

KDS-25 PRE-ENGINEERED FIRE SUPPRESSION SYSTEM

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

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FOREWORD

This manual shall only be used by trained professionals familiar with fire protection principles, NFPA-17 and the requirements of the authority(s) having jurisdiction.

Kidde Dual Spectrum assumes no responsibility for the application of any system other than that which is addressed in this manual. The technical data contained herein is strictly for informational purposes. KDS believes the data to be accurate, but it is published and presented without any guarantee or warranty whatsoever. KDS disclaims any liability for any use that may be made of the data and information contained herein by any and all other parties.

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ABBREVIATIONS AND TERMS

ASTM	American Society for Testing and Materials
CGA	Compressed Gas Association
DOT	(United States) Department of Transportation
F	Fahrenheit
FM	Factory Mutual Research Corporation
FT	Foot / Feet
ID	Inside Diameter
KDS	Kidde Dual Spectrum
LB (S)	Pound (s)
MSDS	Material Safety Data Sheet
NFPA	National Fire Protection Association
NPT	National Pipe Thread
OD	Outside Diameter
PSIG	Pounds per Square Inch (Gauge)
RTV	Room Temperature Vulcanizing
SAE	Society of Automotive Engineers Inc
TC	Transport Canada
UL	Underwriters Laboratories Inc

! WARNING !

A WARNING INDICATES AN IMMINENTLY HAZARDOUS SITUATION THAT, IF NOT AVOIDED, COULD RESULT IN DEATH, SERIOUS BODILY INJURY AND/OR PROPERTY OR EQUIPMENT DAMAGE.

! CAUTION !

A CAUTION INDICATES A POTENTIALLY HAZARDOUS SITUATION THAT, IF NOT AVOIDED, COULD RESULT IN PROPERTY OR EQUIPMENT DAMAGE

BALANCED DISTRIBUTION SYSTEM: A system whereby the individual distribution hoses attached to a flow-dividing device are of equal length; in such a system the total length of distribution hose from the extinguisher assembly to each distribution nozzle is equal.

MAY: Used to express what is optional or to express simple futurity.

PRE-ENGINEERED FIRE SUPPRESSION SYSTEM: A system for which the size of the system (i.e., quantity of dry chemical, distribution hose sizes, minimum and maximum distribution hose lengths, number of fittings and number and type of nozzles) is pre-determined by fire tests for specific sizes and types of hazards; installation within the limitations expressed in system manual ensures adequate flow rate, nozzle pressure and pattern coverage.

SHALL: Used to express what is mandatory.

SHOULD: Used to express what is recommended.

UNBALANCED DISTRIBUTION SYSTEM: A system whereby the individual distribution hoses attached to a flow-dividing device are not of equal length.

WILL: Used to express simple futurity.

TABLE OF CONTENTS

FOREWORD	2
ABBREVIATIONS AND TERMS	2
CHAPTER 1 GENERAL INFORMATION	7
1.1 INTRODUCTION.....	7
1.2 SYSTEM OVERVIEW	7
CHAPTER 2 COMPONENT DESCRIPTIONS	8
2.1 INTRODUCTION.....	8
2.2 COMPONENT DESCRIPTIONS	8
2.2.1 EXTINGUISHER ASSEMBLY – P/N 421220-XY	8
2.2.2 EXTINGUISHER MOUNTING BRACKET – P/N 421220	11
2.2.3 HOSE.....	12
2.2.4 DISTRIBUTOR – P/N 420588	13
2.2.5 90° NOZZLE BRACKET – P/N 420584	13
2.2.6 45° NOZZLE BRACKET – P/N 420586	14
2.2.7 CONE NOZZLE – P/N 408878-1	14
CHAPTER 3 SYSTEM DESIGN	16
3.1 INTRODUCTION.....	16
3.2 HAZARD ANALYSIS	16
3.3 MONITORING / ACTIVATING CIRCUIT.....	16
3.4 OVERVIEW.....	16
3.5 NOZZLE COVERAGE.....	17
3.6 TWO NOZZLE DISTRIBUTION SYSTEM	20
3.7 THREE NOZZLE DISTRIBUTION SYSTEM.....	21
3.8 FOUR NOZZLE DISTRIBUTION SYSTEM.....	22
3.8.1 ONE DISTRIBUTOR:	22
3.8.2 ONE 3/4" x 3/4" x 3/4" TEE AND TWO 3/4" x 1/2" x 1/2" TEES	23
3.9 FIVE NOZZLE DISTRIBUTION SYSTEM.....	25
3.10 SIX NOZZLE DISTRIBUTION SYSTEM.....	26
CHAPTER 4 INSTALLATION	29
4.1 INTRODUCTION.....	29
4.2 INSTALLATION.....	29
4.2.1 EXTINGUISHER BRACKET – P/N 421222	29
4.2.2 EXTINGUISHER ASSEMBLY – P/N 421220-XY	30
4.2.3 HOSES	32
4.2.4 DISTRIBUTOR – P/N 420588	33
4.2.5 90° NOZZLE BRACKET – P/N 420584	34
4.2.6 45° NOZZLE BRACKET – P/N 420586	35
4.2.7 CONE NOZZLE – P/N 421222	35
CHAPTER 5 OPERATION	37
5.1 INTRODUCTION.....	37
5.2 OPERATION	37
CHAPTER 6 MAINTENANCE	38

6.1	INTRODUCTION.....	38
6.2	PERIODIC MAINTENANCE	38
6.2.1	EVERY 3000 MILES OR MONTHLY (whichever occurs first).....	38
6.2.2	EVERY 18000 MILES or SEMI-ANNUALLY (whichever occurs first).....	38
6.2.3	EVERY SIX YEARS	40
6.2.4	EVERY TWELVE YEARS	40
6.3	SPECIAL MAINTENANCE	41
6.3.1	HIGH TEMPERATURE INSTALLATIONS.....	41
6.3.2	AFTER SYSTEM DISCHARGE.....	41
CHAPTER 7	EXTINGUISHER ASSEMBLY REBUILD.....	45
7.1	INTRODUCTION.....	45
7.2	REBUILD INSTRUCTIONS	45

TABLE OF FIGURES

FIGURE 1	-	EXTINGUISHER ASSEMBLY.....	8
FIGURE 2	-	PRESSURE VS. TEMPERATURE GRAPH.....	9
FIGURE 3	-	EXTINGUISHER ASSEMBLY CONFIGURATIONS TABLE.....	10
FIGURE 4	-	GAUGE DOWN (-X1) EXTINGUISHER ORIENTATION.....	11
FIGURE 5	-	GAUGE RIGHT (-X2) EXTINGUISHER ORIENTATION.....	11
FIGURE 6	-	EXTINGUISHER MOUNTING BRACKET.....	12
FIGURE 7	-	DISTRIBUTOR.....	13
FIGURE 8	-	90° NOZZLE BRACKET.....	14
FIGURE 9	-	45° NOZZLE BRACKET.....	14
FIGURE 10	-	CONE NOZZLE.....	15
FIGURE 11	-	CONE NOZZLE SPRAY PATTERN.....	17
FIGURE 12	-	TOTAL FLOODING COVERAGE PER NOZZLE (MAX).....	18
FIGURE 13	-	TOTAL FLOODING COVERAGE PER SYSTEM (MAX) TABLE.....	18
FIGURE 14	-	LOCAL APPLICATION COVERAGE PER NOZZLE (MAX).....	19
FIGURE 15	-	LOCAL APPLICATION COVERAGE PER SYSTEM (MAX) TABLE.....	19
FIGURE 16	-	TWO NOZZLE CONFIGURATION DIAGRAM.....	20
FIGURE 17	-	TWO NOZZLE CONFIGURATION TABLE.....	20
FIGURE 18	-	THREE NOZZLE CONFIGURATION DIAGRAM.....	21
FIGURE 19	-	THREE NOZZLE CONFIGURATION TABLE.....	21
FIGURE 20	-	FOUR NOZZLE CONFIGURATION DIAGRAM (DISTRIBUTOR).....	22
FIGURE 21	-	FOUR NOZZLE CONFIGURATION TABLE (DISTRIBUTOR).....	23
FIGURE 22	-	FOUR NOZZLE CONFIGURATION DIAGRAM.....	24
FIGURE 23	-	FOUR NOZZLE CONFIGURATION TABLE.....	24
FIGURE 24	-	FIVE NOZZLE CONFIGURATION DIAGRAM.....	25
FIGURE 25	-	FIVE NOZZLE CONFIGURATION TABLE.....	26
FIGURE 26	-	SIX NOZZLE CONFIGURATION DIAGRAM.....	27
FIGURE 27	-	SIX NOZZLE CONFIGURATION TABLE.....	27
FIGURE 28	-	EXTINGUISHER BRACKET MOUNTING HOLE TEMPLATE.....	30
FIGURE 29	-	GAUGE DOWN (-X1) EXTINGUISHER ORIENTATION.....	31
FIGURE 30	-	GAUGE RIGHT (-X2) EXTINGUISHER ORIENTATION.....	32
FIGURE 31	-	DISTRIBUTOR MOUNTING HOLE TEMPLATE.....	34
FIGURE 32	-	90° NOZZLE BRACKET MOUNTING HOLE TEMPLATE.....	34
FIGURE 33	-	45° NOZZLE BRACKET MOUNTING HOLE TEMPLATE.....	35
FIGURE 34	-	CONE NOZZLE.....	36
FIGURE 35	-	CONTROL HEAD (EXPLODED VIEW).....	39
FIGURE 36	-	GAUGE DOWN (-X1) EXTINGUISHER ORIENTATION.....	43
FIGURE 37	-	GAUGE RIGHT (-X2) EXTINGUISHER ORIENTATION.....	44
FIGURE 38	-	CONTROL HEAD (EXPLODED VIEW).....	47
FIGURE 39	-	VALVE (CROSS-SECTION VIEW).....	48
FIGURE 40	-	421220-X1 SIPHON TUBE ORIENTATION.....	49
FIGURE 41	-	421220-X2 SIPHON TUBE ORIENTATION.....	49
FIGURE 42	-	APPROPRIATE AGENT TYPE TABLE.....	50
FIGURE 43	-	SUGGESTED PRESSURIZATION EQUIPMENT DETAIL.....	51

CHAPTER 1 GENERAL INFORMATION

1.1 INTRODUCTION

This manual provides comprehensive information about the KDS-25 Pre-Engineered Fire Suppression System. It includes component descriptions as well as system design, installation, operation and maintenance information. The Appendix to this manual includes technical drawings containing supplementary information for all applicable components.

1.2 SYSTEM OVERVIEW

The KDS-25 Pre-Engineered Fire Suppression System is specifically designed to provide pre-engineered fire protection for heavy-duty vehicles used in both on and off road applications. It consists of a stored pressure type extinguisher assembly and a distribution system. The extinguisher assembly contains 25 lbs of ABC rated monoammonium phosphate or BC rated Purple K dry chemical extinguishing agent and is secured in place by an extinguisher bracket. The distribution system consists of hydraulic hoses that connect the extinguisher assembly to nozzles through fittings, tees, distributors, or some combination thereof. Nozzles are secured in place and aimed at hazard areas using nozzle brackets.

The KDS-25 Pre-Engineered Fire Suppression System may be controlled by a wide variety of fire detection systems. Kidde Dual Spectrum Protection Panel P/N's 413410, 413484, 421246, 421262 and/or Expansion Module P/N's 413411, 421247 are examples of appropriate control devices.

The KDS-25 Pre-Engineered Fire Suppression System has been thoroughly tested to meet or exceed various requirements, recommended environmental practices and/or standards set forth by DOT, FM, NFPA, SAE, UL and more. Testing included, but was not limited to:

- Class A Live Fire Tests
- Class B Live Fire Tests
- Fuel Splash Tests
- Flow Rate Tests
- 30-Day Elevated Temperature Tests
- Thermal Cycling Tests
- Functional Tests at Temperature Extremes
- Salt Spray Corrosion Tests
- Pressure Washing Tests
- Vibration Tests
- Shock Resistance Tests

CHAPTER 2 COMPONENT DESCRIPTIONS

2.1 INTRODUCTION

This section provides a functional description of the components of a KDS-25 Pre-Engineered Fire Suppression System.

2.2 COMPONENT DESCRIPTIONS

2.2.1 EXTINGUISHER ASSEMBLY – P/N 421220-XY

The extinguisher assembly consists of a cylinder, valve, gauge, gauge shield, discharge adapter, anti-recoil cap and an electrically operated control head with an electric actuator all supplied as a single assembly (figure 1).

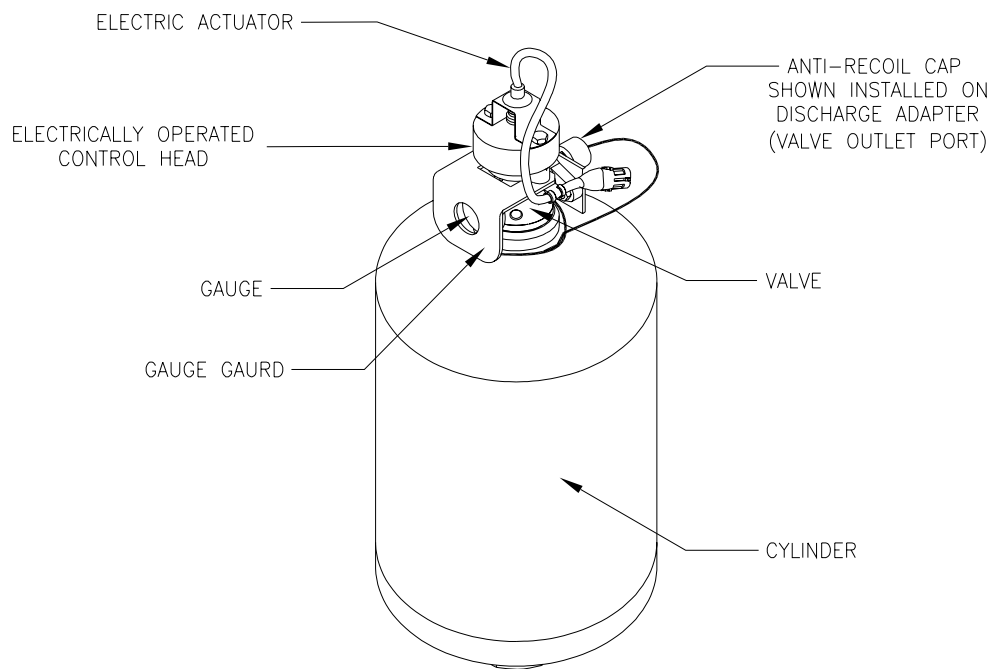


FIGURE 1 - EXTINGUISHER ASSEMBLY

The extinguisher assembly is a stored pressure type extinguisher that contains 25 pounds of ABC rated monoammonium phosphate or BC rated Purple K dry chemical extinguishing agent pressurized with nitrogen plus 15% helium to 360 psig at 70° F. If the ambient temperature is not 70° F, the pressure will vary (figure 2).

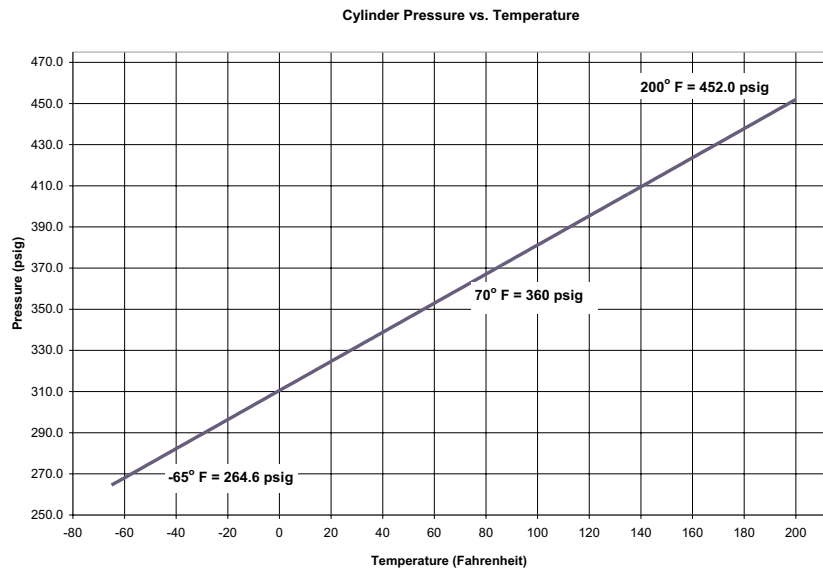


FIGURE 2 - PRESSURE VS. TEMPERATURE GRAPH

The cylinder contains the pressurized dry chemical extinguishing agent. It is constructed of steel and meets DOT and TC specifications. The valve is normally closed; when opened it allows discharge of the cylinder contents. It is mounted directly to the cylinder and is constructed of a nickel-plated brass body that is equipped with a spring-loaded check, fusible pressure relief plug and a pressure gauge. The gauge shield protects the gauge from damage. It is mounted to the valve and includes a large opening on its face to allow easy reading of the gauge. The discharge adapter is used to allow connection of a distribution hose to the valve outlet port. It is mounted to the valve and has a $\frac{3}{4}$ " NPT male fitting. The anti-recoil cap is used to provide a controlled and safe discharge if the extinguisher is accidentally actuated.

! WARNING !
THE ANTI-RECOIL CAP SHALL BE INSTALLED ON THE VALVE OUTLET PORT AT ALL TIMES EXCEPT WHEN THE EXTINGUISHER IS CONNECTED TO THE DISTRIBUTION PIPING.

It is permanently attached to the cylinder with a tether and shall be installed on the valve outlet port at all times except when the extinguisher is connected to the distribution piping or when the extinguisher is being filled. The electrically operated control head is used to open the valve. It is mounted to the valve and is constructed of a nickel-plated brass body that is equipped with a self-locking piston. The electric actuator presses the piston inside the control head into the open position when it is activated. It is mounted to the electrically operated control head.

All extinguisher assemblies may be mounted in either the horizontal or vertical position using the extinguisher mounting bracket.

! CAUTION !
EXTINGUISHER ASSEMBLY WILL NOT FUNCTION AS INTENDED IF ORIENTED INCORRECTLY. CORRECT MOUNTING ORIENTATION INFORMATION IS CONTAINED ON THE EXTINGUISHER ASSEMBLY NAMEPLATE AND IN THIS MANUAL.

The extinguisher assemblies are available in four unique configurations with differing combinations of dry chemical extinguishing agent type and gauge location (figure 3). The last two digits of the extinguisher assembly part number (421220-XY) are modified to indicate the selected configuration. If the 'X' is replaced with a 1, the extinguisher assembly will contain ABC rated monoammonium phosphate dry chemical extinguishing agent. If the 'X' is replaced with a 2, the extinguisher assembly will contain BC rated Purple K dry chemical extinguishing agent. If the 'Y' is replaced with a 1, the extinguisher assembly will be a gauge down configuration and if mounted horizontally (long axis of the cylinder horizontal) the gauge shall face down (toward the ground) (figure 4). If the 'Y' is replaced with a 2, the extinguisher assembly will be a gauge right configuration and if mounted horizontally (long axis of the cylinder horizontal) the gauge shall face to the right as looking from the valve end of the cylinder (figure 5).

PART NUMBER	DRY CHEMICAL EXTINGUISHING AGENT TYPE*	GAUGE LOCATION
421220-11	ABC	Down
421220-12	ABC	Right
421220-21	BC	Down
421220-22	BC	Right

* ABC Dry Chemical Extinguishing Agent is Pyrochem ABC 90% P/N 711; BC Dry Chemical Extinguishing Agent is Pyrochem Purple K P/N 721.

FIGURE 3 - EXTINGUISHER ASSEMBLY CONFIGURATIONS TABLE

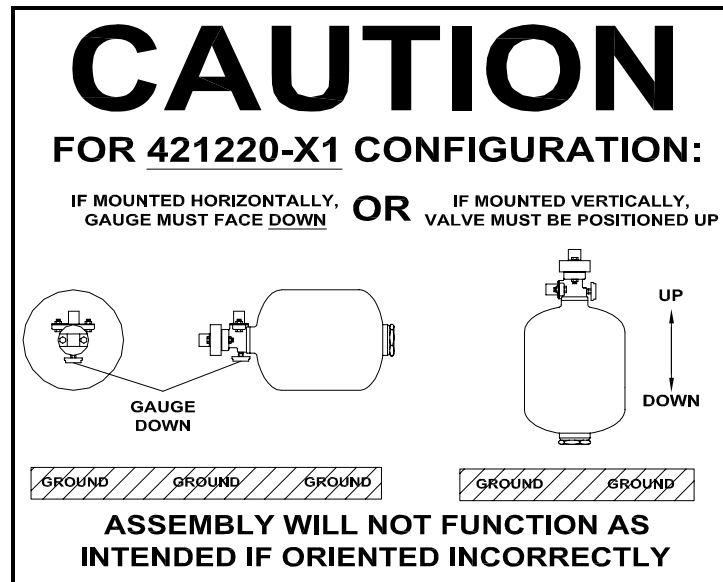


FIGURE 4 - GAUGE DOWN (-X1) EXTINGUISHER ORIENTATION

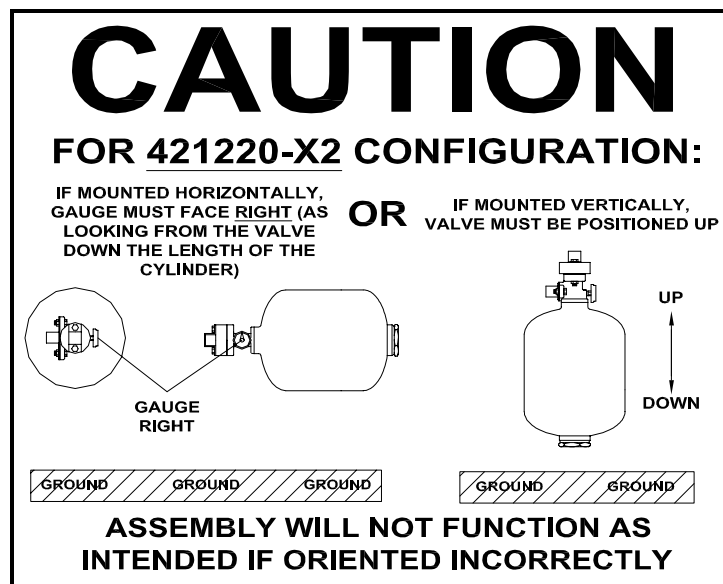


FIGURE 5 - GAUGE RIGHT (-X2) EXTINGUISHER ORIENTATION

2.2.2 EXTINGUISHER MOUNTING BRACKET – P/N 421222

The extinguisher mounting bracket is used to mount an extinguisher assembly in either the horizontal or vertical position (figure 6). It is constructed of steel and contains two band-clamps to secure the extinguisher assembly and an anti-recoil cap storage point to secure the anti-recoil cap when not in use. The extinguisher mounting bracket shall

be secured to a surface that will support a minimum 80 pound load using $\frac{3}{8}$ ", SAE grade 5 or better hardware.

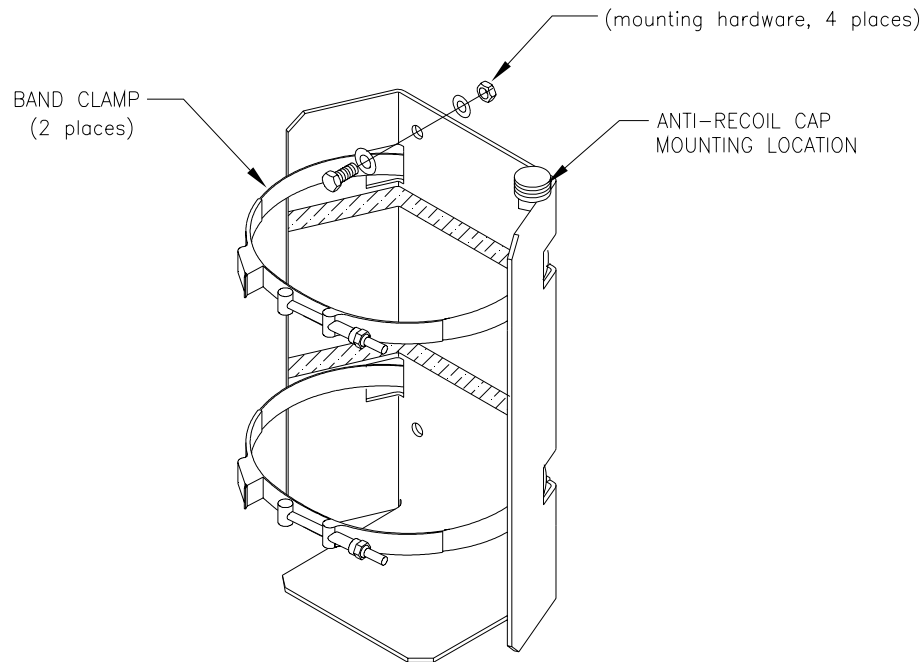


FIGURE 6 - EXTINGUISHER MOUNTING BRACKET
(shown in vertical mounting position)

2.2.3 HOSE

All hoses used within a KDS-25 Pre-Engineered Fire Suppression System shall meet SAE 100 R1 and/or SAE 100 R5 minimum specifications and shall have an appropriate operating temperature range for the intended application.

Fittings shall be used where hoses are connected to the extinguisher assembly, distributor, tees, nozzle bracket and/or nozzles. Reusable type or crimp type fittings are acceptable. Swivel couplings are acceptable. Elbows may be used to connect hoses provided the maximum quantity per the limitations of applicable distribution system configuration is not exceeded.

The following SAE standards should be used for reference:

- SAE J516, Hose Fitting
- SAE J517, Hydraulic Hose
- SAE J343, Test Procedure For SAE 100R Series Hydraulic Hose and Hose Assemblies

Alternatively, type 304 or type 316 seamless stainless steel rigid tubing conforming to ASTM-A-269 may be used in place of flexible hose. If any

one portion of the distribution system after the first flow dividing fitting (distributor or tee) is constructed of rigid tubing, then all portions of the distribution system after the first flow dividing fitting shall be constructed of rigid tubing. $\frac{3}{4}$ " OD tubing shall be used in place of $\frac{3}{4}$ " ID flexible hose and $\frac{1}{2}$ " OD tubing shall be used in place of $\frac{1}{2}$ " ID flexible hose.

2.2.4 DISTRIBUTOR – P/N 420588

The distributor is a manifold that is used to distribute dry chemical extinguishing agent from the extinguisher assembly to individual nozzles (figure 7). It has one $\frac{3}{4}$ " NPT female inlet port and four $\frac{1}{2}$ " NPT female outlet ports; unused outlet ports may be plugged with a $\frac{1}{2}$ " NPT male plug as necessary. The distributor may be used in lieu of or in combination with tees as specified in the applicable distribution system limitations table.

The distributor is constructed of steel and is zinc plated to prevent corrosion. It contains an integral mounting flange and shall be secured in place using $\frac{5}{16}$ " hardware.

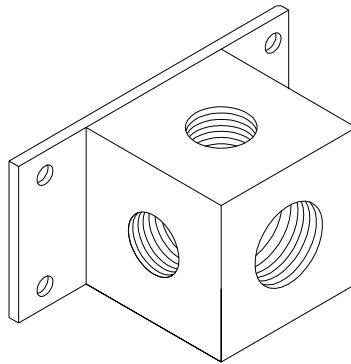


FIGURE 7 - DISTRIBUTOR

2.2.5 90° NOZZLE BRACKET – P/N 420584

The 90° nozzle bracket is used to mount a cone nozzle and couple it to a hose (figure 8). It is constructed of a 2" x 2" x $\frac{1}{8}$ " steel 90° angle bracket welded to a schedule 40 iron coupling with two $\frac{1}{2}$ " NPT female ports. The 90° nozzle bracket is zinc plated to prevent corrosion. It contains an integral mounting flange and shall be secured in place using $\frac{5}{16}$ " hardware.

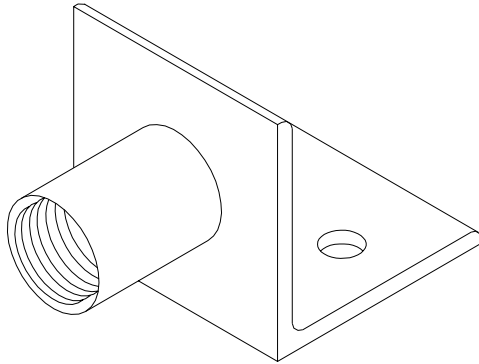


FIGURE 8 - 90° NOZZLE BRACKET

2.2.6 45° NOZZLE BRACKET – P/N 420586

The 45° nozzle bracket is used to mount a cone nozzle and couple it to a hose (figure 9). It is constructed of a 2" x 2" x 1/8" steel 90° angle bracket welded to a schedule 40 iron 45° elbow with two 1/2" NPT female ports. The 45° nozzle bracket is zinc plated to prevent corrosion. It contains an integral mounting flange and shall be secured in place using 5/16" hardware.

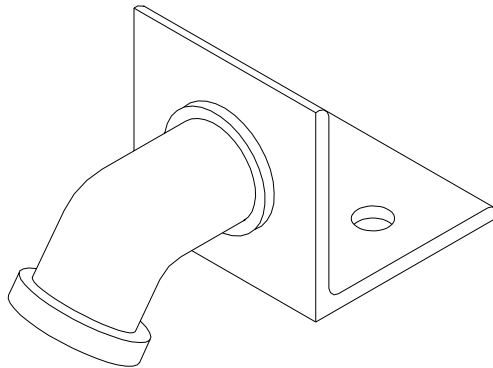


FIGURE 9 - 45° NOZZLE BRACKET

2.2.7 CONE NOZZLE – P/N 408878-1

The cone nozzle is used to disperse a cone shaped spray of dry chemical extinguishing agent for total flooding application and local application (figure 10). It is constructed of plated steel and contains an integral 45° steel cone outlet port and a 1/2" NPT male inlet port. The cone nozzle has a protective cap tethered to it which shall be installed on the outlet port at all times except when automatically blown off during a discharge or for inspection purposes.

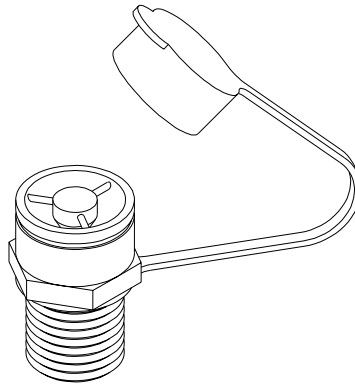


FIGURE 10 - CONE NOZZLE
(shown with protective cap attached but NOT installed in place)

CHAPTER 3 SYSTEM DESIGN

3.1 INTRODUCTION

This section provides instructions and limitations for designing a KDS-25 Pre-Engineered Fire Suppression System.

3.2 HAZARD ANALYSIS

Prior to designing or installing a KDS-25 Pre-Engineered Fire Suppression System, a comprehensive hazard analysis shall be performed on the subject vehicle. The hazard analysis serves to establish what and where the primary fire hazards are so the system can be configured to provide maximum protection. Configuration decisions include, but are not limited to: quantity and location of extinguisher assemblies, type of dry chemical extinguishing agent and quantity and location of nozzles. The hazard analysis shall only be performed by a trained professional familiar with fire protection principles, in accordance with the requirements of the authority(s) having jurisdiction and with the assistance of an individual knowledgeable with the subject vehicle and its fire history (if applicable).

3.3 MONITORING / ACTIVATING CIRCUIT

The KDS-25 Pre-Engineered Fire Suppression System may be controlled by a wide variety of fire detection systems. The extinguisher assembly's electrical specifications and minimum monitoring / activating circuit requirements are outlined below:

- Isolation between either electrical connector pin and the extinguisher assembly is ≥ 2 Meg Ohms.
- Resistance across the electrical connector pins is ≤ 1.6 Ohms in quiescent state.
- The extinguisher assembly will activate when >1.0 Amp is applied across the electrical connector pins.
- The maximum monitoring current across the electrical connector pins is 0.01 Amp
- The maximum no-fire current across the electrical connector pins is 0.3 Amp for 0.05 Seconds or 0.15 Amp for 30 Seconds.

Kidde Dual Spectrum Protection Panel P/N's 413410, 413484, 421246, 421262 and/or Expansion Module P/N's 413411, 421247 are examples of appropriate control devices.

3.4 OVERVIEW

The KDS-25 Pre-Engineered Fire Suppression System may be configured with a two, three, four, five or six nozzle distribution system. The distribution system consists of hydraulic hoses that connect the extinguisher assembly to nozzles through fittings, tees, distributors, or some combination thereof. Nozzles are secured in place and aimed at hazard areas using nozzle brackets. Each nozzle provides a module of protection for a hazard area; either as a volume for total

flooding application or as an area for local application. For each distribution system configuration there are minimum and maximum hose length, diameter, ratio and fitting limitations.

! WARNING !
THE KDS-25 PRE-ENGINEERED FIRE SUPPRESSION SYSTEM MAY NOT FUNCTION AS INTENDED IF THE LIMITATIONS EXPRESSED FOR EACH DISTRIBUTION SYSTEM CONFIGURATION ARE NOT STRICTLY ADHERED TO

3.5 NOZZLE COVERAGE

Each nozzle disperses dry chemical extinguishing agent in a cone shaped spray pattern approximately 5 feet across at 6 feet from its face (figure 11).

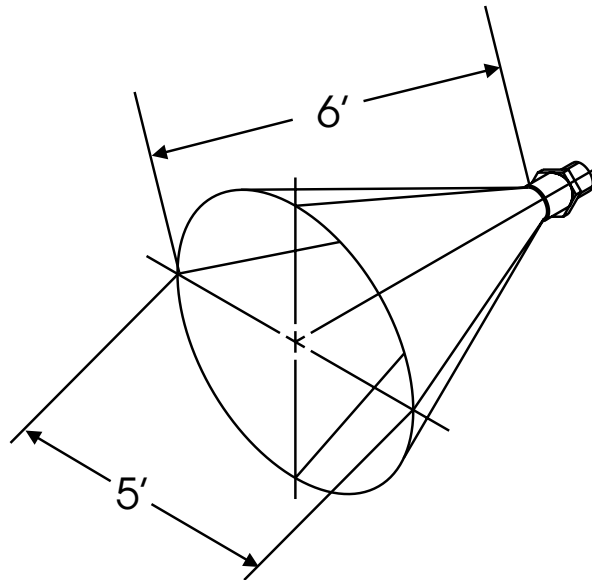


FIGURE 11 - CONE NOZZLE SPRAY PATTERN

Nozzles may be used for total flooding application, local application or some combination thereof. Total flooding application is used for hazards in enclosed areas. Local application is used for hazards in unenclosed areas. When determining appropriate application methods, hidden and/or shadowed hazard areas that are hard to reach and/or are partially obstructed must be considered and accommodated for.

When used for total flooding application each nozzle provides a module of coverage for a maximum volume of 216 cubic feet (figure 12).

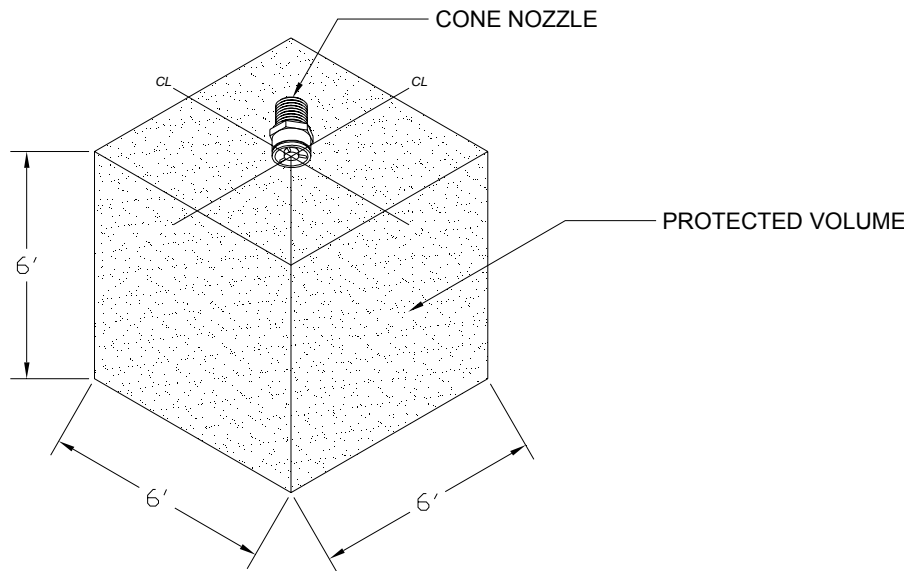


FIGURE 12 - TOTAL FLOODING COVERAGE PER NOZZLE (MAX)

Maximum system coverage for total flooding application ranges from a volume of 432 cubic feet utilizing a two nozzle configuration to a volume of 1296 cubic feet utilizing a six nozzle configuration (figure 13).

NUMBER OF NOZZLES	MAXIMUM TOTAL COVERAGE (VOLUME - CUBIC FEET)
2	432
3	648
4	864
5	1080
6	1296

FIGURE 13 - TOTAL FLOODING COVERAGE PER SYSTEM (MAX) TABLE

When used for local application each nozzle provides a module of coverage for an maximum area of 6.25 square feet (figure 14).

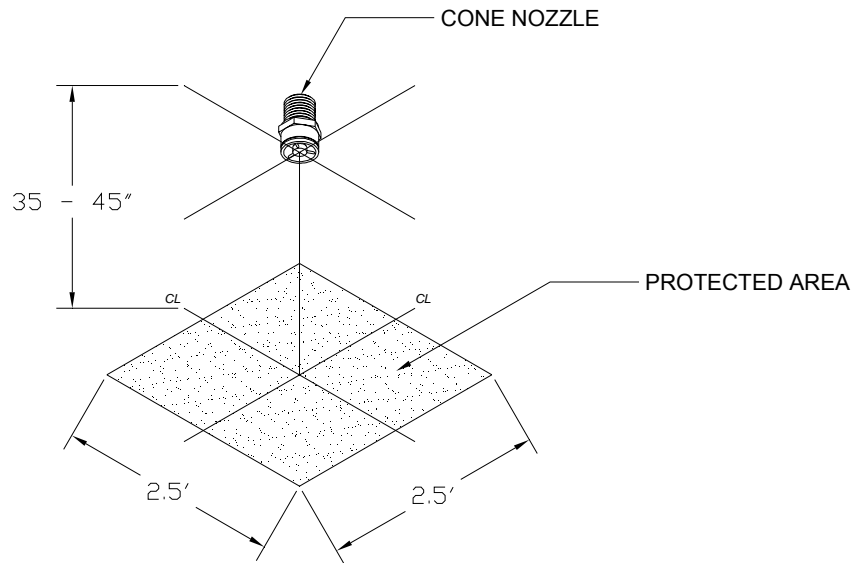


FIGURE 14 - LOCAL APPLICATION COVERAGE PER NOZZLE (MAX)

! CAUTION !
IF A LOCAL APPLICATION METHOD IS USED FOR THE PURPOSE OF EXTINGUISHING A FLAMMABLE LIQUID SURFACE; THE MINIMUM NOZZLE INSTALLATION HEIGHT SHALL BE 45 INCHES TO PREVENT THE LIQUID FROM SPLASHING OUTSIDE THE COVERAGE AREA.

Maximum system coverage for local application ranges from an area of 12.5 square feet utilizing a two nozzle configuration to an area of 37.5 square feet utilizing a six nozzle configuration (figure 15).

NUMBER OF NOZZLES	MAXIMUM TOTAL COVERAGE (AREA - SQUARE FEET)
2	12.5
3	18.75
4	25.0
5	31.25
6	37.5

FIGURE 15 - LOCAL APPLICATION COVERAGE PER SYSTEM (MAX) TABLE

Total flooding and local application methods may be used in any combination and may be located adjacent or non-adjacent to each other.

3.6 TWO NOZZLE DISTRIBUTION SYSTEM

A two nozzle distribution system is configured using $\frac{3}{4}$ " hose, $\frac{1}{2}$ " hose and one $\frac{3}{4}$ " x $\frac{1}{2}$ " x $\frac{1}{2}$ " tee (figure 16 & 17). One $\frac{3}{4}$ " hose connects from the extinguisher assembly valve outlet port to the tee inlet. One $\frac{1}{2}$ " hose each, two total, connects from the two tee outlets to nozzles #1 and #2.

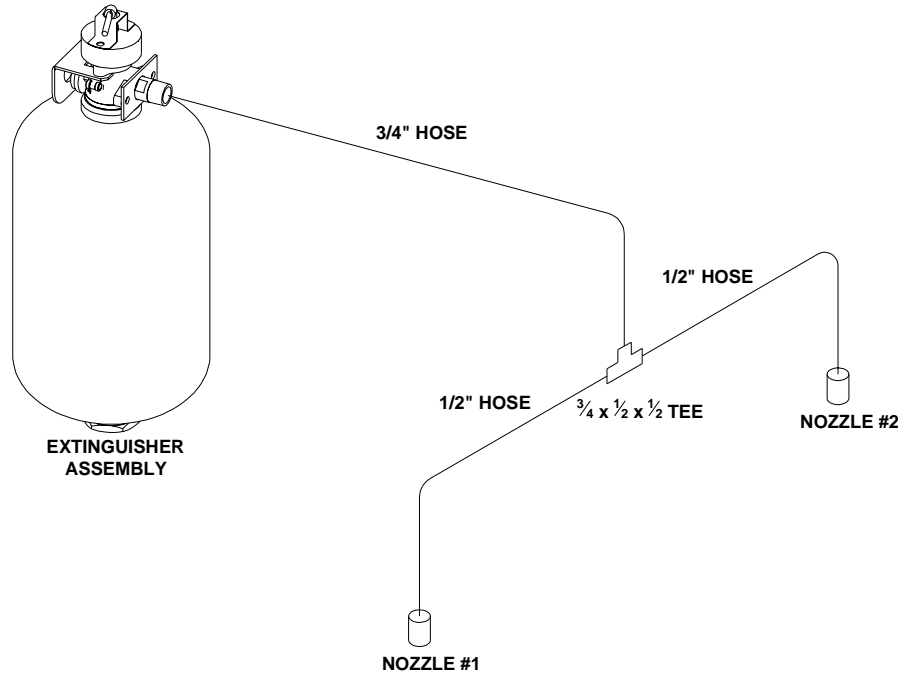


FIGURE 16 - TWO NOZZLE CONFIGURATION DIAGRAM

HOSE LOCATION	HOSE DIAMETER (I.D. – INCHES)	HOSE LENGTH (FEET)	
		MIN	MAX
EXTINGUISHER TO TEE	$\frac{3}{4}$	5	30
TEE TO EACH NOZZLE	$\frac{1}{2}$	0	15
EXTINGUISHER TO EACH NOZZLE	N/A	10	45

FIGURE 17 - TWO NOZZLE CONFIGURATION TABLE

- Hoses from the tee to each nozzle may differ in length no greater than 2:1 ratio
- Hoses from the tee to each nozzle may exceed the maximum hose length specified when differing hose lengths (unbalanced system) are used provided all other specified limitations are not exceeded

- Total quantity of 3/4" hose may not exceed 30 feet
- Total quantity of 1/2" hose may not exceed 45 feet
- No more than one elbow may be used on each hose

3.7 THREE NOZZLE DISTRIBUTION SYSTEM

A three nozzle distribution system is configured using 3/4" hose, 1/2" hose, one distributor and one 1/2" plug (figure 18 & 19). One 3/4" hose connects from the extinguisher assembly valve outlet port to the distributor inlet. One 1/2" hose each, three total, connects from the three distributor outlets to nozzles #1, #2 and #3 respectively. One 1/2" plug connects to the unused outlet on the distributor.

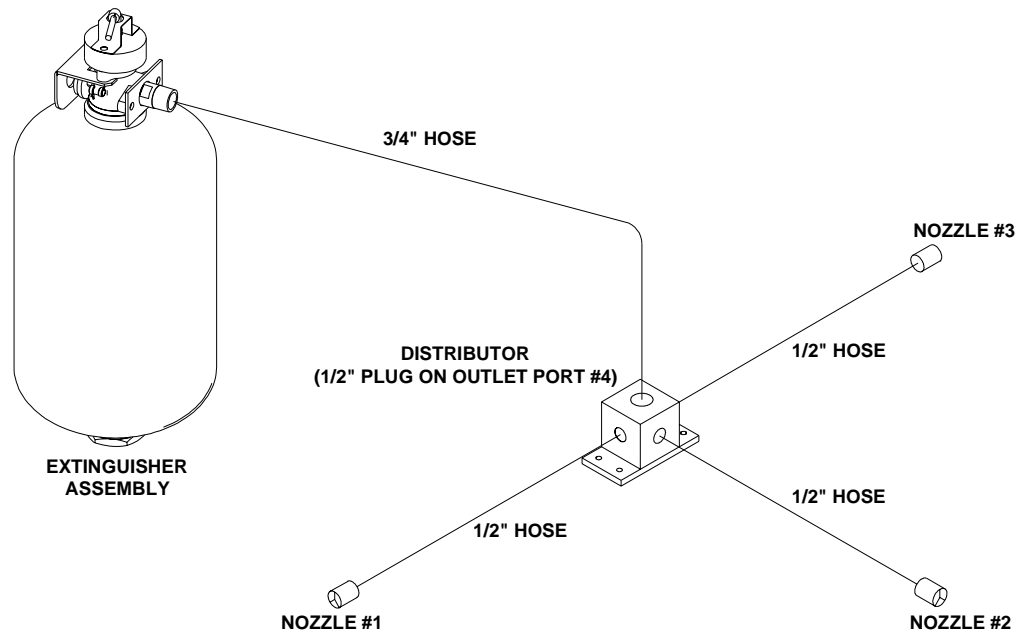


FIGURE 18 - THREE NOZZLE CONFIGURATION DIAGRAM

HOSE LOCATION	HOSE DIAMETER (I.D. – INCHES)	HOSE LENGTH (FEET)	
		MIN	MAX
EXTINGUISHER TO DISTRIBUTOR	3/4	5	30
DISTRIBUTOR TO EACH NOZZLE	1/2	0	15
EXTINGUISHER TO EACH NOZZLE	N/A	10	45

FIGURE 19 - THREE NOZZLE CONFIGURATION TABLE

- Hoses from the distributor to each nozzle may differ in length no greater than 2:1 ratio
- Hoses from the distributor to each nozzle may exceed the maximum hose length specified when differing hose lengths (unbalanced system) are used provided all other specified limitations are not exceeded
- Total quantity of $\frac{3}{4}$ " hose may not exceed 30 feet
- Total quantity of $\frac{1}{2}$ " hose may not exceed 45 feet
- No more than one elbow may be used on each hose

3.8 FOUR NOZZLE DISTRIBUTION SYSTEM

A four nozzle distribution system is configured using $\frac{3}{4}$ " hose, $\frac{1}{2}$ " hose and either one distributor (figure 20 & 21) or one $\frac{3}{4}$ " x $\frac{3}{4}$ " x $\frac{3}{4}$ " tee and two $\frac{3}{4}$ " x $\frac{1}{2}$ " x $\frac{1}{2}$ " tees (figure 22 & 23).

3.8.1 ONE DISTRIBUTOR:

One $\frac{3}{4}$ " hose connects from the extinguisher assembly valve outlet port to the distributor inlet. One $\frac{1}{2}$ " hose each, four total, connects from the four distributor outlets to nozzles #1, #2, #3 and #4 respectively.

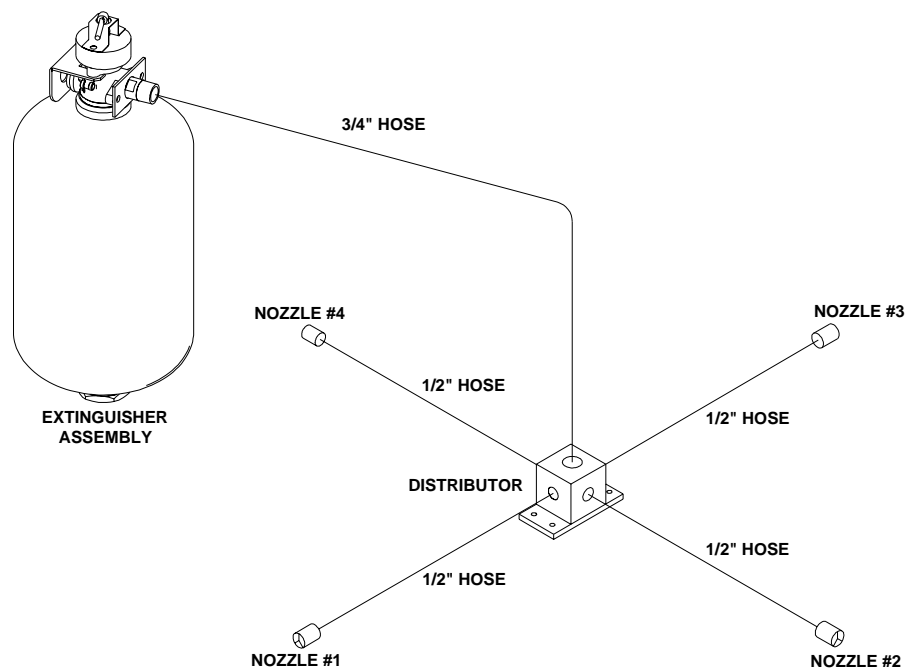


FIGURE 20 - FOUR NOZZLE CONFIGURATION DIAGRAM (DISTRIBUTOR)

HOSE LOCATION	HOSE DIAMETER (I.D. – INCHES)	HOSE LENGTH (FEET)	
		MIN	MAX
EXTINGUISHER TO DISTRIBUTOR	$\frac{3}{4}$	5	45
DISTRIBUTOR TO EACH NOZZLE	$\frac{1}{2}$	0	15
EXTINGUISHER TO EACH NOZZLE	N/A	10	60

FIGURE 21 - FOUR NOZZLE CONFIGURATION TABLE (DISTRIBUTOR)

- Hoses from the distributor to each nozzle may differ in length no greater than 3:1 ratio
- Hoses from the distributor to each nozzle may exceed the maximum hose length specified when differing hose lengths (unbalanced system) are used provided all other specified limitations are not exceeded
- Total quantity of $\frac{3}{4}$ " hose may not exceed 45 feet
- Total quantity of $\frac{1}{2}$ " hose may not exceed 60 feet
- No more than one elbow may be used on each hose

3.8.2 ONE $\frac{3}{4}$ " x $\frac{3}{4}$ " x $\frac{3}{4}$ " TEE AND TWO $\frac{3}{4}$ " x $\frac{1}{2}$ " x $\frac{1}{2}$ " TEES

One $\frac{3}{4}$ " hose connects from the extinguisher assembly valve outlet port to the tee #1 ($\frac{3}{4}$ " x $\frac{3}{4}$ " x $\frac{3}{4}$ ") inlet. One $\frac{3}{4}$ " hose each, two total, connect from the two tee #1 outlets to the tee #2 ($\frac{3}{4}$ " x $\frac{1}{2}$ " x $\frac{1}{2}$ ") and tee #3 ($\frac{3}{4}$ " x $\frac{1}{2}$ " x $\frac{1}{2}$ ") inlets. One $\frac{1}{2}$ " hose each, two total, connects from the two tee #2 outlets to nozzles #1 and #2 respectively. One $\frac{1}{2}$ " hose each, two total, connects from the two tee #3 outlets to nozzles #3 and #4 respectively.

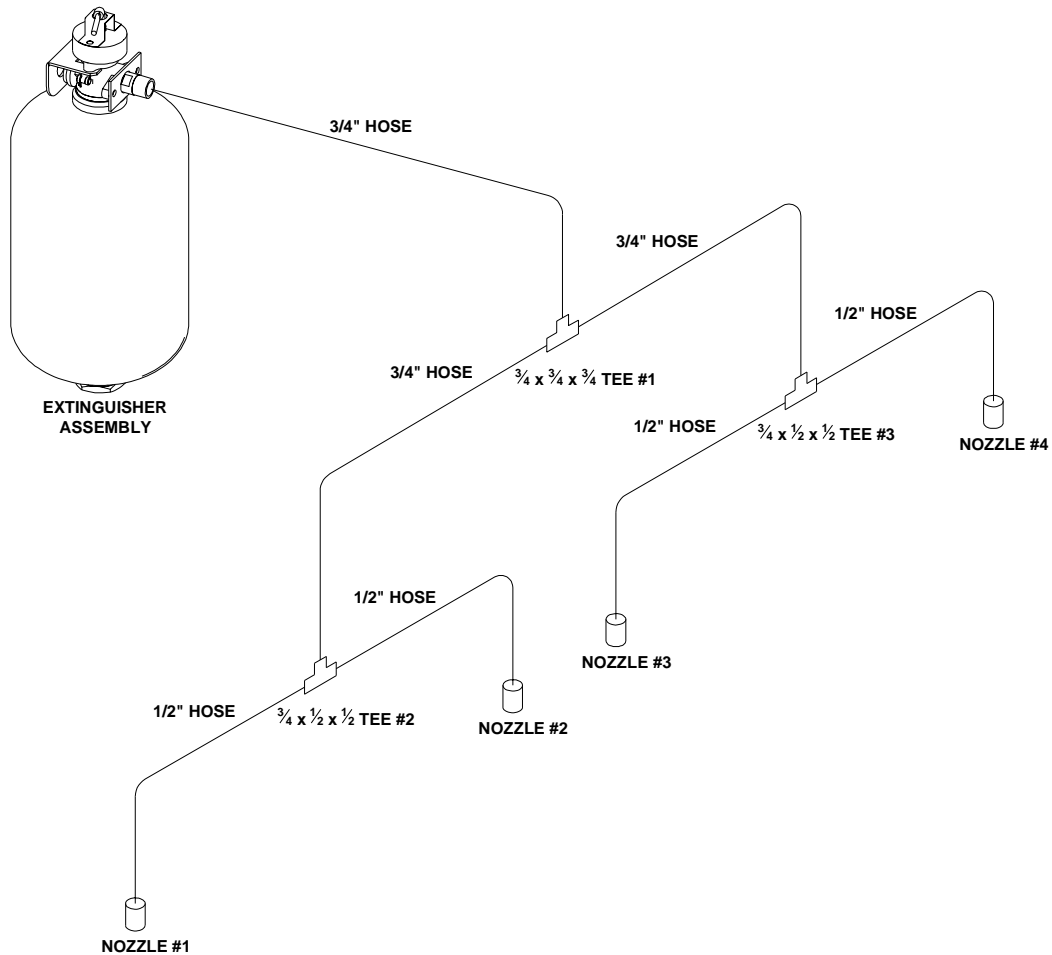


FIGURE 22 - FOUR NOZZLE CONFIGURATION DIAGRAM

HOSE LOCATION	HOSE DIAMETER (I.D. - INCHES)	HOSE LENGTH (FEET)	
		MIN	MAX
EXTINGUISHER TO TEE #1	3/4	5	45
TEE #1 TO TEE #2 OR TEE #3	3/4	0	20
TEE #2 OR TEE #3 TO EACH NOZZLE	1/2	0	15
EXTINGUISHER TO EACH NOZZLE	N/A	10	50

FIGURE 23 - FOUR NOZZLE CONFIGURATION TABLE

- Hoses from tee #1 to tee #2 and tee #3 may differ in length no greater than 3:1 ratio
- Hoses from tee #2 and tee #3 to each nozzle may differ in length no greater than 3:1 ratio
- Hoses from tee #1 to tee #2 and tee #3 and hoses from tee #2 and tee #3 to each nozzle may exceed the maximum hose length specified when differing hose lengths (unbalanced system) are used provided all other specified limitations are not exceeded
- Total quantity of $\frac{3}{4}$ " hose may not exceed 45 feet
- Total quantity of $\frac{1}{2}$ " hose may not exceed 60 feet
- No more than one elbow may be used on each hose

3.9 FIVE NOZZLE DISTRIBUTION SYSTEM

A five nozzle distribution system is configured using $\frac{3}{4}$ " hose, $\frac{1}{2}$ " hose, one distributor and two $\frac{1}{2}$ " x $\frac{1}{2}$ " x $\frac{1}{2}$ " tees (figure 24 & 25). One $\frac{3}{4}$ " hose connects from the extinguisher assembly valve outlet port to the distributor inlet. One $\frac{1}{2}$ " hose each, two total, connects from the two distributor outlets to the tee #1 and tee #2 inlets. One $\frac{1}{2}$ " hose each, two total, connects from the two tee #1 outlets to nozzles #1 and #2 respectively. One $\frac{1}{2}$ " hose each, two total, connects from the two tee #2 outlets to nozzles #3 and #4 respectively. One $\frac{1}{2}$ " hose connects directly from the distributor outlet to nozzle #5. One $\frac{1}{2}$ " plug connects to the unused outlet on the distributor.

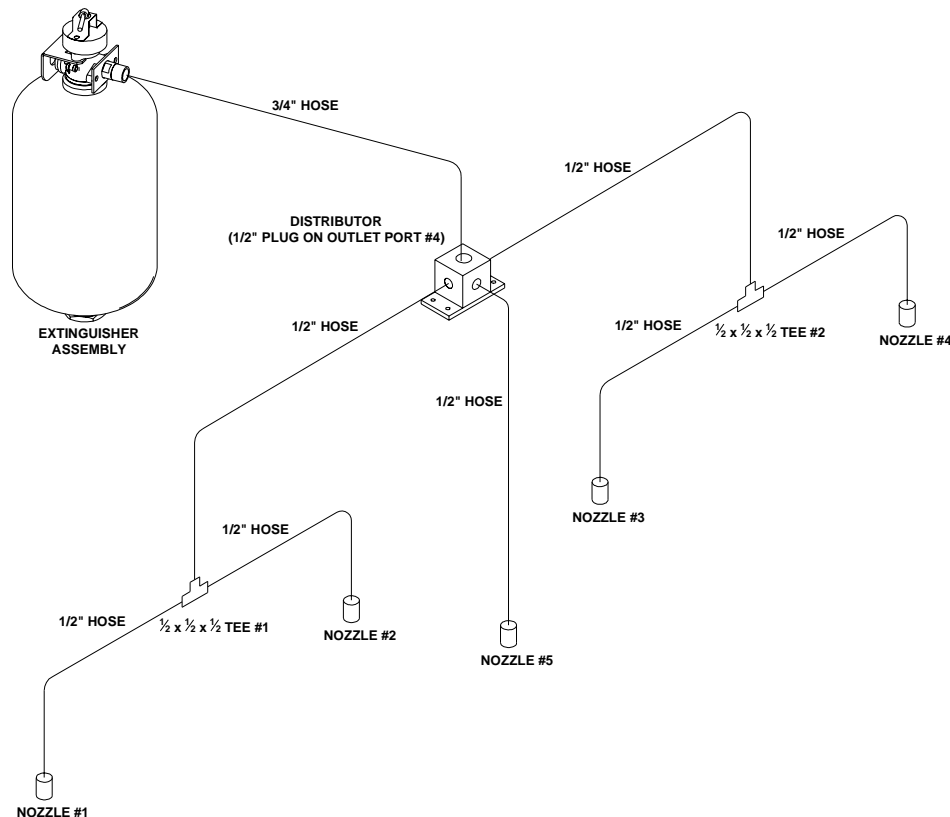


FIGURE 24 - FIVE NOZZLE CONFIGURATION DIAGRAM

HOSE LOCATION	HOSE DIAMETER (I.D. – INCHES)	HOSE LENGTH (FEET)	
		MIN	MAX
EXTINGUISHER TO DISTRIBUTOR	$\frac{3}{4}$	5	30
DISTRIBUTOR TO TEE #1 OR TEE #2	$\frac{1}{2}$	0	10
DISTRIBUTOR TO NOZZLE #5	$\frac{1}{2}$	0	10
TEE #1 OR TEE #2 TO EACH NOZZLE	$\frac{1}{2}$	0	10
EXTINGUISHER TO EACH NOZZLE	N/A	10	40

FIGURE 25 - FIVE NOZZLE CONFIGURATION TABLE

- Hoses from the distributor to tee #1 and tee #2 may differ in length no greater than 2:1 ratio
- Hoses from tee #1 and tee #2 to each nozzle may differ in length no greater than 2:1 ratio
- The hose from the distributor to nozzle #5 and the hose from the distributor to tee #1 and tee #2 may differ in length no greater than 2:1 ratio
- Hoses from the distributor to tee #1 and tee #2, hoses from tee #1 and tee #2 to each nozzle and the hose from the distributor to nozzle #5 may exceed the maximum hose length specified when differing hose lengths (unbalanced system) are used provided all other specified limitations are not exceeded
- Total quantity of $\frac{3}{4}$ " hose may not exceed 30 feet
- Total quantity of $\frac{1}{2}$ " hose may not exceed 50 feet
- No more than one elbow may be used on each hose

3.10 SIX NOZZLE DISTRIBUTION SYSTEM

A six nozzle distribution system is configured using $\frac{3}{4}$ " hose, $\frac{1}{2}$ " hose, one distributor and three $\frac{1}{2}$ " x $\frac{1}{2}$ " x $\frac{1}{2}$ " tees (figure 26 & 27). One $\frac{3}{4}$ " hose connects from the extinguisher assembly valve outlet port to the distributor inlet. One $\frac{1}{2}$ " hose each, three total, connects from the three distributor outlets to the tee #1, tee #2 and tee #3 inlets respectively. One $\frac{1}{2}$ " hose each, two total, connects from the two tee #1 outlets to nozzles #1 and #2 respectively. One $\frac{1}{2}$ " hose each, two total, connects from the two tee #2 outlets to nozzles #3 and #4 respectively. One $\frac{1}{2}$ " hose each, two total, connects from the two tee #3 outlets to nozzles #5 and #6 respectively. One $\frac{1}{2}$ " plug connects to the unused outlet on the distributor.

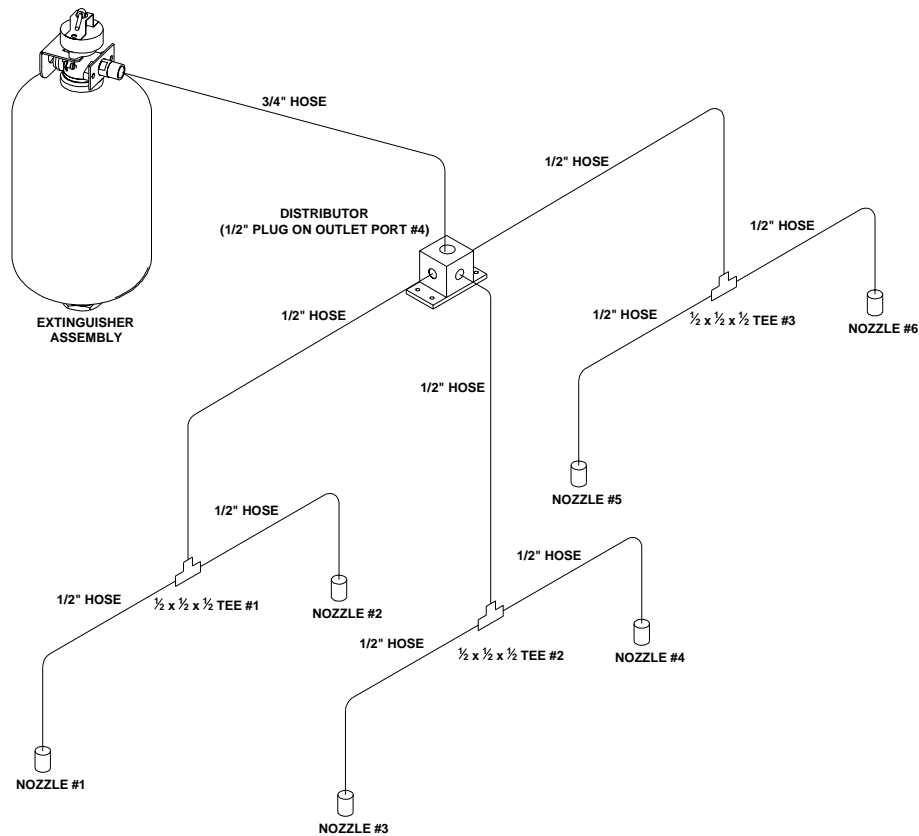


FIGURE 26 - SIX NOZZLE CONFIGURATION DIAGRAM

HOSE LOCATION	HOSE DIAMETER (I.D. – INCHES)	HOSE LENGTH (FEET)	
		MIN	MAX
EXTINGUISHER TO DISTRIBUTOR	3/4	5	15
DISTRIBUTOR TO TEE #1, TEE #2 OR TEE #3	1/2	0	5
TEE #1, TEE #2 OR TEE #3 TO EACH NOZZLE	1/2	0	5
EXTINGUISHER TO EACH NOZZLE	N/A	10	30

FIGURE 27 - SIX NOZZLE CONFIGURATION TABLE

- Hoses from the distributor to tee #1, tee #2 and tee #3 may differ in length no greater than 2:1 ratio



Kidde Dual Spectrum

- Hoses from tee #1, tee #2 and tee #3 to each nozzle may differ in length no greater than 2:1 ratio
- Hoses from the distributor to tee #1, tee #2 and tee #3 and hoses from tee #1, tee #2 and tee #3 to each nozzle may exceed the maximum hose length specified when differing hose lengths (unbalanced system) are used provided all other specified limitations are not exceeded
- Total quantity of $\frac{3}{4}$ " hose may not exceed 15 feet
- Total quantity of $\frac{1}{2}$ " hose may not exceed 45 feet
- No more than one elbow may be used on each hose

CHAPTER 4 INSTALLATION

4.1 INTRODUCTION

This section provides instructions for installing a KDS-25 Pre-Engineered Fire Suppression System.

4.2 INSTALLATION

4.2.1 EXTINGUISHER BRACKET – P/N 421222

The extinguisher bracket may be mounted in either a horizontal or vertical position (5 degree angle offset maximum) as necessary for the desired extinguisher assembly orientation. It may be mounted in an interior or exterior location, provided the location will not exceed the maximum operating temperatures of the extinguisher assembly (-65°F to +200°F) or subject it to excessive environmental extremes – clean, dry locations are best. Locations that are unprotected from hazards such as flying road debris, salt, etc and/or locations that may otherwise subject the extinguisher assembly to physical damage and/or abuse are not recommended.

! CAUTION !
**ENSURE THE MOUNTING LOCATION IS READILY ACCESSIBLE FOR INSPECTION
AND PROVIDES ADEQUATE CLEARANCE FOR EXTINGUISHER ASSEMBLY
REMOVAL FOR MAINTENANCE.**

The extinguisher mounting bracket shall be secured to a surface that will support a minimum 80 pound load using $\frac{3}{8}$ " SAE grade 5 or better hardware (figure 28).

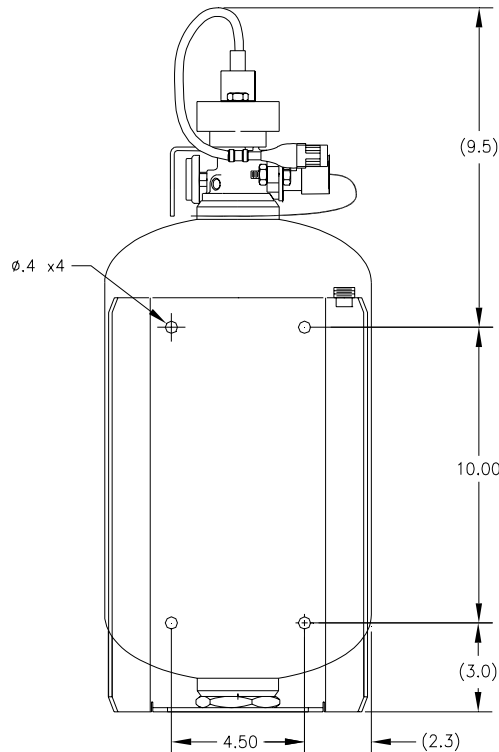


FIGURE 28 - EXTINGUISHER BRACKET MOUNTING HOLE TEMPLATE
(for horizontal mounting rotate 90°)

! WARNING !
MOUNTING HARDWARE MUST BE ORIENTED SUCH THAT BOLT HEADS ARE ON THE EXTINGUISHER SIDE OF THE BRACKET. IF INSTALLED BACKWARDS AND BOLTS PROTRUDE TOWARD THE EXTINGUISHER ASSEMBLY, THE STRUCTURAL INTEGRITY OF THE CYLINDER MAY BE COMPROMISED AND AN EXTREMELY HAZARDOUS SITUATION CREATED.

After the extinguisher assembly is set in place in the bracket and oriented correctly per the extinguisher nameplate instructions, torque the band clamps to 20 lb. ft. (nominal). After the distribution piping is connected to valve outlet port, screw the anti-recoil cap to the mounting location provided on the bracket.

4.2.2 EXTINGUISHER ASSEMBLY – P/N 421220-XY

The extinguisher assembly shall be mounted in the extinguisher bracket in either a horizontal or vertical position (5 degree angle offset maximum) in a location that will not exceed the maximum operating temperatures of the extinguisher assembly (-65°F to +200°F) or subject it to excessive environmental extremes – clean, dry locations are best. Locations that are unprotected from hazards such as flying road debris, salt, etc and/or

locations that may otherwise subject the extinguisher assembly to physical damage and/or abuse are not recommended.

! CAUTION !
EXTINGUISHER ASSEMBLY WILL NOT FUNCTION AS INTENDED IF ORIENTED INCORRECTLY. 421220-X1 AND 421220-X2 CONFIGURATIONS REQUIRE DIFFERENT MOUNTING ORIENTATIONS ('X' WILL BE REPLACED WITH A 1 OR 2 DEPENDING ON AGENT TYPE BUT HAS NO EFFECT ON ORIENTATION REQUIREMENTS)

Always double-check the extinguisher nameplate to ensure the correct configuration has been obtained for the intended application. Extinguisher nameplates are color coded for quick visual verification: -X1 configuration nameplates are white with black text and -X2 configuration nameplates are black with white text. For -X1 configurations only, if mounted horizontally, the gauge must face the ground (figure 29). For -X2 configurations only, if mounted horizontally, the gauge must face to the right as looking from the valve down the length of the cylinder (figure 30). For either configuration, if mounted vertically, the valve must be positioned up.

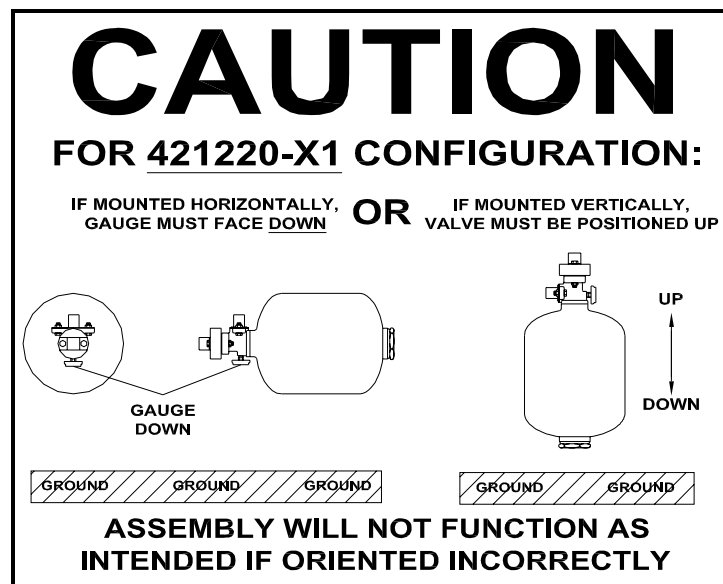


FIGURE 29 - GAUGE DOWN (-X1) EXTINGUISHER ORIENTATION

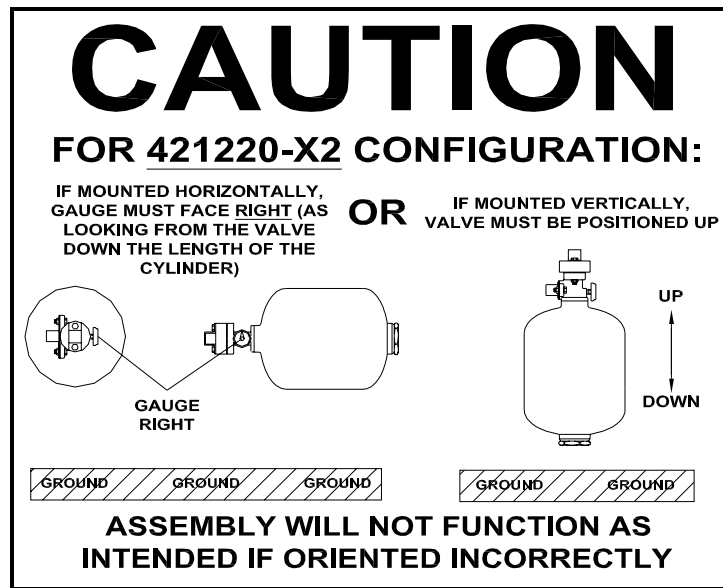


FIGURE 30 - GAUGE RIGHT (-X2) EXTINGUISHER ORIENTATION

! WARNING !
THE ANTI-RECOIL CAP SHALL BE INSTALLED ON THE VALVE OUTLET PORT AT ALL TIMES EXCEPT WHEN THE EXTINGUISHER IS SECURELY INSTALLED IN THE BRACKET AND CONNECTED TO THE DISTRIBUTION PIPING.

After the distribution piping is connected to the valve outlet port, screw the anti-recoil cap to the mounting location provided on the bracket.

4.2.3 HOSES

All hoses used within a KDS-25 Pre-Engineered Fire Suppression System shall meet SAE 100 R1 and/or SAE 100 R5 minimum specifications and shall have an appropriate operating temperature range for the intended application.

Fittings shall be used where hoses are connected to the extinguisher assembly, distributor, tees, nozzle bracket and/or nozzles. Reusable type or crimp type fittings are acceptable. Swivel couplings are acceptable. Elbows may be used to connect hoses provided the maximum quantity per the limitations of applicable distribution system configuration is not exceeded.

For each distribution system configuration there are minimum and maximum hose length, diameter, ratio and fitting limitations.

! WARNING !
**THE KDS-25 PRE-ENGINEERED FIRE SUPPRESSION SYSTEM MAY NOT
FUNCTION AS INTENDED IF THE LIMITATIONS EXPRESSED FOR EACH
DISTRIBUTION SYSTEM CONFIGURATION ARE NOT STRICTLY ADHERED TO**

Hoses may be run in any direction with any number of bends provided the limitations expressed by the hose manufacturer, including minimum bend radius, are not exceeded. They shall be adequately secured using insulated p-clamps, or other similar means, to protect from rubbing, chafing, dragging, etc. Unprotected exposure to hazard areas shall be kept to an absolute minimum.

The following SAE standards should be used for reference:

- SAE J516, Hose Fitting
- SAE J517, Hydraulic Hose
- SAE J343, Test Procedure For SAE 100R Series Hydraulic Hose and Hose Assemblies

Alternatively, type 304 or type 316 seamless stainless steel rigid tubing conforming to ASTM-A-269 may be used in place of flexible hose. If any one portion of the distribution system after the first flow dividing fitting (distributor or tee) is constructed of rigid tubing, then all portions of the distribution system after the first flow dividing fitting shall be constructed of rigid tubing. $\frac{3}{4}$ " OD tubing shall be used in place of $\frac{3}{4}$ " ID flexible hose and $\frac{1}{2}$ " OD tubing shall be used in place of $\frac{1}{2}$ " ID flexible hose.

4.2.4 DISTRIBUTOR – P/N 420588

The distributor may be mounted in an interior or exterior location as appropriate for the applicable distribution system configuration. It may be mounted in any orientation provided there is adequate clearance for distribution hoses to be secured in place at the inlet and outlet ports. No pipe dope or Teflon tape shall be used on the threads of distribution hoses connected to the distributor. The distributor contains an integral mounting flange and shall be secured in place using $\frac{5}{16}$ " hardware (figure 31).

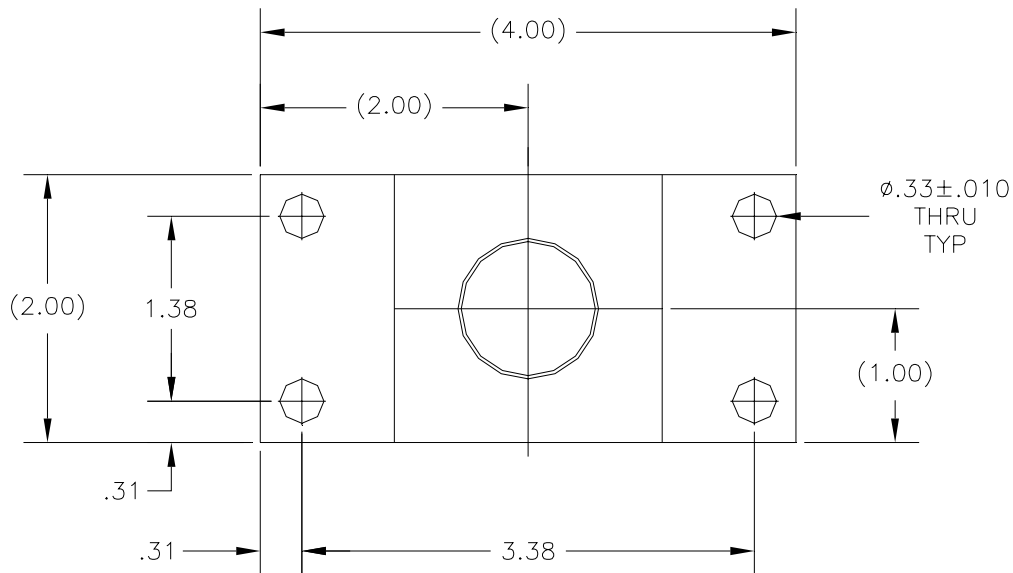


FIGURE 31 - DISTRIBUTOR MOUNTING HOLE TEMPLATE

4.2.5 90° NOZZLE BRACKET – P/N 420584

The 90° nozzle bracket may be mounted in any orientation provided there is adequate clearance for the distribution hose and cone nozzle to be secured in place at the inlet and outlet ports. They shall be oriented such that when installed, the cone nozzle is aimed at the hazard area(s) per the applicable distribution system configuration. No pipe dope or Teflon tape shall be used on the threads of the distribution hose or cone nozzle connected to the 90° nozzle bracket. The 90° nozzle bracket contains an integral mounting flange and shall be secured in place using 5/16" hardware (figure 32).

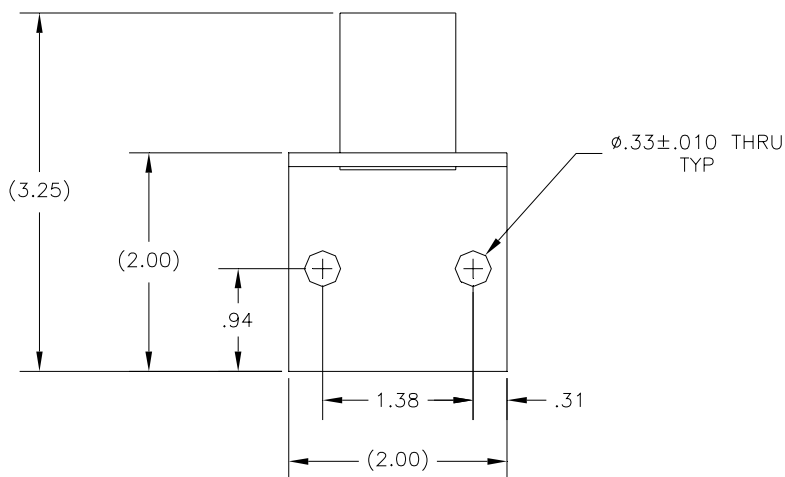


FIGURE 32 - 90° NOZZLE BRACKET MOUNTING HOLE TEMPLATE

4.2.6 45° NOZZLE BRACKET – P/N 420586

The 45° nozzle bracket may be mounted in any orientation provided there is adequate clearance for the distribution hose and cone nozzle to be secured in place at the inlet and outlet ports. They shall be oriented such that when installed, the cone nozzle is aimed at the hazard area(s) per the applicable distribution system configuration. No pipe dope or Teflon tape shall be used on the threads of the distribution hose or cone nozzle connected to the 45° nozzle bracket. The 45° nozzle bracket contains an integral mounting flange and shall be secured in place using 5/16" hardware (figure 33).

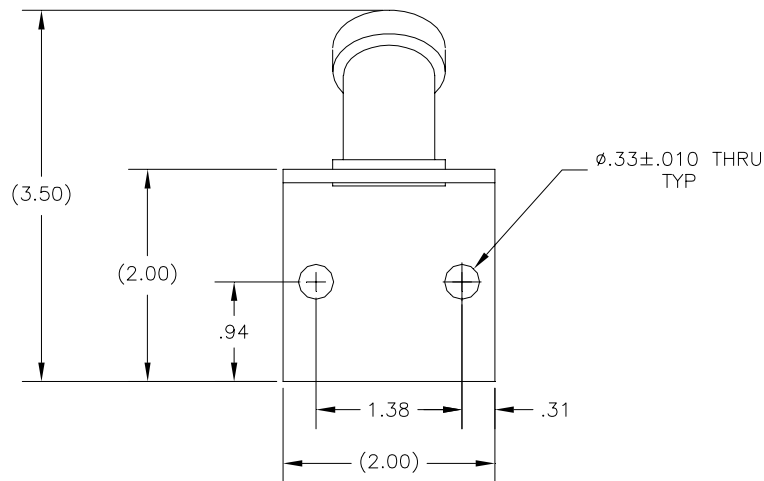


FIGURE 33 - 45° NOZZLE BRACKET MOUNTING HOLE TEMPLATE

4.2.7 CONE NOZZLE – P/N 408878-1

The cone nozzle (figure 34) shall be secured in place at the outlet port of a 90° nozzle bracket or 45° nozzle bracket. It shall be aimed at the hazard area(s) per the applicable distribution system configuration. No pipe dope or Teflon tape shall be used on the threads of the cone nozzle. The cone nozzle has a protective cap tethered to it which shall be installed on the outlet port at all times except when automatically blown off during a discharge or for inspection purposes. Replacement caps are available as P/N 26494302.

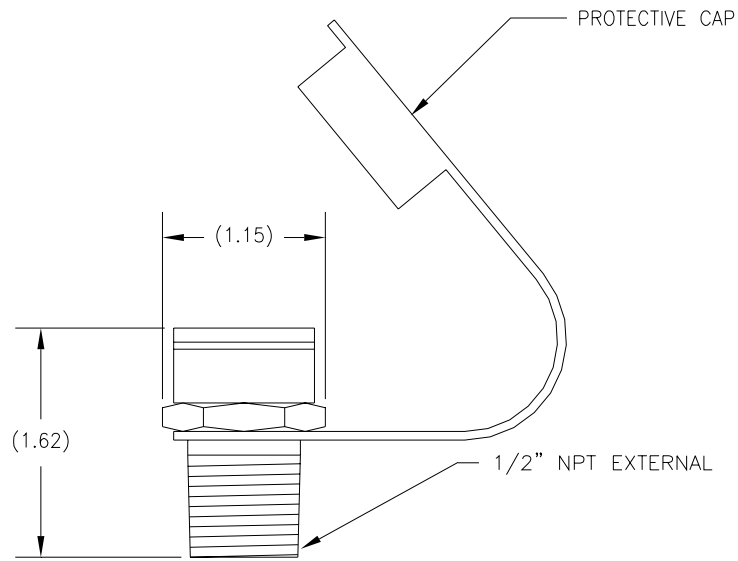


FIGURE 34 - CONE NOZZLE
(shown with protective cap attached but NOT installed in place)

CHAPTER 5 OPERATION

5.1 INTRODUCTION

This section provides an operational overview of a KDS-25 Pre-Engineered Fire Suppression System

5.2 OPERATION

The KDS-25 Pre-Engineered Fire Suppression System consists of an extinguisher assembly and a distribution system. The extinguisher assembly is secured in place by an extinguisher bracket. The distribution system consists of hydraulic hoses that connect the extinguisher assembly to nozzles through fittings, tees, distributors, or some combination thereof. Nozzles are secured in place and aimed at hazard areas using nozzle brackets.

In quiescent state, the system is completely passive; it draws no electrical current and aside from a self-contained pressure gauge, has no moving parts.

When a control device (fire detection system) sends an electrical activation signal to the extinguisher assembly, the electrical actuator activates and through the resultant mechanical action of the electrically operated control head, opens the valve. This action allows the dry chemical extinguishing agent contained inside the extinguisher cylinder to discharge out the valve outlet port, through the distribution system and out each of the cone nozzles into the protected area(s). Each cone nozzle disperses the dry chemical extinguishing agent in a cone shaped pattern approximately 5 feet across at 6 feet from the nozzle. The discharge lasts approximately 10 to 30 seconds depending on the distribution system configuration.

Periodic maintenance shall be performed on the KDS-25 Pre-Engineered Fire Suppression System in accordance with this manual. A qualified fire protection equipment company may rebuild the extinguisher assembly after it has been activated.

CHAPTER 6 MAINTENANCE

6.1 INTRODUCTION

This section provides maintenance instructions for periodic maintenance grouped by recommended maintenance interval for a KDS-25 Pre-Engineered Fire Suppression System. The maintenance intervals specified are for typical transit bus applications and may be modified in accordance with the rigors of the application (equipment type and / or environmental circumstances). Maintenance should be performed more frequently when circumstances require. Refer to NFPA-17 for further information. This section also includes maintenance instructions for special maintenance required after the system has discharged.

6.2 PERIODIC MAINTENANCE

6.2.1 EVERY 3000 MILES OR MONTHLY (whichever occurs first)

1. Verify neither the protected equipment nor the hazards have changed.
2. Verify no obvious physical damage or condition exists that might prevent system operation.
3. Verify the electrical connectors and electrical wiring have no visible damage and all connectors are securely seated.
4. Verify the extinguisher pressure gauge pointer is in the green arc at room temperature (70°F)
5. Verify the fire extinguisher assembly is oriented correctly per the nameplate instructions.
6. Verify the distribution system is in place, intact and unobstructed; this shall include, but not be limited to hoses, nozzles and nozzle protective caps.

6.2.2 EVERY 18000 MILES or SEMI-ANNUALLY (whichever occurs first)

1. Inspect the cylinder per CGA Pamphlet C-6.
2. Verify proper operation of the electrically operated control head as follows (figure 35):

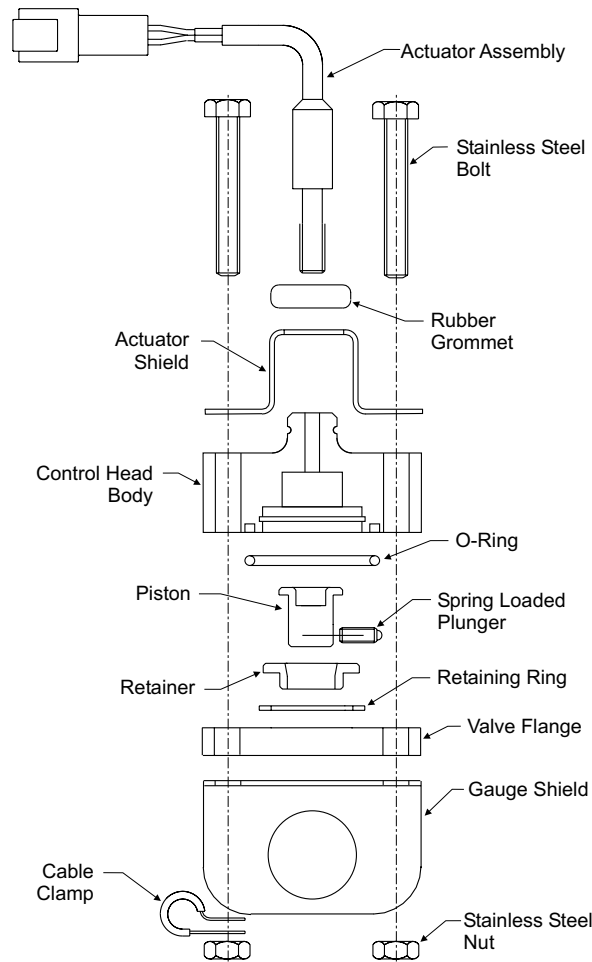


FIGURE 35 - CONTROL HEAD (EXPLODED VIEW)

- a. Unplug the electrical connector at the electric actuator.

! CAUTION !

WHEN THE CONTROL HEAD IS REMOVED FROM THE VALVE, THE VALVE HAS CRITICAL COMPONENTS EXPOSED TO THE ENVIRONMENT. EXTREME CARE MUST BE TAKEN TO NOT ALLOW FOREIGN OBJECTS TO ENTER THE VALVE BODY. IF THIS OCCURS THE ASSEMBLY MAY NOT FUNCTION AS INTENDED.

- b. Remove the control head with electric actuator, actuator shield and gauge guard from the valve.
- c. Unscrew and remove the electric actuator from the control head.
- d. Using a small screwdriver, or similar device, push down on the piston through the port for the electric actuator. Verify that the piston moves easily and fully locks in the actuated (out) position.

- e. Reset the piston by pushing in on the spring-loaded plunger on its side while pushing the piston back into the body of the control head.
- f. Apply RTV Silicone Sealant to the threads of the electric actuator.
- g. Screw the electric actuator completely into the control head hand tight.
- h. Verify the nylon body of the electric actuator sits tight against the body of the actuator.
- i. Verify the integrity of the control head o-ring.
- j. Put a light coat of Dow Corning Grease P/N 55M on the control head o-ring and install on the control head.
- k. Verify the piston is NOT in the actuated (out) position.

! WARNING !

IF THE CONTROL HEAD IS MOUNTED TO THE VALVE WHILE THE PISTON IS IN THE ACTUATED (OUT) POSITION, THE EXTINGUISHER WILL DISCHARGE.

- l. Secure the control head to the valve tightly using the two supplied bolts and self-locking nuts. The bolts shall be threaded through the actuator shield, control head, valve and gauge guard to hold all in place. One of the bolts shall also be threaded through the actuator cable clamp to hold it in place on either side facing either direction.
- m. Verify the fire detection system is NOT in a fire alarm condition.
- n. Plug in the electrical connector previously unplugged at the electric actuator.

6.2.3 EVERY SIX YEARS

Have the fire extinguisher assembly rebuilt in accordance with chapter 7 of this manual by a qualified fire protection equipment company familiar with Kidde Dual Spectrum equipment. Rebuild shall include actuator, seals and dry chemical replacement.

NOTE: The date of manufacture of the extinguisher assembly is printed (MM/YYYY) on a label applied to the top neck of the cylinder. This is the date that should be used to determine the 6 year service interval date. If the cylinder has been rebuilt it will be marked in an equivalent manner.

6.2.4 EVERY TWELVE YEARS

Have the cylinder hydrostatically tested by a qualified fire protection equipment company familiar with Kidde Dual Spectrum equipment. Use hydrostatic test adapter P/N 878453.

NOTE: The date of manufacture of the cylinder is stamped (MM/YY) on the neck of the cylinder. This is the date that should be used to determine the 12 year service interval date.

6.3 SPECIAL MAINTENANCE

6.3.1 HIGH TEMPERATURE INSTALLATIONS

If the extinguisher assembly is installed in a location in which it is regularly subjected to ambient temperatures in excess of 150°F, the following should be performed annually.

- a. Unplug the electrical connector at the electric actuator.

! CAUTION !
WHEN THE ELECTRIC ACTUATOR IS REMOVED FROM THE CONTROL HEAD, THE CONTROL HEAD HAS CRITICAL COMPONENTS EXPOSED TO THE ENVIRONMENT. EXTREME CARE MUST BE TAKEN TO NOT ALLOW FOREIGN OBJECTS TO ENTER THE CONTROL HEAD. IF THIS OCCURS THE ASSEMBLY MAY NOT FUNCTION AS INTENDED.

- b. Unscrew and remove the electric actuator from the control head.

! CAUTION !
THE ELECTRIC ACTUATOR SHALL ONLY BE REPLACED WITH KDS P/N 421218-1. IF OTHER DEVICES ARE USED THE ASSEMBLY MAY NOT FUNCTION AS INTENDED.

- c. Apply RTV Silicone Sealant to the threads of a NEW electric actuator (P/N 421218-1).
- d. Screw the electric actuator completely into the control head hand tight.
- e. Verify the nylon body of the electric actuator sits tight against the body of the actuator.
- f. Verify the fire detection system is NOT in a fire alarm condition.
- g. Plug in the electrical connector previously unplugged at the electric actuator.

6.3.2 AFTER SYSTEM DISCHARGE

! WARNING !
AFTER A FIRE, DO NOT PERFORM ANY MAINTENANCE UNTIL THE EQUIPMENT HAS COOLED SUFFICIENTLY. WORKING ON THE EQUIPMENT BEFORE IT HAS COOLED MAY RESULT IN BODILY INJURY AND / OR DEATH.

1. Install the protective caps on the outlet port of all cone nozzles to prevent the introduction of foreign material into the distribution system while removing the discharged dry chemical extinguishing agent from the vehicle surfaces.

! CAUTION !
DRY CHEMICAL EXTINGUISHING AGENT IS CORROSIVE AND SHOULD BE REMOVED FROM ALL VEHICLE SURFACES AS SOON AS PRACTICALLY POSSIBLE.

2. Brush, blow, vacuum or wash all discharged dry chemical extinguishing agent from all vehicle surfaces.
3. Unplug the electrical connector from the extinguisher assembly.
4. Unscrew the distribution hose from the discharge adapter on the extinguisher assembly.
5. Unscrew the anti-recoil cap from its storage point on the extinguisher bracket and install it on the valve outlet port on the extinguisher assembly.
6. Remove the extinguisher assembly from the extinguisher bracket and set aside. The extinguisher assembly may be discarded or rebuilt in accordance with this manual by a qualified fire protection equipment company.
7. Unscrew all cone nozzles. Blow off with DRY air or DRY nitrogen. Verify no obvious physical damage or condition exists that might prevent normal operation. Replace any cone nozzle or protective cap that was exposed to direct flame or subjected to excessive heating. Set aside.

! WARNING !
NEVER USE WATER TO BLOW OUT DISTRIBUTION PIPING. RESIDUAL MOISTURE MAY CAUSE CORROSION AND RESULT IN DISTRIBUTION SYSTEM RESTRICTION AND/OR BLOCKAGE.

! WARNING !
NEVER USE OXYGEN TO BLOW OUT DISTRIBUTION PIPING. OXYGEN MAY EXPLODE IF CONTACTED BY OIL

8. Connect a pressurized DRY air or DRY nitrogen source to the distribution hose that was removed from the discharge adapter on the extinguisher assembly. Blow out the distribution piping until residual dry chemical extinguishing agent no longer discharges from any of the distribution piping terminations.
9. Inspect the entire distribution system. Verify no obvious physical damage or condition exists that might prevent normal operation. Replace any hose, fitting, tee, elbow, distributor or nozzle bracket that was exposed to direct flame or subjected to excessive heating.
10. Install all cone nozzles with protective caps in place.
11. Obtain a NEW or REBUILT extinguisher assembly and double-check the extinguisher nameplate to ensure it is the correct configuration for the intended application (dry chemical extinguishing agent type and gauge location). Also double-check that the extinguisher pressure gauge pointer is in the green arc at room temperature (70°F).

NOTE: The extinguisher nameplates are color coded for quick visual verification: -X1 configuration nameplates are white with black text and -X2 nameplates are black with white text.

! CAUTION !
EXTINGUISHER ASSEMBLY WILL NOT FUNCTION AS INTENDED IF ORIENTED INCORRECTLY. 421220-X1 AND 421220-X2 CONFIGURATIONS REQUIRE DIFFERENT MOUNTING ORIENTATIONS ('X' WILL BE REPLACED WITH A 1 OR 2 DEPENDING ON AGENT TYPE BUT HAS NO EFFECT ON ORIENTATION REQUIREMENTS)

12. Install the extinguisher assembly in the extinguisher bracket. Orient per the instructions on the extinguisher nameplate (figure 36 & 37). Torque the two band clamps on the extinguisher bracket to 20 lb. ft. (nominal).

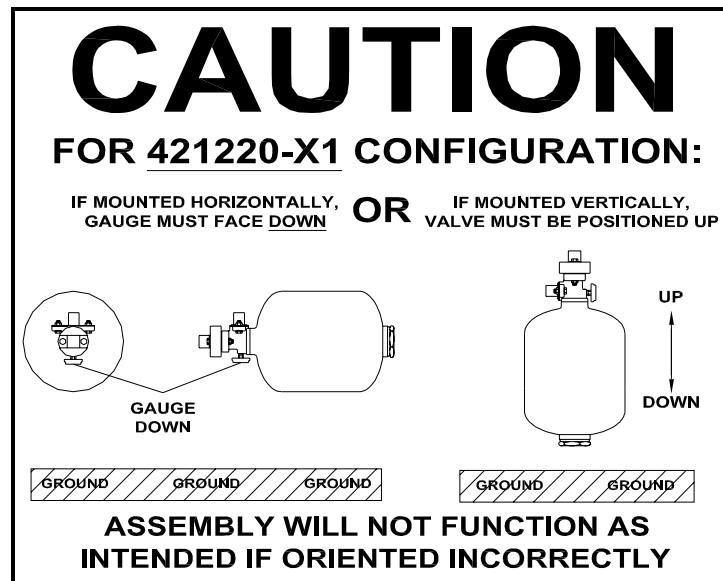


FIGURE 36 - GAUGE DOWN (-X1) EXTINGUISHER ORIENTATION

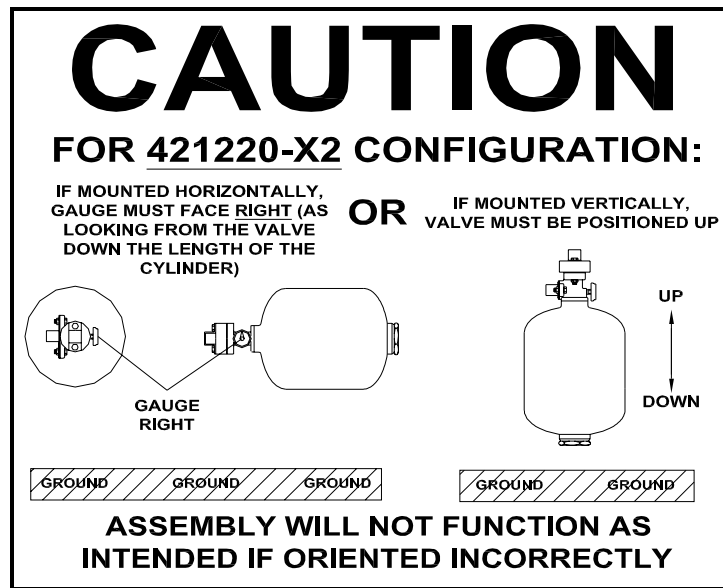


FIGURE 37 - GAUGE RIGHT (-X2) EXTINGUISHER ORIENTATION

! WARNING !
THE ANTI-RECOIL CAP SHALL BE INSTALLED ON THE VALVE OUTLET PORT AT ALL TIMES EXCEPT WHEN THE EXTINGUISHER IS CONNECTED TO THE DISTRIBUTION PIPING.

13. Unscrew the anti-recoil cap from the valve outlet port and screw it to the mounting location provided on the extinguisher bracket. Immediately screw the distribution hose to the discharge adapter on the extinguisher.
14. Verify the fire detection system is NOT in fire alarm condition.
15. Plug in the electrical connector previously disconnected from the extinguisher assembly.
16. Brush, blow, vacuum or wash any residual dry chemical extinguishing agent that released onto vehicle surfaces during the course of the above outlined special maintenance.

CHAPTER 7 EXTINGUISHER ASSEMBLY REBUILD

7.1 INTRODUCTION

This section provides instructions for rebuilding an extinguisher assembly after it has discharged or every six years (whichever occurs first).

7.2 REBUILD INSTRUCTIONS

All mechanical parts necessary to perform a rebuild are available in the extinguisher assembly rebuild kit P/N 421218. In addition to the kit, the following items are required:

Tools:

- 7/16" Hand Wrench
- 1/2" Hand Wrench
- Small External Retaining Ring (Snap Ring) Pliers
- Small Strap Wrench
- Torque Wrench, 50 +/- 1 lb. ft
- 2" Crowfoot Wrench (for use w/ torque wrench)
- 2 1/2" Crowfoot Wrench (for use w/ torque wrench)

Equipment:

- Platform Scale, 75 lb minimum capacity, 0.1 lb minimum resolution
- Pneumatic Belt Vise (or equivalent device to securely clamp extinguisher assembly to a rigid structure capable of withstanding the full thrust of a discharging extinguisher assembly)
- Appropriate Extinguisher Pressurization Equipment (inclusive of compressed gas cylinder pressure regulator, pressure gauge, shutoff valve, vent valve and all necessary hoses, fitting, etc)
- Shop air supply of DRY air or DRY nitrogen

Materials:

- RTV Silicone Sealant
- Dow Corning Grease P/N 55M
- Loctite Primer P/N N7649
- Loctite Refrigerant Sealant P/N 554
- Dry Chemical Extinguishing Agent (Pyrochem, ABC 90%, P/N 711 or Pyrochem, Purple K, P/N 721 as appropriate)
- Dry Nitrogen Gas

Literature:

- CGA Pamphlet C-6
- MSDS for Dry Chemical Extinguishing Agent

<p style="text-align: center;">! WARNING ! REBUILD SHALL ONLY BE PERFORMED BY A TRAINED PROFESSIONAL IN STRICT ACCORDANCE WITH THE FOLLOWING INSTRUCTIONS</p>

! CAUTION !

DO NOT ATTEMPT TO REBUILD ANY EXTINGUISHER ASSEMBLY WITHOUT FIRST CHECKING THE HYDROSTATIC TEST DATE OF THE CYLINDER. IT IS ILLEGAL TO RECHARGE OR TRANSPORT THE CYLINDER WITHOUT FIRST INSPECTING IT INTERNALLY, EXTERNALLY AND HYDROSTATICALLY IF MORE THAN 12 YEARS HAVE ELAPSED SINCE THE PREVIOUS HYDROSTATIC TEST. REGARDLESS OF THE PREVIOUS INSPECTION DATE, IT IS ILLEGAL TO REFILL ANY PRESSURIZED CONTAINER THAT LEAKS, BULGES, HAS DEFECTIVE SAFETY DEVICES OR CORROSION, UNTIL IT IS PROPERLY REPAIRED AND REQUALIFIED AS SPECIFIED IN DOT REGULATIONS.

! WARNING !

THE EXTINGUISHER ASSEMBLY MUST BE FULLY DISCHARGED BEFORE PROCEEDING WITH THE FOLLOWING INSTRUCTIONS.

1. Remove the electrically operated control head with electric actuator, actuator shield and gauge guard from the valve. Set both aside.
2. SLOWLY unscrew and remove the valve with siphon tube from the cylinder. Verify no compressed gas or dry chemical extinguishing agent is venting from the bleed-hole located on the top thread of the valve body before fully unscrewing.
3. Unscrew and remove the siphon tube from the valve. Set both aside.
4. Remove the anti-recoil cap with tether from the cylinder. Set aside.
5. Unscrew and remove the base plug from the cylinder. Set aside.
6. Tap both necks of the cylinder on a wooden block to remove any residual dry chemical.
7. Use DRY air or DRY nitrogen to blow any residual dry chemical from the cylinder neck threads, valve, siphon tube and base plug.
8. Visually inspect the entire inside and outside of the cylinder per CGA Pamphlet C-6.
9. Rebuild the electrically operated control head (figure 38):

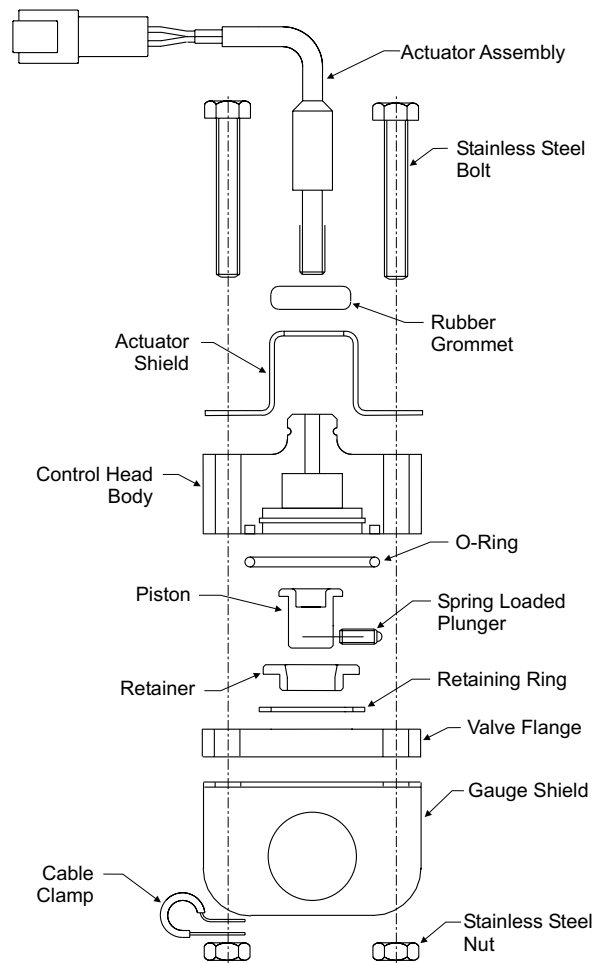


FIGURE 38 - CONTROL HEAD (EXPLODED VIEW)

- a. Verify no obvious physical damage or condition exists that might impede proper operation.
- b. Unscrew and remove the electric actuator from the control head.
- c. If actuated (out), reset the piston by pushing in on the spring-loaded plunger on its side while pushing the piston back into the body of the control head.
- d. Using a small screwdriver, or similar device, push down on the piston through the port for the electric actuator. Verify that the piston moves easily and fully locks in the actuated (out) position.
- e. Reset the piston by pushing in on the spring-loaded plunger on its side while pushing the piston back into the body of the control head.
- f. Apply RTV Silicone Sealant to the threads of a new electric actuator.
- g. Screw the electric actuator completely into the control head hand tight.
- h. Verify the nylon body of the electric actuator sits tight against the body of the control head.

- i. Verify the piston is NOT in the actuated (out) position.
 - j. Set aside.
10. Rebuild the valve (figure 39):

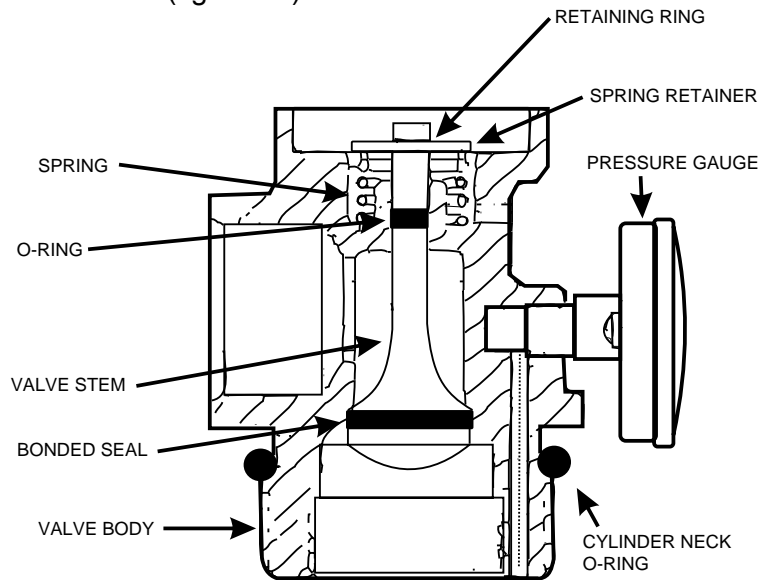


FIGURE 39 - VALVE (CROSS-SECTION VIEW)

- a. Verify no obvious physical damage or condition exists that might impede proper operation.
- b. Remove the retaining ring from the end of the valve stem
- c. Remove the spring retainer, spring and valve stem with o-ring from the valve body.
- d. Use DRY air or DRY nitrogen to blow any residual dry chemical from the valve body.
- e. Put a light coat of Dow Corning Grease P/N 55M on a NEW valve stem o-ring and install on the valve stem. Do NOT allow grease to get on the bonded seal on the valve stem.
- f. Slide the valve stem into the valve body until it is fully seated.
- g. Place the spring and spring retainer over the end of the valve stem.
- h. Replace the retaining ring on the end of the valve stem (to accomplish this, the spring will need to be compressed by holding bonded seal end of the valve stem in place while pressing on the spring retainer).
- i. Put a light coat of Dow Corning Grease P/N 55M on a NEW valve o-ring and install on the valve.
- j. Apply Loctite Primer P/N N7649 to the threads of the siphon tube and allow to cure.
- k. Apply Loctite Refrigerant Sealant P/N 554 to the threads of the siphon tube.

! WARNING !
ASSEMBLY WILL NOT FUNCTION AS INTENDED IF THE SIPHON TUBE IS NOT ORIENTED AS DEPICTED IN FIGURE 40 OR 41 AS APPROPRIATE BASED ON EXTINGUISHER ASSEMBLY PART NUMBER.

- I. Screw the siphon tube into the valve until bottomed-out and then unscrew it only enough to orient per one of the following figures (figure 40 & 41).

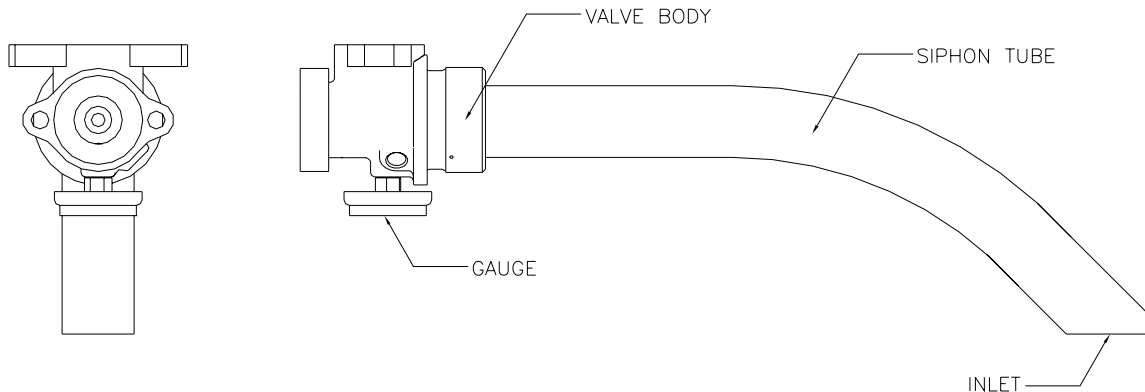


FIGURE 40 - 421220-X₁ SIPHON TUBE ORIENTATION

! FOR USE WITH 421220-X₁ EXTINGUISHER ASSEMBLIES ONLY !
 (X will be replaced with a 1 or 2 based on agent type)

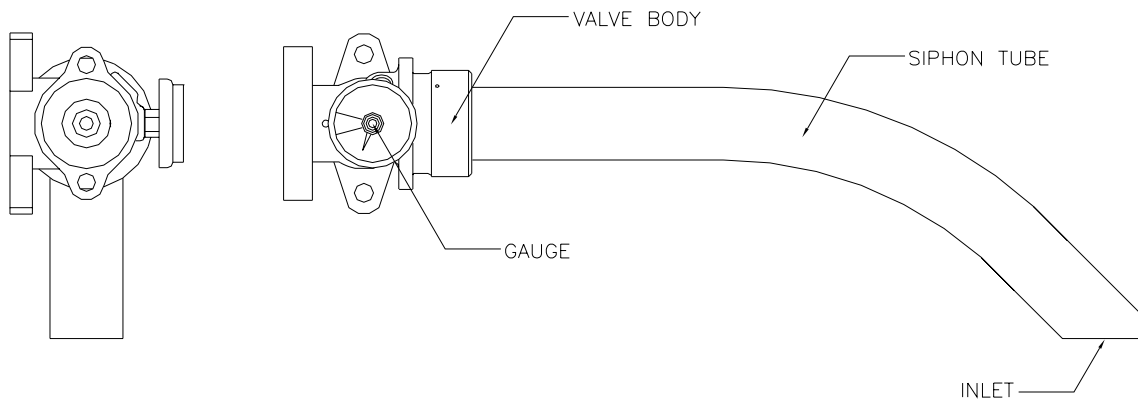


FIGURE 41 - 421220-X₂ SIPHON TUBE ORIENTATION

! FOR USE WITH 421220-X₂ EXTINGUISHER ASSEMBLIES ONLY !
 (X will be replaced with a 1 or 2 based on agent type)

- m. Allow Loctite Refrigerant Sealant P/N 554 on siphon tube threads to cure.
- n. Verify orientation of siphon tube.

- o. Set aside.
- 11. Replace the anti-recoil cap with tether by placing the loop in the tether around the neck of the cylinder.
- 12. Screw the valve with siphon tube into the cylinder neck at the end of the cylinder with the DOT stamps. Torque to 50 +/- 1 lb. ft.

! WARNING !
DO NOT MIX DIFFERENT TYPES OF DRY CHEMICAL EXTINGUISHING AGENT. MIXING AGENTS IN A PRESSURIZED CYLINDER MAY LEAD TO A DANGEROUS BUILD UP OF PRESSURE. MIXING AGENTS MAY ALSO RESULT IN CAKING OF THE AGENT WHICH MAY PREVENT THE ASSEMBLY FROM FUNCTIONING AS INTENDED.

! WARNING !
UNDER NO CIRCUMSTANCES SHALL THE VALVE BE REINSTALLED WHEN THE CYLINDER IS FULL OF AGENT. ALWAYS INSTALL THE VALVE FIRST, THEN FILL THE CYLINDER THROUGH THE CYLINDER NECK AT THE OPPOSITE END OF THE CYLINDER.

- 13. Orient the assembly so the valve is toward the ground. Use a funnel to fill the cylinder with 25 +/- 0.1 lbs. of the appropriate type of NEW dry chemical extinguishing agent (figure 42).

EXTINGUISHER ASSEMBLY PART NUMBER*	DRY CHEMICAL EXTINGUISHING AGENT TYPE	AGENT PART NUMBER
421220- <u>1</u> Y	ABC	Pyrochem, ABC 90%, P/N 711
421220- <u>2</u> Y	BC	Pyrochem, Purple K, P/N 721

* Y will be replaced with a 1 or 2 based on gauge location

FIGURE 42 - APPROPRIATE AGENT TYPE TABLE

- 14. Put a light coat of Dow Corning Grease P/N 55M on a NEW base plug o-ring and install on the base plug.
- 15. Screw the base plug into the cylinder neck opposite the valve. Torque to 50 +/- 1 lb. ft.

! WARNING !

UNDER NO CIRCUMSTANCES WHILE PRESSURIZING THE CYLINDER SHALL THE EXTINGUISHER ASSEMBLY BE ALLOWED TO 'FREE STAND' WITHOUT EITHER THE CHARGING APPARATUS OR THE ANTI-RECOIL CAP INSTALLED ON THE VALVE OUTLET PORT. IF NEITHER DEVICE IS INSTALLED, THE EXTINGUISHER ASSEMBLY SHALL BE SECURELY MOUNTED TO A RIGID STRUCTURE CAPABLE OF WITHSTANDING THE FULL FORCE THAT WILL RESULT IF THE VALVE IS OPENED.

16. Securely mount the extinguisher assembly to a rigid structure.

! CAUTION !

USE A CALIBRATED PRESSURE GAUGE WHEN PRESSURIZING THE CYLINDER; DO NOT RELY ON THE FILL TANK PRESSURE REGULATOR OR THE CYLINDER PRESSURE GAUGE TO DETERMINE APPROPRIATE CYLINDER PRESSURE.

17. Pressurize the cylinder through the discharge adapter to 360 PSIG at 70° F using dry nitrogen gas (figure 43).

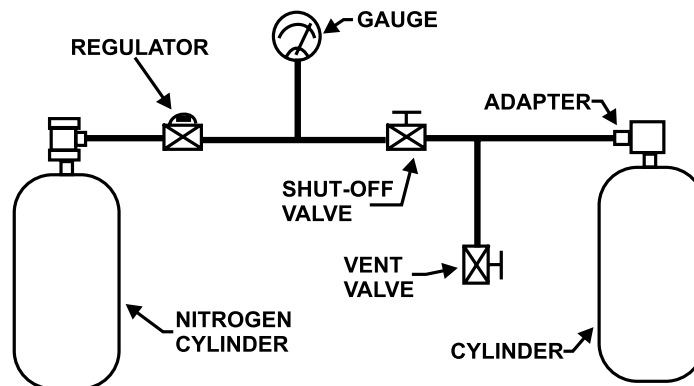


FIGURE 43 - SUGGESTED PRESSURIZATION EQUIPMENT DETAIL

18. Verify there are no leaks using a soap solution on the valve, valve to cylinder joint and base plug to cylinder joint.
19. Screw the anti-recoil cap onto the valve outlet port.
20. Put a light coat of Dow Corning Grease P/N 55M on a NEW control head o-ring and install on the control head.
21. Verify the piston on the electrically operated control head is NOT in the actuated (out) position.

! WARNING !

IF THE CONTROL HEAD IS MOUNTED TO THE VALVE WHILE THE PISTON IS IN THE ACTUATED (OUT) POSITION, THE EXTINGUISHER WILL DISCHARGE.

22. Secure the control head to the valve tightly using the two supplied bolts and self-locking nuts. The bolts shall be threaded through the actuator shield, control head, valve and gauge guard to hold all in place. One of the bolts shall also be threaded through the actuator cable clamp to hold it in place on either side facing either direction.
23. Affix a clearly and permanently marked a label indicating the date of rebuild to the neck of the cylinder.

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INITIAL RELEASE

DATE: 5/14/04

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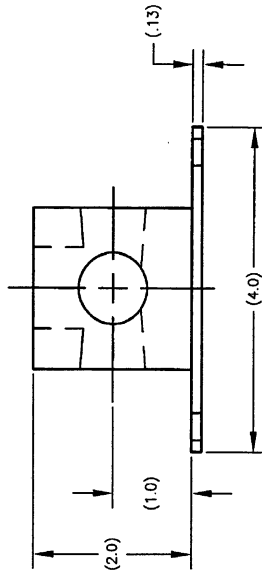
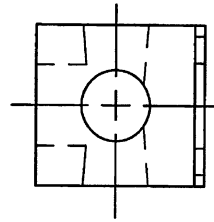
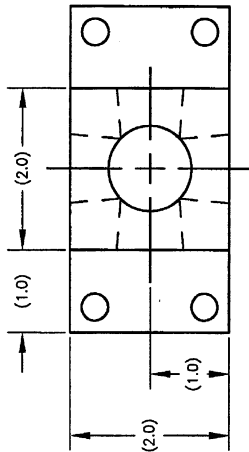
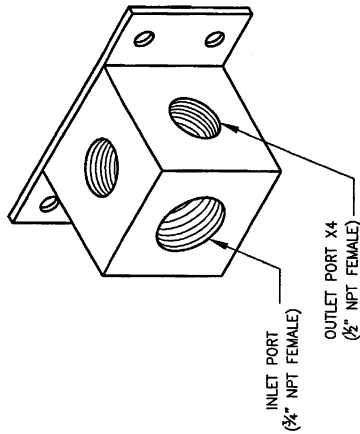
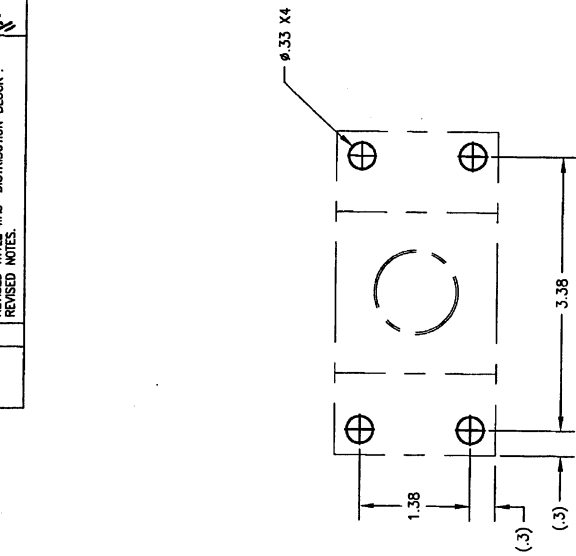
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ISSUE

DATE

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DATE	DESCRIPTION	APPROVED
6-13-00	INITIAL RELEASE	VI
	REVISED AS REQUESTED PER ECR 2950. USE COMPANY FORMAT. WAS C SIZE FORMAT. ADDED MOUNTING HOLE TEMPLATE. REVISED TITLE WAS "DISTRIBUTION BLOCK". REVISED NOTES.	



- OPERATION: THIS EXTINGUISHER IS USED IN CONJUNCTION WITH DISTRIBUTION HOSES, AS A MEANS TO DISTRIBUTE DRY CHEMICAL EXTINGUISHING AGENT FROM THE EXTINGUISHER ASSEMBLY TO INDIVIDUAL NOZZLES.
- REFER TO KOS MANUAL 160296, "KOS-25 PRE-ENGINEERED FIRE SUPPRESSION SYSTEM; INSTALLATION, OPERATION AND MAINTENANCE MANUAL" FOR COMPREHENSIVE INFORMATION

- INSTALLATIONS:
 - ASSEMBLY MAY BE MOUNTED IN ANY ORIENTATION PROVIDED THERE IS ADEQUATE CLEARANCE FOR THE DISTRIBUTION HOSES TO BE SECURED IN PLACE AT THE INLET AND OUTLET PORTS
 - INLET AND OUTLET PORTS MAY BE MOUNTED USING 5/16" HARDWARE OR BY WELDING
 - UNUSED OUTLET PORT(S) MAY BE PLUGGED WITH A 1/2" NPT PLUG

- NOTES: UNLESS OTHERWISE SPECIFIED
 - NOMINAL WEIGHT: 2 LBS
 - INLET PORT: 3/4" NPT FEMALE
 - OUTLET PORTS (X4): 1/2" NPT FEMALE
 - FINISH: ZINC PLATED

INTERFACE CONTROL DRAWING

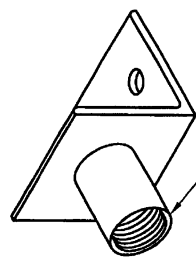
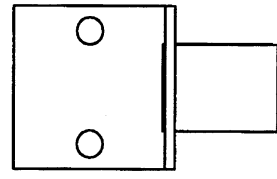
CITY	STATE	COUNTRY	INDUSTRY OR DESCRIPTION
EVANSTON	ILLINOIS	USA	Kidde Dual Spectrum
A DIVISION OF Kidde Technologies, Inc. 10000 W. WISCONSIN AVE. GAITHERSBURG, MD 20878			
DESIGNED BY	DATE	APPROVED BY	DATE
V. MARIN	07/02/99	W. SELBY	06/13/99
C. SIMPSON	06/13/99		
PART OR SUBPART NO. D 105BU0			QUANTITY 420588
PART NAME DISTRIBUTOR			PART NO. 420588

CAD PREPARED DRAWING USING AUTOCAD R2000
 NOT TO BE MANUALLY ALTERED.

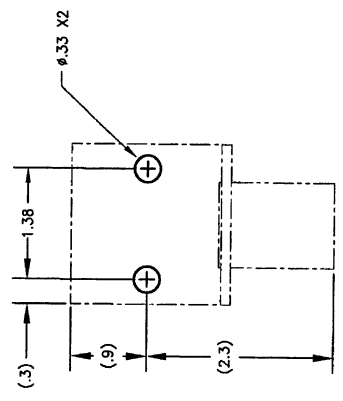
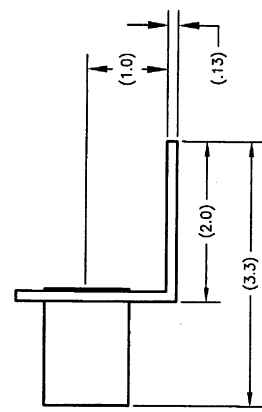
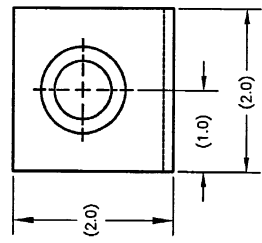
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REV	DATE	DESCRIPTION	APPROVED	RM
A	12/21/01	INITIAL RELEASE	[Signature]	VM
REVISED AS REQUESTED PER EPO 02148 INCORPORATED NEW COMPANY LOGO AND SIZE FORMAT. ADDED MOUNTING HOLE TEMPLATE REVISED NOTES				



INLET / OUTLET PORT
 (1/2" NPT FEMALE)



MOUNTING HOLE TEMPLATE

- OPERATION:
 a. THIS ASSEMBLY IS USED TO SECURE A CONE NOZZLE (KOS P/N 408878-1) IN PLACE AM IT AT A HAZARD AREA AND COUPLE IT TO A DISTRIBUTION HOSE SUPPRESSION SYSTEM. SEE INSTALLATION, OPERATION AND MAINTENANCE MANUAL* FOR COMPREHENSIVE INFORMATION
 - SPECIFICATIONS:
 a. NOMINAL WEIGHT: .5 LBS
 b. NOMINAL INLET PORTS: 1/2" NPT FEMALE
 c. FINISH: ZINC PLATED
 - INSTALLATION:
 a. ASSEMBLY MAY BE MOUNTED IN ANY ORIENTATION PROVIDED THERE IS A SURFACE TO MOUNT THE ASSEMBLY AND CONE NOZZLE TO BE SECURED IN PLACE AT THE INLET AND OUTLET PORTS
 b. ASSEMBLY SHALL BE MOUNTED USING 5/16" HARDWARE OR BY WELDING
- NOTES: UNLESS OTHERWISE SPECIFIED

INTERFACE CONTROL DRAWING

CITY	UNIVERSITY	PART OR DRAWING NO.	INDUSTRY OR DESCRIPTION	REV	DATE
Kidde Dual Spectrum A DIVISION OF Kidde Technologies, Inc. 10000 W. SELBY DENVER, COLORADO, 80231					
DESIGNED BY	V. MARIN	DATE	07/02/09		
CHECKED BY	W. SELBY	DATE	08/13/09		
APPROVED BY	C. SIMPSON	DATE	09/13/09		
REV	DESCRIPTION <td>DATE</td> <td></td> <td></td> <td></td>	DATE			
D	058UO				
PART OR DRAWING NO.			INDUSTRY OR DESCRIPTION		
420584			90° NOZZLE BRACKET		
D 058UO			420584		

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 NOT TO BE MANUALLY ALTERED.

STEP 1

