

TRI-MAX SUPER-60 SKID COMPRESSED AIR FOAM SYSTEM



OPERATIONS, TRAINING, & MAINTENANCE MANUAL

January 1, 2010

TABLE OF CONTENTS

| CHAPTER 1 INTRODUCTION | | PAGE |
|---|--|-------------|
| Section 1 | Manufacturer | 3 |
| Section 2 | Warranty | 3 |
| Section 3 | Warnings, Cautions, Notes & Call Outs | 3 |
| Section 4 | Manual Changes and Reproduction | 4 |
| CHAPTER 2 SYSTEM DESCRIPTION | | |
| Section 1 | General Information | 5 |
| Section 2 | Specifications | 5 |
| Section 3 | Transporting | 6 |
| Section 4 | Components | 6-8 |
| CHAPTER 3 OPERATING INSTRUCTIONS | | |
| Section 1 | Initial Setup | 9 |
| Section 2 | Foam Products | 9 |
| Section 3 | System Depressurization | 10 |
| Section 4 | Preventative Maintenance Checks and Services (PMCS) | 11-12 |
| Section 5 | Normal Operating Instructions | 13 |
| Section 6 | Cold Weather Operations | 14 |
| Section 7 | Emergency Procedures | 14-15 |
| Section 8 | Aviation Refueling Operations | 15-16 |
| Section 9 | Fuel Spill Procedures | 16 |
| CHAPTER 4 TRAINING | | |
| Section 1 | Training Program | 17 |
| Section 2 | Training Aid | 17 |
| Section 3 | Program of Instruction | 17-18 |
| CHAPTER 5 MAINTENANCE | | |
| Section 1 | General Instructions | 19 |
| Section 2 | Technical Assistance | 19 |
| Section 3 | Repair Parts | 19-21 |
| Section 4 | Special Tools & Accessories | 21 |
| Section 5 | Maintenance Log | 22-23 |
| Section 6 | Servicing Under Normal Conditions | 24-27 |
| Section 7 | Servicing Under Cold Conditions | 27 |
| Section 8 | Scheduled Maintenance | 28 |
| Section 9 | Unscheduled Maintenance | 28 |
| Section 10 | Troubleshooting | 30-31 |
| Section 11 | Storage & Protection | 31 |

CHAPTER 1

INTRODUCTION

1-1. MANUFACTURER:

A. The TRI-MAX SUPER 60 SKID is manufactured by:

Kingsway Industries, INC
6680 Lockheed Dr. Suite B
Redding, CA 96002

Phone: (530) 722-0272
Fax: (530)722-0450
E-mail: support@trimax.us
Website: www.trimax.us

B. The manufacturer is totally committed to supporting the owners and operators of the TRI-MAX SUPER 60 SKID system. Don't hesitate to contact the factory either by telephone, E-Mail, FAX, or the Website if you have a problem that you can't solve or have a product improvement idea. The TRI-MAX website has a Comment/Assistance Page for obtaining product information, providing customer feedback, and soliciting technical assistance.

1-2. WARRANTY: The TRI-MAX 60 has a 2-year limited warranty to be free from defects in material and workmanship beginning on the date of delivery. The manufacturer's liability is limited solely to the repair or replacement of the defective part and does not include labor. The warranty card that accompanies the unit should be returned to the manufacturer. The manufacturer shall in no way be liable for any incidental or consequential damages which may result from any defects in material or workmanship or from the breach of any express or implied warranty. The manufacturer does not warranty the performance of the system impacted by environmental conditions, abuse and end user competence. If the optional protective cover is purchased with and used on the system, the Limited 2-Year Warranty shall be extended to a 5 year period. Individuals with a warranty claim should contact the manufacturer and provide the Serial Number for the system which can be found on the data plate on the foam tank.

All new or remanufactured Kingsway/Tri-Max systems come with a 2 year manufacturer's warranty against defects in materials and workmanship, which starts from the date of purchase. This warranty can be extended to a standard setting 5 year period with the purchase of the appropriate weather cover if included in the original purchase agreement. If a defect is found during the warranty period, Kingsway will make it right. However, you the customer also have a part to play in the warranty. Very simply - the warranty will be void if the required preventative checks and simple periodic maintenance procedures required in the appropriate Operators Manual are not performed and documented by Kingsway qualified, trained and certified personnel. Copies of these inspections must be provided with any warranty claim submission. Kingsway provides the appropriate training and certification free of charge at our factory in Redding, California. Come visit us. When lives and futures depend on equipment choices, you'll choose Kingsway/Tri-Max!

1-3. WARNINGS, CAUTIONS, NOTES & CALL OUTS: Are used to emphasize important and critical instructions and are used for the following conditions:

- A. **WARNING**: An operating procedure, practice, etc., which if not correctly followed could result in personal injury or loss of life.
- B. **CAUTION**: An operating procedure, practice, etc., which, if not strictly observed, could result in damage to, or destruction of, equipment.
- C. **NOTE**: An operating procedure, condition, etc., which it is essential to highlight.
- C. **CALL OUT**: A notation used to explain the difference of the TM SUPER-60 and the TRI-MAX 60 LP standard units in a procedure or any other information listed. See example CALL OUT box.

STANDARD UNIT CALL OUT

This is an example of a CALL OUT box that will be used to point out a difference between the Super 60 and the Standard 60 LP

1-4. MANUAL CHANGES AND REPRODUCTION:

- A. **MANUAL CHANGES:**
 - (1) The manufacturer will provide equipment update changes to this manual. Each change will be consecutively numbered and have an effective date. The change summary sheet should be filed in the front section of the manual prior to the Table of Contents.
 - (2) This manual and the associated updates will be posted on the TRI-MAX web site.
 - (3) Users can help improve this manual by providing any errors, inconsistencies, helpful information, or recommended improvements to the manufacturer. All recommendations submitted should reference the appropriate Chapter/Paragraph (if applicable) and the name and contact (phone, e-mail, fax, etc) for the person submitting the information.
- B. **REPRODUCTION:** Reproduction of all information, illustrations, and checklists in this manual is authorized.

CHAPTER 2

SYSTEM DESCRIPTION

2-1. GENERAL INFORMATION:

The TRI-MAX SUPER 60 SKID Compressed Air Foam fire suppression system uses compressed air to propel fire fighting foam. Thousands of tight radius bubbles quickly cool and smother a fire by providing a thick vapor-sealing blanket of foam that virtually eliminates re-ignition. The TRI-MAX Super-60 is unique system that has two hoses that can be discharged simultaneously or independently of one another. The Standard TRI-MAX 60LP does not have the dual discharge capability, this is the main difference between the TR-MAX Super-60 and TRI-MAX 60LP.

The foam will adhere to horizontal and vertical surfaces. This system allows the operator to seal a fuel spill and flammable vapors with foam thus reducing or eliminating a potential fire. The 60 gallon system produces approximately 1200 gallons of finished foam. It takes approximately 4 minutes, in the full open position, to fully discharge the 1200 gallons of finished foam. The system will discharge the foam approximately 75-85 feet in a no wind condition allowing fire-fighting personnel without protective clothing to avoid thermal injuries. There is an approximate 25% reduction in discharge distance using the Freeze Protected Foam solution at -40 degrees F/C due to the increased viscosity of the foam. The system can easily be serviced by the operator. Trained personnel can accomplish all maintenance except the hydrostatic pressure testing of the Air Cylinders, Premix Tank, and the Discharge Hose.

2.2. SPECIFICATIONS: SEE CALL OUT

- A. Height: 32 ¾ inches Width: 52 inches Length: 70 inches
- B. Loaded Weight: 1130 LBS Empty Weight: 630 LBS
- C. Premix Tank: 60 gallon capacity
- D. Finished Foam Capacity: Approximately 1200 gallons
- E. Finished Foam Discharge Rate: 1" hose approx 250-300 gpm, 1.5" hose approx 450 gpm.
- F. Discharge Duration:
 - 1" Discharge hose approx 3 min 45 sec.,
 - 1.5" discharge hose approx 1 min 45 sec.
- G. Foam Discharge Distance: 75-85 feet in a no wind condition from 1" rubber booster line (50-60 feet at -40 degrees F/C using freeze protected foam solution)
- H. Air Cylinder (Industrial): Two (2) 150 CF 2250 psi
- I. Regulator: Adjustable pressure 0-400 psi
- J. Dispensing Hose: 100 feet of 1" hard rubber booster and 1.5" collapsible hose.
- K. Hose Length (max): 200 feet per discharge side.
- L. Pressure Relief Valve: 200 psi
- M. Ball Valves: 400 psi
- N. Check Valves: Two one-way
- O. Recharge Time: 6-8 minutes

TR-MAX 60LP CALL OUT

The 60LP model does not have two hoses, therefore the 1.5" discharge hose specifications do not apply.

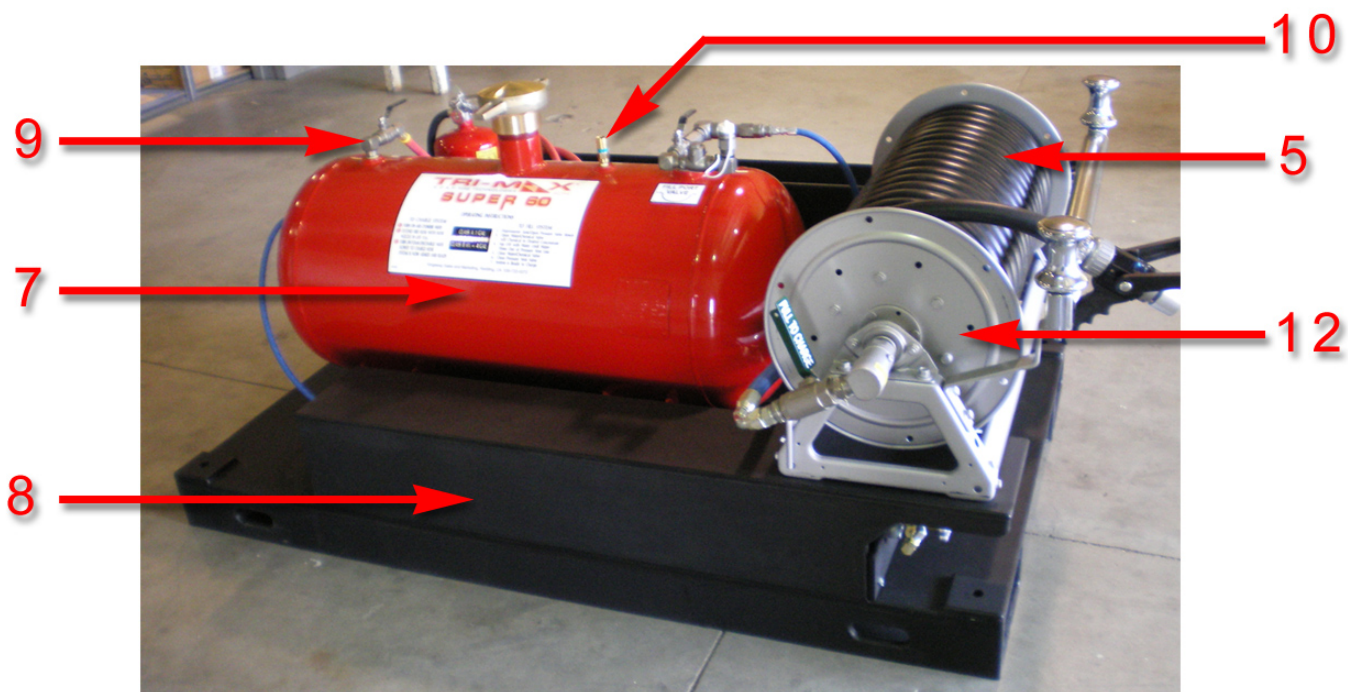
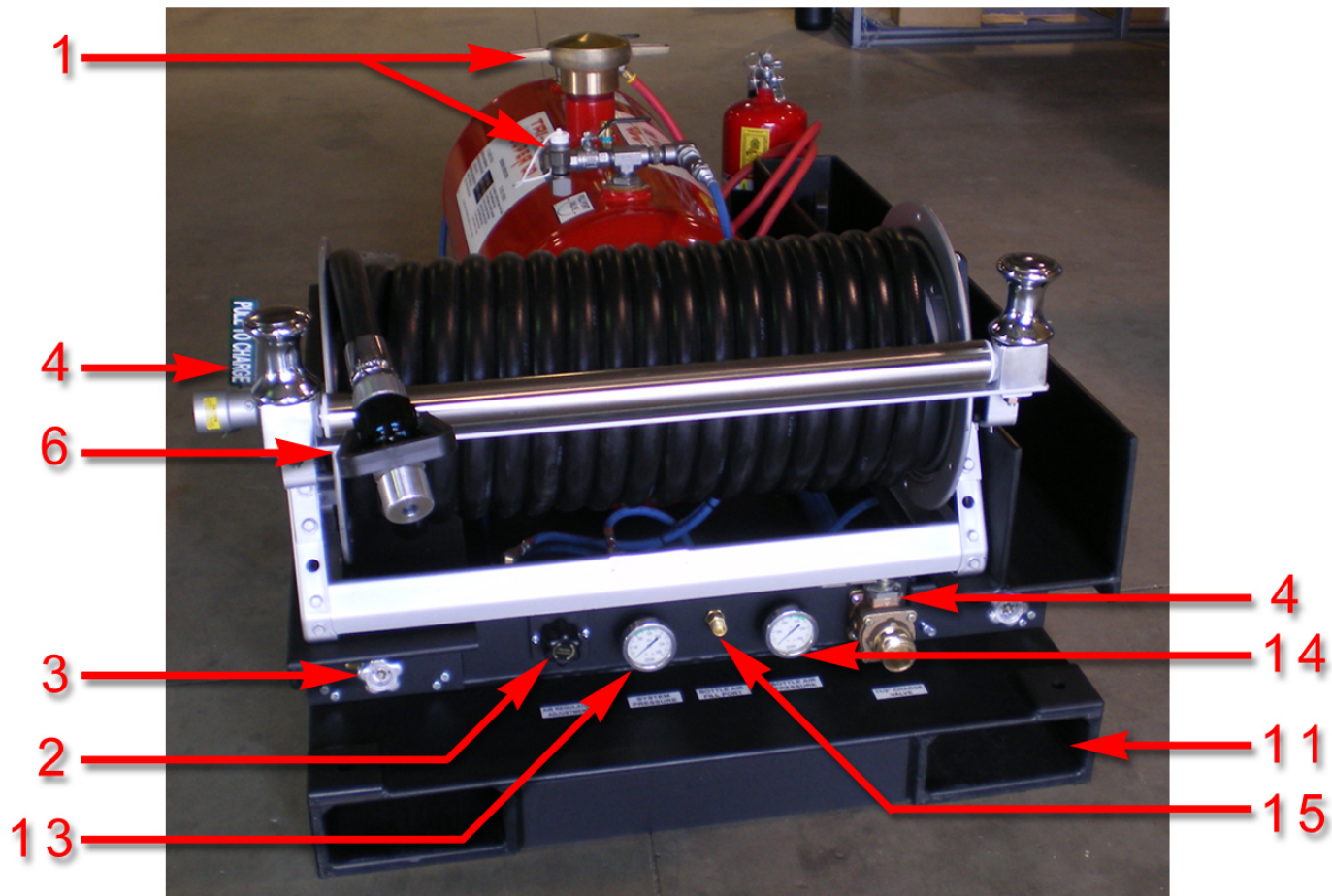
2-3. TRANSPORTING:

The TRI-MAX SUPER 60 SKID should be thoroughly secured when transporting in trailers and vehicles. The bottom of the frame has holes that allow a fork lift to move the system (see components). Other sections of the system should not be used for these purposes. Utilize the frame when re-positioning the system. Do not push on any of the components (i.e. gauges regulators etc.) when moving the system.

2-4. SYSTEM COMPONENTS:

- 1. 3" WATER/CHEMICAL FILL PORT** is located on top of the PREMIX TANK and allows solution to enter the Premix Tank. The Water/Chemical fill port is fitted with a twist on cap with a pressure seal. Always ensure this cap is tightly secured after serving the unit. Do not over tighten fill port cap.
- 2. AIR CYLINDER REGULATOR** adjusts the air flow from the Air Cylinders for the system. The regulator maintains a 0-175 psi system operating pressure and has been set to an operational pressure of 150-160 psi. The regulator's operational temperature range is -40 to +160 degrees F.
- 3. AIR CYLINDER VALVES** are located on the Air Cylinder positioned at either side of the control panel. An internal over pressure relief valve opens and vents the Air Cylinder if the internal pressure reaches 3360 psi. An air pressure indicating gauge is mounted on the main control panel, and on Air Cylinder Valves.
- 4. FOAM CHARGE VALVE(S)** fills the discharge hose with pressurized foam when placed in the open position. The valve should be positioned in the full open position (handle is in line with the hose) for all operations and closed (handle is perpendicular to the hose) at all other times. On the TRI-MAX Super-60 Unit, when using 1.5" line, ensure that the entire length of hose is deployed.
- 5. FOAM DISCHARGE HOSE** is 1 inch inside diameter x 100 feet rubber booster line or attach Wild land collapsible hose if longer length is desired. The Arctic Hose is to be used in extreme cold temperatures. A combination of hose sections up to 200 feet can be used without system performance degradation.
- 5A. FOAM DISCHARGE HOSE** is 1.5 inch inside diameter x 100 ft collapsible hose. A combination of hose sections up to 200 feet can be used without system performance degradation. This hose is not installed on the standard TRI-MAX 60LP unit.
- 6. FOAM DISCHARGE NOZZLE(S)** have a 2 position hand activated lever. Forward is closed and aft is full open. The valve is marked with open and closed decals. The 1.5" Collapsible hose may be equipped with standard smooth bore CAF nozzle or Coarse to Fine adjustable fan nozzle.

7. **PREMIX TANK** has a capacity of 60 gallons and is ASME approved. The Serial number for the system is stamped on a data plate on the tank. Mounted to the tank are the Pressure Vent Valve, Water/Chemical Fill Port, Refill Port, and Pressure Relief Valve. The tank pressure normal operating range is 100-170 psi.
8. **AIR CYLINDERS** are standard 150 CF INDUSTRIAL style 2250 psi tanks pressure tested at 2250psi. The system has 2 Air Cylinders, located on either side of the unit encased within the frame. They. One cylinder is capable of activating the system but for maximum efficiency using both discharges, it is recommended that both cylinders be turned on simultaneously. Compressed air or nitrogen can be used in the air cylinders.
9. **PRESSURE VENT VALVE** is located on top of the Premix Tank. The valve is used in the foam refill process and to depressurize the system after use. The valve is closed when it is perpendicular to the plumbing and is open when parallel (in-line) with the plumbing.
10. **PRESSURE RELIEF VALVE** is located on top of the Premix Tank. The static pressure in the PREMIX TANK may increase during warm weather if the unit is left in the direct sunlight. When the system is pressurized for operation, the Premix Tank pressure may exceed 200 psi. If this happens, the Pressure Relief Valve will open and vent any excess pressure. Some agent may appear on the ground, however, the function or the operation of the system is not affected.
11. **LIFT OPENING** is located on the front-bottom of the unit and should be used for all lifting and lifting needs. No other part of the frame should be used for these purposes.
12. **MANUAL HOSE REEL** is mounted on the front of the system and holds 100 feet of 1 inch rubber booster hose.
13. **AIR CYLINDER HIGH PRESSURE GAUGE:** is used to show the Air Cylinder Pressure. When testing the Air Cylinder Pressures this gauge should read between 2000-2250 psi.
14. **OPERATION SYSTEM PRESSURE GAUGE:** Shows the System operating pressure in the PREMIX TANK. Normal pressure should read 100-175 psi.
15. **SINGLE POINT AIR CYLINDER RE-CHARGE PORT:** Is equipped with a dust cover that will be removed during Air Cylinder re-charge procedure.



CHAPTER 3

OPERATING INSTRUCTIONS

3-1. INITIAL SETUP:

The TRI-MAX SUPER 60 SKID comes fully assembled and the Air Cylinders are charged unless the unit is shipped by air freight. The 60-gallon Premix Tank must be filled prior to use and testing. Users should turn on the Air Cylinder Valve(s) and verify there is 2000-2250 psi pressure. The Air Cylinders should be refilled or “topped off” if the cylinder pressure is less than 2000 psi reading on the Air Cylinder High Pressure Gauge. The proper Aqueous Film Forming Foam (AFFF) solution should be selected based on operational ambient temperatures prior to putting the unit in service. Liquid dish soap can be used in the Premix Tank if training is going to be conducted. The dish soap does not harm the system and can be mixed with the AFFF without any performance degradation.

3-2. FOAM SOLUTION PRODUCTS:

- A. The TRI-MAX SUPER 60 SKID can use any type of AFFF fire suppression foam chemical solution. Recommended foam chemicals include Class A foam, Class B foam, Fire-Trol or Terra Foam, and Freeze Protected AFFF Foam solution when operated in sub freezing temperatures. Terra Foam provides 24 hour extended structure protection. Class B MC-1 Hazmat approved foam contains enzyme emulsifier that breaks down petroleum products and makes them potable. All recommended foams are EPA, USDA, and OSHA approved.
- B. The following amounts of foam solution should be added to the 60 gallon Premix Tank:
 - (1) Class A (Wild land) foam : 1 gallon
 - (2) Class B 3% solution: 2 gallons
 - (3) Class B 6% solution: 4 gallons
 - (4) Liquid Dish soap or Training Foam solution (Training only): 2 gallons
 - (5) Freeze Protected AFFF solution: 60 gallons
 - (6) Other foam products: Follow the foam manufacturer’s recommendation.
- C. It is recommended that freeze protected foam solution be used in the concentrate form when positioning the units outside during freezing weather. The TRIMAX Freeze Protected Foam solution provides protection down to the -40 degrees C/F. Freeze protected solutions should be used at full strength and not mixed with water.

3-3. SYSTEM DEPRESSURIZATION

CAUTION

Ensure the Premix Tank is depressurized and the Air Cylinders are closed before conducting any maintenance on the system.

- A. Close the Air Cylinder Valves.
- B. Close the Foam Charge Valve (if open).
- C. Open the Pressure Vent Valve slowly to relieve the Premix Tank and gauge pressures.
- D. Close the Pressure Vent Valve.

3-4. PREVENTATIVE MAINTENANCE CHECKS & SERVICES (PMCS)

- A. Recommend the PMCS CHECKLIST be completed every month.
- B. Personnel completing the PMCS should be thoroughly familiar with the TRI-MAX SUPER 60 SKID system and the information in this manual.
- C. Recommend a tag be maintained on each unit that indicates the date and the initials of the individual completing the PMCS, the type and ratio of the AFFF in the Premix Tank, and the location of the MSDS for an emergency situation.

**TRI-MAX SUPER 60 SKID
PREVENTATIVE MAINTENANCE CHECKS AND SERVICES
(PMCS)
CHECKLIST**

DATE COMPLETED _____

NAME _____ SIGNATURE _____

- _____ 1. Conduct a visual inspection of the system for chaffing lines, loose lines, dirt, corrosion or damage. Check that the O-ring is not protruding where the Air Cylinder valve screws into the Air Cylinder. If the O-ring is protruding, the cylinder should be removed and the O-ring replaced.
- _____ 2. Conduct System pressure Check.
 - A. Turn on one air cylinder and note pressure. Close the air cylinder and check the pressure on the remaining air cylinder.
 - (1) Conduct a leak check if either Air Cylinder pressure is below 2000 psi:
 - (a) Turn on Air Cylinder(s) with low pressure.
 - (b) Spray a light soap solution on all air lines and fittings.
 - (c) Tighten fittings, replace O-rings, or replace leaking component.
 - (2) Remove, recharge, and reinstall Air Cylinders

(Continued on following page)

**TRI-MAX SUPER 60 SKID PMCS CHECKLIST
(Continued)**

B. Check the Premix Tank level.

- (1) Open the Water/Chemical and Pressure Vent Valves.
- (2) Fill up the Premix Tank if low.
- (3) Close the Water/Chemical Valves.

_____ 3. Note any other problems:

3-5. NORMAL OPERATING INSTRUCTIONS

WARNING

The TRI-MAX SUPER 60 SKID discharges foam solution at a high pressure. A sudden pressure surge could cause the operator to lose control of the hose if the nozzle and hose are not held securely when the Foam Discharge Nozzle is opened. Open the nozzle slowly to the full open position.

Consult the foam manufacturer's MSDS for the proper precautions and treatments if the foam is sprayed into the facial area (eyes, nose, and mouth).

NOTE

It is recommended that the air cylinders normally be left in the closed position.

The TRI-MAX Super-60 is equipped with two hoses, one 1" booster line and one 1.5" collapsible line. Both Hoses may be simultaneously discharged, or discharged independently.

- A. Ensure the Foam Discharge Nozzle(s) is in the closed (forward) position.
- B. To operate one hose independently, open one (1) Air Cylinder by turning the valve counter clockwise. To discharge BOTH hoses simultaneously ensure both Air Cylinders are opened by turning both the Air Cylinder Valves counter clockwise.
- C. Fully Extend 1.5" hose if it is to be charged.
- D. Turn on the Foam Charge Valve(s) of the hose intended to be discharged slowly to the full open position (handle should be in line with the hose). The 1" booster hose Foam Charge Valve is located on the hose reel, and the brass 1.5" collapsible hose Foam Charge Valve fitted to the TRI-MAX Super-60 is located adjacent to the High Pressure Air Cylinder Gauge.
- E. Aim the Nozzle at the base of the fire and open the Foam Discharge Valve slowly (rear position).
- F. Shoot the system in 5 to 10 second bursts across the base of the fire or directly on objects that are on fire. Move the nozzle slowly to build up a layer of foam over the fire surface.

TRI-MAX 60LP CALL OUT

B. Open one (1) Air Cylinder by turning the valve counter clockwise.

SKIP step C on the TRI-MAX 60LP standard unit.

3-6. COLD WEATHER OPERATIONS

- A. It is recommended that the TRI-MAX SUPER 60 SKID system be equipped with the Arctic Discharge Hose, Protective Cover and Freeze protected foam solutions when extreme cold weather conditions are anticipated.
- B. There will be a degraded performance in extreme cold weather since the viscosity and density of the foam is greater.
- C. The foam blanket in cold temperatures will be wetter and the discharge distances will decrease. Users should anticipate a discharge distance of 50-60 feet in sustained Sub 0 temperatures.
- D. The foam will tend to skip a short distance on a frozen surface so the person employing the system should aim short of the intended target.

3-7. EMERGENCY PROCEDURES

A. LOOSE HOSE

WARNING: Do not attempt to catch a runaway hose.

- (1) Move to the unit and close the Foam Charge Valve immediately (valve handle should be perpendicular to the hose).
- (2) Close the Foam Discharge Nozzle (valve handle is full forward).

IF CONTINUING TO FIGHT THE FIRE:

- (3) Open Foam Charge Valve slowly.
- (4) Hold the hose securely and open the Foam Discharge Nozzle slowly (valve handle is full aft).

B. NO FOAM DISCHARGE

- (1) Close the Foam Discharge Nozzle (move the handle full forward).
- (2) Close the Foam Charge Valve.
- (3) Open the backup Air Cylinder Valve.
- (4) Open Foam Charge Valve slowly (valve handle should be in line with the hose).
- (5) Hold the hose securely and open the Foam Discharge Nozzle (valve handle is full aft) slowly.

C. SHUT DOWN PROCEDURES

- (1) Close the Foam Discharge Nozzle.
- (2) Close the Foam Charge Valve.
- (3) Close the Air Cylinder Valves.
- (4) Open the Foam Discharge Nozzle to depressurize the hose. Close the valve when all of the foam has been expended from the hose.
- (5) Open the Pressure Vent Valve slowly until all pressure is relieved.
- (6) Secure the fire hose.

3-8. AVIATION REFUELING OPERATIONS

- A. Helicopter hot refuel operations are by nature hazardous. An accident during refueling can result in catastrophic damage to the aircraft and possible injury or loss of life to the refuel/aircraft crew. The TRI-MAX SUPER 60 SKID provides the user a stand off capability along with the ability to prevent fires by covering up flammable liquids, sealing vapors, and cooling the surface.
- B. The following techniques will help prevent catastrophic affects of accidents and reduce the overall risk of aviation refueling operations: NOTE These techniques are for informational purposes only, and are not a substitute for certified training.
 - (1) FIREGUARDS: The protective cover (if utilized) should be removed from the unit and the hose be moved to the fireguard position. Fireguards should stand just outside the rotor disc at a 45 degree angle on the side of the aircraft the refueling nozzle is located on. This position allows the fire guard the best view to monitor the refuel operation, alert the crew to any problem, and quickly react to a fire or fuel spill situation while remaining well clear of the affected area. Priorities should be given to the crew, the fuel spill, and the main fire areas.
 - (2) IN THE EVENT A FIRE OCCURS: The safety of the re-fueler and aircraft crew is the number one priority. Fuel burning in the vicinity of the aircrew should be extinguished first. Open the Foam Discharge Nozzle fully and sweep the foam stream across the base of the flames starting at the leading edge and moving slowly to the rear. Use short 5-10 second bursts checking the effectiveness of the foam between bursts. Once the fuel on the ground has been extinguished, begin foaming any remaining portion of the aircraft that is burning.

- (3) IF FUEL HAS BEEN SPILLED ON THE GROUND AND THE AIRCRAFT: Foam the aircraft first by positioning the Foam Discharge Nozzle to the full open position in order to get the maximum foam possible on the aircraft. Fuel spilled in the vicinity of the engine, exhaust, or the intake should be foamed immediately to prevent ignition. Once the aircraft has been foamed, the fuel on the ground should be covered with a blanket of foam. Monitor the crew egress and reapply foam to any areas where the foam blanket has been compromised. This action can be accomplished in approximately 20 seconds by a trained fireguard. Quick action on the part of the fireguard is critical to prevent a fuel spill from becoming a fuel fire.

3-9. FUEL SPILL PROCEDURES:

- A. The hazard of fuel spills can be reduced by applying a blanket of foam on top of the fuel to seal vapors and reduce the chance of combustion.
- B. Cover any personnel who have been drenched with fuel with foam to prevent combustion.

WARNING

Do not hit the spilled fuel directly with an unrestricted flow of foam or with the Nozzle in the full open position. This action could spread the fuel creating a greater hazard and cause injury to refuel personnel. The operator should be positioned a minimum of 30-40 feet from the fire to maximize the effectiveness of the system. Personnel exposed to foam should follow the instructions listed in the foam manufacturer's Material Safety Data Sheet (MSDS).

CHAPTER 4

TRAINING

4-1. TRAINING PROGRAM

- A. Training on the TRI-MAX SUPER 60 SKID system should be conducted at least annually for all operators.
- B. Maintainers should complete initial training and refresher training as required.
- C. Trainers should be thoroughly familiar with the system, fire behavior, hazard identification and basic fire fighting skills.
- D. Operator training should be conducted using a “hands-on” approach in a live fire scenario whenever possible. Live fire training can often be accomplished through coordination with a local fire department.

4-2. TRAINING AIDS:

Liquid dish soap or training foam can be mixed with water at a ratio of 1 gallon per 30 gallon tank providing the training is being conducted in non-freezing environment. The training solution should be placed in the Premix Tank when it is almost full of water in order to maximize the volume of solution available. Dish soap does not cause any damage to the system and can be mixed with AFFF without any impact on the operation.

4-3. TRAINING PROGRAM OF INSTRUCTION (POI):

A. OPERATORS & MAINTAINERS

- (1) Component Identification (Pages 6-8)
- (2) PMCS (Pages 10-12)
- (3) Normal and Cold Weather Operating Instructions (Pages 13-14)
- (4) Emergency Procedures (Pages 14-15)
- (5) Aviation Refueling Operations (if applicable) (Pages 15-16)
- (6) Fuel Spill Operations (Page 16)
- (7) Hands-On Operation, preferably on a live fire scenario (Page 13)

B. MAINTAINERS

- (1) General Maintenance Instructions and Technical Assistance
 (Page 19)
- (2) Repair Parts and Special Tools (Pages 19-21)
- (3) Foam Solution Products (Page 9)
- (4) Maintenance Log (Pages 24-25)
- (5) Servicing Under Normal and Cold Conditions (Pages 26-29)
- (6) Scheduled Maintenance (Page 30)
- (7) Unscheduled Maintenance (Pages 30-32)
- (8) Troubleshooting Procedures (Page 32)
- (9) Storage and Protection (Page 33)

CHAPTER 5

MAINTENANCE

5.1. GENERAL INSTRUCTIONS

- A. The TRI-MAX SUPER 60 SKID system was designed to be easy to operate and simple to maintain. The system has few moving parts; however, it is a vital lifesaving piece of equipment that requires some minimal maintenance.
- B. It is recommended that the monthly PMCS be accomplished.
- C. It is also very important that responsible personnel be assigned the responsibility to service and maintain the system.
- D. The final important task is maintaining thorough documented records of the maintenance performed. These records should include copies of the completed PMCS Checklists, the Maintenance Log, when the Premix Tank was filled and the type/mixture of foam in each unit. A MSDS sheet should be readily available for the type of foam being utilized. Recommend a tag be affixed to each unit that lists the date and initials of the individual performing the PMCS, the foam type and mixture ratio (if any), and the location of the MSDS.

5-2. TECHNICAL ASSISTANCE:

The manufacturer is totally committed to providing technical assistance whenever required. Maintainers should contact the manufacturer whenever a problem arises that cannot be solved using the information in this manual or when unusual situations are encountered.

5-3. REPAIR PARTS

- A. The TRI-MAX SUPER 60 SKID repair parts are listed in this paragraph. All repair parts can be obtained from the manufacturer by using a credit card or a purchase order. Many of the parts can also be purchased at local dive shops or hardware stores. O-rings should be purchased from the factory, an authorized TRI-MAX distributor, or from a certified scuba shop.
- B. The manufacturer will replace parts that fail due to defects in workmanship during the one-year warranty period at no cost. The defective part must be returned to the manufacturer to receive credit. Users should contact the manufacturer by phone, e-mail, fax, or by completing the comment page on the website to receive replacement parts.

TRI-MAX SUPER 60 SKID REPAIR PARTS

| DESCRIPTION | PART # |
|---|---------|
| Reel with Spool & Guide Assembly | 1TM60 |
| Roller Guide TM60 Reel | 2TM60 |
| Bracket For TM60 Reel | 3TM60 |
| TM60 Manifold | 4TM60 |
| Tm30 Manifold | 4TM60-A |
| Hose Barb Fitting | 5TM60 |
| 1 ½" Charge Valve w/Handle & Adapter | 6TM60 |
| Pressure Relief Valve ½" | 7TM60 |
| Regulator | 8TM60 |
| Mounting Ring (2 ea.) | 8TM60-A |
| Straight JIC | 9TM60 |
| 1 ½" Hose Fittings (2 ea.) | 10TM60 |
| 1 ½" Air Equip Hose (6ft.) | 11TM60 |
| 1 ½" Straight JIC | 12TM60 |
| Double Male Hex Nipple Brass | 13TM60 |
| 1" Hose Fittings (2 ea.) | 14TM60 |
| 1" Air Equip Hose (2 ft) | 20TM60 |
| Straight JIC | 15TM60 |
| Straight Male Adapter | 16TM60 |
| Coupler | 17TM60 |
| Pipe Cross Female Branch | 18TM60 |
| Service Tee Female Branch | 19TM60 |
| FP-MP Branch Tee (2 ea.) | 21TM60 |
| Bulk Head Fitting (3 ea.) | 22TM60 |
| T-120 Industrial Air Cylinders (2 ea.) | 23TM60 |
| Standard Valve Compressed Air (2 ea.) | 24TM60 |
| Long Handle Pressure Cap | 27TM60 |
| Inside Lug Bushing Without Screen | 28TM60 |
| Poly Based Frame | 29TM60 |
| 60 GAL. Tank | 30TM60 |
| 1" Saberjet Nozzle Single Shutoff | 67TM60 |
| 1" X 1 ½" Saberjet Adapter | 68TM60 |
| Nozzle, Smooth Bore Tip ¾" | 31TM60 |
| Hooklok | 32TM60 |
| 1" Ball Valve (Discharge) | 33TM60 |
| 1" Ball Shut off w/Swivel & Pistol Grip & Tip | 34TM60 |
| TM60 Manual | 36TM60 |
| Tri-Max 60 Low Profile Cover | 37TM60 |
| ¾" Male Elbow | 38TM60 |
| ¾" Hose Fitting | 39TM60 |
| ½" Vent Hose (12 ft.) | 40TM60 |
| DESCRIPTION | PART # |
| Low Pressure Gauge | 41TM60 |
| High Pressure Gauge | 42TM60 |
| Check Valve | 43TM60 |
| ½" 90 degree Male Elbow (4 ea.) | 44TM60 |

| | |
|------------------------------------|--------|
| ¼" 90 degree Male Elbow (5 ea.) | 45TM60 |
| 45 degree Male Elbow JIC-NPT | 46TM60 |
| | |
| ¾" Closed Nipple (3 ea.) | 47TM60 |
| ¼" JIC Straight (12 ea.) | 48TM60 |
| 90 degree Pipe Elbow Male | 49TM60 |
| Pipe Reducer Bushing | 50TM60 |
| Pipe Coupling | 51TM60 |
| 90 degree Female Elbow (3 ea.) | 52TM60 |
| Pipe Coupling Male | 53TM60 |
| SCBA to Scuba Fitting | 54TM60 |
| Reducer | 55TM60 |
| Male Reducer | 56TM60 |
| ¾" Brass Ball Valve (2 ea.) | 57TM60 |
| Directional ½" Check Valve (2 ea.) | 58TM60 |
| Swing Valve (Flapper Valve) | 59TM60 |
| 1" Booster Hose (100 ft.) | 60TM60 |
| ¼" Check Valve | 62TM60 |
| ¼ Hose Fitting (16 ea.) | 63TM60 |
| ¼" Air Equip Hose (12 ft.) | 64TM60 |
| Tank Fill Dust Cap | 65TM60 |
| Funnel Adapter 2 QT. | 66TM60 |
| FA-Scuba Tester | 101B |
| Scuba Regulator | 101C |
| AFFF 3%, 6% | 101D |

5-4. SPECIAL TOOLS & ACCESSORIES

- A. **PRESSURE TESTER:** A hand held gauge to easily determine the amount of pressure in the Air Cylinders is available from the manufacturer or local distributors. A scuba connection adapter is provided and should be installed in the industrial bottle fitting prior to connecting the pressure tester.
- B. **FUNNEL:** A Two (2) Quart threaded funnel is provided with each unit to fill the Premix Tank.

TRI-MAX SUPER 60 SKID MAINTENANCE LOG

PREVENTATIVE MAINTENANCE CHECKS & SERVICES (PMCS)

| SCHEDULED DATE | DATE COMPLETED | SIGNATURE |
|----------------|----------------|-----------|
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |

SCHEDULED MAINTENANCE

| ACTION | DATE DUE | DATE COMPLETED | SIGNATURE |
|--|----------------------|----------------|-----------|
| Check Air Cylinder pressures | _____ (6 months) | _____ | _____ |
| Wash unit & apply WD40 or equivalent over non-painted surfaces | _____ (6 months) | _____ | _____ |
| Lubricate and recycle pressure relief valve | _____ (6 months) | _____ | _____ |
| Air Cylinder visual inspection and certification | _____ (12 months) | _____ | _____ |

TRI-MAX SUPER 60 SKID MAINTENANCE LOG (Continued)

SCHEDULED MAINTENANCE (Continued)

| ACTION | DATE DUE | DATE COMPLETED | SIGNATURE |
|--|----------------------|-------------------|-----------|
| System Operations check | _____ (12 months) | _____ | _____ |
| Air Cylinder hydrostatic test | _____ (5 years) | _____ | _____ |
| Premix Tank & Discharge Hose hydrostatic test | _____ (5 years) | _____ | _____ |

UNSCHEDULED MAINTENANCE

| ACTION | DATE COMPLETED | SIGNATURE |
|--------|-------------------|-----------|
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |

5-6. SERVICING UNDER NORMAL CONDITIONS

A. SYSTEM PRESSURE CHECK

- (1) Ensure the Pressure Vent Valve, Water/Chemical Fill Port, and the Foam Charge Valves are closed.
- (2) Open one Air Cylinder and check the pressure reading on the High Pressure Air Cylinder Gauge is between 2000-2250 psi. Check the pressure on the Premix Tank gauge is between 150-175 psi. Close the Air Cylinder and open the Pressure Vent Valve to release pressure in the Premix Tank. Open the other Air Cylinder and check for an operating pressure of 2000-2250 psi. Close the Air Cylinder.
- (3). Conduct a leak check if either Air Cylinder pressure is below 2000 psi or if any air noise or solution leaks are detected.
 - (a) Spray a light soap solution on all air lines and fittings to check for leaks.
 - (b) Tighten leaking fittings or replace O-rings.
 - (c) Contact manufacturer if regulator has an internal leak.
 - (d) Recharge and replace the Air Cylinder(s).

B. AIR CYLINDER PRESSURE CHECK, RECHARGE AND REPLACEMENT

CAUTION

Ensure the system is depressurized before conducting any maintenance on the system. The Air Regulator can be damaged if removal is attempted with pressure in the system. Extreme care should be used when handling and transporting the Air Cylinders. Do not fully drain the Air Cylinders as this will allow moisture to enter the cylinders. Ensure that all replacement o-rings for the Air Cylinder valve and the Air Cylinders are purchased from the factory, a TRI-MAX distributor, or a certified scuba shop

NOTE

Ensure the O-ring is secured when removing and transporting the Air Cylinder.

- (1) **AIR CYLINDER PRESSURE CHECK:** Check the Air Cylinder pressures for normal operating pressure (2000-2250psi).
 - (a) Open Air cylinder Valve on One (1) Air Cylinder.

- (b) Ensure pressure on Air Cylinder High Pressure gauge is within normal operating pressure range. (2000-2250 psi).
- (c) Close Air cylinder Valve on Air Cylinder.
- (d) Repeat procedure for Secondary Air Cylinder.

This method will result in the loss of 50-100 lbs of air per cylinder which, in turn, will require a more frequent refilling of the Air Cylinders.

Conduct a leak check if either Air Cylinder pressure is below 2000 psi:

- (a) Turn on Air Cylinder(s) that showed low pressure.
- (b) Spray a light soap solution on all air lines and fittings.
- (c) Close Air Cylinder Valve(s).
- (c) Tighten fittings, replace O-rings, or replace leaking component.

(2) AIR CYLINDER RECHARGE

Single point Air Cylinder Re-Charge Port Procedure

- (a) Remove Air Cylinder Re-Charge Port cover
- (b) Connect Air line from Air Compressor or Cascade System with screw on adapter.
- (c) Open the Air Cylinder Valve on desired cylinder
- (d) Turn Regulator knob counterclockwise to shut off low pressure air to premix tank.

NOTE:

Do not allow high pressure air to bleed into Pre-Mix tank during refill process. Air pressure will register on low pressure gauge (if pressure vent valve is closed) if pressure is allowed into Pre-Mix tank.

- (e) Turn on Air Compressor or Cascade System to pump air into cylinder.
- (f) Monitor High Pressure Air Cylinder Gauge and fill Air Cylinder until Gauge reads 2250 psi or just above.
- (g) Close Air Cylinder Valve once pressure reaches desired pressure.
- (h) Repeat steps c-f on Secondary Air Cylinder is necessary.
- (i) Remove Air line from Single Point Re-Charge Port.
- (j) Replace Air Cylinder Re-Charge Port cover

Cylinder Re-Charge Removal Procedure

- (a) Ensure the Air Cylinder Valve is closed.
- (b) Depressurize the system by opening the Pressure Vent Valve.
- (c) Unscrew the Air Cylinder connector.
- (d) Lift out the Air Cylinder.
- (e) Have the Air Cylinder filled to 2250 psi. Either compressed air or nitrogen can be used in the Air Cylinders.
- (f) Verify the Air Cylinder pressure using the pressure tester.
- (g) Replace the Air Cylinders in the cradle.
- (h) Re-connect airline to air cylinder and replace regulator.
- (i) Turn on Air Cylinder and verify 2000-2250 psi pressure if the pressure was not verified by using a pressure tester.

C. PREMIX TANK FILLING

CAUTION

Ensure the system is depressurized before conducting any maintenance on the system. Also ensure the Water/Chemical valve is closed prior to pressuring the system to prevent a backsplash of the solution which might cause an injury to personnel.

- (1) Close the Air Cylinder Valves.
- (2) Close the Foam Charge Valve.
- (3) Open the Pressure Vent Valve slowly and leave open.
- (4) Open the Water/Chemical Fill Port

- (5) Add water until the Premix Tank is approximately 75% full (Water level can be determined by placing your hand on the side of the tank to determine temperature.
- (6) Add the appropriate amount of foam agent: 2 gallons for Class A (Wildfire), 4 gallons for 3% AFFF, training foam and liquid Dawn dish soap (for training only), 4 gallons for 6% AFFF, and 60 gallons for Freeze Protected Foam solutions
- (7) Add water until it flows out of the Pressure Vent Valve drain line.
- (8) Close the Water/Chemical Fill and Pressure Vent Valves. Remove the water hose.

CAUTION

Failure to close the Pressure Vent Valve will cause the Premix Tank drain hose to oscillate and may cause injury to personnel.

- (9) Purge the solution from the Water/Chemical fill lines to prevent freezing by waiting 5 minutes for the solution to settle, opening both tank valves, and closing the valves. An alternate method is to use air to force the solution into the tank after the foam has settled.
- (10) Note the type of foam and mixture ratio on a self-installed water proof label applied in a visible area on the Premix tank.

5-7. SERVICING UNDER COLD CONDITIONS

- A. Fill the Premix Tank with Freeze Protected Foam solution whenever the existing temperatures are below 32 degrees F. Freeze protected foam solution provides coverage down to -40 degrees (F/C). Freeze Protected Foam solutions should be used in the concentrate form and not diluted.

5-8. SCHEDULED MAINTENANCE RECOMMENDATIONS:

A. AIR CYLINDERS

- (1) Pressures to be checked at least every 6 months.
- (2) An annual visual inspection be completed every 12 months
- (3) A hydrostatic test to be completed every 5 years.

B. CLEANING AND LUBRICATION: (Complete at least every 6 months)

- (1) Wash unit with soap and water.
- (2) Apply WD40 or equivalent on all non-painted surfaces.
- (3) Apply WD40 on Pressure Relief Valve and recycle.

C. PREMIX TANK:

- (1) Pressurize and check for leaks every 12 months.
- (2) Hydrostatic test be completed every 5 years. This test includes an internal and external visual inspection as well as pressure testing the hose and tank.

D. DISCHARGE HOSE: Hydrostatic test be completed every 5 years.

E. FOAM SOLUTION: The foam solution should be tested bi-annually per the guidance outlined in the National Fire Protection Association standards. It is recommended that only one system be tested annually providing the same brand, type of foam, and water source (if mixed) is used in all of the systems. An independent foam testing laboratory is Dyne Technologies, 2357 Ventura Dr., Suite 108, Woodbury, MN 55125, (866) 713-2299.

F. PERFORMANCE CHECK

- (1) The system should be pressurized and discharged once a year.
- (2) Freeze Protected Foam solutions can be reused if desired.

5-9. UNSCHEDULED MAINTENANCE

- A. Unscheduled maintenance will need to be performed as required. Contact the manufacturer if a malfunction cannot be corrected after employing good troubleshooting procedures.
- B. The following procedures should apply to all TRI-MAX SUPER 60 SKID systems:

(1) REPLACE AIR REGULATOR

NOTE

The Regulator is adjustable; however, the pressure is set at the factory at 150-160 psi.

REMOVAL PROCEDURE

1. Ensure air cylinder valves are closed.
2. Depressurize system by opening the pressure vent valve. Verify all pressures read 0 psi.
3. Remove both 1/4" hose lines from both the low (300 psi) and the high (5000 psi) pressure gauges.
4. Remove both 1/4" hose lines from the pressure out ports on the air regulator.
5. Remove adjustment knob from the regulator, slide regulator back.
6. Remove remaining hoses and fittings from the regulator and replace in the same position on the new regulator.

INSTALLATION PROCEDURE

1. Slide the regulator into position and attach both 1/4" in and out lines using two wrenches to prevent damage to the hoses and regulator.
2. Reattach 1/4" hoses to the low (300 psi) and the high (5000 psi) gauges. Tighten bolts in the ring to the regulator.
3. Re-install the knob.
4. Charge the system by opening air cylinder valve.
5. Check for leaks using soap and water spray.

(2) REPLACE GAUGES

CAUTION

Ensure the system is depressurized before conducting any maintenance on the system.

- (a) Ensure that the Air Cylinder Valve is closed.
- (b) Depressurize the system by opening the Pressure Vent Valve. Ensure all pressure gauges read 0 psi.
- (c) Remove gauge using proper wrenches.
- (d) Install new gauge.

- (e) Charge the system by opening Air Cylinder Valve and check for leaks by squirting soap solution on connections.

(3) REPLACE PRESSURE RELIEF VALVE

- (a) The **PRESSURE RELIEF VALVE** is located on top of the PREMIX TANK.
- (b) Ensure the Premix Tank is fully depressurized.
- (c) Remove defective Pressure Relief Valve and install new one.
- (d) Pressurize the system and check for air stabilization and leaks.

(4) REPLACE CHECK VALVE:

- (a) Depressurize system
- (b) Remove defective check valve by removing airline
- (c) Replace new check valve.
- (d) Replace air lines
- (e) Complete air line leak check

5-10. TROUBLESHOOTING

A. NO PRESSURE ON GAUGES

- (1) Air Cylinder Valve is not turned on.
- (2) Air Cylinders are empty.
- (3) Pressure indicating Gauge is inoperative.
- (4) Broken or blocked air line.
- (5) Air Regulator has malfunctioned.

B. FOAM DOES NOT DISCHARGE FROM HOSE

- (1) Premix Tank is empty.
- (2) Air Cylinder is empty.
- (3) Air Cylinder is not turned on.
- (4) Foam Charge Valve is off.
- (5) Nozzle is in the off position.
- (6) Nozzle valve has malfunctioned.
- (7) Blockage in the dispensing hose.
- (8) Foam solution in Premix Tank is frozen.
- (9) Faulty check valve

C. AIRLINE LEAK

- (1) Air hose fitting is loose or broken.
- (2) Air line is blocked or broken.

D. SYSTEM IS NOT FULLY DISCHARGING

- (1) Insufficient volume of air in the Air Cylinder.
- (2) Foam Discharge Nozzle is not fully opening.
- (3) Foam Discharge Hose has a restriction.
- (4) Air Regulator has malfunctioned or is not properly adjusted (Arctic Regulator only).
- (5) The solution is frozen or near freezing.
- (6) There is a blockage in the Premix Tank.
- (7) Defective check valve

E. SOLUTION IS RUNNING OUT OF PREMIX TANK OVERFLOW

Pressure vent valve is open.

F. SOLUTION IS RUNNING OUT OF WATER/CHEMICAL FILL PORT

Water/Chemical Fill Port is open.

5-11. STORAGE AND PROTECTION

- A. A PMCS should be conducted if the system has been placed in storage prior to placing the unit in an operational status.
- B. It is recommended that a weatherproof protective cover be used if the unit is going to be positioned outside. Ultraviolet sun-rays can cause long term damage to the hoses and gauges if the unit is not covered. Additionally, frozen rain and snow can restrict the movement of discharge hose. A heavy duty protective cover with reflective markings and frame securing devices is available from the manufacturer.