

TRI-MAX TERMINATOR

TWIN AGENT SYSTEM



OPERATIONS, TRAINING AND MAINTENANCE MANUAL
April 1, 2009

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CHAPTER 1

INTRODUCTION

1-1. MANUFACTURER

- a. The TRI-MAX 30 is manufactured by:

Kingsway Sales and Marketing, LLC
6680 Lockheed Dr Ste B
Redding, CA 96002

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

- b. The manufacturer is totally committed to supporting the owners and operators of the Tri-Max TERMINATOR system. Do not 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 (www.Tri-Max.info) has a Comment/Assistance Page for obtaining product information, providing customer feedback, soliciting technical assistance and contracting for on-site training.

- 1-2. **CERTIFICATION AND RATING:** The Tri-Max TERMINATOR is certified by the Southwest Research Institute to meet UL Standard 711 sections 5.2 and 6.2. It is rated as a 10a, 160BC system when used in conjunction with a UL 162 rated Class A or Class B foam solutions, and PKWW dry chemical powder.

- 1-3. **WARRANTY:** The Tri-Max TERMINATOR is fully warranted for one year from date of delivery to be free from defects in material and workmanship. This warranty is limited to parts only and labor is not included. The manufacturer's liability is limited solely to the repair or replacement of the defective part. 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 and user competence.

1-4. WARNINGS, CAUTIONS, & NOTES: 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 is essential to highlight.

1-5. 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 associated updates will be posted on the Tri-Max website (www.Tri-Max.info).
 - (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 for all owners and operators.

CHAPTER 2

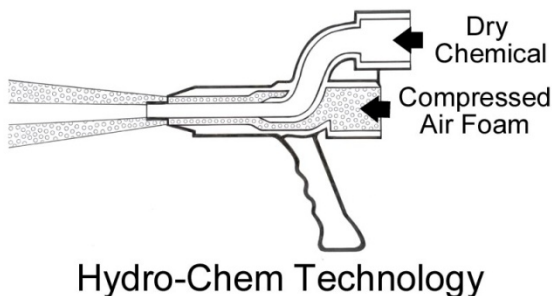
TERMINATOR SYSTEM DESCRIPTION

2-1. GENERAL INFORMATION:

The Tri-Max TERMINATOR twin agent system is a self-contained fire suppression system that utilizes the advanced Tri-Max™ and Hydro-Chem™ technologies to dispense aqueous film forming foam (AFFF) and dry chemical agents for extinguishing all Class A, B, and C fires. The 60-gallon AFFF system produces approximately 1200 gallons of finished foam made of small radius bubbles that quickly cool and smother a fire by providing a thick vapor-sealing blanket of foam that virtually eliminates re-ignition. 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 Hydro-Chem™ nozzle enables the 150 lbs of dry chemical agent to be used as a stand-alone agent or be encapsulated within the foam stream providing both agents on the fire at the same time.

The Hydro-Chem™ nozzle enables both agents to be discharged a minimum of 65 feet in a no-wind condition, thereby providing a safe standoff distance for firefighting personnel that do not have thermal protective clothing. There is an approximate 15-25% reduction in discharge distance when using the arctic foam solutions in subfreezing conditions due to the increased viscosity of the foam concentrate. The operator can quickly and easily service the system. Trained personnel can accomplish all of the maintenance except the hydrostatic pressure testing of the High Pressure Cylinders, Premix Tank, and the Discharge Hose.

The TERMINATOR combines the rapid fire extinguishing characteristics of dry chemical with its ability to extinguish three-dimensional or liquid/gas pressure fires as well as the securing, cooling, and sealing ability of AFFF. The PKW dry chemical is stored in a Tank and is expelled by compressed air or pressurized nitrogen gas through a one-inch twin-agent hand line. The Aqueous Film Forming Foam (AFFF) concentrate is pre-mixed at 3% or 6% in a tank. It is expelled by pressurized compressed air through a second hose of the twin-agent hand line. Foam quality and expansion ratios are enhanced by the Tri-Max™ cold compressed air technology. Additional compressed air is injected through the patented mixer to provide foam expansion ratios of up to 20 to 1. The resulting cold dense foam has small uniform bubbles, superior vapor seal, exceptional drain-back time, longer life foam blanket and extended discharge distance. The Foam blanket is also capable of sealing of flammable or harmful vapors from fuel and other hazardous materials (HAZMAT).



Hydro-Chem™ technology is applied at the nozzle where the compressed air foam encapsulates the dry chemical and aids in precise, extended projection of the chemical to the source of the fire. The patented Hydro-Chem™ nozzle is used as a safer, more efficient means of integrating these technologies for the fire suppression. The encapsulated dry chemical can be utilized in all weather conditions. The unit is designed to give twin agent fire fighting capability to mobile and stationary facilities where a minimum of installation space is available.

When filled with BC (sodium bicarbonate), PKW (potassium Bicarbonate) or SK (potassium chloride) dry chemical agent, the dry chemical units are recommended for use against all Class B (oil, gas, petroleum) or Class C (electrical) fires. When filled with ABC (all-purpose) dry chemical agent, they can be used on all Class A (wood, paper, textiles, etc., as well as Class B and C fires.

Use of the Williams PKW (Potassium Bicarbonate) purple K dry chemical agent is recommended since the dark purple coloring of the agent aids in visually displaying where the agent is being applied, especially when used in combination with the AFFF solution.

2.2. SPECIFICATIONS:

1. Height: 84 inches Width: 48 inches Length: 94 inches
2. Loaded weight 2200 lbs. Empty weight 1570 lbs.
3. Premix Tank: 60-gallon capacity
4. Dry Chemical Tank: 150 lbs.
5. Finished Foam Capacity: Approximately 1200 gallons
6. Discharge Nozzle: Hydro-Chem™ Twin Agent System Nozzle
7. Discharge Rate (max): 300 gal/minute of finished foam
8. Foam Discharge Distance: Minimum of 65 feet (straight distance) in a no-wind condition (50-60 feet at -40 degrees F/C using the Tri-Max -40 Arctic Foam solution)
9. High Pressure Cylinder (Industrial): Two (2) 150 cu.ft. 2250 psi
10. Regulator: Adjustable Regulator
11. Dispensing Hose: 50 feet of 3/4" twin-agent rubber hose
12. Hose Length: 50 feet on standard hose reel
13. Pressure Relief Valve: 200 psi
14. Air Hose: 3/8 inch 2000 psi, high pressure line from Regulator to foam tank, 1/4 inch line to Dry Chemical System
15. Ball Valves: 400 psi
16. Check Valves: Two one-way
17. Recharge Time: 15 minutes

2.3 TRANSPORTING: The Tri-Max TERMINATOR should be thoroughly secured when transporting in trailers and vehicles. Anchoring points are installed around the frame for proper transportation security. Pick up points are provided in the front and sides for forklift use. Other sections of the system should not be used for these purposes. Do not push on any of the components (i.e. gauges regulators etc.) when moving the system. A trailer option may be supplied for easier transport.

2-4. RECEIVING INSPECTION

The following inspection should be performed after receipt:

1. Verify there is no damage to the system.
2. Make certain both discharge nozzle handles are closed.
3. The Air Cylinders should be filled to 2250 psi.
4. Ensure the Foam Charge and Dry Chemical charge valves are closed.
5. Ensure both “Pull to Charge” handles on reel are closed.

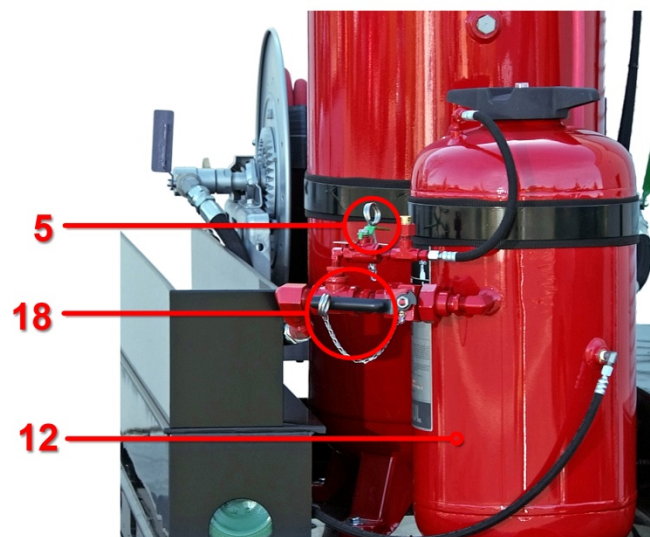
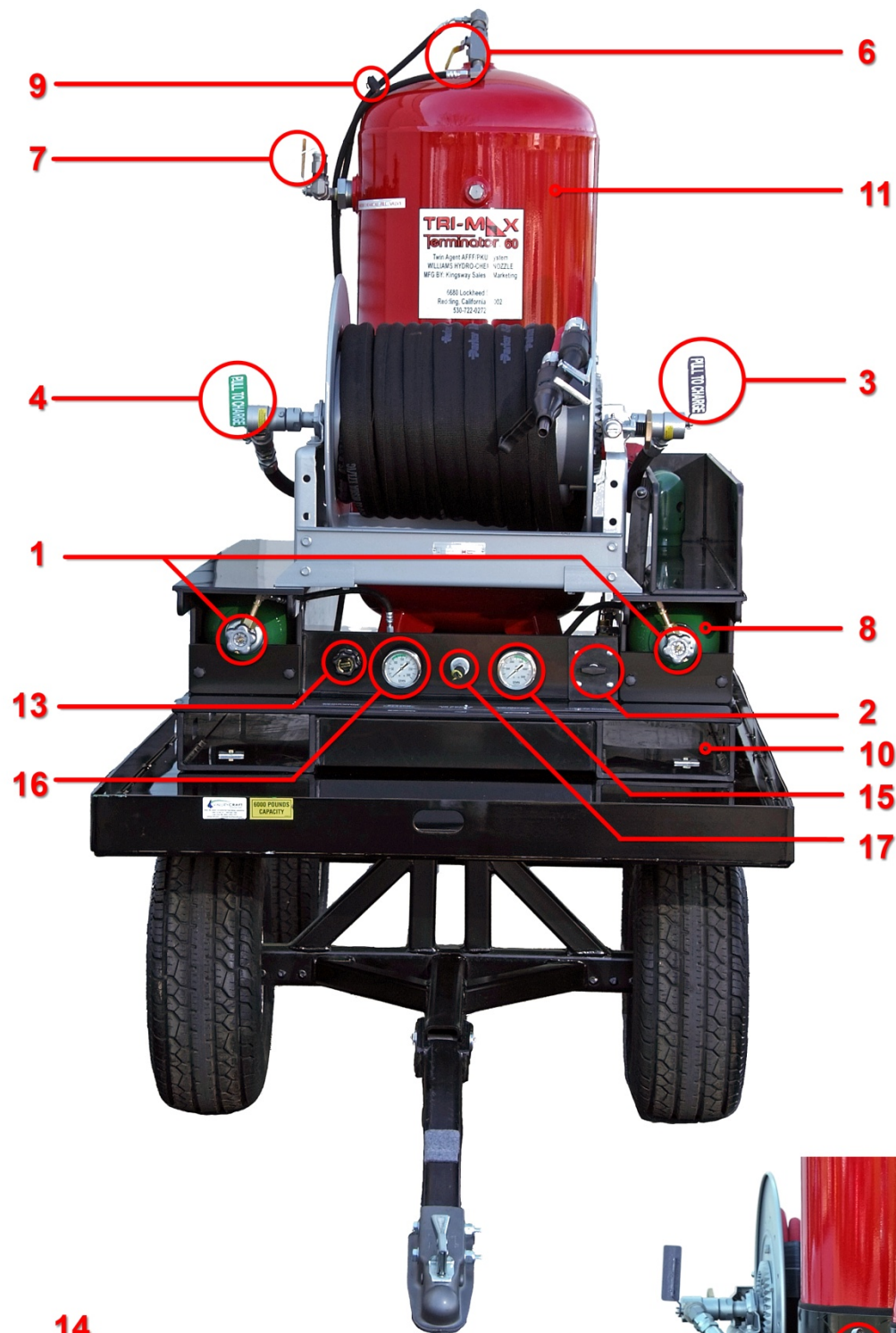
2-5. SYSTEM PRESSURE CHECK

- (1) Ensure the Foam, Dry Chem., Tank Vent Valves and the Foam Charge Valves are closed. Open the high pressure cylinder valve.
- (2) Check the high pressure cylinder gauge to ensure it is between 2000 and 2250 psi. Close the High Pressure Cylinder and open the Pressure Vent Valve to release pressure in the Foam Pre-Mix Tank. Both systems operate using the same air pressure system.
 - (a) Perform same check for the Dry Chem Side.
 - a. Pull PK System Charge Handle
 - b. Check for leaks
 - c. Close Charge handle and perform purge sequence according to directions on side of dry chem. vessel.
- (3) Conduct a leak check if High Pressure 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.
 - (c) Contact manufacturer if regulator has an internal leak.
 - (d) Recharge the High Pressure Cylinder(s).

2-6. SYSTEM COMPONENTS:

1. **HIGH PRESSURE CYLINDER VALVES** An internal over pressure relief valve opens and vents the High Pressure Cylinder if the internal pressure reaches 3360 psi.
2. **DRY CHEMICAL AIR CHARGE HANDLE** when pulled allows compressed air to charge Dry Chemical tank.
3. **DRY CHEMICAL CHARGE VALVE (“PULL TO CHARGE”)** allows dry chemical to fill the hose after system is pressurized.
4. **FOAM CHARGE VALVE (“PULL TO CHARGE”)** 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.
5. **DRY CHEMICAL PRESSURE/ VENT VALVE** is green and located on the agent vessel and is a part of the shut down procedure. In the normal pinned position, the valve allows the agent vessel to be pressurized. In the shut-down procedure the valve is moved to the open position.
6. **FOAM VENT VALVE** is located on the agent vessel and is a part of the shut down procedure. In the closed position, the valve allows the agent vessel to be pressurized. In the shut-down procedure the valve is moved to the open position.
7. **PREMIX TANK REFILL PORT** is located on the Premix Tank. It is threaded to accept a funnel for adding foaming agent and water. A standard water hose can be attached to the Premix Tank Refill Port to facilitate the refilling process. The port has a dust cap, ball valve and check valve. Move the ball valve handle parallel with the piping for filling.
8. **HIGH PRESSURE CYLINDERS** are standard 150 CF INDUSTRIAL style. The system has 2 High Pressure Cylinders. Dry compressed air or nitrogen can be used in the High Pressure Cylinders.
9. **PRESSURE RELIEF VALVES** are located on the Premix Tank and Dry Chemical Tank. The static pressure in the PREMIX TANK or DRY CHEMICAL 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.
10. **LIFTING POINTS** are located at the front and sides of the unit and should be used for all external lift operations.
11. **FOAM 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 Foam Charge Valve, Pressure Vent Valve, and Refill Port. The tank pressure normal operating range is 165 psi.

12. **DRY CHEMICAL STORAGE TANK** Has the capacity to hold 150 lbs of dry chemical.
13. **HIGH PRESSURE CYLINDER REGULATOR** adjusts the airflow from the High Pressure Cylinders for the system. The regulator incorporates a check valve that protects the regulator from Chemical contamination. The regulator maintains a 0-185 psi system operating pressure and has been set for operational pressures of 175 psi for operation.
14. **FOAM/DRY CHEMICAL DISCHARGE NOZZLES** are a 2-position-2-valve hand activated lever known as the Williams Hydro-Chem. TM nozzle. Forward is closed and aft is full open. The FOAM valve is marked "water/foam". The Dry Chemical Valve is marked "Powder".
15. **HIGH PRESSURE AIR CYLINDER GAUGE:** is used to monitor the Air Cylinder Pressure. When testing the Air Cylinder Pressures this gauge should read between 2000-2250 psi.
16. **OPERATION SYSTEM PRESSURE GAUGE:** Shows the System operating pressure in the PREMIX TANK. Normal pressure should read 100-175 psi.
17. **SINGLE POINT AIR CYLINDER RE-CHARGE PORT:** Is equipped with a dust cover that will be removed during Air Cylinder re-charge procedure.
18. **DRY CHEMICAL LINE CHARGE VALVE** is painted black and is attached to the dry chemical agent vessel. This valve is in the open position for normal system operation. The valve is used in the dry chemical purge procedure to stop chemical from entering the discharge hose.



CHAPTER 3

SYSTEM OPERATING INSTRUCTIONS

3.1. INITIAL SETUP:

- a. The TERMINATOR comes fully assembled and the High Pressure Cylinders are normally charged unless prohibited by the shipping company. Users should turn on the High Pressure Cylinder handles and verify there is 2000-2400 psi pressure. The High Pressure Cylinders should be refilled if the cylinder pressure is less than 2000 psi.
- b. The 60-gallon Premix Tank must be filled prior to use. 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 instead of foam concentrate if training is going to be conducted and environmental conditions restrict the use of AFFF. The dish soap does not harm the system and can be mixed with the AFFF without any performance degradation. The proper Dry Chemical should be filled according to manufacturers instruction.
- c. The valves should be positioned as follows:

Hand Line Nozzles.	CLOSED
High Pressure Cylinder Valves.	CLOSED
Dry Chemical Tank Valve (to hose reel).....	PINNED
Activation Handles.....	OFF

The High Pressure Cylinders should normally be in the closed position and opened to operate the system.

3-2. NORMAL OPERATING INSTRUCTIONS

WARNING

The TRI-MAX TERMINATOR 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 High Pressure Cylinders be normally left in the closed position.

- a. Ensure the Discharge Nozzles are in the closed (forward) position.
- b. Open the High Pressure Cylinders by turning the valve counter clockwise.
- c. Adjust Regulator to desired operating pressure (typically 175 psi).
- d. Pull Dry Chemical Air Charge handle to charge dry chemical tank
- e. Extend the hose.
- f. Pull the dry chemical purple “Pull to Charge” valve on hose reel and green foam “Pull to Charge” Valve.
- g. Aim the Nozzle at the base of the fire or Hazardous spill and open (rear position) the Hydro-Chem nozzle handles slowly.
- h. Shoot the system in 5 to 10 second bursts across the base of the fire or directly on objects that are on fire or covered with HAZMAT. Move the nozzle slowly to build up a layer of foam over the fire/spill surface.

NOTE

Be prepared for a significant pressure surge. Compressed air foam has a high-energy discharge with reaction forces equal to much larger hand line flows of conventional water/foam.

When approaching the fire, open the compressed air foam (AFFF) nozzle first and sweep across the base of the fire. When headway on the fire is gained, open the dry chemical nozzle to extinguish three dimensional pressure fuel fires. Use the dry chemical in short bursts as needed to effect extinguishments. Work the fire slowly from the left to the right with the foam nozzle open. Use short bursts of foam if longer distance is required. The ground fire should stay out. If any area needs reworking, go back to the left, then proceed to the right again with both nozzles on.

3-3. PURGING PROCEDURES:

a. DRY CHEMICAL SYSTEM PURGING

1. Make sure the nozzle “Powder” discharge valve is closed.
2. Close dry chemical air charge handle.
3. Close black dry chemical purge valve on dry chemical vessel, open green dry chemical pressure vent valve.
4. Open the nozzle “Powder” discharge valve slowly until stream is clear of dry chemical, then close the nozzle. Repeat as needed until all air pressure and dry chemical has been released from “Powder” Nozzle, Valve and Line.

b. FOAM SYSTEM PURGING

1. Close Air Cylinder valve(s).
2. Close the foam charge handle
3. Open the water /foam handle until foam stops flowing.

3-4. SYSTEM DEPRESSURIZATION

CAUTION

Ensure the agent tanks are depressurized and the High Pressure

Cylinders are closed before conducting any maintenance or servicing on the system.

NOTE

Always vent off air pressure from both systems after the system has been charged. Do not leave the system pressurized when the unit is not being used.

- a. Close dry chemical air charge handle.
- b. Close the High Pressure Cylinder Valves.

- c. Close the Foam Charge Valve (if open).
- d. Close the PKW system valve. (if used)
- e. Open the Pressure Vent Valve, slowly to relieve the Premix Tank pressure.
- f. Close the Pressure Vent Valve after all pressure has been released.

3-5. SERVICING SYSTEMS

a. FOAM AND DRY CHEMICAL PRODUCTS:

- (1) The Tri-Max TERMINATOR can use any type of AFFF fire suppression foam and dry chemical agents and selected types of HAZMAT and DECON foam agents. Recommended subfreezing foam concentrates include the Tri-Max Arctic Foam (-40 degrees C/F) and ECO Extreme (-20 degrees F/-26 degrees C). For Vapor Suppression procedures The Tri-Max HAZMAT additive is highly recommended for maximum vapor suppression operations. Class B MC-1 Hazmat approved foam contains an enzyme emulsifier that breaks down petroleum products and makes them potable. The DECON AFFF and DECON additives are compatible for the TERMINATOR.
- (2) The following amounts of AFFF foam solution should be added to the 60-gallon Premix Tank:
 - (a) Class B 3% solution: 2 gallon
 - (b) Class B 6% solution: 4 gallons
 - (c) Liquid Dish soap or Training Foam solution (Training only): 1 gallon
 - (d) Tri-Max Arctic AFFF: 60 gallons for extreme cold temperatures.
- (3) It is recommended that a freeze protected foam solution be used in the concentrate form when positioning the units outside during freezing weather. The TRI-MAX Arctic Foam solution provides protection down to the -40 degrees C/F. The freeze-protected solution should be used at full strength and not mixed with water.
- (4) It is recommended that the Williams PKW be used as the dry chemical agent since the brilliant purple color significantly assists in application detection.

TABLE I. COMPONENT CAPACITIES

Model No.	Dry Chemical (lbs.)	*AFFF (gals)	*ARCTIC AFFF	Air Cylinders
TM TERMINATOR	BC 150 SK 150 PKW, ABC 150	3% - 2.0 gal. 6% - 3.0 gal.	60 gal.	Two (2) 150 cu.ft.

***Notes:**

- (1) AFFF containers may hold slightly more than indicated volume.
- (2) AFFF concentrate and all premixes regardless of strength (percent concentrate) freeze at about the same temperature as water, 32°F (0°C); therefore, the contents of the container must be protected when freezing weather is expected.
- (3) TRI-MAX Arctic AFFF freeze proof solution is available for operation to -40°C/F operating conditions. This freeze proof solution has been formulated for use in TRI-MAX equipment only and may not function properly in other types of foam systems. The TRI-MAX Arctic foam must be used at full strength as a solution and not as a concentrate, therefore, the amount of foam required should match the gallon capacity of the AFFF premix tank, which is 60 gallons for the TRI-MAX TERMINATOR.
- (4) AFFF premix is usable against Class A and B fires, but should not be used against Class C fires where a danger of electrical shock exists (building or electrical facility fires).
- (5) AFFF concentrate and water are particularly effective in securing spilled hydrocarbon fires against re-ignition.

b. FOAM PREMIX TANK FILLING**CAUTION**

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

- 1) Ensure PKW and FM valves are closed.
- 2) Close the High Pressure Cylinder Valves.
- 3) Close the Foam Charge Valve.

- 4) Open the Pressure Vent Valve slowly and leave open.
- 5) Remove the Water/AFFF Chemical Fill Port white dust cap install Fill Funnel. Open ball valve.
- 6) Add the appropriate amount of foam agent: 1 gallon for Class A (Wildfire), 2 gallons for 3% AFFF, 1 gallon training foam and liquid Dawn dish soap (for training only), 4 gallons for 6% AFFF, and 60 gallons for TRI-MAX Arctic Foam Solution
- 7) Connect a standard water hose to the Tank Refill Port.
- 8) Add water until (water not foam) flows out of the Pressure Vent Valve drain line.
- 9) Remove the water hose.
- 10) Close water/chemical fill ball valve.
- 11) Remove the water hose.

CAUTION

Failure to close Pressure Vent Valve will cause the Pre-Mix tank to loose air pressure when air bottle is turned on.

Note the type of foam and mixture ratio on a self-installed waterproof label applied in a visible area on the Premix tank.

NOTE

SERVICING FOAM SYSTEMS UNDER COLD CONDITIONS

Fill the Premix Tank with TRI-MAX Arctic Foam solution whenever the existing temperatures are below 32 degrees F. The TRI-MAX –40 FOAM provides coverage down to –40 degrees (F/C). The TRI-MAX Arctic Foam solution should be used in the concentrate form and not diluted.

c. DRY CHEMICAL REPLACEMENT

1. Close air cylinder Valve, and Dry chemical air charge handle.
2. Pull pin on black dry chemical purge valve and close valve.
3. Pull pin and open green dry chemical vent valve.
4. Open purple dry chem. “Pull to charge” valve and “powder” handle on nozzle to vent dry chemical tank pressure.
5. Remove cap from vessel after pressure has been released.
6. Fill tank with dry chemical to within 6 inches from top of tank.
7. Replace fill cap and seat firmly.
8. Close dry chemical vent valve and open dry chemical line charge valve.
9. Close pull to charge ball valve and power handle on nozzle.

WARNING

Gas or dry chemical escaping from the safety vent in the side of the cap indicates that the container is still under pressure. STOP LOOSENING THE CAP! Depressurize the container by opening the vent valve and discharge nozzle.

WARNING

Do not mix ABC agent with any other dry chemical agent. A chemical reaction causing unsafe over pressurization of the unit may result. Clean container thoroughly before changing dry chemicals of any type.

3-6. EMERGENCY PROCEDURES

a. SHUT DOWN PROCEDURES

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

b. LOOSE HOSE

WARNING

Do not attempt to catch a runaway hose.

- (1) Move to the unit and close the Green “Pull to Charge Valve” immediately.
- (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 should be full aft).

c. NO FOAM DISCHARGE

- 1) Make sure High Pressure Cylinder valves are open and check pressure gauges to insure proper operating pressures.
- 2) Close the Foam Discharge Nozzle (move the handle full forward).
- 3) Close the Foam Charge 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.

3-7. 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 TERMINATOR 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:

- (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.

3-8. FUEL/HAZMAT SPILL PROCEDURES:

- a. The hazard of fuel/HAZMAT spills can be reduced by applying a blanket of foam on top of the fuel/HAZMAT to seal vapors and reduce the chance of combustion or contact with HAZMAT.
- 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).

3-9. DECONTAMINATION OPERATIONS: The TERMINATOR can be used to disperse decontamination agents. The system should be prepared by accomplishing the following items:

- a. All of the solution in the Premix tank should be removed (except for Decon AFFF).
- b. The required amount of DECON agent(s) should be added to the Premix tank and water added (if required).
- b. The decon agent should be dispensed by placing the system into operation and opening the "Water/Foam" handle on the Hydro-Chem nozzle.

3-10. 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) Adjust regulator to “0” pressure and open Air cylinder Valve on One (1) Air Cylinder.
- (b) Ensure pressure on High Pressure Air Cylinder 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.
- (e) Relieve pressure by adjusting regulator up, thus allowing air pressure to enter foam tank.
- (f) Relieve pressure by opening foam vent valve.

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) Adjust Regulator to “0” and 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 cylinders.
- (d) Turn on Air Compressor or Cascade System to pump air into cylinder.
- (e) Monitor High Pressure Air Cylinder Gauge and fill Air Cylinders until Gauge reads 2250 psi or just above.

- (f) Close Air Cylinder Valves once pressure reaches desired pressure.
- (g) Repeat steps c-f on Secondary Air Cylinder is necessary.
- (h) Remove Air line from Single Point Re-Charge Port.
- (i) 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.
- (i) Turn on Air Cylinder and verify 2000-2250 psi pressure if the pressure was not verified by using a pressure tester.

CHAPTER 4

TRAINING

4-1. TRAINING PROGRAM

- a. Training on the Tri-Max TERMINATOR 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. Fill premix tank approx. 75% with water then add dish soap; continue to fill with water until water flows from the Pressure Vent Valve. 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 8-10)
- (2) PMCS (Pages 29-33)
- (3) Normal and Cold Weather Operating Instructions (Pages 11-18)
- (4) Emergency Procedures (Pages 18-19)

- (5) Aviation Refueling Operations (if applicable) (Pages 19-20)
- (6) Fuel Spill Operations (Pages 20-21)
- (7) Hands-On Operation, preferably on a live fire scenario (Pages 11-18)

b. MAINTAINERS

- (1) General Maintenance Instructions and Technical Assistance (Page 24)
- (2) Repair Parts and Special Tools (Pages 24-26)
- (3) Foam Solution Products (Page 15)
- (4) Maintenance Log (Pages 30-33)
- (5) Servicing Under Normal and Cold Conditions (Pages 15-18)
- (6) Scheduled Maintenance (Pages 28-29)
- (7) Unscheduled Maintenance (Page 34)
- (8) Troubleshooting Procedures (Pages 35-36)
- (9) Storage and Protection (Page 36)

CHAPTER 5

MAINTENANCE

5-1. GENERAL INSTRUCTIONS

- a. The TRI-MAX TERMINATOR 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 TERMINATOR repair are available from the manufacturer. All repair parts can be obtained from the manufacturer by using a credit card or a purchase order.

- 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.

5-4. SPECIAL TOOLS & ACCESSORIES

- a. FUNNELS: A Two (2) Quart threaded funnel is provided with each unit to fill the Premix Tank. A larger funnel for the Dry Chemical Tank is available.
- b. A Scuba to SCBA adapter for filling air bottles has been provided.

5-5. CLEAN OUT DRY CHEMICAL SYSTEM

A plugged pick-up tube in the Dry Chemical Tank or a packed hose caused by the failure to fully purge the system will cause a decreased dry chemical flow. If this condition is suspected after use, clear the hand line per section 5-2. If this does not clear the discharge line, the hand line must be disconnected and cleared by inserting an air hose and routing the clogged chemical out.

5-6. LUBRICATION

Lubricate the following:

- 1. Hose reel bearings and gears.
- 2. Fill cap threads on dry chemical vessel.

5-7. DRY CHEMICAL SYSTEM INSPECTION SCHEDULE

a. MONTHLY INSPECTION

Conduct a visual inspection in conjunction with the visual inspection outlined in PMCS section of manual (Section 7-10)

b. ANNUAL INSPECTION AND PERFORMANCE CHECK

- 1. Unreel the dual hose to its full length. Open the High Pressure Cylinder valves. Discharge enough dry chemical out of the hand line to insure that the system is in proper working order. Discharge enough AFFF premix through the discharge nozzle to satisfy the operators that the system is performing normally. .

2. Purge hand line, refill both containers, replace nitrogen cylinder, if required, and generally put unit back in standby condition. If the unit has been in storage, the annual inspection operational test should be carried out before it is put back into service.

c. HYDROSTATIC TESTING

1. The dual twinned hose line requires a hydrostatic test every 5 years IAW NFPA standards.
2. The dry chemical pressure vessel requires a hydrostatic test at least every 12 years or whenever there is evidence of dents or pitting of the metal.

5-8. SCHEDULED MAINTENANCE RECOMMENDATIONS FOR TERMINATOR:

a. HIGH PRESSURE 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 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

The system should be pressurized and discharged once a year.

5-9. 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 TERMINATOR 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.

NOTE

Copy the following PMCS Checklist pages to be used every month. Keep originals in manual for additional copies.

**TRI-MAX TERMINATOR
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.
- _____ 2. Check to ensure tamper seals are installed on the High Pressure Cylinder Valves, the Foam Charge Valve, and the Water/Chemical Fill Valve and Pressure Vent Valve. Tamper seals are optional on the Water/Chemical and Pressure Vent Valves if the large High Pressure Cylinder Retention Plate that fully covers both tank valves is installed).
 - a. Turn on one High Pressure Cylinder and note pressure. Close the High Pressure Cylinder and check the pressure on the remaining High Pressure Cylinder.
 - (1) Conduct a leak check if either High Pressure Cylinder pressure is below 2000 psi:
 - (a) Turn on High Pressure Cylinder(s) with broken seal.
 - (b) Spray a light soap solution on all airlines and fittings.
 - (c) Tighten fittings, replace O-rings, or replace leaking component.
 - (2) Remove, recharge, and reinstall High Pressure Cylinders
 - (3) Reapply tamper seals

(Continued on following page)

TRI-MAX TERMINATOR PMCS CHECKLIST (Continued)

- b. Check the Premix Tank level if both the High Pressure Cylinder Valve and the Foam Charge Valve tamper seals are broken.
 - (1) Open the Water/Chemical and Pressure Vent Valves.
 - (2) Fill up the Premix Tank if low.
 - (3) Close the Water/Chemical Valves.
 - (4) Reapply tamper seals

_____ 3. Note any other problems:

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TRI-MAX TERMINATOR MAINTENANCE LOG

PREVENTATIVE MAINTENANCE CHECKS & SERVICES (PMCS)

SCHEDULED DATE	DATE COMPLETED	SIGNATURE
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

SCHEDULED MAINTENANCE

ACTION	DATE DUE	DATE COMPLETED	SIGNATURE
Check High Pressure Cylinder pressures	_____ (6 months)	_____	_____
Wash unit & apply WD40 or equivalent over non-painted surfaces	_____ (6 months)	_____	_____
Lubricate and recycle pressure relief valve	_____ (6 months)	_____	_____
High Pressure Cylinder	_____	_____	_____

visual inspection
and certification

(12 months)

TRI-MAX TERMINATOR MAINTENANCE LOG

SCHEDULED MAINTENANCE (Continued)

ACTION	DATE DUE	DATE COMPLETED	SIGNATURE
System Operations check	_____ (12 months)	_____	_____
High Pressure Cylinder hydrostatic test	_____ (5 years)	_____	_____
Premix Tank & Discharge	_____	_____	

Hose hydrostatic test	(5 years)		

UNSCHEDULED MAINTENANCE

ACTION	DATE COMPLETED	SIGNATURE
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

5-11. UNSCHEDULED MAINTENANCE

Unscheduled maintenance will need to be performed as required. Contact the manufacturer if a malfunction cannot be corrected after employing good troubleshooting procedures.

(1) REPLACE AIR REGULATOR

REMOVAL PROCEDURE

1. Ensure High Pressure Cylinder valves are closed.
2. Depressurize system by opening the pressure vent valve. Verify all pressures read 0 psi.
3. Remove all hoses and fittings from the regulator and replace in the same position on the new regulator.

INSTALLATION PROCEDURE

1. Slide the regulator in place.
2. Reattach all hoses to regulator gauges. Secure with mounting nut on regulator neck.
3. Charge the system by opening High Pressure Cylinder valve.
4. 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 High Pressure 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 High Pressure Cylinder Valve and check for leaks by squirting soap solution on connections.

(3) REPLACE PRESSURE RELIEF VALVE

- (a) The Pressure Relief Valve is located near the fill port.
- (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) Remove airline from the Check Valve and unscrew Check Valve from Regulator.
- (b) Remove fitting from the check valve
- (c) Install the fitting into the check valve in the direction of the airflow, which is towards the Premix Tank. Reinstall check valve onto regulator and test for leaks.

5-12. TROUBLESHOOTING

a. NO PRESSURE ON GAUGES

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

b. FOAM DOES NOT DISCHARGE FROM HOSE

- (1) Premix Tank is empty.
- (2) High Pressure Cylinder is empty.
- (3) High Pressure 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) 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 High Pressure 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.
- (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.

5-13. TERMINATOR STORAGE AND PROTECTION

- 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 sunrays 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.