstable, soft ground (mud, sand, snow, strewn debris, etc.) where conventional jacking equipment tends to sink.

#### **1-5 INTERRELATIONSHIP OF COMPONENTS**

Refer to figure 1-1 for the interrelationship of the six basic components (air source, pressure regulator, controller, safety inline relief valve, interconnecting hose, and lift bag) comprising MULTIFORCE® Air Lifting Bag Systems and their relative sizes.

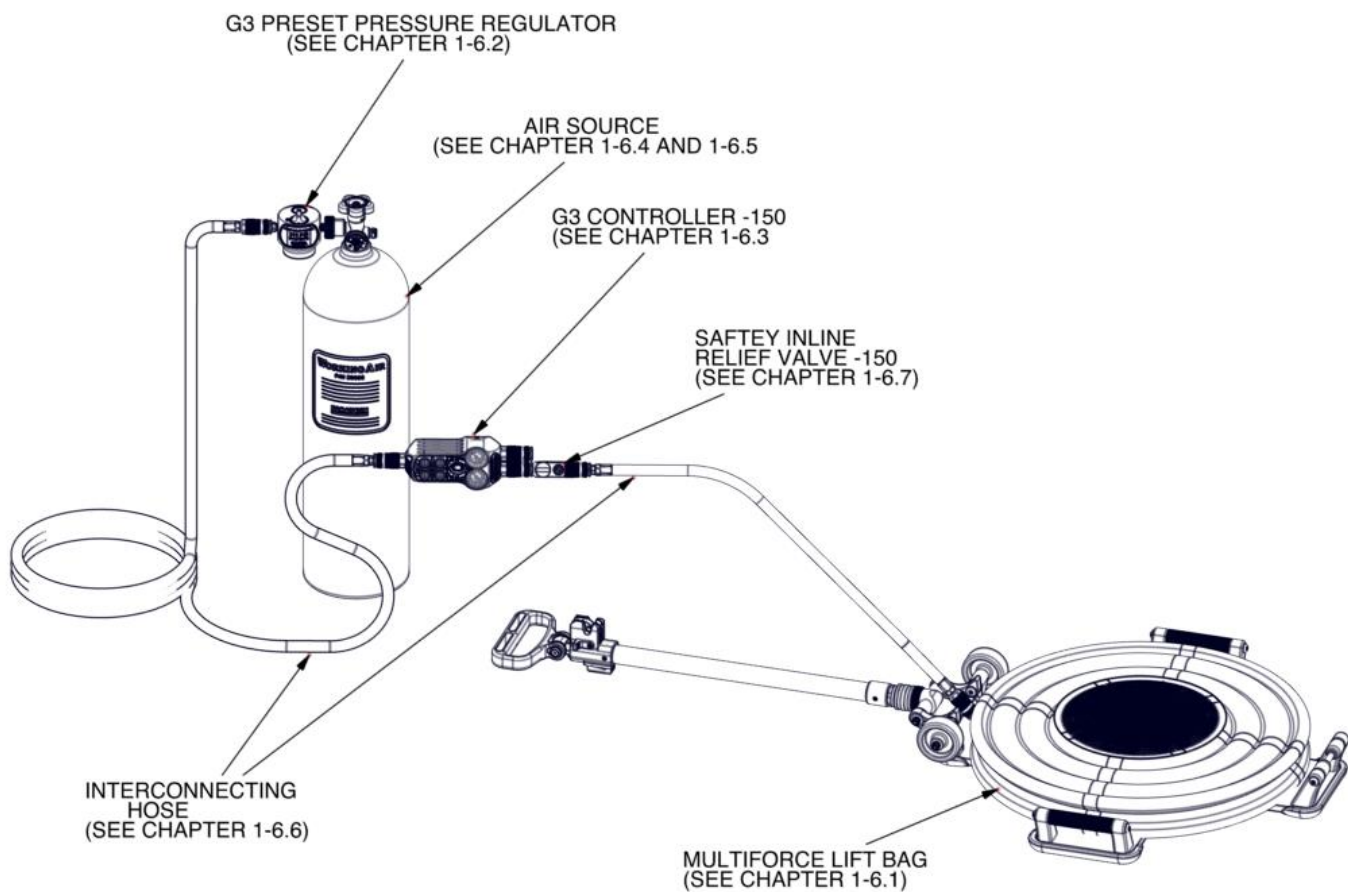


Figure 1-1. MULTIFORCE® Air Lifting Bag System, Model with Remote Placement Shown.

For further component explanation, see the chapter shown under the component within figure 1-1.

See Chapter 2 “OPERATION” for component connection and system operation.



## 1-6 EQUIPMENT DESCRIPTION

### 1-6.1 LIFT BAG

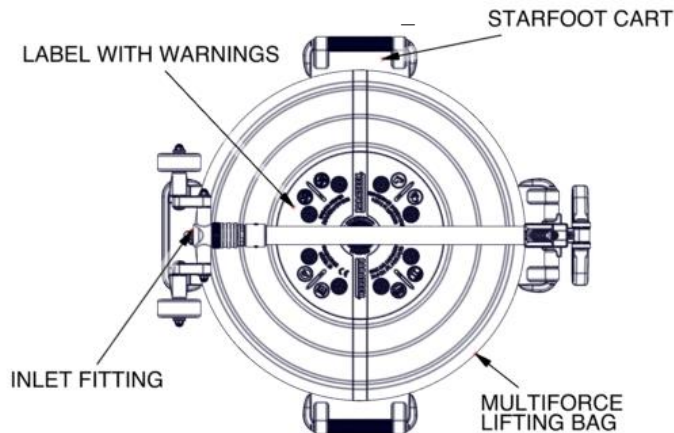


Figure 1-2. MULTIFORCE® Lift Bag, Model with Remote Placement Shown

MULTIFORCE® Lift Bags (figure 1-2) are composite items fabricated from neoprene and a continuous weave of aramid fabric for strength and rigidity even at full inflation pressure of 150 psi (10.3 bar).

Lift bag end caps incorporate molded raised surfaces designed for maximum friction and holding capability. An integrated end cap safety relief valve is standard for added protection.

All air bags have a bright yellow "X" molded into their end caps that extend through the sides to provide high visibility during pre-inflation centering.

The left hand threaded air inlet fitting includes a tethered nipple cap that provides protection from contamination and also helps prevent damage to the outside surface of the fitting. The tether is to prevent accidental loss of the cap.

A Remote Lifting Base is an integral part of the standard MULTIFORCE® Lift Bag that allows for placement away from the load as well as stability during the lift. Remote Lifting Base features include wheels for easy transport, removable/telescoping handle, low friction sliders, and handles for tie-down or carrying.

The MULTIFORCE® Basic Model features a full size placement base, low friction sliders, left/right handles, and

a carry strap for easy transport and nipple protection. The Basic Model does not include the telescoping handle or wheels.

The MULTIFORCE® Compact Model features a smaller placement base, low friction sliders, and a carry strap for easy transport and nipple protection. The Compact model does not include left/right handles, telescoping handle or wheels. It was designed with a reduced footprint for easier compartment storage on vehicles.

- The Remote Placement Base will provide stabilization of the bag, during placement. Do not rely on it for stabilization during the lift and always use independent stabilization devices such as Paratech Rescue Struts or cribbing.

A yellow, symbol driven, warning label is permanently molded into top end cap surfaces of all bags for quick reference and reminders of safety related warnings and information.

Each Lift Bag is proof tested at twice the operating (full inflation) pressure and has a minimum burst pressure of four times the operating 150 psi (10.3 Bar) pressure. All MULTIFORCE® Models have the same performance capabilities and specifications, Refer to Table 1-1 for a summary of the technical data for each MULTIFORCE® Lift Bag.





### 1-6.2 PRESSURE REGULATOR.

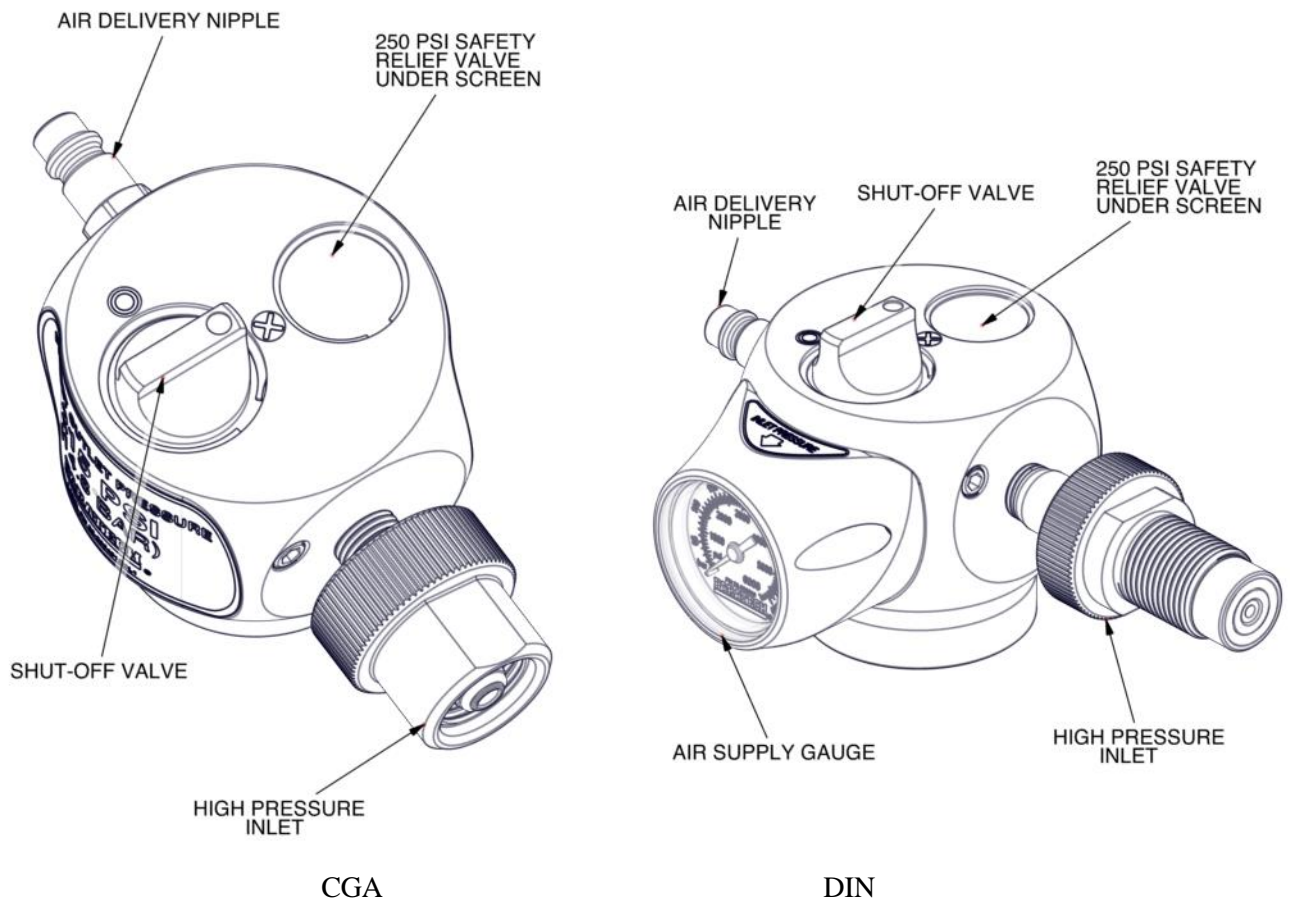


Figure 1-3 Preset Pressure Regulators

The pressure regulators (figure 1-3) automatically reduces inlet pressure of up to 5,500 psi (379 bar) to 215 psi (14.8 bar). The pressure regulator is designed to mate with a CGA-346/347 adapter fitting. Other fittings are available such as CGA-580 (nitrogen cylinder adapter), DIN nipple and nut assembly and British nipple and knob assemblies are also available.

The pressure regulator incorporates a piston sensor and soft seated main valve to provide bubble tight service.

The pressure regulator will operate with any breathing air. When using any gaseous media, it is necessary to remove moisture to prevent "icing"; a condition that occurs at high

expansion ratios during regulator operation. A 10 micron internal filter is incorporated in the pressure regulator. Coarser filters are available if excessive contamination is a problem.

The shut-off valve is either opened to permit regulated delivery air to pressurize the lift bag system or closed to prevent (seal off) regulated delivery air.

A 250 psi (17.2 bar) safety relief valve is installed to prevent delivery pressures exceeding 250 psi (17.2 bar). A Supply pressure gauge is installed to monitor pressures from the bottle /source on DIN models.

### 1-6.3 CONTROLLERS.

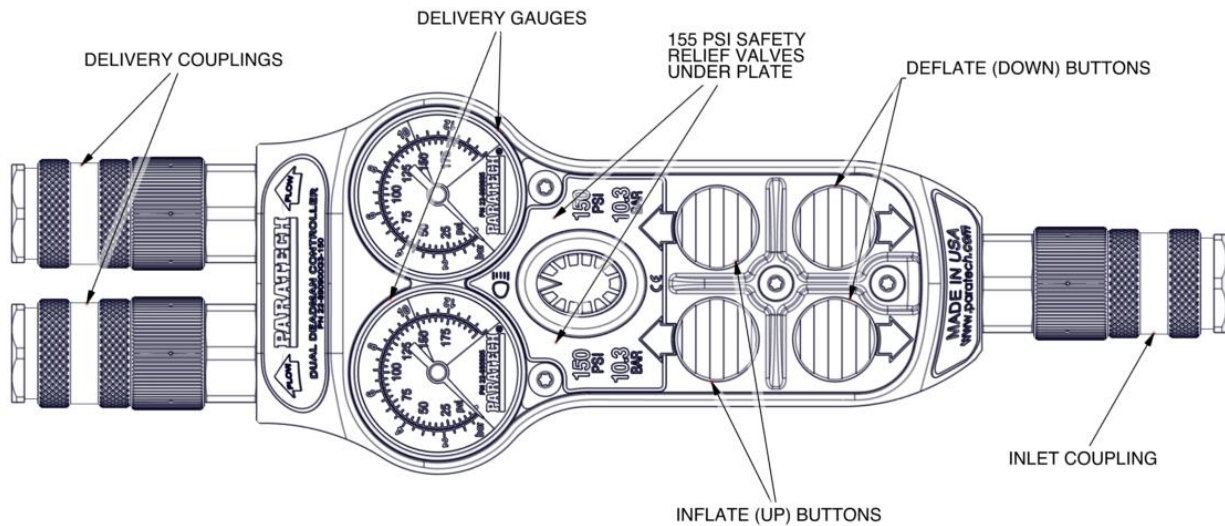


Figure 1-5. Dual Deadman 150 psi ALB Controller

A Dual Deadman controller is available for use with MULTIFORCE® Air Lifting Bag Systems. The Dual Deadman 150 psi ALB controller (figure 1-5) is single input/dual output.

This controller incorporates a vented (for safety) locking, quick connect, couplings to prevent accidental disconnection during use.

Green (up) and Red (down) buttons permit regulated air pressure to inflate the lift bag or deflate to relieve system air pressure to collapse the lift bag. The delivery gauges are provided to monitor the air pressure applied to the lift bag(s).

155 psi (10.7 bar) non-adjustable safety relief valves are installed into the controller to limit the applied air pressure and prevent over pressurizing. Due to the tolerance associated with mechanical vent relief valves; controllers are set 5 psi (0.4 bar) higher to 155 psi (10.7 bar) to insure the system always gets to 150 psi (10.3 bar) operation.

The Dual Deadman controller has a second set of controls that are identical yet independent from the first set so two air bags can be controlled at the same time yet independently. If using the Dual Deadman controller in a single lift bag operation, either set can be used.

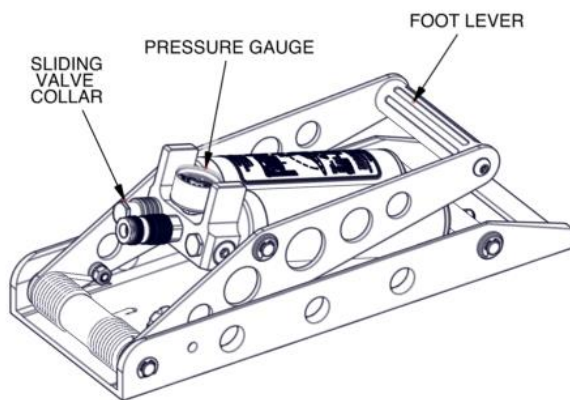


Figure 1-6. Manual Compressor

1-6.4 **MANUAL COMPRESSOR.** The manual compressor (figure 1-6) is a foot/hand lever operated compressor used to deliver pressurized air to the air bag. A sliding valve collar permits isolating one of the two cylinders thereby increasing the delivered pressure and decreasing the delivered volume by a factor of 2.

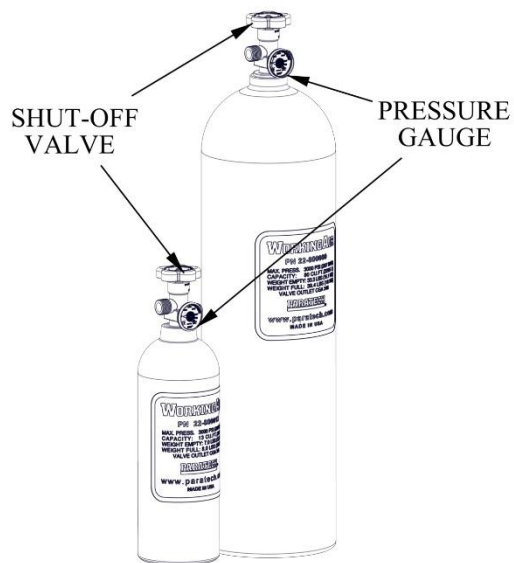


Figure 1-7. Air Cylinder

1-6.5 **AIR CYLINDER.** The air cylinder (figure 1-7) is used to store compressed air for use on the air bag. The shut off valve that permits or prevents the flow of compressed air to the regulator.

The pressure gauge measures the amount of pressure within the tank.

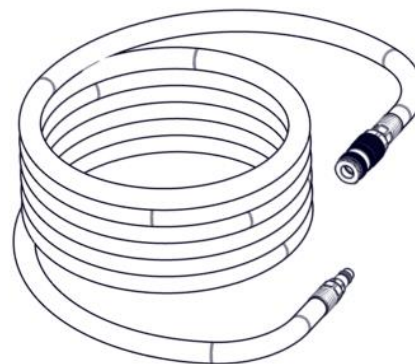


Figure 1-8. Hoses

1-6.6 **HOSES.** Hoses (figure 1-8) are used to convey air from the air supply source to the lift bag(s). All hoses are equipped with locking, quick connect, fittings to prevent their accidental disconnection.

All hoses are general purpose Ø3/8" inside diameter PVC (vinyl) core, single spiral poly yarn braid reinforced and a PVC abrasion resistant cover.

The service temperature range is -15°F to +150°F (-25°C to +65°C). All hoses have a working pressure of 300 psi (20.7 Bar) with a 4:1 safety factor.

Available hose lengths are 16 foot (5meter), 32 foot (10 meter) and 50 foot (15 meter). Available color in all lengths are red, yellow, blue, green, grey, and black.

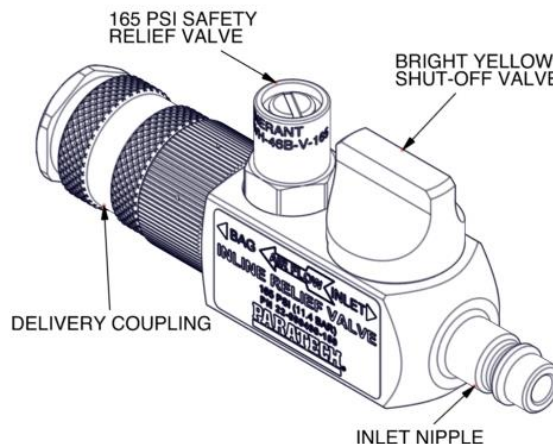


Figure1-9. Inline Relief Valve

1-6.7 **INLINE RELIEF VALVE.** The safety inline relief valve (figure 1-9) is designed to keep MULTIFORCE® lift bags fully and properly inflated when the lift bag(s) are; 1. Disconnected from the controller and 2. When excess pressure must be automatically relieved due to shifting loads and/or temperature changes.

The safety inline relief valve consists of an air inlet and outlet with locking vented (for safety) ring quick connect fitting. A shut-off valve is used to isolate the lift bag and a non-adjustable safety relief valve designed to relieve lift bag pressures in excess of 165psi. Inline relief valves for 150 psi are easily identified by a bright yellow shut off knob.

1-6.8 **FITTINGS.** A variety of adapters, couplings and air fittings are available to permit alternate air sources to inflate the MULTIFORCE® lift bag(s) or enable various air powered tools and accessories to be equipped with the same fittings permitting convenience of operation and/or

combining equipment resources such as hoses, regulators, self-contained compressed air cylinders, etc.

1-7 **REFERENCE DATA.** Reference data pertaining to MULTIFORCE® lift bags system components are summarized for quick reference in Tables 1-1 and 1-2.

## 1-8 **EQUIPMENT, ACCESSORIES, DOCUMENTS.**

1-8.1 **EQUIPMENT SUPPLIED.** Data pertaining to the dimensions and weight of MULTIFORCE® lift bags are presented in Table 1-2.

1-8.2 **ACCESSORIES.** Accessories used in conjunction with MULTIFORCE® lift bag systems are listed with sufficient descriptive information regarding their use and application in Chapter 4, Parts List.

1-8.3 **DOCUMENTS.** No documents other than this publication are required as supporting literature for MULTIFORCE® lift bag system.

Table 1-1. MULTIFORCE® Lift Bag Reference Data  
**LIFT BAG CONSTANTS:**

Base Material.....	Neoprene
Reinforcing Material, Continuous Weave.....	Aramid
Surface Type.....	Molded Non-Slip
Short Term Temperature Range °F (°C).....	-75 (-60) to +200 (+105)
Continuous Duty Temperature Range °F (°C).....	-40 (-40) to +150 (+65)
Maximum Working Pressure PSI (Bar).....	150 (10.3)
Test Pressure PSI (Bar).....	300 (20.6)

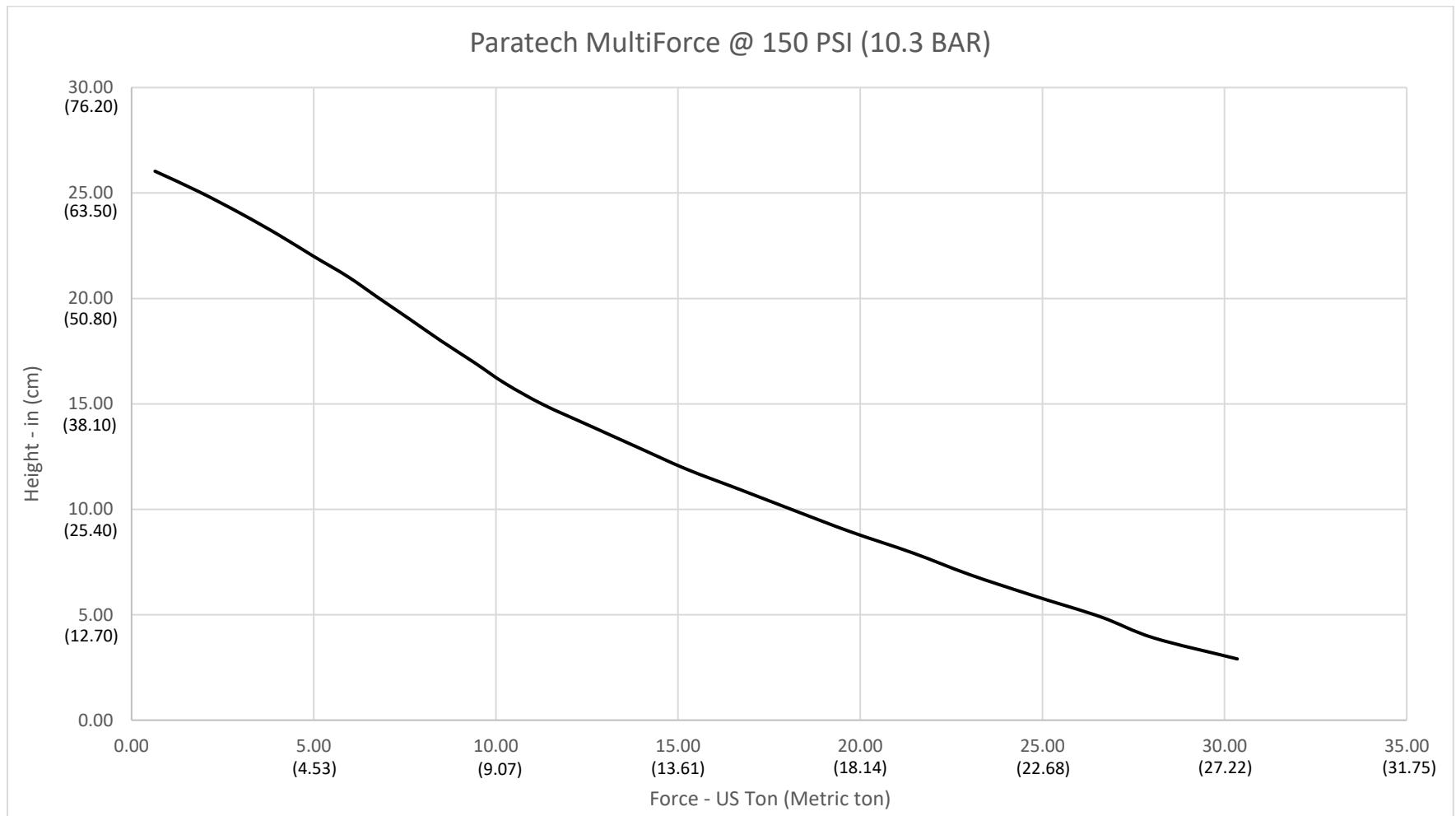


Table 1-1. MULTIFORCE® Lift Bag Reference Data (Continued)

## MULTIFORCE AIR BAGS TECHNICAL DATA

PN	MODEL	DIMENSIONS W/O NIPPLE (BAG ONLY)		STORAGE DIMENSIONS (W/LIFT BASE) L X H X W		WEIGHT		MAX LIFT CAPACITY		MAX WORK PRESSURE		MAX LIFT HEIGHT		MAX AIR CAPACITY	
		mm	INCH	mm	INCH	KG	LBS	METRIC TON	US TONS	BAR	PSI	mm	INCH	LITERS	CU. FT
22-88D025	REMOTE PLACEMENT	Ø597 X 114.3	Ø23.5 X 4.50	780 X 153 X 711	30.7 X 6 X 28	27.5	60.6	28	31	10.3	150	660	26	888.3	31.4
22-88D025B	BASIC			731.8 X 123.9 X 711	28.8 X 4.9 X 28	24.6	54.2								
22-88d025C	COMPACT			621.3 X 123.9 X 600.2	24.5 X 4.9 X 23.6	23.4	51.6								

Table 1-1. MULTIFORCE® Lift Bag Reference Data (Continued)





## CHAPTER 2 OPERATION

### 2-1 INTRODUCTION

2-1.1 MULTIFORCE® Lifting Bag Systems are multi-application, portable inflation systems used for lift and displacement of heavy rigid objects, up to 62,000 lbs. (28,123 kilograms), while requiring less than 4.5 inches (11.43 centimeters) of insertion clearance. Total capable lift is 26 inches (66 centimeters). Inflation may be obtained from any air source (self-contained compressed air cylinder, air compressor, truck air brake system, building compressed air system, foot pump, etc.) capable of supplying 150 psi (10.3 Bar) pressure.

2-1.2 MULTIFORCE® Lifting Bag Systems are designed for use in emergency situations such as building collapse, structural containment, vehicular extrication, industrial entrapment, and excavation collapse and containment. The specific situation requiring the use of a MULTIFORCE® Lifting Bag System will be one that benefits from remote placement and high lift.

See Chapter 2-8 (page 2-5) for application examples.

### 2-2 SYSTEM FUNCTIONAL OPERATION.

Functionally, an interconnected MULTIFORCE® Lift Bag System operates as follows:

a. A self-contained air cylinder, air compressor, foot pump or alternate air supply provides the necessary volume and pressure to pressurize the system and ultimately inflate the lift bag.

b. After a lift bag(s) is properly positioned for a lift/displacement, the air supply is “turned on”. High pressure air is reduced by the pressure regulator to a usable 165 psi (11.3 Bar)

c. The reduced air pressure is supplied via an air hose to a 150 psi ALB controller. The controller permits air to flow via air hose(s) to either one or two lift bags permitting a controlled lift/displacement. In the line between the controller and the lift bag(s) are inline relief valve(s) to maintain proper pressure in the lift bags while disconnected from the controller.

d. As air flows into the lift bag, it increases in height resulting in a corresponding lift/displacement. Maximum lift/displacement force occurs at approximately 4.5 inches of inflation height (minimum reduction of the lift bag cross section). As additional air flows into the lift bag, the cross section reduces as the height increases resulting in a corresponding reduction in lift/displacement capacity. The lower portion of the bag inflates first, to assist in stabilizing the load.

e. When the lift bag(s) are to be partially or fully deflated, control(s) on the controller are operated to perform this function as well as prevent any further inlet pressure from flowing beyond the controller.

f. At the conclusion of operation, the air supply is “turned-off”, any residual system air pressure is relieved (“bled off”) through the controller, the system components are disconnected, inspected and stored for later use.

### 2-3 COMPONENT INTERCONNECT PRIOR TO INFLATION.

#### WARNING

Refer to the SAFETY FIRST instructions preceding chapter 1 for those safety first procedures to be followed for each specific operational phase of the application at hand. Regardless of the lift bag applications or environmental conditions, strict adherence to SAFETY FIRST is essential to prevent personnel injury/death and/or equipment damage. It may make a difference between saving a life or endangering/sacrificing another life.

2-3.1 The following procedures describe in detail a typical interconnection of the previously described components comprising a MULTIFORCE® Air Lifting Bag System. This procedure can be accomplished by trained personnel in less than one minute. If the specific application does not require the use of all of the referenced components or some of the components are not available, eliminate the non-applicable steps and proceed with the interconnection. Any adapters,

couplings and/or fittings required in conjunction with the components are addressed generally but not specific during the interconnection. It is assumed these parts are available and will be installed where required in the system.

2-3.2 Refer to Table 1-1 for the lift bag load/displacement and full inflation height when assessing the application at hand. Once proper lift/displacement and height is determined and the individual components selected, it is only necessary to clean, where required, the individual components sufficiently to clear them of any contaminants that would prevent their full engagement and proper locking to each other and to interconnect the components.

**WARNING**

Refer to the SAFETY FIRST instructions preceding chapter 1 and adhere to applicable “prior to inflation” procedures.

**WARNING**

Most steps within this chapter discuss component connection. Check that the quick connect vented (for safety) coupling is fully engaged and locked into position to assure a leak free connection. Be certain to turn the safety locking ring on any quick connect coupling to the locked position as shown in figure 2-1.

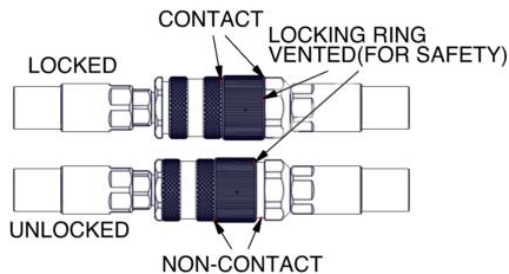


Figure 2-1 Vented (For Safety) Quick Connect Coupling Safety Locking Ring

a. Remove all dust, dirt, oil or grease from the MULTIFORCE® Air Lifting Bag System components. Do not use any system components without first cleaning off any contaminants.

b. Inspect all inlet and delivery fittings for any damage that will permit air leakage. Do not use any component if an air leakage condition is suspected or exists.

c. Attach the high pressure inlet of the pressure regulator to the air supply. Tighten connection to prevent air leakage. Do not over tighten.

d. Check that the pressure regulator shut-off valve is closed (full clockwise). Check that the pressure regulator pressure adjusting knob is full counterclockwise to close the internal needle valve (no flow through the pressure regulator).

e. Attach an air hose quick connect coupling to the pressure regulator air delivery nipple using the appropriate interconnecting fittings as required.

f. Attach the inlet quick connect coupling on a 150 psi ALB controller to the air hose quick connect nipple.

g. Attach the inlet quick connect nipple on a safety inline relief valve to the delivery quick connect coupling on a 150 psi ALB controller . Check that the safety inline relief valve shut-off valve is closed (full clockwise).

h. Using a Dual Deadman 150 psi ALB controller, attach the inlet quick connect nipple on a second safety inline relief valve to the second delivery quick connect coupling on the Dual Deadman 150 psi ALB controller . Check that the safety inline relief valve shut-off valve is closed (full clockwise).

i. Attach an air hose quick connect nipple to the safety inline relief valve delivery quick connect coupling using the appropriate interconnecting fittings as required. Connect additional lengths of air hose of the same color as required.

j. If a second safety inline relief valve is used, attach air hose quick connect nipple to the second safety inline relief valve delivery coupling using the appropriate interconnecting fittings as required. A different colored air hose should be used to permit the rapid and positive identification of the lift bag connected to each side of the controller. Connect additional lengths of air hose of the same color as required.

k. Attach a lift bag nipple to the air hose quick connect coupling.

l. If a second lift bag is being used, attach the second lift bag nipple to the other air hose quick connect coupling.

m. The MULTIFORCE® Air Lifting Bag System is now fully interconnected and can be positioned with any required shoring and/or cribbing, and inflated for a lift/displacement.

## 2-4 NORMAL OPERATING PROCEDURE DURING INFLATION.

Proceed as follows to inflate the lift bag(s) after the individual components are interconnected, (per chapter 2-3) the lift bag(s) are positioned and the necessary shoring and/or cribbing is in position.

### WARNING

Refer to the SAFETY FIRST instructions preceding chapter 1 and adhere to the applicable "during and while inflated" procedures.

### WARNING

Be sure **all** shut-off valves are in a closed position prior to opening the air supply to the system; this will prevent an uncontrolled lift/displacement.

a. **Slowly** open (turn counter-clockwise) the air supply to the pressure regulator. The supply pressure will be indicated on the air supply pressure source gauge as well and on the DIN pressure regulator supply pressure gauge. The delivery pressure is factory preset to 215 psi (14.8 bar).

b. **Slowly** open (turn counter-clockwise) the pressure regulator shut-off valve.

c. Open the shut-off on the safety inline relief valve(s).

### NOTE:

**When operating the lift bag, always inflate slowly and only lift or move the amount necessary.**

d. Press the green inflate button of the Dual Deadman 150 psi ALB controller repeatedly to **slowly** inflate the lift bag to the required height or 150 psi (10.3 bar). Inflating the lift bag(s) slowly will minimize the possibility of shifting. If a second lift bag is interconnected to the controller, operate the second green button inflate the second lift bag. The lift bags may be inflated simultaneously or alternately

e. With the lift bag inflated to the desired height/pressure closed (turn clockwise) the shut-off valve on the safety inline relief valve(s).

f. If additional lift bags are required for the application, proceed as follows;

1. Determine the lift bag to remain inflated and in position. Be sure the shut-off valve on the associated safety inline relief valve is in the off position.

2. Before disconnecting the safety inline relief valve from the controller, be sure to release the pressure between the components by pressing the red button. Be sure the gauge on the controller reads 0 psi before disconnection. Release the vented safety locking ring on the quick connect coupling between the controller and the safety inline relief valve. Disengage the coupling lock ring to release the safety inline relief valve from the controller

3. Attach the inlet port quick connect nipple on a coupling on the controller. Check that the safety inline relief valve shut-off valve is closed (full clockwise).

4. Attach an air hose quick connect nipple to the safety inline relief valve delivery coupling using the appropriate interconnecting fittings as required. Connect additional lengths of air hose as required.

5. Attach a lift bag nipple to the air hose quick connect coupling.

6. Press the green inflate button of the 150 psi ALB controller or dual "Deadman" 150 psi ALB controller repeatedly to **slowly** inflate the lift bag to the required height or 150 psi (10.3 bar). Inflating the lift bag(s) slowly will minimize the possibility of shifting.

7. Adhere to procedural steps 1 through 6 to add any additional quantity of lift bags required for the application.

## 2-5 **CHANGING AIR CYLINDERS.**

### **NOTE**

If the air source for a given application requires the use of air cylinder, it should be changed during inflation whenever the air cylinder pressure falls below 200 psi (13.8 Bar).

a. Close (turn clockwise) the air cylinder and the pressure regulator shut-off valves. The supply pressure gauge on the pressure regulator should indicate 0 psi. The delivery pressure gauge will indicate the regulated pressure until the internal pressure is relieved, any residual system air pressure will be relieved through the controller.

b. Turn the pressure regulator pressure adjusting knob full counter clockwise to close the internal needle valve (no flow through the pressure regulator).

c. As required, turn the nut on the pressure regulator high pressure inlet or interconnecting air cylinder to pressure regulator fitting to the unlocked position. Disengage the inlet nipple to release the air cylinder from the pressure regulator.

d. Attach the high pressure inlet on the pressure safety inline relief valve to the outlet port quick connect regulator to a full air cylinder. Tighten all connections just enough to prevent air leakage. Do not over tighten.

e. Slowly open (turn counter clockwise) the air supply to the pressure regulator. The supply pressure will be indicated on the air supply pressure gauge as well as on the pressure DIN regulator supply pressure gauge. The delivery pressure gauge on the pressure regulator should indicate 0 psi.

f. **Slowly** open (turn counter-clockwise) the pressure regulator shut-off valve.

## 2-6 **NORMAL OPERATING PROCEDURE DURING DEFLATION.**

### **NOTE**

If a lift bag(s) is to be removed after it is deflated, shoring or cribbing must be in position, as required, to restrain the load permitting the removal of the lift bag(s).

a. To either partially or fully deflate an inflated lift bag(s) **disconnected** from a controller, open and close as required the shut-off valve on the safety inline relief valve to slowly achieve the desired deflation. The lift bag design prevents it from deflating rapidly. Alternately opening and closing the shut-off valve will permit a more slowly controlled deflation. This prevents any quick load movements that may cause damage or personnel injury. Repeat for any additional lift bag(s) disconnected from the controller that can be partially or fully deflated.

b. To either partially or fully deflate an inflated lift bag (s) **connected** to a controller, press and release the red Button repeatedly to **slowly** deflate the lift bag. Repeat for an additional lift bag connected to the controller if it can be partially or fully deflated.

c. Gather the system components together in preparation for movement to another work area or for disconnection, post inspection and storage.

## **2-7 COMPONENT DISCONNECTION AFTER DEFLATION.**

The following procedures describe in detail a typical disconnection of the previously described components comprising a MULTIFORCE® Air Lifting Bag System. This procedure can be accomplished by trained personnel in less than one minute. If the specific application did not require the use of all of the referenced components or some of the components are not available, eliminate the non-applicable steps and proceed with the disconnection. Any adapters, couplings and/or air fittings used in conjunction with the components are not addressed during the disconnection.

a. After the lift bag(s) has been removed from its lift/displacement position and the interconnected system components are gathered together, check that the supply pressure gauge and delivery pressure gauge on the pressure regulator indicate 0 psi.

1. If the DIN model supply pressure gauge indicates a pressure other than 0 psi turn off the air supply. Any residual system air pressure will be relieved through the controller. If a significant pressure is still indicated, the air supply shut-off valve is probably defective and air leakage should be anticipated when the air supply is disconnected from the pressure regulator.

2. Be sure the air supply is turned off and press the red Button to exhaust air from the system.

b. Turn the safety locking ring on the air hose quick connect coupling, interconnecting the lift bag, to the unlocked position. Disengage the coupling lock ring to release the lift bag from the air hose.

c. Turn the safety locking ring on the safety inline relief valve quick connect coupling, interconnecting the air hose, to the unlocked position. Disengage the coupling lock ring to release the air hose from the safety inline relief valve.

d. Turn the safety locking ring on the 150 psi ALB controller quick connect coupling, interconnecting the safety inline relief valve, to the unlocked position. Disengage the coupling lock ring to release the safety inline relief valve from the 150 psi ALB controller.

e. If a dual “Deadman” 150 psi ALB controller is used with two safety inline relief valves and associated lift bags, repeat preceding steps b through d.

f. Turn the safety locking ring on the air hose quick connect coupling, interconnecting the pressure regulator to the unlocked position. Disengage the coupling lock ring to release the air hose from the pressure regulator.

g. As required, turn the safety locking ring on the air source fitting quick connect coupling, interconnecting the pressure regulator to the unlocked position. Disengage the coupling lock ring or other fitting to release the pressure regulator from the air source.

h. If the components are not to be immediately reused, perform the post operation inspection and storage in accordance with Chapter 3.

## **2-8 APPLICATIONS.**

2-8.1 MULTIFORCE® Air Lifting Bag Systems are multi-application, portable inflation systems used for lift and displacement of heavy rigid objects, up to 62,000 pounds (28,123 kilograms), while requiring less than 4.5 inches (11.43 centimeters) of bag insertion clearance. Total capable lift is 26 inches (66 centimeters).

2-8.2 MULTIFORCE® Air Lifting Bag Systems are designed for use in emergency situations such as building collapse, structural containment, vehicular extrications, industrial entrapment, and excavation collapse and containment.

2-8.3 In addition to use during emergency situations, MULTIFORCE® Air Lifting Bag Systems are also effectively used for:

a. Preventive and/or corrective maintenance procedures where positioning and aligning heavy equipment and machinery in mills, manufacturing facilities and maintenance shops is required such as

b. Lifting or shifting pipelines requiring welding and maintenance.

c. Breaking out granite and marble blocks and slabs in quarrying operation.

d. Re-railing railroad and mining cars, pre-stressing support columns, general maintenance requiring lifting in rail, mining, underground and subway work.

e. Lifting operations underwater or on unstable, soft ground (mud, sand, snow, strewn debris, etc.) where conventional jacking equipment tends to sink.

2-8.4 In addition to the SAFETY FIRST Procedures in the front of this publication, the following general application notes and procedures should be followed whenever a MULTIFORCE® Air Lifting Bag System is to be employed.

a. All procedures should be used as guidelines, not absolute dictates. Any previous application may, as a result of a seemingly inconsequential change, require modification or possibly completely new procedures to achieve the same result.

b. Lift bags are relatively lightweight, the maximum weight is 60.6 pounds (27.5 kg) for the remote placement model.

c. If a lift bag is being used to lift or displace a thin surface or material, use plywood between the lift bag and the surface to more evenly distribute the applied force.

d. If a lift bag will be used on an icy, greasy or otherwise slick surface, use a granular material such as sand between the lift bag and the surface to increase the coefficient of friction, thereby preventing the lift bag from slipping.

e. Build support cribbing/bracing height to a point that just allows the lift bag(s) to be inserted. Safety

cribbing/bracing must be installed as the load is being lifted, remembering the generally applied rule to “lift an inch, crib an inch”. Care must be exercised to avoid injury and damage in the event of a drop and/or load shift. The top support cribbing/bracing layer must be sufficiently solid to prevent a cribbing/bracing shift and collapse during inflation when the lift bag(s) take on the characteristic double dome shape. Build safety cribbing/bracing after the desired lift to minimize the drop distance in the event of air loss after inflation. After full safety cribbing/bracing is in place, the lift bag may be slowly deflated and removed, and the support cribbing/bracing removed, allowing the load to rest fully on the safety cribbing/bracing.

f. Under no conditions should MULTIFORCE® Air Lifting Bag Systems be stacked.

g. When lifting large cylindrical objects, use a lift bag on both sides of cylinder and wedges to provide an even lift.

## **2-9 LIFT BAG CHEMICAL COMPATIBILITY**

Use the following chemical compatibility table only as a guide in determining the MULTIFORCE® Air Lift Bag resistance to solvents, acids, salts and other chemical solutions. Each commodity is assigned an alpha character to denote its expected effect upon the lift bag. The specific ratings in this table are based upon published literature from various polymer suppliers and manufacturers and “Chemical Resistance Guide for Elastomers II” published by Compass Publications, copyright 1994. Paratech is unable to guarantee their accuracy and therefore assumes no liability for the use thereof.

### **A. - EXCELLENT SERVICE**

Long service may be expected with little reduction in properties due to the exposure. Suitable for continuous service.

### **B. - GOOD SERVICE**

Good service may be expected, but properties will be affected by the exposure. Usually suitable for continuous and intermittent service.

### **C. - FAIR SERVICE**

Fair service may be expected if exposure is limited or infrequent. Not recommended for continuous use but may give some service if it is the only option available.

### **U. - NOT RECOMMENDED FOR CONTINUOUS USE**

### **BLANK - INSUFFICIENT INFORMATION**

The table positions which are not rated indicate insufficient information at the time of publication to determine an accurate rating.

## A

Acetamide.....	B
Acetic Acid 5%.....	A
Acetic Acid 30%.....	A
Acetic Acid, Hot High Press.....	C
Acetic Acid, Glacial.....	U
Acetic Anhydride.....	A
Acetone.....	C
Acetophenone.....	U
Acetyl Acetone.....	U
Acetyl Chloride.....	U
Acetylene.....	
Acetylene Tetrabomide.....	B
Acrylonitrile.....	C
Adipic Acid.....	A
Aero Lubriplate.....	A
Aero Safe 2300.....	U
Aero 2300W.....	U
Aero Shell IAC.....	B
Acero Shell 7A Grease.....	B
Aero Shell 17 Grease.....	B
Aero Shell 750.....	U
Aerozene 50 (50% Hydrazine 50%UDMH).....	U
Air- Below 300°F (148.9°C).....	A
Air Above 300°F (148.9°C).....	U
Alkazene.....	U
Alum-N3Cr-K.....	A
Aluminum Acetate.....	B
Aluminum Bromide.....	A
Aluminum Chloride.....	A
Aluminum Fluoride.....	A
Aluminum Nitrate.....	A
Aluminum Phosphate.....	A
Aluminum Salts.....	A
Aluminum Sulfate.....	A
Ambrex 33 Mobil.....	B
Amines, Mixed.....	B
Ammonia Anhydrous (Liquid).....	A
Ammonia Gas, Cold.....	A
Ammonia Gas, Hot.....	B
Ammonia & Lithium Metal Solution.....	U
Ammonium Carbonate.....	A
Ammonium Chloride.....	A
Ammonium Hydroxide (Concentrate).....	A
Ammonium Nitrate.....	A
Ammonium Nitrite.....	A
Ammonium Persulfate Solution.....	A
Ammonium Persulfate 10%.....	A
Ammonium Phosphate.....	A
Ammonium Phosphate, Mono-Basic.....	A
Ammonium Phosphate, Dibasic.....	A
Ammonium Phosphate, Tribasic.....	A
Ammonium Salts.....	A
Ammonium Sulfate.....	A
Ammonium Sulfide.....	A
Amyl Acetate.....	U
Amyl Alcohol.....	A

Amyl Borate.....	A
Amyl Chloride.....	U
Amyl Chloranaphthalene.....	U
Amyl Naphthalene.....	U
Anderol L-774 (diester).....	U
Anderol L-826 (diester).....	U
Anderol L-829 (diester).....	U
Ang-25 (Glyceral Ester).....	B
Ang-25 (di-ester Base) (TG749).....	U
Anhydrous Ammonia.....	A
Anhydrous Hydrazine.....	B
Anhydrous Hydrogen Fluoride.....	U
Anline.....	U
Anline Dyes.....	B
Anline Hydrchloride.....	U
Anline Oils.....	U
Animal Fats.....	B
Animal Fats (Lard Oil).....	B
AN-O-3 Grade M.....	B
An-O-6.....	B
AN-O-366.....	B
AN-VV-O-366b Hydr Fluid.....	B
Ansul Ether.....	U
Aqua Regia.....	U
Argon.....	U
Aroclor 1248.....	U
Aroclur 1254.....	U
Aroclur 1260.....	A
Aromatic Fuel 50%.....	U
Arsenic Acid.....	A
Arsenic Trichloride.....	A
Askarel.....	U
Asphalt Emulsion.....	U
Asphalt Topping.....	B
ASTM Oil #1.....	A
ASTM Oil #2.....	B
ASTM Oil #3.....	B
ASTM Oil #4.....	U
ASTM Reference Fuel A.....	B
ASTM Reference Fuel B.....	U
ASTM Reference Fuel C.....	U
ATL-857.....	U
Atlantic Dominion F.....	B
Aurex 903R Mobil.....	B
Automatic Transmission Fluid.....	B
Automotive Brake Fluid.....	B

## B

Bardol B.....	U
Barium Chloride.....	A
Barium Hydroxide.....	A
Barium Salts.....	A
Barium Sulfate.....	A
Barium Sulfide.....	A
Bayol D.....	B
Beer.....	A
Beet Sugar Liquors.....	A
Benzaldehyde.....	U

Benzene.....	U
Benzenesulfonic Acid.....	A
Benzine.....	B
Benzochloride.....	U
Benzoic Acid.....	A
Benzophenol.....	U
Benzyl Alcohol.....	B
Benzyl Benzoate.....	U
Benzyl Chloride.....	U
Black Point 77.....	C
Black Suphate Liquors.....	A
Blast Furnace Gas.....	U
Bleach Solutions.....	U
Borax.....	A
Bordeaux Mixture.....	B
Boric Acid.....	A
Boron Fluids (HEF).....	U
Brake Fluid (Non-Petroleum).....	B
Bray GG-130.....	U
Brayco 719-R (WH-910).....	B
Brayco 885 (MIL-L-6085A).....	U
Brayco 910.....	B
Bret 710.....	B
Brine.....	A
Brom-113.....	U
Brom-114.....	B
Bromine.....	U
Bromine Anhydrous.....	U
Bromine Pentafluoride.....	U
Bromine Trifluoride.....	U
Bromine Water.....	B
Bromobenzene.....	U
Bromochloro Trifluoroethane.....	U
Bunker Oil.....	B
Butadiene.....	U
Butane.....	U
Butane 2, 2-Dimethyl.....	B
Butane 2, 3-Dimethyl.....	B
Butanol (Butyl Alcohol).....	A
1-Butene, 2-Ethyl.....	U
Butter.....	B
Butyl Acetate.....	U
Butyl Acetate Ricinoleate.....	U
Butyl Acrylate.....	U
Butyl Alcohol.....	B
Butyl Amine.....	U
Butyl Benzoate.....	U
Butyl Butyrate.....	U
Butyl Carbitol.....	C
Butyl Cellosolve.....	U
Butyl Cellosolve Adipate.....	U
Buty Ether.....	U
Butyl Oleate.....	U
Butyl Stearate.....	U
Butylene.....	C
Butyraldehyde.....	U
Butyric Acid.....	U



## C

Carbon Tetrachloride .....	U
Carbonic Acid .....	A
Castor Oil.....	A
Cellosolve .....	U
Cellosolve Acetate .....	U
Cellosolve Butyl .....	U
Celloguard .....	A
Cellulube A60 (Now Fyrquel) .....	U
Cellulube 90, 100, 150, 220, 300, 500U	
Cellutherm 2505A .....	U
Cetane (Hexadecane) .....	B
China Wood Oil (Tung Oil).....	A
Chloracetic Acid .....	A
Chlorodane .....	C
Chlorextol .....	B
Chlorinated Salt Brine .....	U
Chlorinated Solvents, Dry.....	U
Chlorinated Solvents, Wet .....	U
Chlorine, Dry .....	C
Chlorine, Wet.....	C
Chlorine Dioxide .....	U
Chlorine Dioxide (8% CI as NACIO2 in solution) .....	U
Chlorine Trifluoride.....	U
Chloroacetone .....	C
Chloroacetic Acid .....	U
Chlorobenzene .....	U
Chlorobenzene, (Mono) .....	U
Chlorobromo Methane.....	U
Chlorobutadiene.....	U
Chlorododecane .....	U
Chloroform .....	U
O-Chloronaphthalene.....	U
1-Chloro 1-Nitro Ethane .....	U
Chlorosulfonic Acid.....	U
Chlorotoluene .....	U
Chlorox .....	B
O-Chlorophenol .....	U
Chrome Alum .....	A
Chrome Plating Solutions .....	U
Chromic Acid .....	U
Chromic Oxides 88 Wt % Aqueous Solution.....	U
Circo Light Process Oil.....	B
Citric Acid .....	A
City Service Koolmotor - AP Gear Oil 140-E.P. Lube .....	B
City Service #65, #120, #250.....	B
Cobalt Chloride.....	A
Cobalt Chloride, 2N.....	A
Cocoa nut Oil.....	A
Cod Liver Oil.....	B
Coffee .....	A
Coke Oven Gas.....	U
Coliche Liquors .....	A
Convelex 10 .....	U
Coolanol (Monsanto) .....	A
Copper Acetate .....	B

Copper Chloride .....	A
Copper Cyanide.....	A
Copper Salts .....	A
Copper Sulfate.....	A
Copper Sulfate 10% .....	A
Copper Sulfate 50% .....	A
Corn Oil .....	A
Cottonseed Oil.....	A
Creosols .....	U
Creosote .....	C
Creosote, Coal Tar .....	B
Creosote, Wood Tar .....	B
Creosylic Acid.....	U
Crude Oil.....	U
Cumene .....	U
Cutting Oil .....	B
Cyclohexane.....	U
Cyclohexanol .....	B
P-Cymene.....	U

## D

Decalin .....	U
Decane .....	U
Delco Brake Fluid .....	B
Denatured Alcohol .....	A
Detergent Solutions .....	B
Developing Fluids (Photo) .....	A
Dextron .....	B
Diacetone .....	U
Diacetone Alcohol.....	U
Diazon .....	C
Dibenzyl Ether .....	U
Dibenzyl Sebacate.....	U
Dibromoethyl Benzene.....	U
Dibutylamine.....	U
Dibutyl Ether.....	U
Dibutyl Phthalate.....	U
Dibutyl Sebacate .....	U
O-Dichlorobezene .....	U
P-Dichlorobenzene.....	U
Dichloro-Butane .....	U
Dichloro-Isopropyl Ether .....	U
Dicyclohexylamine .....	U
Diesel Oil .....	B
Di-Ester Lubricant MIL-L7808.....	U
Di-Ester Synthetic Lubricant.....	U
Diethylamine.....	
Diethyl Benzene .....	U
Diethyl Ether.....	U
Diethyl Sebacate .....	U
Diethylene Glycol .....	A
Diffuorodibromomethane .....	U
Disobutylene .....	U
Disocetyl Sebacate .....	U
Disopropyl Benzene .....	U
Disopropyl Ketone .....	U
Dimethyl Aniline.....	U
Dimethyl Formamide .....	U
Dimethyl Phthalate.....	U
Dinitro Tuluene .....	U

Diocetyl Phthalate .....	U
Diocetyl Sebacate.....	U
Dioxane .....	U
Diozolane .....	U
Dipentene .....	U
Diphenyl .....	U
Diphenyl Oxides.....	U
Dow Chemical 50-4.....	B
Dow Chemical ET378 .....	U
Dow Chemical ET588 .....	B
Dow Corning-3.....	A
Dow Corning-4.....	A
Dow Corning-5.....	A
Dow Corning-11.....	A
Dow Corning-33.....	A
Dow Corning-44.....	A
Dow Corning-55.....	A
Dow Corning-200.....	A
Dow Corning-220.....	A
Dow Corning 510 .....	A
Dow Corning-550.....	A
Dow Corning-705.....	A
Dow Corning-710.....	A
Dow Corning-1208.....	A
Dow Corning-4050.....	A
Dow Corning-6620.....	A
Dow Corning-F60.....	A
Dow Corning-F61.....	A
Dow Corning-XF60.....	A
Dow Guard .....	A
Dowtherm Oil.....	U
Dowtherm A or E .....	U
Dowtherm 209, 50% Solution .....	B
Drinking Water.....	B
Dry Cleaning Fluids .....	U
DTE Light Oil .....	B

## E

Elco 28-EP Lubricant .....	C
Epichlorohydrin.....	U
Epoxy Resins.....	A
Esam-6 Fluid .....	B
Esso Fuel 208 .....	B
Esso Golden Gasoline.....	U
Esso Motor Oil .....	C
Esso Transmission Fluid (TypeA) .....	B
Esso WS3812 (MIL-L-7808A) .....	U
Esstic 42, 43 .....	B
Ethane.....	
Ethanol .....	A
Ethanol Amine.....	
Ethers.....	U
Ethyl Acetate-Organic Ester .....	U
Ethyl Acetoacetate.....	U
Ethyl Acrylate.....	U
Ethyl Acrylic Acid.....	B
Ethyl Alcohol .....	A
Ethyl Benzene.....	U
Ethyl Benzoate .....	U
Ethyl Bromide .....	U

Ethyl Cellosolve..... U  
 Ethyl Cellulose ..... B  
 Ethyl Chlorocarbonate ..... U  
 Ethyl Chloroformate ..... U  
 Ethyl Cyclopentane..... C  
 Ethyl Ether..... U  
 Ethyl Formate ..... B  
 Ethyl Hexanol ..... A  
 Ethyl Mercaptan..... C  
 Ethyl Oxalate ..... U  
 Ethyl Pentachlorobenzene..... U  
 Ethyl Silicate..... A  
 Ethylene..... A  
 Ethylene Chloride ..... U  
 Ethylene Chlorohydrin..... B  
 Ethylene Diamine ..... A  
 Ethylene Dibromide..... U  
 Ethylene Dichloride ..... U  
 Ethylene Glycol ..... A  
 Ethylene Oxide ..... U  
 Ethylene Trichloride ..... U  
 Ethylmorpholine Stannous Octoate  
 (50/50 Mixture).....

## F

F-60 Fluid (Dow Corning)..... A  
 F-61 Fluid (Dow Corning)..... A  
 Fatty Acids..... B  
 FC-43 Heptacosofluorotributylamine A  
 FC75 Fluorocarbon ..... A  
 Ferric Chloride..... A  
 Ferric Nitrate..... A  
 Ferric Sulfate ..... A  
 Fish Oil ..... A  
 Fluoroboric Acid..... A  
 Fluorine (Liquid) ..... C  
 Fluorobenzene ..... U  
 Fluorocarbon Oils ..... A  
 Fluorolube..... A  
 Fluorinated Cyclic Esters..... U  
 Fluosilicic Acid..... A  
 Formaldehyde .....  
 Formic Acid..... A  
 Freon, 11 ..... U  
 Freon, 12 ..... A  
 Freon, 12 and ASTM Oil #2 (50/50  
 Mixture)..... B  
 Freon, 12 ans Suniso 4G -(50/50  
 Mixture)..... B  
 Freon, 13..... A  
 Freon 13B1 ..... A  
 Freon, 14..... A  
 Freon, 21 ..... B  
 Freon, 22..... A  
 Freon, 22 and ASTM Oil (50/50  
 Mixture)..... B  
 Freon, 31 ..... A  
 Freon, 32..... A  
 Freon, 112..... B  
 Freon, 113..... A

Freon, 114 ..... A  
 Freon, 114B2..... A  
 Freon, 115 ..... A  
 Freon, 142b ..... A  
 Freon, 152a ..... A  
 Freon, 218 ..... A  
 Freon, C316..... A  
 Freon, C318..... A  
 Freon, 502 ..... A  
 Freon, 502 ..... A  
 Freon, BF ..... B  
 Freon, MF ..... U  
 Freon, TF..... A  
 Freon, TA..... A  
 Freon, TC ..... A  
 Freon, TMC..... B  
 Freon, T-P35 ..... A  
 Freon, T-WD602..... B  
 Freon, PCA ..... A  
 Fuel Oil ..... B  
 Fuel Oil, Acidic..... B  
 Fuel Oil, #6 ..... U  
 Fumaric Acid..... B  
 Fuming Sulpharic Acid - (20/25%  
 Oleum)..... U  
 Furan (Furfuran)..... U  
 Furfural ..... B  
 Furfuraldehyde..... B  
 Furfaryl Alcohol..... U  
 Furyl Carbinol..... U  
 Fryquel A60 ..... U  
 Fryquel 90,100,150,220,300,500..... U

## G

Gallic Acid ..... B  
 Gasoline ..... B  
 Gelatin..... A  
 Girling Brake Fluid ..... B  
 Glacial Acetic Acid ..... U  
 Glauber's Salt ..... A  
 Glucose ..... A  
 Glue (Depending ion Type)..... A  
 Glycerine-Glycerol..... A  
 Glycols ..... A  
 Green Suphate Liquor ..... B  
 Gulfcrown Grease ..... B  
 Gulf Endurance Oils..... B  
 Gulf FR Fluids (Emulsion)..... B  
 Gulf FRG-Fluids ..... A  
 Gulf FRP-Fluids ..... U  
 Gulf Harmony Oils..... B  
 Gulf High Temperature Grease ..... B  
 Gulf Legion Oils ..... B  
 Gulf Paramount Oils ..... B  
 Gulf Sucurity Oils ..... B

## H

Halothane..... U  
 Hannifin Lube A ..... A  
 Heavy Water ..... B  
 HEF-2 (High EnergyFuel)..... U

Helium..... A  
 N-Heptane ..... B  
 N-Hexaldehyde..... A  
 Hexane..... U  
 N-Hexane-1 ..... B  
 Hexyl Alcohol .....  
 High Viscosity Lubricant, U4..... B  
 High Vicosity lubricant, H2..... B  
 Hilo MS #1 ..... U  
 Houghto-Safe 271 (Water and Glycol  
 Base)..... B  
 Houghto-Safe 620 (Water/Glycol)..... B  
 Houghto-Safe 1010, Phosphate Ester U  
 Houghto-Safe 1120, Phosphate Ester U  
 Houghto-Safe 5040  
 (Water/OilEmulsion) ..... B  
 Hydraulic Oil (Petroleum Base) ..... B  
 Hydrazine ..... U  
 Hydrobromic Acid..... U  
 Hydrobromic Acid 40%..... B  
 Hydrocarbons (Saturated)..... B  
 Hydrochloric Acid Hot 37% ..... U  
 HydrochloricAcid Cold 37% ..... B  
 Hydrochloric Acid 3 Molar ..... C  
 Hydrochloric Acid Concentrated ..... U  
 Hydrocyanic Acid..... B  
 Hydro-Drive, MIH-50 (Petroleum  
 Base)..... B  
 Hydro-Drive, MIH-10 (Petroleum  
 Base)..... B  
 Hydrofluoric Acid, 65% Max. Cold .. A  
 Hydrofluoric Acid, 65%Min.Cold .... U  
 Hydrofluoric Acid, 65%Max. Hot ..... C  
 Hydrofluoric Acid, 65% Min. Hot..... U  
 Hydrofluosilicic Acid ..... B  
 Hydrogen Gas, Cold ..... A  
 Hydrogen Gas, Hot..... A  
 Hydrogen Peroxide (1) ..... B  
 Hydrogen Peroxide 90%(1) ..... U  
 Hydrogen Sulfide Dry, Cold ..... A  
 Hydrogen Sulfide Dry, Hot..... B  
 Hydrogen Sulfide Wet, Cold ..... A  
 Hydrogen Sulfide Wet, Hot ..... B  
 Hydrolube-Water/Ethylene Glycol..... B  
 Hydroquinone ..... U  
 Hydyne ..... B  
 Hyjet..... U  
 Hyjet III ..... U  
 Hyjet S ..... U  
 Hyjet W ..... U  
 Hypochlorous Acid..... U

## I

Industron FF44 ..... B  
 Industron FF48 ..... B  
 Industron FF53 ..... B  
 Industron FF80 ..... B  
 Iodine..... U  
 Iodine Pentafluoride ..... U  
 Isobutyl Alcohol .....  
 Iso-Butyl N-Butyrate ..... U

Isododecane .....	B
Iso-Octane.....	B
Isophorone (Ketone) .....	U
Isopropanol .....	A
Isopropyl Acetate.....	U
Isopropyl Alcohol .....	A
Isopropyl Chloride .....	U
Isopropyl Ether .....	U

## J

JP 3 (MIL-J-5624) .....	U
JP 4 (MIL-J-5624) .....	U
JP 5 (MIL-J-5624).....	U
JP-6(MIL-J-25656).....	U
JP X (MIL-F-25604).....	B

## K

Kel F Liquids Kerosene .....	C
Keystone #87HX-Grease .....	U

## L

Lactams-Amino Acids .....	B
Lactic Acid, Cold.....	
Lactic Acid, Hot.....	U
Lacquers .....	U
Lacquer Solvents .....	U
Lactic Acids .....	A
Lard, Animal Fats .....	B
Lavender Oil .....	U
Lead Acetate .....	B
Lead Nitrate .....	A
Lead Sulfamate .....	A
Lehigh X1169 .....	B
Lehigh X1170 .....	B
Light Grease .....	U
Ligroin (Petroleum Ether or Benzine) B	
Lime Bleach.....	B
Lime Sulphur.....	A
Lindol, Hydraulic Fluid (Phosphate Ester Type) .....	U
Linoleic Acid.....	U
Linseed Oil .....	A
Liquid Oxygen.....	U
Liquid Petroleum Gas (LPG) .....	B
Liquimoly .....	B
Lubricating Oils, Diester.....	C
Lubricating Oils, Petroleum Base .....	B
Lubricating Oils, SAE 10, 20, 30, 40, 50 .....	B
Lye Solutions.....	A

## M

Magnesium Chloride.....	A
Magnesium Hydroxide .....	B
Magnesium Sulfate .....	A
Magnesium Sulfite.....	A
Magnesium Salts.....	A
Malathion.....	
Maleic Acid .....	U
MCS 312.....	U
MCS 352.....	U

MCS 463 .....	U
Mercuric Chloride .....	A
Mercury.....	A
Mercury Vapors .....	A
Mesityl Oxide (Ketone).....	U
Methane .....	
Methanol .....	A
Methyl Acetate.....	
Methyl Acetoacetate.....	U
Methyl Acrylic Acid .....	B
Methyl Alcohol .....	B
Methyl Benzoate .....	U
Methyl Bromide .....	U
Methyl Butyl Ketone.....	U
Methyl Carbonate.....	U
Methyl Cellosolve .....	B
Methyl Chloride .....	U
Methyl Chloroformate.....	U
Methyl D-Bromide.....	U
Methyl Cyclopentane .....	U
Methylene Chloride.....	U
Methyl Dichloride .....	U
Methyl Ether .....	C
Methyl Ethyl Ketone (MEK) .....	U
Methyl Ethyl Ketone Peroxide .....	U
Methyl Formate .....	B
Methyl Isobutyl Ketone (MIBK).....	U
Methyl Isopropyl Ketone .....	U
Methyl Methacrylate .....	U
Methyl Oleate.....	U
Methyl Salicylate .....	U
MIL-L-644B .....	C
MIL-L-2104B.....	A
MIL-L-2105B.....	A
MIL-G-2108.....	A
MIL-S-3136B, Type I Fuel .....	B
MIL-S-3136B, Type II Fuel.....	U
MIL-S-3136B, Type III Fuel.....	U
MIL-S-3136B, Type IV.....	A
MIL-S-3136B, Type V.....	B
MIL-S-3136B, Type VI.....	U
MIL-S-3136B, Type VII .....	C
MIL-L-3150A .....	B
MIL-G-3278.....	U
MIL-L-3503 .....	B
MIL-L-3545B.....	B
MIL-C-4339C .....	U
MIL-G-4343B .....	B
MIL-L-5020A .....	B
MIL-J-5161F.....	U
MIL-C-5545A .....	B
MIL-H-5559A.....	B
MIL-F-5566 .....	B
MIL-G-5572.....	U
MIL-F-5602 .....	B
MIL-H-5606B .....	B
MIL-J-5624G, JP-3 .....	U
MIL-J-5624G, JP-4 .....	U
MIL-J-5624, JP-5 .....	U
MIL-L-6081C.....	B

MIL-L-6082C.....	B
MIL-H-6083C .....	B
MIL-L-6085A.....	U
MIL-L-6086B.....	A
MIL-A-6091 .....	A
MIL-L-6387.....	A
MIL-C-6529C.....	B
MIL-F-7024A .....	U
MIL-H-7083A .....	B
MIL-G-7118A .....	C
MIL-G-7187 .....	U
MIL-G-7421A .....	C
MIL-H-7644 .....	B
MIL-L-7645.....	B
MIL-G-7711A .....	U
MIL-L-7808F .....	U
MIL-L-7870A.....	B
MIL-C-8188C.....	U
MIL-A-8243B .....	B
MIL-L-8383B .....	A
MIL-H-8446B .....	B
MIL-I-8660B .....	A
MIL-L-9000F .....	B
MIL-T-9188B.....	U
MIL-L-9236B.....	U
MIL-E-9500.....	A
MIL-L-10295A.....	B
MIL-L-10324A.....	B
MIL-G-10924B .....	U
MIL-L-11734B.....	C
MIL-O-11773 .....	C
MIL-P-12098.....	B
MIL-H-13862 .....	B
MIL-H-13866A .....	B
MIL-H-13910B .....	B
MIL-H-13919A .....	B
MIL-L-14107B.....	A
MIL-L-15016.....	B
MIL-L-15017.....	B
MIL-15018B.....	A
MIL-L-15019A.....	A
MIL-L-15719A.....	B
MIL-G-15793 .....	C
MIL-F-16884.....	C
MIL-F-16929A.....	C
MIL-L-16958A.....	B
MIL-F-17111.....	B
MIL-L-17331D.....	B
MIL-L-17353A.....	C
MIL-L-17672B .....	A
MIL-L-18486A.....	A
MIL-G-18709A .....	A
MIL-H-19457B .....	U
MIL-F-19605.....	C
MIL-L-19701.....	C
MIL-L-2126- .....	B
MIL-G-21568A .....	A
MIL-H-22072 .....	B
MIL-H-22251 .....	B
MIL-L-22396.....	A

MIL-L-23699A..... C  
 MIL-G-23827A..... C  
 MIL-G-25013D..... B  
 MIL-F-25172..... C  
 MIL-L-25336B..... C  
 MIL-F-25524A..... C  
 MIL-G-25537A..... B  
 MIL-F-25558B..... B  
 MIL-F-25576C..... C  
 MIL-H-25598..... B  
 MIL-F-25656B..... U  
 MIL-L-25681C..... B  
 MIL-G-25760A..... C  
 MIL-L-25968..... C  
 MIL-L-26087A..... A  
 MIL-G-27343..... A  
 MIL-P-27402..... B  
 MIL-H-27601A..... B  
 MIL-G-27617.....  
 MIL-I-27686D..... B  
 MIL-L-27694A..... A  
 MIL-L-46000A..... C  
 MIL-H-46001A..... A  
 MIL-L-46002..... A  
 MIL-H-46004..... B  
 MIL-P-46064A..... B  
 MIL-H-81019B..... B  
 MIL-S-81087..... A  
 MIL-H-83282..... B  
 Milk..... A  
 Mineral Oils..... A  
 Mobil 24 DTE..... B  
 Mobil HF..... B  
 Mobil Delvac 1100, 1110, 1120, 1130B.....  
 Mobil Nivac 20 and 30..... A  
 Mobil Velocite C..... B  
 Mobilgas WA200, Type Automatic.....  
 Trans. Fluid..... B  
 Mobil Oil SAE 20..... B  
 Mobiltherm 600..... B  
 Mobilux..... B  
 Mono Bromobenzene..... U  
 Mono Chlorobenzene..... U  
 Mono Ethanolamine..... U  
 Monomethyl Aniline..... U  
 Monmethyl Ether..... A  
 Monmethyl Hydrazine..... B  
 Monoitroluene & DinitrotolueneÊ  
 (40/60 Mix.)..... U  
 Monovinyl Acetylene..... B  
 Mopar Brake Fluid..... B  
 Mustard Gas..... A

## N

Naptha..... U  
 Napthalene..... U  
 Naphthalenic Acid..... U  
 Natural Gas..... A  
 Neatsfoot Oil..... U  
 Neon..... A

Neville Acid..... U  
 Nickel Acetate..... B  
 Nickel Chloride..... B  
 Nickel Salts..... B  
 Nickel Sulfate..... A  
 Niter Cake..... A  
 Nitric Acid (1) 3 Molar..... U  
 Nitric Acid (1) Concentrated..... U  
 Nitric Acid Dilute..... B  
 Nitric Acid (1) Red Fuming(RFNA) ..U  
 Nitric Acid (1)Inhibited, Red fuming  
 (IRFNA)..... U  
 Nitrobenzene..... U  
 Nitrobenzine..... U  
 Nitroethane..... C  
 Nitrogen..... A  
 Nitrogen(Tetroxide(N2O4)(1))..... U  
 Nitromethane..... C  
 Nitropropane..... U

## O

O-A-548A..... B  
 O-T-6324b..... U  
 Octachloro toluene..... U  
 Octadecane..... B  
 N-Octane..... U  
 Octyl Alcohol..... B  
 Oleic Acid..... C  
 Oleum (Fuming Sulfuric Acid)..... U  
 Oleum Spirits..... C  
 Olive oil..... B  
 Oronite 8200..... A  
 Oronite 8515..... A  
 Orthochloro Ethyl Benzene..... U  
 Ortho-Dichlorobenzene..... U  
 OS 45 Type III(OS45)..... A  
 OS 45 Type IV (OS45-1)..... A  
 OS70..... A  
 Oxalic Acid..... B  
 Oxygen, Cold..... A  
 Oxygen, Cold 200-400°F..... U  
 Ozone..... C

## P

P-S-66lb..... C  
 P-D-680..... C  
 Paint Thinner, Duco..... U  
 Palmitic Acid..... B  
 Para-dichlorobenzene..... U  
 Par-al-Ketone..... U  
 Parker O Lube..... A  
 Peanut Oil..... B  
 Pentane, 2 Methyl..... B  
 Pentane, 2-4 Dimethyl..... B  
 Pentane, 3 Methyl..... B  
 N-Pentane..... A  
 Perchloric Acid..... B  
 Perchloroethylene..... U  
 Petroleum Oil, Crude..... B  
 Petroleum Oil, Below 250°F(121.1°C)  
 ..... B

Petroleum Oil, Above 250°F(121.1°C)  
 ..... U  
 Phenol..... U  
 Phenol, 70%/30% H2O..... U  
 Phenol, 85%/15% H2O..... U  
 Phenylbenzene..... U  
 Phenyl Ethyl Ether..... U  
 Phenyl Hydrazine..... U  
 Phorone..... U  
 Phosphoric Acid 20%..... B  
 Phosphoric Acid 45%..... B  
 Phosphoric Acid, 3 Molar..... C  
 Phosphoric Acid, Concentrated..... U  
 Phosphorous Trichloride Acid..... U  
 Pickling Solution..... U  
 Picric Acid, H2O Solution.....  
 Picric Acid, Molten..... U  
 Pinene..... C  
 Pine Oil..... U  
 Piperidine..... U  
 Plating Solutions, Chrome..... U  
 Plating Solutions, Others.....  
 Pneumatic Service..... A  
 Polyvinyl Acetate Amulsion..... B  
 Potassium Acetate..... B  
 Potassium Chloride..... A  
 Potassium Cupro Cyanide..... A  
 Potassium Cyanide..... A  
 Potassium Dichromate..... A  
 Potassium Hydroxide..... A  
 Potassium Nitrate..... A  
 Potassium Salts..... A  
 Potassium Sulfate..... A  
 Potassium Sulfite..... A  
 Prestone Antifreeze..... A  
 PRL-High Temp. Hydr. Oil..... B  
 Producer Gas..... B  
 Propane..... B  
 Propane Propionitrile..... B  
 Propyl Acetate..... U  
 N-Propyl Acetone..... U  
 Propyl Alcohol..... A  
 Propyl Nitrate..... U  
 Propylene Oxide..... U  
 Pyranol, Transformer Oil..... B  
 Pyranol..... U  
 Pydraul, 10E, 29ELT..... U  
 Pydraul, 30E, 50E, 65E, 90E..... U  
 Pydraul, 115E..... U  
 Pydraul, 230E, 312C, 540C..... U  
 Pyridine Oil..... U  
 Pyrogard 42, 43, 53, 55 (Phosphate  
 Ester)..... U  
 Pyrogard, C, D..... B  
 Pyrolingneous Acid..... U  
 Pyrolube..... U  
 Pyrrole..... U

## R

Radiation..... C  
 Rapeseed Oil..... B

Red Oil (MIL-H-5606) .....	B
Red Line 100 Oil .....	B
RJ-1 (MIL-F-25558) .....	B
RP-1 (MIL-R-25576) .....	B

## S

Sal Ammoniac .....	A
Salicylic Acid .....	C
Salt Water .....	A
Santo Safe 300 .....	U
Sewage .....	B
Shell Alvania Grease #2 .....	B
Shell Carnea 19 and 29 .....	U
Shell Diala .....	B
Shell Iris 905 .....	A
Shell Iris 3XF Mine Fluid (Fire Resist. Hydr.) .....	B
Shell Iris Tellus #27, Pet. Base .....	B
Shell Iris Tellus #33 .....	B
Shell Iris UMF (5% Aromatic) .....	B
Shell Lo Hydrax 27 and 29 .....	B
Shell Macoma 72 .....	B
Silicate Esters .....	A
Silicone Greases .....	A
Silicone Oils .....	A
Silver Nitrate .....	A
Sinc;air Opaline CS-EP Lube .....	B
Skelly, Solvent B, C, E .....	U
Skydrol 500 .....	U
Skydrol 7000 .....	U
Soap Solutions .....	A
Socony Vacuum AMV AC781 (Grease) .....	B
Socony Vacuum PD959B .....	B
Soda Ash .....	A
Sodium Acetate .....	B
Sodium Bicarbonate (Baking Soda) .....	A
Sodium Bisulfite .....	A
Sodium Borate .....	A
Sodium Carbonate (Soda Ash) .....	A
Sodium Chloride .....	A
Sodium Cyanide .....	A
Sodium Hydroxide .....	B
Sodium Hypochlorite .....	B
Sodium Metaphosphate .....	B
Sodium Nitrate .....	B
Sodium Perborate .....	B
Sodium Peroxide .....	B
Sodium Phosphate (Mono) .....	B
Sodium Phosphate (Dibasic) .....	A
Sodium Phosphate (Tribasic) .....	B
Sodium Salts .....	B
Sodium Silicate .....	A
Sodium Sulfate .....	A
Sodium Sulfide .....	A
Sodium Sulfite .....	A
Sodium Thiosulfate .....	A
Sovasol #1, 2 and 3 .....	B
Sovasol #73 and 74 .....	B
Soybean Oil .....	A

Spry .....	B
SR-6 Fuel .....	U
SR-10 Fuel .....	U
Standard Oil Mobilube GX90-EP Lube .....	B
Stannic Chloride .....	B
Stannic Chloride 50% .....	U
Stannous Chloride .....	A
Staulfer 7700 .....	U
Steam, Below 350°F (176.7°C) .....	U
Steam, Above 350°F (176.7°C) .....	U
Stearic Acid .....	B
Stoddard Solvent .....	C
Styrene .....	U
Styrene (Monomer) .....	U
Sucrose Solutions .....	A
Sulfite Liquors .....	B
Sulfur .....	A
Sulfur Chloride .....	U
Sulfur Dioxide, Wet .....	B
Sulfur Dioxide, Dry .....	U
Sulfur Dioxide, Liquodified under pressure .....	U
Sulfur Hexafluoride .....	A
Sulfur Liquors .....	B
Sulfur Molten .....	C
Sulfur Trioxide .....	U
Sulfuric Acid Dilute .....	B
Sulfuric Acid Concentrated .....	U
Sulfuric Acid 20% Oleum .....	U
Sulfuric Acid 3 Molar .....	C
Sulfurous Acid .....	B
Sunoco SAE 10 .....	B
Sunoco #3661 .....	B
Sunoco All Purpose Grease .....	B
Sunsafe(Fire Resist Hydr.Fluid) .....	B
Super Shell Gas .....	B
Swan Finch EP Lube .....	U
Swan Finch Hypoid-90 .....	B

## T

TT-N-95a .....	C
TT-N-97B .....	C
TT-I-735b .....	B
TT-S-735, Type I .....	B
TT-S-735, Type II .....	C
TT-S-735, Type III .....	C
TT-S-735, Type IV .....	A
TT-S-735, Type V .....	B
TT-S-735, Type VI .....	B
TTT-656b .....	U
Tannic Acid .....	B
Tannic Acid, 10% .....	A
Tar Bituminous .....	C
Tartaric Acid .....	U
Terpineol .....	U
Tertiary Butyl Alcohol .....	B
Tertiary Butyl Catechol .....	B
Tertiary Butyl Mercaptan .....	U
Tetrabromomethane .....	U
Tetrabutyl Titanate .....	B

Tetrachloroethylene .....	U
Tetraethyl Lead .....	U
Tetraethyl Lead "Blend" .....	U
Tetrahydrofuran .....	U
Tetralin .....	U
Texaco 3450 Gear Oil .....	U
Texaco Capella A and AA .....	B
Texaco Meropa #3 .....	B
Texaco Regal B .....	U
Texaco Uni-Temp. Grease .....	B
Texamatic "A" Transmission Oil .....	B
Texamatic 1581 Fluid .....	B
Texamatic 3401 Fluid .....	B
Texamatic 3525 Fluid .....	B
Texamatic 3528 Fluid .....	B
Texas 1500 Oil .....	B
Thiokol TP-908 .....	B
Thiokol TP-95 .....	B
Thionyl Chloride .....	U
Tidewater Oil-Beedol .....	B
Tidewater Oil-Multigear 140, EP Lube .....	B
Titanium Tetrachloride .....	U
Toluene .....	U
Toluene Diisocyanate .....	U
Transformer Oil .....	B
Transmission Fluid Type A .....	B
Triacetin .....	B
Triaryl Phosphate .....	U
Tributoxyethyl Phosphate .....	U
Tributyl Mercaptan .....	U
Tributyl Phosphate .....	U
Trichloroacetic Acid .....	U
Trichloroethane .....	U
Trichloroethylene .....	U
Tricresyl Phosphate .....	B
Triethanol Amine .....	U
Triethyl Aluminum .....	U
Triethyl Borane .....	U
Trifluoroethane .....	U
Trinitrotoluene .....	A
Trioctyl Phosphate .....	U
Tripoly Phosphate .....	B
Tung Oil (China Wood Oil) .....	B
Turbine Oil .....	U
Turbine Oil #15 (MIL-L-7808A) .....	U
Turbine Oil #35 .....	B
Turpentine .....	U
Type I, Fuel (MIL-S-3136) .....	B
Type II Fuel (MIL-S-3136) .....	U
Type III Fuel (MIL-S-3136) .....	U

## U

Ucon Hydrolube J-4 .....	B
Ucon Lubricant LB-65 .....	A
Ucon Lubricant LB-135 .....	A
Ucon Lubricant LB-285 .....	A
Ucon Lubricant LB-300 .....	A
Ucon Lubricant LB-625 .....	A
Ucon Lubricant LB-1145 .....	A
Ucon-Lubricant 50-HB55 .....	A

Ucon-Lubricant 50-HB100 ..... A  
 Ucon Lubricant 50-HB260 ..... A  
 Ucon Lubricant 50-HB660 ..... A  
 Ucon Lubricant 50-HB5100 ..... A  
 Ucon Oil LB-385 ..... A  
 Ucon Oil LB-400X ..... A  
 Ucon 50-HB-280X (Polyacrylon  
 Glycol Deriv.) ..... A  
 Univis 40 (Hydr. Fluid) ..... B  
 Univolt #35 (Mineral Oil)..... B  
 Unsymmetrical Dimethyl Hydrazine  
 (UDMH) ..... B

## V

VV-B-680 ..... B  
 VV-G-632 ..... A  
 VV-G-671c ..... A  
 VV-H-910 ..... B  
 VV-I-530a ..... B

VV-K-211d ..... C  
 VV-K-220a ..... B  
 VV-L-751b ..... B  
 VV-L-800 ..... B  
 VV-L-820b ..... B  
 VV-L-825a, Type I ..... A  
 VV-L-825a, Type II ..... A  
 VV-L-825a, Type III ..... B  
 VV-O-526 ..... A  
 VV-P-216a ..... B  
 VV-P-236 ..... B  
 Varnish ..... U  
 Vegetable Oil ..... C  
 Versilube ..... A  
 Vinegar ..... B  
 Vinyl Chloride ..... U

## W

Wagner 21B Brake Fluid ..... B  
 Water ..... A

Wemco C ..... B  
 Whiskey and Wines ..... A  
 White Pine Tar ..... U  
 White Oil ..... B  
 Wolmar Salt ..... B  
 Wood Alcohol ..... A  
 Wood Oil ..... B

## X

Xylene ..... U  
 Xylidenes-Mixed-Aromatic Amines.. U  
 Xylol ..... U  
 Xenon ..... A

## Z

Zeolites ..... A  
 Zinc Acetate ..... B  
 Zinc Chloride ..... A  
 Zinc Salts ..... A  
 Zinc Sulfate ..... A



## CHAPTER 3 MAINTENANCE AND STORAGE

### 3-1 GENERAL.

The major components and accessories of a MULTIFORCE® Air Lifting Bag System require little maintenance to ensure optimum performance. However, this maintenance must be performed to ensure personnel and equipment safety, and the assurance that when the system is to be utilized, it will function as designed and intended. This chapter provides preventive and corrective maintenance procedures that are necessary to verify that the MULTIFORCE® Air Lifting Bag System will operate satisfactorily.



Do not drag or drop the bag on the nipple area, as this can cause breakage of the brass inflation fitting and render the bag useless. ***BREAKAGE OF THE BRASS INFLATION FITTING IS NOT COVERED UNDER WARRANTY.***

### 3-2 PREVENTIVE MAINTENANCE PLAN.

Preventive maintenance of the MULTIFORCE® Air Lifting Bag System is accomplished in accordance with paragraphs 3-3 and 3-4.

### 3-3 POST OPERATION PREVENTIVE MAINTENANCE

Because of the contaminants present where a MULTIFORCE® Air Lifting Bag System is generally used (maintenance sites, construction sites, accident sites, etc.), it is important that the system components be thoroughly cleaned, inspected and prepared for their next use before being placed in storage.

#### 3-3.1 CLEANING



Do not use any petroleum based product to clean components of the MULTIFORCE® Air Lifting Bag System. Petroleum based products could adversely react with the non-metallic parts of the system components and may result in a component failure when none should be expected or tolerated.

a. Keep the exterior of all components clean of all dirt, grit, oil and grease accumulations. Except for the lift bag(s), wipe the exterior surfaces with a lint free cotton machinery wiping towel **LIGHTLY** dampened with soap and warm water solution. Be particularly careful to remove all dirt, sand, grit, etc. from quick connect couplings and nipples. Swirl in a bucket with the soap and water solution until clean. Rinse with a wiping towel **LIGHTLY** dampened with clean water. Then dry the surfaces thoroughly with a clean, dry wiping towel or low pressure compressed air. Also clean the lift bag with a soap and warm water solution, but scrub the lift bag with a stiff bristle broom or brush and rinse by spraying with cold water. If the cleaning solution or rinse water gets into the lift bag through the nipple, allow the lift bag to dry thoroughly before its next use.

#### 3-3.2 INSPECTION.

a. While the lift bag is still wet with the cleaning solution, inflate to 30 psi and check for air bubbles denoting a leak(s). Except for air leakage from between the air inlet fitting and the male nipple, replace rather than attempt to repair a leaking lift bag. If air leakage is detected from around the male nipple threads, proceed as follows:

1. Deflate the lift bag.
2. Disconnect the quick connect coupling from the lift bag male nipple.

### **WARNING**

The nipple of the MULTIFORCE® air bag has **LEFT HANDED** threads. When removing or installing a replaceable male nipple from/into a lift bag inlet fitting, be sure to hold the air bag over inlet fitting stationary while turning the male nipple. (**LEFT HANDED**) Allowing it to turn, will loosen its bond with the lift bag. During operation, this will result in air leakage or possibly the ejection of the fitting, resulting in a hazardous condition and rendering the lift bag useless.

3. Unscrew the lift bag **left handed** male nipple by inserting a 3/16" hex key into the hex socket located in the air inlet hole of the fitting and rotating it **clockwise**. Be sure to hold the air bag over the inlet fitting stationary.



4. Clean the interfacing threads and inspect the male nipple for visual damage. If damaged, discard. If not damaged, install back into the inlet fitting by turning it counter-clockwise. **The nipple is to be torqued to 84 in.\*lbs (7 ft.\*lbs).**

5. Reconnect the lift bag to an air source, reinflate to 30 psi and recheck for air leaks. If none are found, deflate the lift bag, disconnect the quick connect coupling and install the tethered protective cap over the male nipple in preparation for storage.

b. –After a lift bag is clean and dry, all surfaces should be thoroughly inspected for cuts, abrasion, air bubbles and bulges (ply separation), and other similar damage. Remove all debris from the surface. Minor surface cuts and abrasion can be repaired with rubber cement and should not be considered a problem unless they are deep enough to expose Kevlar reinforcement layer

c. Inspect the remote lift base for damage including, cracks, chips, deformation, and excessive slider puck wear. Make sure the handle assembly extends/contracts smoothly, locks into four positions, and has a functioning quick disconnect.

d. Inspect hose assemblies for cuts, cracks, crimps and brittleness. Inspect the hose quick connect coupling and nipple for secureness of attachment and burr, nicks, corrosion and other similar damage that would prevent a leak proof interconnection.

e. Refer to the separate instruction manuals provided with the pressure regulator and controllers to inspect these components.

f. If during the last three (3) months the MULTIFORCE® Air Lifting Bag System and accessories have not been used for training or actual operational functions, they should be field tested to ensure they do not leak and are fully operational in preparation for their next use.

### 3-3.3 **REPAIR**

The only repairs authorized on MULTIFORCE® Air Lifting Bag System components are those designated in the separate instruction manuals provided with the pressure regulator and 150 psi ALB controllers, and the following procedures detailing replacement of the quick connect couplings and nipples.

a. **AIR HOSE NIPPLE REPLACEMENT.** Refer to figure 3-1 and replace a worn or otherwise damaged air hose nipple in accordance with the following procedure.

1. Square cut the air hose just behind the ferrule to release the nipple. Discard the nipple but the ferrule can be reused if not damaged.
2. Screw the ferrule counterclockwise fully onto the hose and back the ferrule out 1/2 turn. There should be approximately 1/16 inch clearance between the ferrule inside shoulder at the end of the hose.
3. Hold the ferrule stationary and turn the nipple clockwise into the ferrule until it is fully seated.

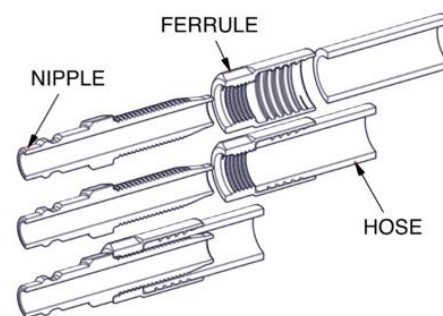


Figure 3-1. Air hose Nipple Replacement

b. **AIR HOSE QUICK CONNECT COUPLING REPLACEMENT.** Refer to figure 3-2 and replace a worn or otherwise damaged air hose quick connect coupling in accordance with the following procedure.

1. Square cut the air hose just behind the ferrule to release the quick connect coupling stem and the assembled ferrule (quick connect coupling). Discard the quick connect coupling but the ferrule can be reused if not damaged.
2. Unscrew the ferrule from the quick connect coupling stem. Screw the ferrule, counterclockwise, fully onto the hose and back the 1/2 turn. There should be approximately 1/16 inch clearance between the ferrule inside shoulder at the end of the hose.
3. Hold the ferrule stationary and turn the quick connect coupling stem clockwise into the ferrule until it is fully seated.

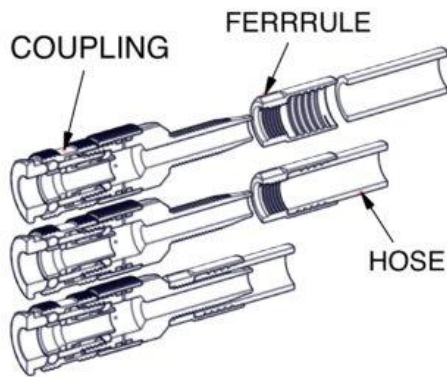


Figure 3-2. Air Hose Quick Connect Coupling Replacement

a. **COMPONENT QUICK CONNECT COUPLING AND NIPPLE REPLACEMENT.** The quick connect couplings and nipples assembled into the pressure regulator, 150 psi ALB controllers and the safety inline relief valve are screw-type fittings. When their replacement is required, it is only necessary to unscrew the damaged part (quick connect coupling and/or nipple), remove and discard the "O" ring and screw in a replacement part using a new "O" ring. If an "O" ring is not used, be sure to wrap the male threads with two turns of teflon tape to assure a leak free connection.

### 3-4 **STORAGE.**

3-4.1 Storage of the MULTIFORCE® Air Lifting Bag System components in a stationary, mobile or at a movable facility requires the following:

a. The short term (1 hour or less) temperature range must be within the limits of -75°F (-60°C) to +220°F (+105°C). The continuous temperature range must be within the limits of -40°F (-40°C) to +150°F (+65°C).

b. The components must be protected from any extreme environmental conditions where blowing dust, sand, grit and other similar materials could cause damage. If these environmental conditions are likely to be encountered, plastic wrap all components for protection.

c. The inlet nipple shall be covered with the tethered protective cap when not in use.

3-4.2 Additional storage requirements of the MULTIFORCE® ALB System components are required in a truck or at a movable facility requires the following:

a. The preferred storage orientation of the MULTIFORCE® ALB is lying flat with THE BASE SLIDER PUCKS face down. If storing the MULTIFORCE® ALB vertically FIG 3-3, position it so the weight is on 2 of the base legs. In either orientation, the bag should be strapped down securely to the floor or wall to prevent damage from constant bumping during transport.

b. System components designed for 150 psi operation (pressure regulator, 150 psi ALB controller, safety inline relief valve and other metallic items) that are stored in a truck compartment where they are subjected during transport to constant bumping will eventually be damaged. It is strongly recommended that these components be stored in their own cushioned cartons. It is further recommended that all components be strapped down, braced or otherwise secured within the compartment during transport.

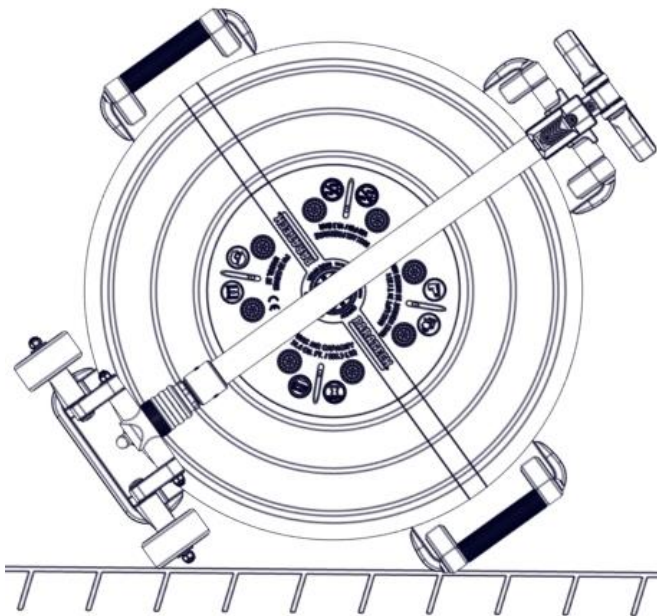


Figure 3-3. Vertical Storage





## CHAPTER 4 PARTS LIST

**4-1 INTRODUCTION.** This chapter lists available standard and optional parts for the MULTIFORCE® Air Lifting Bag System. The parts list is used to identify and locate all repair parts, including all attaching hardware supplied. The parts should be ordered by part number when ordered from Paratech Incorporated, 1025 Lambrecht Road, Frankfort, Illinois 60423-7000.

### 4-2 LIST OF MAJOR COMPONENTS.

The MULTIFORCE® Air Lifting Bag System is comprised of the user selected major components denoted in table 4-1.

Figure 4-2 Index Number	Qty	Component Name	Page No.
1-2	1	Air Source	4-2
3-4	1	Pressure Regulator	4-2
5-6	1	Controllers	4-3
7	1	Air Hose	4-3
8-10	1	Lift Bag	4-4
22	1	Safety Inline Relief Valve	4-5
23-72	1	Adapters and Fittings	4-6
73-75	1	Ratchet and Belt, and Lift Slings	4-8
76-82, 85	1	Miscellaneous	4-7
83-84	1	Air Control Case	4-7

Table 4-1. List of Major Components

### 4-3 PARTS LIST TABLES.

The MULTIFORCE® Air Lifting Bag System parts are listed in table 4-2. The table contains five columns which

are described below:

**4-3.1 FIGURE AND INDEX NUMBER COLUMN.** This column shows the figure and index number of each part listed. Table 4-2 relates to illustrations contained in chapter 4. The index numbers which identify the individual parts are separated from the figure number by a hyphen. Index numbers run consecutively.

**4-3.2 DESCRIPTION COLUMN.** The DESCRIPTION column describes each part (by noun name and modifiers) in sufficient detail for clarity. Descriptions are successively indented to the right to show assembly and part relationship.

**4-3.3 QUANTITY COLUMN.** Quantities specified in the QUANTITY column are the total number of each part required per assembly.


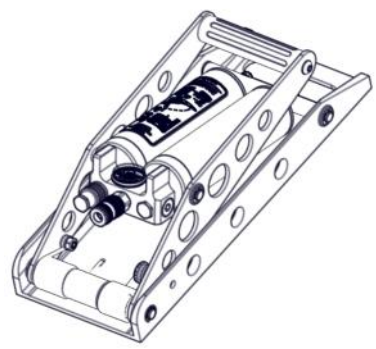

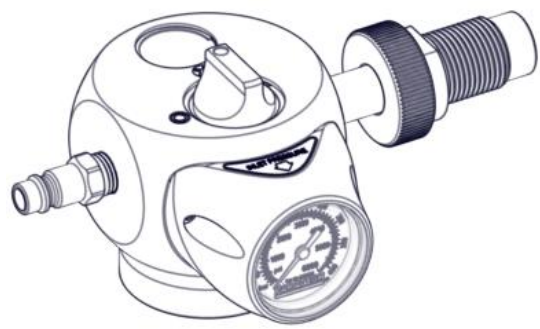
**4-3.4 CAGE COLUMN.** The assembly and parts are identified by the five digit code 30978. The code number, in accordance with Federal Supply Cataloging Handbook H-4-1, identifies Paratech Incorporated, 1025 Lambrecht Road, Frankfort, IL 60423-7000 as the manufacturer of all parts.

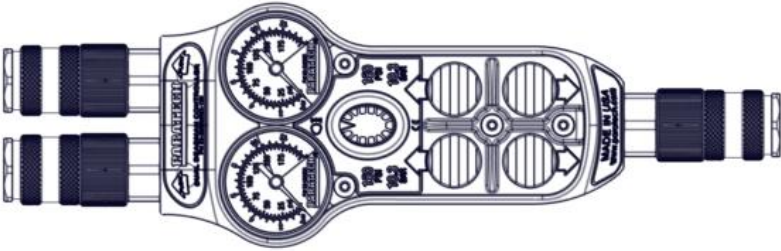
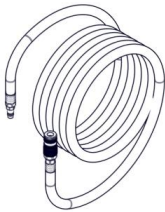
**4-3.5 PART NUMBER COLUMN.** The part number column contains an identifying number for each part listed. Vendor numbers are shown where applicable.

### 4-4 LIST OF MANUFACTURERS.

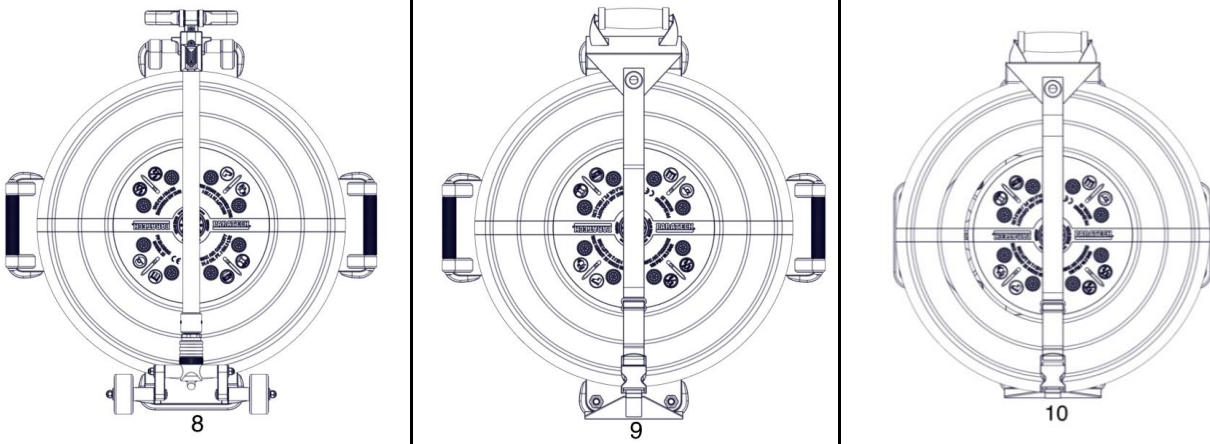
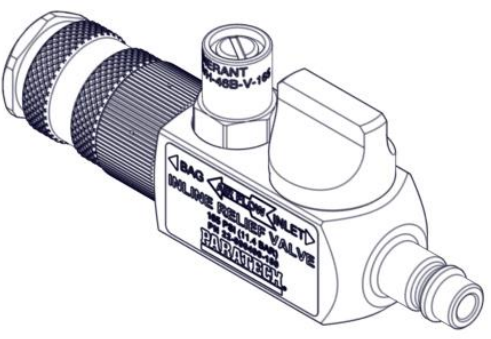
Manufacturer's (vendor's) code number (30978) used in parts list tables is in accordance with Federal Supply Cataloging Handbook H-4-1 and identifies Paratech Incorporated, 1025 Lambrecht, Road, Frankfort, IL 60423-7000 as the manufacturer of all parts.

Table 4-2 MULTIFORCE Lifting Bag System Components Parts List

Item	Description	Quantity	CAGE	22-PN
<b>AIR SOURCE</b>				
4-2-1	AIR CYLINDER, With valve and gauge, 13 cu ft (368 litres).....	1	30978	800013
-1	AIR CYLINDER, With valve and gauge, 80 cu ft (2,265 litres)...	1	30978	800080
-2	MANUAL AIR COMPRESSOR (hand/foot pump).....	1	30978	800400
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>1</p> </div> <div style="text-align: center;">  <p>2</p> </div> </div>				
<b>PRESSURE REGULATORS</b>				
4-2-3	PRESSURE REGULATOR, Piston Type, 5500 to 0 psi..... (379 to 0 bar), CGA 346/347 inlet	1	30978	895401G3
-4	PRESSURE REGULATOR, Piston Type, 5500 to 0 psi..... (379 to 0 bar) DIN inlet	1	30978	895401DG3
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>3</p> </div> <div style="text-align: center;">  <p>4</p> </div> </div>				

Ieem	Description	Quantity	CAGE	22-PN
<b>CONTROLLERS</b>				
4-2-6	CONTROLLER, Dual "Deadman" 150 psi ALB Controller G3	1	30978	890900G3-150
 <p>6</p>				
<b>AIR HOSE</b>				
4-2-7	AIR HOSE, Black, 3/8 inch (9.5 mm) dia. X 16 ft (4.9 m) long...	1	30978	890513
-7	AIR HOSE, Blue, 3/8 inch (9.5 mm) dia. X 16 ft (4.9 m) long....	1	30978	890514
-7	AIR HOSE, Yellow, 3/8 inch (9.5 mm) dia. X 16 ft (4.9 m) long..	1	30978	890515
-7	AIR HOSE, Red, 3/8 inch (9.5 mm) dia. X 16 ft (4.9 m) long.....	1	30978	890516
-7	AIR HOSE, Green, 3/8 inch (9.5 mm) dia. X 16 ft (4.9 m) long...	1	30978	890517
-7	AIR HOSE, Grey, 3/8 inch (9.5 mm) dia. X 16 ft (4.9 m) long....	1	30978	890518
-7	AIR HOSE, Black, 3/8 inch (9.5 mm) dia. X 32 ft (9.8 m) long...	1	30978	890522
-7	AIR HOSE, Blue, 3/8 inch (9.5 mm) dia. X 32 ft (9.8 m) long....	1	30978	890523
-7	AIR HOSE, Yellow, 3/8 inch (9.5 mm) dia. X 32 ft (9.8 m) long..	1	30978	890520
-7	AIR HOSE, Red, 3/8 inch (9.5 mm) dia. X 32 ft (9.8 m) long.....	1	30978	890521
-7	AIR HOSE, Green, 3/8 inch (9.5 mm) dia. X 32 ft (9.8 m) long...	1	30978	890524
-7	AIR HOSE, Grey, 3/8 inch (9.5 mm) dia. X 32 ft (9.8 m) long....	1	30978	890525
-7	AIR HOSE, Black, 3/8 inch (9.5 mm) dia. X 50 ft (15.2 m) long..	1	30978	890546
-7	AIR HOSE, Blue, 3/8 inch (9.5 mm) dia. X 50 ft (15.2 m) long...	1	30978	890543
-7	AIR HOSE, Yellow, 3/8 inch (9.5 mm) dia. X 50 ft (15.2 m) long	1	30978	890542
-7	AIR HOSE, Red, 3/8 inch (9.5 mm) dia. X 50 ft (15.2 m) long....	1	30978	890541
-7	AIR HOSE, Green, 3/8 inch (9.5 mm) dia. X 50 ft (15.2 m) long..	1	30978	890544
-7	AIR HOSE, Grey, 3/8 inch (9.5 mm) dia. X 50 ft (15.2 m) long...	1	30978	890545
 <p>7</p>				



Item	Description	Quantity	CAGE	22-PN
4-2-8	<b>MULTIFORCE AIR LIFTING BAGS</b> MULTIFORCE, With Remote Placement...	1	30978	88D025
-9	MULTIFORCE, BASIC.....	1	30978	88D025B
-10	MULTIFORCE, COMPACT.....	1	30978	88D025C
				
4-2-22	<b>SAFETY INLINE RELIEF VALVE</b> RELIEF VALVE, Safety inline, 165 psi (11.4 bar).....	1	30978	890490-150
				
4-2-23	<b>ADAPTERS AND AIR FITTINGS</b> NIPPLE, 1/4 inch NPTM (fits MULTIFORCE and Vetter).....	1	30978	890667
-24	NIPPLE, 1/8 inch NPTM (fits MULTIFORCE and Vetter).....	1	30978	890668
-25	NIPPLE, 1/8 inch NPTM.....	1	30978	890683
-26	NIPPLE, 1/4 inch NPTF.....	1	30978	890682
-27	NIPPLE, 1/4 inch NPTM.....	1	30978	890681
-28	NIPPLE, 1/2 inch NPTF.....	1	30978	890685
-29	NIPPLE, 1/2 inch NPTM.....	1	30978	890684
-30	NIPPLE, 3/8 inch NPTF.....	1	30978	890777
-31	NIPPLE, 3/8 inch NPTM.....	1	30978	890718
-32	NIPPLE, ALB 3/8-24 LH thread.....	1	30978	890686
-33	NIPPLE, Strut Inlet 1/8 inch NPSM.....	1	30978	796065
-34	NIPPLE, 3/8 inch hose stem.....	1	30978	890691
-35	NIPPLE, 3/8 inch (9.5 mm) hose, locking.....	1	30978	890672
-36	NIPPLE, 3/8 inch hose stem with ferrule.....	1	30978	890691 & 90624



Item	Description	Quantity	CAGE	22-PN
<b>ADAPTERS AND AIR FITTINGS (Continued)</b>				
-37	PROTECTOR, Nipple.....	1	30978	890695
-38	PROTECTOR, Nipple .....	1	30978	890709T
-39	COUPLING, 1/4 inch NPTF.....	1	30978	890711V
-40	COUPLING, 1/4 inch NPTM.....	1	30978	890712V
-41	COUPLING, 1/4 inch NPSM open.....	1	30978	890703V
-42	COUPLING, 1/4 inch NPTM open.....	1	30978	890704V
-43	COUPLING, 1/4 inch NPSM with O-ring.....	1	30978	890721AV
-44	COUPLING, 3/8 inch NPTF.....	1	30978	890716V
-45	COUPLING, 3/8 inch NPTM.....	1	30978	890714V
-46	COUPLING, 3/8 inch hose stem with ferrule.....	1	30978	890700V
-47	COUPLING, 3/8 inch hose stem.....	1	30978	890700AV
-48	COUPLING, 1/2 inch NPTF.....	1	30978	890720V
-49	COUPLING, 1/2 inch NPTM.....	1	30978	890710V
-50	FITTING, 3/8 inch (9.5 mm) hose x 3/8 in. (9.5 mm) hose splice.	1	30978	890673
-51	FITTING, 3/8 in. (9.5 mm) hose x 1/4 in. NPTF.....	1	30978	890675
-52	FITTING, 3/8 inch (9.5 mm) hose x 1/4 in. NPTM.....	1	30978	890674
-53	FERRULE, for 3/8" hose stem.....	1	30978	890624
-54	NIPPLE, Double male.....	1	30978	890730



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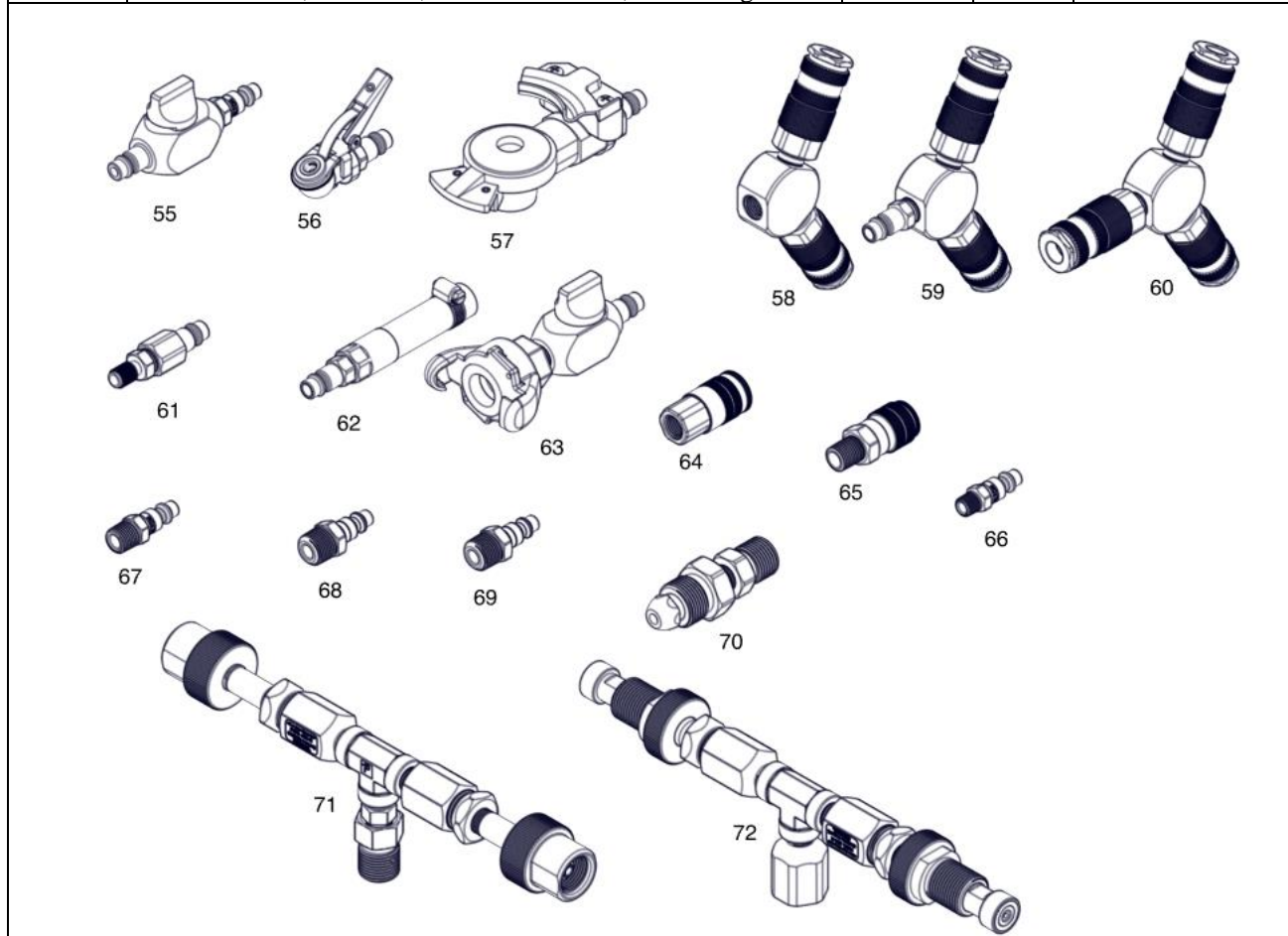


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Item	Description	Quantity	CAGE	22-PN
<b>ADAPTERS AND AIR FITTINGS (Continued)</b>				
-55	NIPPLE, Industrial double male with valve.....	1	30978	890732
-56	NIPPLE, Male and locking tire chuck.....	1	30978	890731
-57	NIPPLE AND GLAD HAND.....	1	30978	890734
-58	Y, With two 1/4 inch NPTM couplings.....	1	30978	890735
-59	Y, With two 1/4 inch NPTM couplings and MULTIFORCE nipple	1	30978	890736
-60	Y, with three couplings.....	1	30978	890740
-61	NIPPLE, Male and tire valve inflator.....	1	30978	890737
-62	NIPPLE, Male and 12 inch (30.5 cm) hose and clamp.....	1	30978	890738
-63	NIPPLE, With industrial twist lock and valve.....	1	30978	890749
-64	COUPLING, Industrial, 1/4 inch NPTF.....	1	30978	890751
-65	COUPLING, Industrial, 1/4 inch NPTM.....	1	30978	890752
-66	NIPPLE, Industrial, 1/8 inch NPTM.....	1	30978	890760
-67	NIPPLE, Industrial, 1/4 inch NPTM.....	1	30978	890761
-68	NIPPLE, Industrial, 3/8 inch NPTM.....	1	30978	890762
-69	NIPPLE, Industrial, 1/4 inch NPTF.....	1	30978	890763
-70	ADAPTER, CGA-346 high pressure air and CGA-580 nitrogen.	1	30978	895380
-71	CONNECTOR, Dual tank, with check valves, CGA-346/347.....	1	30978	800130
-72	CONNECTOR, Dual tank, with check valves, DIN fittings.....	1	30978	800135



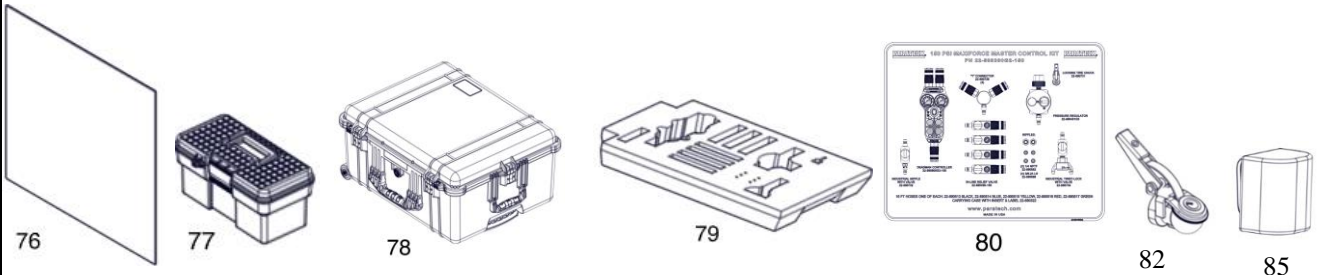
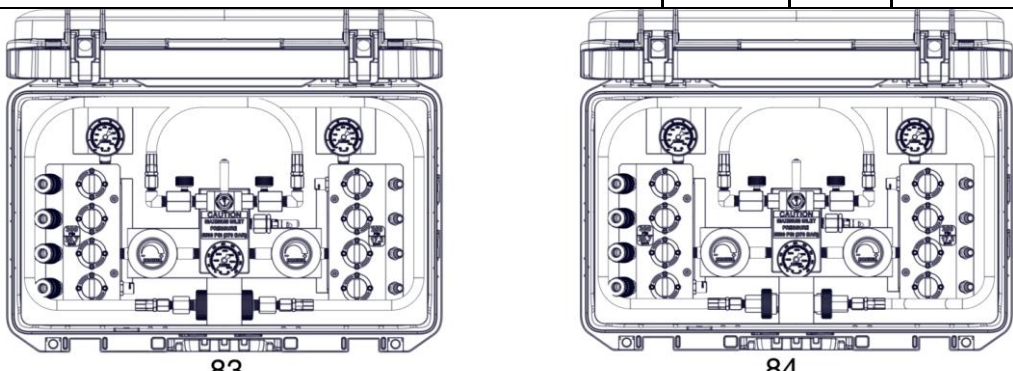
Item	Description	Quantity	CAGE	22-PN
<b>MISCELLANEOUS</b>				
4-2-76	SHEET, Neoprene, 20 in. (508 cm) x 20in. (50.8 cm) x 1/8 in (0.32 cm)	1	30978	890466
-77	STORAGE CASE, 13 x 6 x 4.75 in. (33 x 15.2 x 12.1 cm)	1	30978	000905
-78	STORAGE CASE, CUSTOM U.S., master control package Exterior = 24.83 x 19.69 x 11.88 in. (63.07 x 50.01 x 30.18 cm)	1	30978	890337
-79	150 PSI MASTER CONTROL KIT INSERT.....	1	30978	890324
-80	LABEL, 150 PSI VIEW PARTS .....	1	30978	890150L
-80	LABEL, 10 BAR VIEW PARTS DIN.....	1	30978	890150DL
-82	TIRE CHUCK, Locking 1/4 NPTF.....	1	30978	890750
-85	SADDLEBAG ONLY.....	1	30978	890370
				
<b>AIR CONTROL CASE</b>				
-83	AIR CONTROL CASE, US.....	1	30978	895750
-84	AIR CONTROL CASE, Metric.....	1	30978	895750D
				

Figure and Index Number	Description	Quantity	CAGE	Part Number
	<b>CONTROL PACKAGES</b>			
	CONTROL KIT, U.S. (consists of 1 of each item number: 3, 6,..... 7 [16 ft black], 7 [16 ft yellow], 7 [16 ft red])	1	30978	890351-150
	CONTROL KIT, Metric (consists of 1 of each item number: 4, 6,... 7 [16 ft black], 7 [16 ft yellow], 7 [16 ft red])	1	30978	890351D-10
	VEHICLE MAINTENANCE KIT, (consist 1 of each item number: 6, 7 [16 ft black], 7 [16 ft yellow], 7 [16 ft red]; 2 each of index number: 19, 22)	1	30978	889360-150
	MASTER CONTROL KIT, U.S. (consists of 1 each of index..... number: 3, 6, 7 [16 ft black], 7 [16 ft blue], 7 [16 ft yellow], 7 [16 ft red], 7 [16 ft green], 55, 56, 63, 78, 79, 80; 2 each of index number: 26, 59; 4 each of index number: 22, 32)	1	30978	890300-150
	MASTER CONTROL KIT, Metric (consists of 1 each of index..... number: 4, 6, 7 [16 ft black], 7 [16 ft blue], 7 [16 ft yellow], 7 [16 ft red], 7 [16 ft green], 55, 56, 63, 78, 79, 80; 2 each of index number: 26, 59; 4 each of index number: 22, 32)	1	30978	890300D-10
	SADDLEBAG CONTROL KIT, U.S. (consists of 1 each of index... Number: 3, 5, 22, 85, 7 [16 ft black], 7 [16 ft yellow]	1	30978	890370K
	SADDLEBAG CONTROL KIT, Metric (consists of 1 each of.... index number: 4, 5, 22, 85, 7 [16 ft black], 7 [16 ft yellow]	1	30978	890370DK
	<b>PNEUMATIC COMPONENTS AND ADAPTER KIT</b>			
	PNEUMATIC COMPONENTS AND ADAPTER KIT..... (consists of 1 each of index numbers: 25, 26, 27 28, 29, 34, 39 43, 47, 48, 49, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63 77; and 2 each of item number: 53)	1	30978	890729

#### 4-5 EXPLODED ASSEMBLIES

The following figures illustrate the various components of the two controllers, one pressure regulator and each model MULTIFORCE® Air Lifting Bag. They are accompanied by their parts lists for easy identification and individual components.

Any repairs to the controllers or pressure regulator should be performed according to the specifications documented in their own Operation and Maintenance Manuals obtained from Paratech Incorporated, 1025 Lambrecht Road, Frankfort Illinois, 60423-7000 U.S.A.

#### 4-5-1 **DUAL DEADMAN 150 PSI ALB CONTROLLER**

ITEM	DESCRIPTION	QTY	CAGE	22-PN
1	BODY, DUAL DEADMAN ALB G3	1	30978	890890B
2	O-RING (5/32 X .070) BN70	2	30978	890488
3	GAUGE 1.5" 150 PSI 1/8 BACK MT	2	30978	890605
4	GAUGE BASE FOR G3 CONTROLLERS	2	30978	890860
5	BELLEVILLE DISC SPR .406" ID	2	30978	890499
6	1/8 NPS X 1/2 X 1/8 HEX PANEL NUT	2	30978	890491
7	M4-.7 X 10 BTNHD TORX SS	8	30978	670378
8	VALVE, CLIPPARD MJV-2C	4	30978	891096
9	CLIPPARD VALVE, BAND SEAL	2	30978	891093
10	SPL RET RING FOR 5/8 BORE SS	4	30978	670380
11	Ø1/4" BRASS BALL	6	30978	895419
12	5/16-24 X 5/16 SCH SET SCR SS	6	30978	890893
13	SPRING, C0480-038-0500-S	4	30978	891095
14	CARTRIDGE VALVE BUTTON G3 GRN	2	30978	890861G
15	CARTRIDGE VALVE BUTTON G3 RED	2	30978	890861R
16	VENT RELIEF VALVE, 155 PSI	2	30978	890588
17	DEADMAN GAUGE LIGHT G3	1	30978	890862
18	DUAL DEADMAN BUTTON PLATE G3	1	30978	890863
19	CPLG 1/4 NPSM OPEN VENT ASM	3	30978	890703V
20	LABEL, G3 RED DOWN ARROW	2	30978	890864
21	LABEL DUAL D ALB BUTTON PLATE	1	30978	890866
22	LABEL, DUAL DEADMAN BACK	1	30978	890867
23	LABEL, DUAL DEADMAN ALB FRONT	1	30978	890865

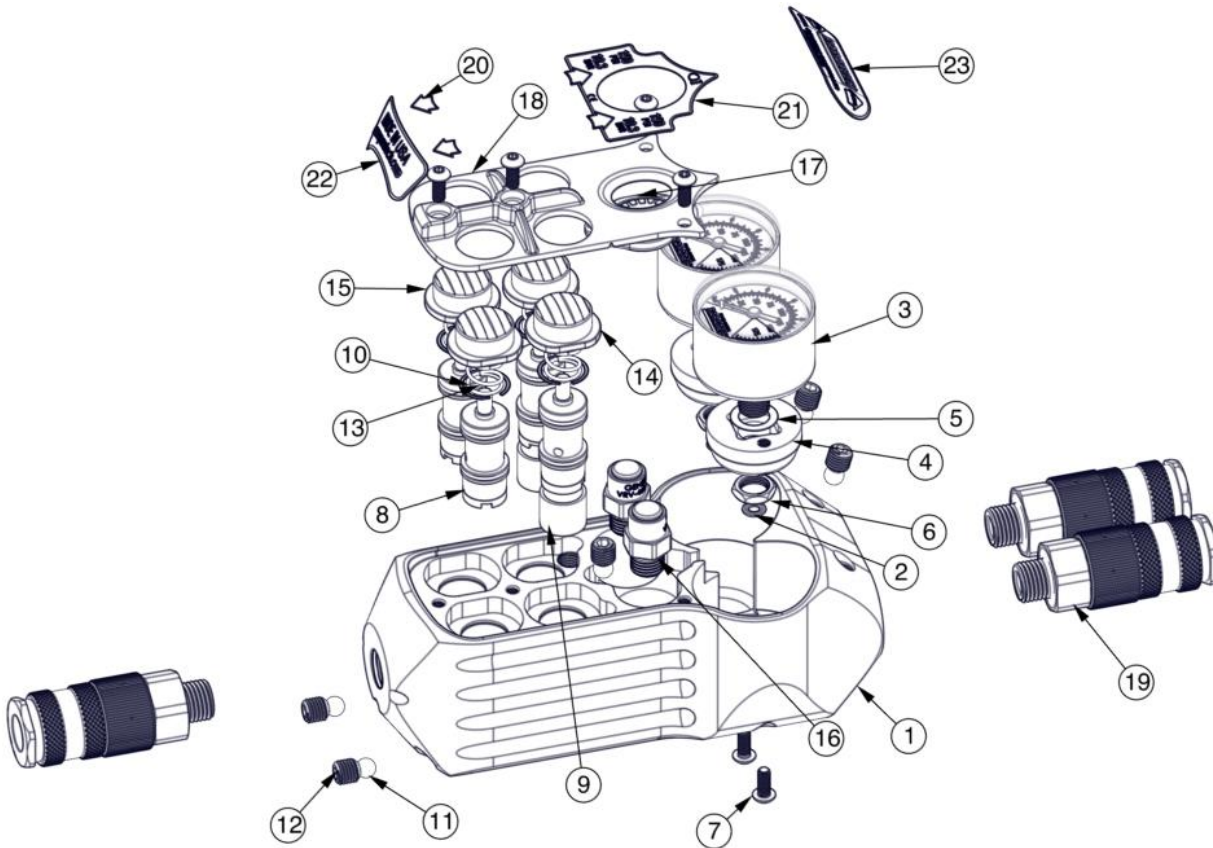


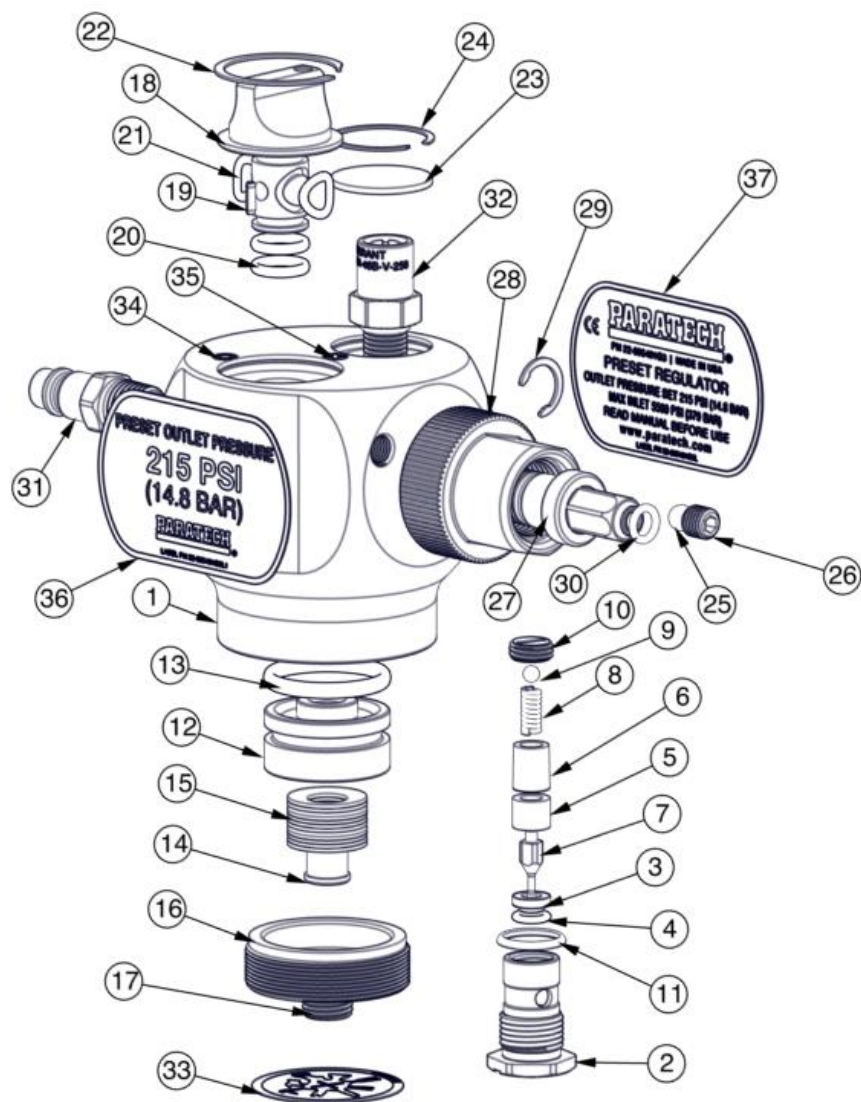
Figure 4-2 DUAL DEADMAN 150 psi ALB Controller G3



**4-5-2 PRESET PRESSURE REGULATOR G3**

ITEM	DESCRIPTION	QTY	CAGE	22-PN
1	BODY, REGULATOR G3, PRESET ALB	1	30978	895423
2	CARTRIDGE HOUSING, REG.	1	30978	895413
3	SEAT, MAIN, CARTR. REGULATOR	1	30978	895412
4	O-RING AS-010 (1/4X.070) BN90	1	30978	895513
5	SPACER FOR CARTRIDGE	1	30978	895414
6	FILTER, SINTER. FOR REGULTR	1	30978	895415
7	NEEDLE, MAIN REG VALVE, CARTR.	1	30978	895411
8	SPRING, NEEDLE VALVE	1	30978	895222
9	BALL 5/32 440-C SS GRADE 24	1	30978	891135
10	END CAP, CARTRIDGE	1	30978	895416
11	O-RING AS-015 90BN (9/16X.070)	1	30978	890252
12	PISTON, PRESET REG	1	30978	895317
13	O-RING AS-121 1-1/16X.103 BN70	1	30978	895247
14	PIN, DISC GUIDE REG	1	30978	895325
15	DISC SPRNG 20X10.2X1MM L=1.55	10	30978	895273
16	REGULATOR END CAP, PRESET G3	1	30978	895329
17	ADJUSTING SCR, PRESET	1	30978	895321
18	KNOB, ON/OFF REGULATOR G3	1	30978	890498
19	SPRING PIN 3/32 X 5/16 S.S.	1	30978	890935
20	O-RING AS-013 (7/16X.070) BN70	2	30978	550174
21	O-RING 5/16X.070 POLYURETH. 90	2	30978	890489
22	Ø1.25 INT RETAINING RING SS	1	30978	895218
23	Ø1" POROUS MEDIA DISC	1	30978	796V48
24	Ø1 LD INT RET RING SS	1	30978	796V43
25	Ø1/4" BRASS BALL	2	30978	895419
26	5/16-24 X 5/16 SCH SET SCR SS	2	30978	890893
27	NIPPLE 5500PSI CGA 347 SHORT	1	30978	895334
28	NUT, 5500PSI CGA 347 SHORT	1	30978	895336
29	RET. CRESCENT RING 1/2" SHAFT	1	30978	15779
30	O-RING 1/4X.070 POLYURETHANE90	1	30978	550195
31	NIPPLE WITH 1/4 NPTM	1	30978	890681
32	VENT RELIEF VALVE, 250 PSI	1	30978	890250
33	LABEL, Ø1.5" PLATE COVER	1	30978	895328
34	ROUND LABEL ON, GREEN G3	1	30978	895ON
35	ROUND LABEL OFF, RED G3	1	30978	895OFF
36	LABEL FOR G3 STRUT REGULATOR	1	30978	895401G3L
37	LABEL BACK PRESET	1	30978	895401G3L1

4-5-2 **PRESET CGA PRESSURE REGULATOR G3 (Continued)**

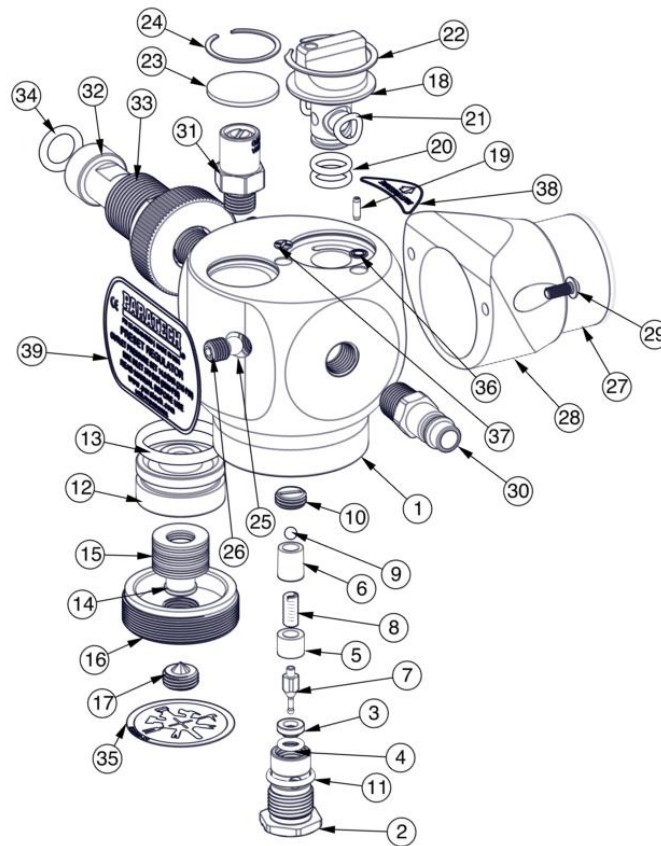


#### 4-5-3 PRESET DIN PRESSURE REGULATOR

ITEM	DESCRIPTION	QTY	CAGE	22-PN
1	BODY, REGULATOR G3, PRESET ALB	1	30978	895410
2	CARTRIDGE HOUSING, REG.	1	30978	895413
3	SEAT, MAIN, CARTR. REGULATOR	1	30978	895412
4	O-RING AS-010 (1/4X.070) BN90	1	30978	895513
5	SPACER FOR CARTRIDGE	1	30978	895414
6	FILTER, SINTER. FOR REGULTR	1	30978	895415
7	NEEDLE, MAIN REG VALVE, CARTR.	1	30978	895411
8	SPRING, NEEDLE VALVE	1	30978	895222
9	BALL 5/32 440-C SS GRADE 24	1	30978	891135
10	END CAP, CARTRIDGE	1	30978	895416
11	O-RING AS-015 90BN (9/16X.070)	1	30978	890252
12	PISTON, PRESET REG	1	30978	895317
13	O-RING AS-121 1-1/16X.103 BN70	1	30978	895247
14	PIN, DISC GUIDE REG	1	30978	895325
15	DISC SPRING 20X10.2X1MM L=1.55	10	30978	895273
16	REGULATOR END CAP, PRESET G3	1	30978	895329
17	ADJUSTING SCR, PRESET	1	30978	895321
18	KNOB, ON/OFF REGULATOR G3	1	30978	890498
19	SPRING PIN 3/32 X 5/16 S.S.	1	30978	890935
20	O-RING AS-013 (7/16X.070) BN70	2	30978	550174
21	O-RING 5/16X.070 POLYURETH. 90	2	30978	890489
22	Ø1.25 INT RETAINING RING SS	1	30978	895218
23	Ø1" POROUS MEDIA DISC	1	30978	796V48
24	Ø1 LD INT RET RING SS	1	30978	796V43
25	Ø1/4" BRASS BALL	2	30978	895419
26	5/16-24 X 5/16 SCH SET SCR SS	2	30978	890893
27	GAUGE 1.5" 6000 PSI 1/8 BACK MT	1	30978	890596
28	GAUGE HOUSING REGULATOR G3	1	30978	890597
29	M4-.7 X 10 BTNHD TORX SS	2	30978	670376
30	NIPPLE WITH 1/4 NPTM	1	30978	890681
31	VENT RELIEF VALVE, 250 PSI	1	30978	890250
32	NIPPLE - DIN	1	30978	895367
33	NUT, 5500 PSI DIN	1	30978	895353
34	O-RING AS-111 7/16X.103 BN70	1	30978	891154
35	LABEL, Ø1.5" PLATE COVER	1	30978	895328
36	ROUND LABEL ON, GREEN G3	1	30978	8950N
37	ROUND LABEL OFF, RED G3	1	30978	8950FF
38	LABEL, INLET PRESSURE	1	30978	895101
39	REGULATOR ALB G3 PRESET DIN	1	30978	895401DG3L



**4-5-3 PRESET DIN PRESSURE REGULATOR (Continued)**



#### 4-5-4 MULTIFORCE – REMOTE PLACEMENT MODEL

ITEM	DESCRIPTION	QTY	CAGE	22-PN
4-4	<b>BAGS (See Table 1-1 for Physical characteristics) MULTIFORCE – REMOTE PLACEMENT</b>	1	3098	88D025
1	PLATES AND BAG	1	30978	N/A
2	REMOTE PLACEMENT BASE, FIN	1	30978	892029
3	FLOATING YOKE SLIDER	4	30978	892087
4	M12-1.75 X 30 SKT FLT HEAD BRS	8	30978	892025
5	TELEHANDLE YOKE	6	30978	892038
7	POLE TELEHANDLE YOKE RIGHT	1	30978	892065
8	POLE TELEHANDLE YOKE LEFT	1	30978	892066
9	FRONT HOOK LATCH	1	30978	892052
10	HANDLE, KNURLED	2	30978	797044
11	3/8-16 X 1.5" BUTHD SS SCR	6	30978	670623
12	PIVOTING POLE TRUNNION	1	30978	892088
13	POLE END CROSS BAR	1	30978	892091
14	HLP POLE YOKE HEX PIVOT PIN	1	30978	892093
15	TELEHANDLE WISHBONE CURVE BAR	2	30978	892053
16	.96 X .375 X .75 LG BRASS BSCH	2	30978	892073
17	STARFOOT ROLLER WHEEL	2	30978	892014
18	SHLDR SCR 3/8X4.01, 5/16-18 SS	2	30978	892110
19	WASHER, PLAIN 5/16 SS A SER W	4	30978	670565
20	LOCK NUT 5/16-18 NYL.INS890686 S.S.	4	30978	015716
21	NIPPLE FOR ALB 3/8-24 LH THD	1	30978	890686
22	SCR FLAT SCH 1/2-20 X .6 BRASS	8	30978	892108
23	INSIDE TELESOPING POLE	1	30978	892043
24	INNER STOP RING	1	30978	892046
25	TELEHANDLE END PLUG	3	30978	892060
26	SET SCR CUP 5/16-18 X 7/16 SS	1	30978	892096
27	LOCKING RING FOR HLP POLE	1	30978	550358Y
28	SPRING, RELEASE, 5/8 CPLG	1	30978	550325
29	REL. RING, 5/8 CPLG	1	30978	550322
30	SPRING, INSERT, 5/8 CPLG	1	30978	550326
31	INSERT, 5/8 CPLG	1	30978	550323
32	GASKET SEAL FOR 5/8"CPLG	1	30978	550334
33	FRONT HOUSING, 5/8 CPLG	1	30978	550321
34	BALL 7/32 SS 440-C GRADE 24	6	30978	550326
35	1" FAKE NIPPLE POLE END	1	30978	892089
36	1/4-20 X 3/16 SET SCR SS W/NYL	4	30978	790014
37	OUTSIDE TELESOPING POLE	1	30978	892042
38	TELESOPING POLE BUTTON END	1	30978	892051
39	HEX SHAFT LATCH LOCK ROCKER	1	30978	892119
40	1/4-20 BTNHD SKT SCR PIN	1	30978	892058
41	SPRING C0360-035-0440-S	1	30978	892059
42	SPRING PIN Ø1/8 X 1.25 LONG SS	1	30978	892082
43	PIN LATCH HOOK	1	30978	892055
44	DOWEL PIN, 3/16 X 3/4, PTFE	1	30978	892101
45	FEM 10-32 THD ROUND STANDOFF	1	30978	892099
46	POLE RELEASE	2	30978	892098
47	SCH CAP SCR, 10-32 X 1/2, SS	2	30978	892016
48	SCH CAP SCR 1/4-20 X 1/4 SS	1	30978	892086
49	SPRING C048-042-1250-S	1	30978	892105
50	SPRING BLOCK PLATE	1	30978	982081
51	FLH CAP SCR, #6-32 X 3/8 LG SS	2	30978	892084
53	INSIDE TELESOPING POLE PLUG	1	30978	892061
54	1/4-20 X 3/8" SCH CAP SCR SS	2	30978	892083
55	SQUARE INSERT- MULTIFORCE	2	30978	892070
56	PIVOTING D HANDLE	1	30978	829062
57	SPLINE SHAFT	1	30978	892068
58	SPRING, WAVE C075-L2-S17	1	30978	892112
59	SPLINE PUSH BUTTON	1	30978	892079
60	HEYCO 1693 SHORT PLUG	1	30978	892111
61	1/4-20 X .75 SKT FLH BLACK SS	1	30978	892044
62	O-RING AS-019 13/16X.070 BN70	2	30978	550335
63	HEX SHAFT LATCH LOCK	1	30978	892118
64	SET SCR #8-32 X 1/4 LG CUP SS	1	30978	892130
65	SPRING C0120-016-1000-S	1	30978	892120
66	HEX SHAFT BUSHING	1	30978	892141

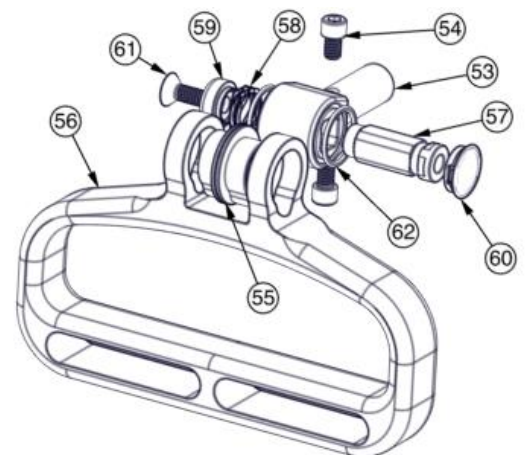
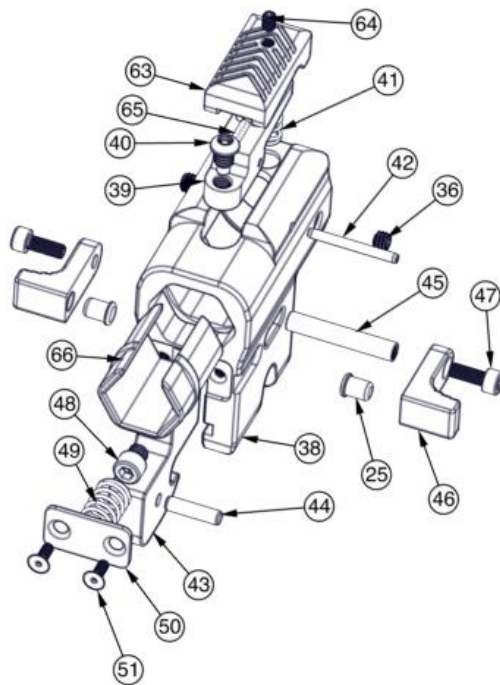
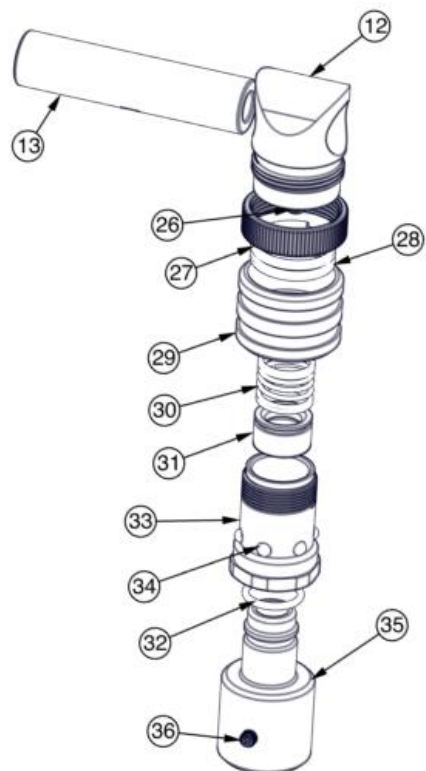
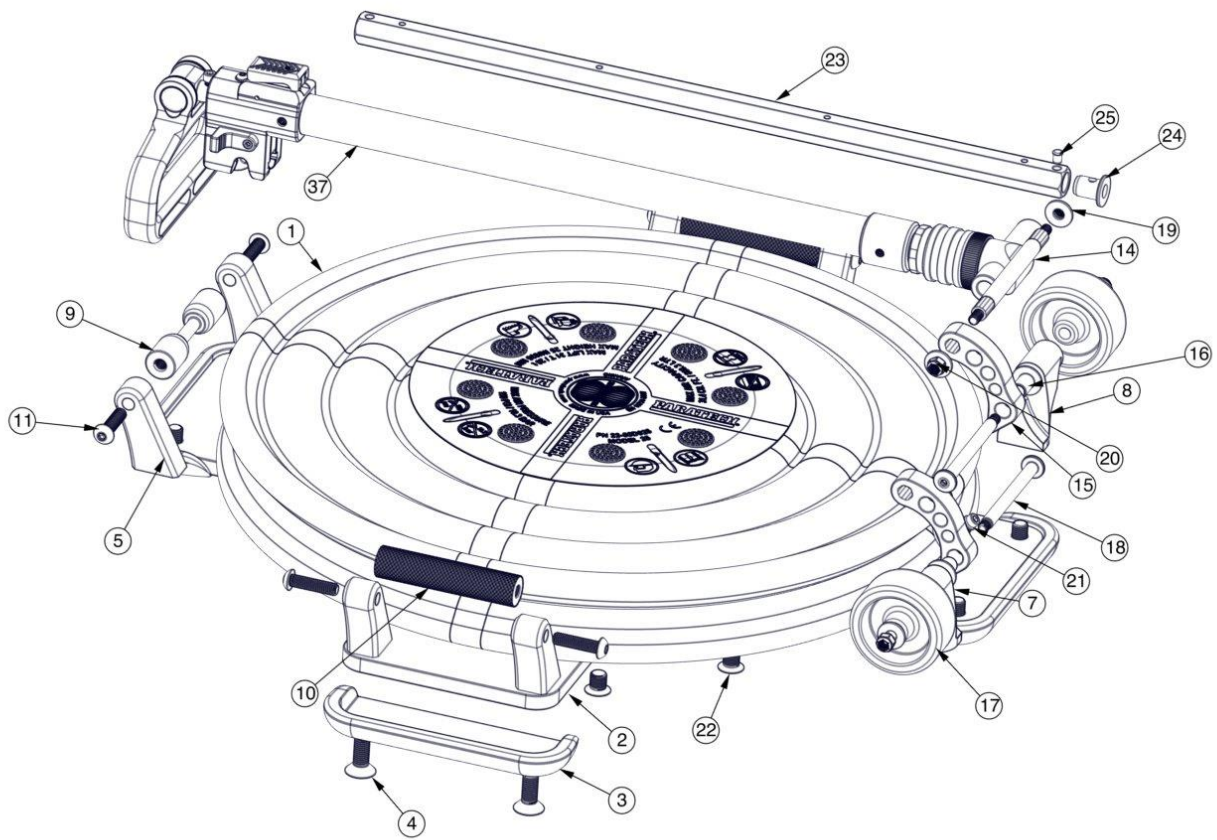


Figure 4-4, MULTIFORCE Remote Placement

#### 4-5.5 **MULTIFORCE – BASIC MODEL**

ITEM	DESCRIPTION	QTY	CAGE	22-PN
4-5	<b>LIFT BAGS (See Table 1-1 for Physical Characteristics)</b> MULTIFORCE BASIC	1	30978	88D025B
-1	MULTIFORCE – 25, BAG AND PLATES	1	30978	N/A
-2	STARFOOT PLATE, BASIC FINISHED	1	30978	892121
-3	FLOATING YOKE SLIDER	4	30978	892087
-4	M12X1.75 X 30 SKT FLTH SCR SS	4	30978	892025
-5	TELEHANDLE YOKE	2	30978	892038
-7	HANDLE, KNURLED	2	30978	797044
-8	3/8-16 X 1.5" BUTHD SS SCR	4	30978	670623
-9	NIPPLE FOR ALB 3/8-24 LH THD	1	30978	890686
-10	SCR FLAT SCH 1/2-20 X .6 BRASS	8	30978	892108
-11	MULTIFORCE CARRY STRAP	1	30978	892128
-12	MULTIFORCE CARRY STRAP NUT	4	30978	892124
-13	M12X1.75 X 20 SKT FLTH SCR SS	4	30978	892127

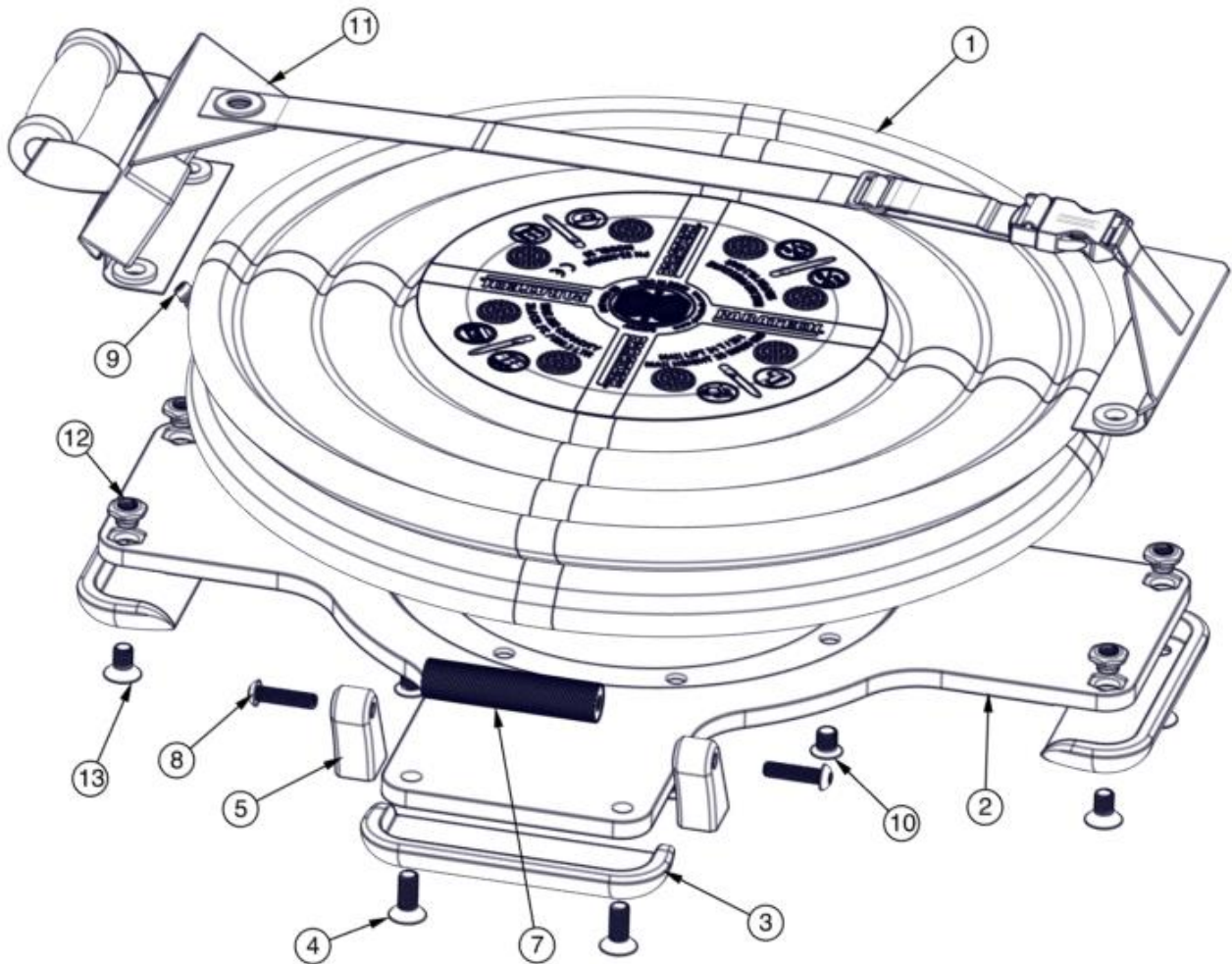


Figure 4-5, MULTIFORCE Basic



#### 4-5.6 **MULTIFORCE – COMPACT MODEL**

ITEM	DESCRIPTION	QTY	CAGE	22-PN
4-6	<b>LIFT BAGS (See Table 1-1 for Physical Characteristics)</b> MULTIFORCE COMPACT	1	30978	88D025C
-1	MULTIFORCE – 25, BAG AND PLATES	1	30978	N/A
-2	COMPACT PLACEMENT BASE, FIN	1	30978	892122
-3	FLOATING YOKE SLIDER	4	30978	892087
-4	M12X1.75 X 20 SKT FLTH SCR SS	8	30978	892127
-5	NIPPLE FOR ALB 3/8-24 LH THD	1	30978	890686
-6	SCR FLAT SCH 1/2-20 X .6 BRASS	8	30978	892108
-7	MULTIFORCE CARRY STRAP	1	30978	892128
-8	MULTIFORCE CARRY STRAP NUT	8	30978	892124

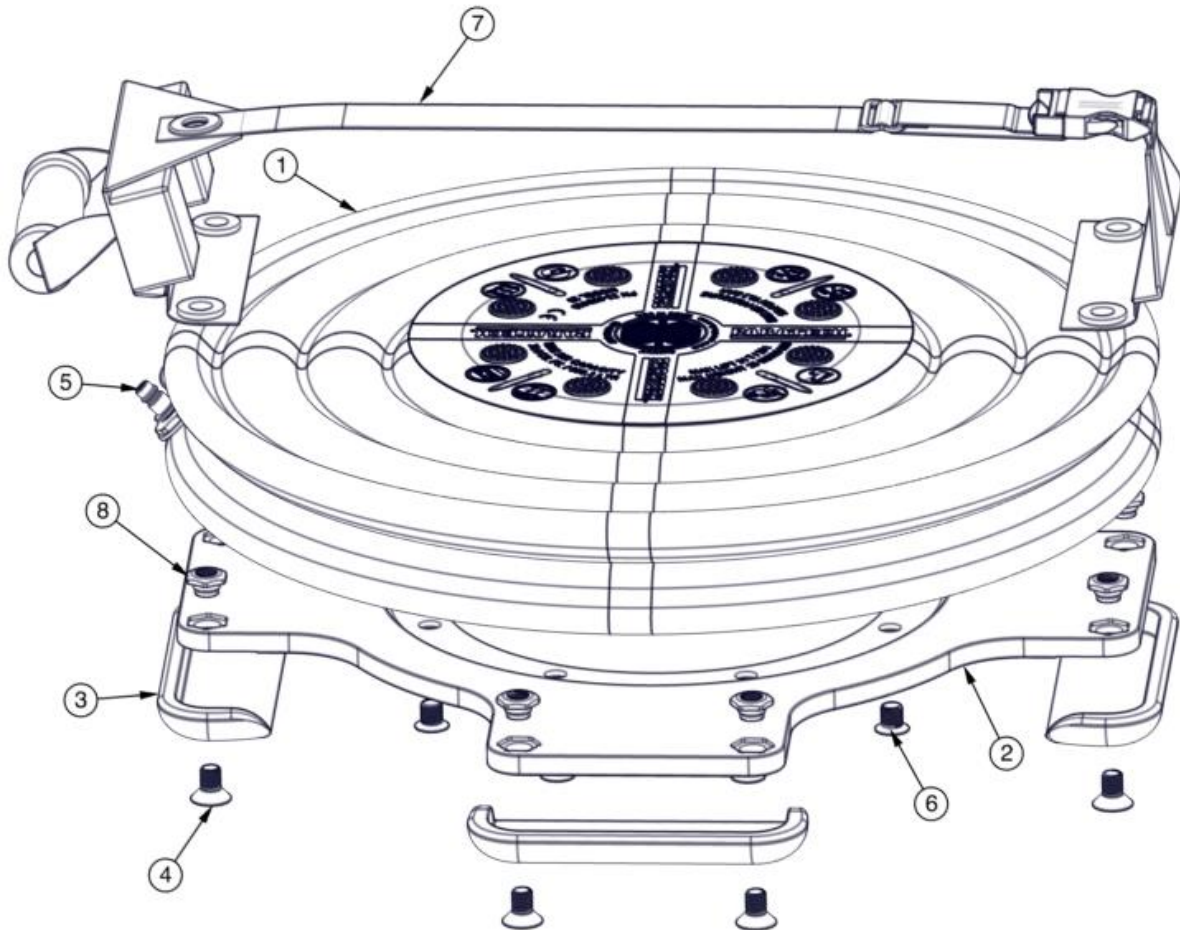


Figure 4-6, MULTIFORCE Compact





## MULTIFORCE WARRANTY

Each **MULTIFORCE** or component thereof, manufactured by Paratech Incorporated, has been thoroughly inspected and properly adjusted before shipment to insure the highest quality and the greatest possible reliability.

Paratech Incorporated (hereinafter referred to as "Seller") hereby warrants the **MULTIFORCE** or component thereof to the original retail buyer only against defects in material and workmanship under normal use and service, for 3 years. This warranty shall constitute the sole warranty of the Seller with respect to the **MULTIFORCE** or component thereof. **THE SELLER HEREBY DISCLAIMS AND EXCLUDES ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.** The Seller neither assumes nor authorizes any other person to assume for it any other obligations or liabilities in connection with the sale or use of this product.

Should there be any defects in the material or workmanship of the **MULTIFORCE**, buyer should return the defective product to the factory for inspection with shipping prepaid and a copy of receipt from the date of purchase. If inspection shows that the **MULTIFORCE** or a component thereof is defective and that such defects were not caused by negligence, misuse, accident or unauthorized service, the product sold hereunder will be repaired or replaced at the option of the Seller, without charge, FOB at the factory, Frankfort, Illinois.

**THIS REMEDY SHALL BE THE EXCLUSIVE REMEDY FOR BREACH OF WARRANTY WITH RESPECT TO THE MULTIFORCE OR COMPONENTS THEREOF. THE SELLER SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY BREACH OF WARRANTY WITH RESPECT TO THE MULTIFORCE AND COMPONENTS THEREOF FROM ANY DELAY IN THE PERFORMANCE OF THE REMEDY HEREUNDER.**

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