P/N 83-131005-001
October 2015

KVS Dry Chemical Fire Suppression System

Vehicle and Heavy Mobile Machinery Fire Suppression Systems

Design, Installation, Operation and Maintenance Manual

FM APPROVED

Kidde Fire Systems

FOREWORD

This manual is written for Kidde Fire Systems trained personnel who are installing a KVS Dry Chemical Fire Suppression System. This manual must be read and understood prior to any installation of a KVS Dry Chemical Fire Suppression System.

Note: This Manual, P/N 83-131005-001, is to be used by qualified and factory-trained personnel, knowledgeable of NFPA standards and any other applicable codes and standards in effect.

This manual is intended to clearly and accurately reflect the KVS Dry Chemical Fire Suppression System System. This publication describes the operation, installation and maintenance of the system, P/Ns.

As with all mechanical equipment, the KVS Dry Chemical Fire Suppression System needs periodic care to assure that they will operate effectively and safely. Inspection frequency should be based on the need of the vehicle or in/on which the system is located. Maintenance should be conducted in accordance with the relevant paragraphs of this manual by qualified maintenance personnel.

IMPORTANT

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

Any questions concerning the information presented in this manual should be addressed to:

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KVS Dry Chemical Fire Suppression Systems should be designed, installed, inspected, maintained, tested and recharged by qualified, factory trained and certified personnel in accordance with all applicable codes and standards, including (but not limited to) the following:

- Standard of the National Fire Protection Association:
  - NFPA 17 *Standard for Dry Chemical Systems*
  - NFPA 72 *National Fire Alarm Code*
  - NFPA 120 *Standard for Fire Protection and Control in Coal Mines*
  - NFPA 122 *Standard for Fire Protection and Control in Metal/Nonmental Minning and Metal Processing Facilities*
- FM Global:
  - 7-40 *Loss Prevention Data Sheet for Heavy Duty Mobile Equipment*
- SAE
  - J1614 *Wiring Distribution Systems for Construction, Agricultual, and Off-Road Work Machines*
- All applicable Federal, state, and local standards.
- All instructions, limitations, etc. contained in this manual, P/N 83-131005-001.
- All information contained on the system container nameplate(s).

Installers should consult the above standards, as well as the Authority Having Jurisdiction (AHJ), and adhere to all Warnings and Cautions defined in the Safety Summary, and throughout the manual.

Note: Possession of this document does not convey any approvals, rights or authorization to purchase, design, install, maintain, repair or inspect the systems herein described.

TERMS AND ABBREVIATIONS

AH:	Ampere Hour	MSHA	Mine Safety and Health Administration
AWG:	American Wire Gauge	N.C.:	Normally Closed
°C	Celsius	NEMA	National Electrical Manufactures Association
CGA	Compressed Gas Association	NFPA:	National Fire Protection Association
CO_2:	Carbon Dioxide	N.O.:	Normally Open
DC:	Direct Current	NPT	National Pipe Tread
DOT:	Department of Transportation	O.D.	Outside Diameter
°F	Farenheit	P/N:	Part Number
FM/FMRC:	Factory Mutual (Research Corporation)	psig	pound(s) per square inch
ft.	Feet	SAE	Society of Automotive Engineers
H_20	Water	TC:	Transport Canada
HVAC:	Heating, Venting and Air Conditioning	UL/ULI:	Underwriters Laboratories, Inc.
Hz:	Hertz (Frequency)	ULC:	Underwriters Laboratories of Canada
I.D.	Inside Diameter	USBM	US Bureau of Mines
in.	inch	V:	Volts
m.	meter	Vac:	Volts AC
mA:	Milliamperes	Vdc:	Volts DC

SAFETY SUMMARY

KVS-21, 25H, 33, 45, and 68 Fire Suppression Systems uses pressurized equipment; therefore, personnel responsible for fire suppression systems must be aware of the dangers associated with the improper handling, installation or maintenance of this equipment.

Fire suppression system service personnel must be thoroughly trained in the proper handling, installation and service of KVS-21, 25H, 33, 45, and 68 Fire Suppression Systems equipment and follow the instructions used in this manual and in the Safety Bulletin and cylinder nameplate contained in this Appendix.

Kidde has provided warnings and cautions at appropriate locations throughout the text of this manual. These warnings and cautions are to be adhered to at all times. Failure to do so may result in serious injury to personnel.

In addition, Material Safety Data Sheets for KVS-21, 25H, 33, 45, and 68 Fire Suppression Systems and nitrogen are available. Personnel must also be familiar with the information contained on these data sheets.

SAFETY BULLETIN 1, MARCH 2, 1987
SUBJECT: SAFE CYLINDER HANDLING PROCEDURES

WARNING **Pressurized (charged) cylinders are extremely hazardous and if not handled properly are capable of violent discharge. This may result in serious bodily injury, death and property damage.**

Before handling Kidde system products, all personnel must be thoroughly trained in the safe handling of the containers as well as in the proper procedures for installation, removal, filling, and connection of other critical devices, such as flex hoses, control heads, discharge heads, and anti-recoil devices.

READ, UNDERSTAND and ALWAYS FOLLOW the operation and maintenance manuals, owners manuals, service manuals, etc., that are provided with the individual systems.

The following safety procedures must be observed at all times:

Moving Container: Containers must be shipped compactly in the upright position, and properly secured in place. Containers must not be rolled, dragged or slid, nor allowed to be slid from tailgates of vehicles. A suitable hand truck, fork truck, roll platform or similar device must be used.

Rough Handling: Containers must not be dropped or permitted to strike violently against each other or other surfaces.

Storage: Containers must be stored standing upright where they are not likely to be knocked over, or the containers must be secured.

For additional information on safe handling of compressed gas cylinders, see CGA Pamphlet PI titled “Safe Handling of Compressed Gases in Containers”. CGA pamphlets may be purchased from The Compressed Gas Association, Crystal Square Two, 1725 Jefferson Davis Highway, Arlington, VA 22202.

SAFETY BULLETIN, MAY 1, 1993
SUBJECT: SAFE CYLINDER HANDLING PROCEDURES FOR PRESSURIZED CYLINDERS

WARNING **Pressurized (charged) cylinders are extremely hazardous and if not handled properly are capable of violent discharge. This will result in serious bodily injury, death and property damage.**

BEFORE handling Kidde system products, all personnel must be thoroughly trained in the safe handling of the containers as well as in the proper procedures for installation, removal, filling, and connection of other critical devices, such as flexible hoses, control heads, and safety caps.

READ, UNDERSTAND and ALWAYS FOLLOW the operation and maintenance manuals, owners manuals, service manuals, and other information that is provided with the individual systems.

THESE INSTRUCTIONS MUST BE FOLLOWED IN THE EXACT SEQUENCE AS WRITTEN TO PREVENT SERIOUS INJURY, DEATH OR PROPERTY DAMAGE.

Safety Cap

1. Each KVS-21, 25H, 33, 45, and 68 Fire Suppression Systems cylinder is factory equipped with a safety cap installed on the valve outlet, and securely chained to the valve to prevent loss. This device is a safety feature, and will provide controlled safe discharge when installed if the cylinder is actuated accidentally.
2. The safety cap must be installed in the valve outlet AT ALL TIMES except when the cylinders are connected into the system piping or being filled.

The safety cap is intentionally chained to the cylinder valve to prevent loss while in service and must not be removed from its chain.

Protection Cap

A protection cap is factory installed on the actuation port and securely chained to the valve to prevent loss. The cap is attached to the actuation port to prevent tampering or depression of the actuating pin. No attachments (control head, pressure control head) are to be connected to the actuation port during shipment, storage, or handling.

Installation

THIS SEQUENCE FOR CYLINDER INSTALLATION MUST BE FOLLOWED AT ALL TIMES:

1. Install cylinder into bracketing.

WARNING **Discharge hoses or valve outlet adapter must be connected into system piping before attaching to cylinder valve outlet to prevent injury in the event of discharge.**

2. Remove safety cap and connect all cylinder valves into system piping using flex hose or valve outlet adapter.
3. Remove protection cap and attach control heads, pressure control heads, pilot loops, etc. as required.

WARNING **Control heads must be in the set position before attaching to the cylinder valve actuation port, in order to prevent accidental discharge.**

Removal From Service

1. Remove all control heads, pressure operated heads, and pilot loops from cylinder valve, and attach protection cap to actuation port.
2. Disconnect cylinders from system piping at the valve outlet. Disconnect valve outlet adapter, if used.
3. Immediately install safety cap on valve outlet.

WARNING **Do not disconnect the cylinder from system piping if the safety cap is missing. Obtain a new safety cap from Kidde.**

4. Remove cylinder from bracketing.

WARNING **Failure to follow these instructions, and improper use or handling, may cause serious bodily injury, death, and property damage.**

DEFINITIONS

WARNING **Indicates an imminently hazardous situation which, if not avoided, could result in death, serious bodily injury and/or property damage.**

CAUTION **Indicates a potential hazardous situation which, if not avoided, could result in property or equipment damage.**

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CHAPTER 1
GENERAL INFORMATION

1-1 INTRODUCTION

Heavy duty vehicles, used in both on-road and off-road applications require fire suppression to save:

- Costly replacement
- Costly lost production

The Kidde KVS Dry Chemical Fire Suppression System provide this protection.

These are pre-engineered systems and consist of a pressurized cylinder and valve assembly to store the dry chemical suppression agent. An actuation device is used to expel the dry chemical. The delivery system consists of hydraulic hoses and fixed nozzles to transport the dry chemicaldry chemical to the fire hazard.

At the user's option, multiple detection methods can be used for automatic actuation. In addition, manual activation can be used to support system designs.

The following sections describe the components, the nozzle coverage, piping limitations, system design, controls, typical applications, installation and maintenance.

1-2 SYSTEM TESTING

The Kidde KVS Dry Chemical Fire Suppression Systems have been thoroughly tested, as follows:

- **Fire Tests**: In each test, a fire was allowed to progress to an approved pre-burn time before the system was actuated. In these tests, the time allowed before the system was actuated was far in excess of the time an actual detector would require to detect a fire and actuate the system.

  These tests were conducted with maximum hose lengths and cylinder pressure adjusted to represent a -65°F temperature environment. They were also conducted with minimum hose length and cylinder pressure adjusted to represent a +200°F temperature environment.
- **Splash Tests:** Fuel in depth splash tests, using minimum hose lengths, maximum temperature and minimum clearances, were conducted to ensure that the nozzles did not cause burning fuel to splash.
- **Flow Rate Tests:** In order to achieve flow rate requirements for all configurations, operational flow rate tests were conducted at the two temperature extremes, cited under fire tests, and with maximum and minimum hose lengths.
- **Vibration and Shock Tests:** Cyclical vibration and shock testing of all mechanical and electrical components was performed to ensure structural integrity.
- **Functional Tests:** All mechanical components were functionally tested at -65°F and 200°F.
- **Salt Spray Corrosion Tests:** Environmental testing was performed to validate the integrity of all sealed, painted and plated components.

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CHAPTER 2
COMPONENT DESCRIPTIONS

2-1 INTRODUCTION

This chapter provides a functional description of the components and assemblies in the Kidde KVS-21, 25H, 33, 45, and 68 Fire Suppression Systems.

2-2 COMPONENT DESCRIPTIONS

2-2.1 Fire Suppression Components

2-2.1.1 CYLINDER AND VALVE ASSEMBLY, P/N 83-1310XX-001

The pressurized dry chemical cylinder and valve are supplied as a unit and are attached to the vehicle with an appropriately sized steel bracket. All cylinders are made of steel and meet DOT and TC specifications. The cylinders are fitted with a spring loaded check in a nickel-plated brass valve, equipped with a safety relief device and pressure gauge.

The Kidde KVS Dry Chemical Fire Suppression System cylinders are available in five sizes. The number in the designation indicates the weight, in pounds, of the dry chemical charge. Table 2-1 contains specific information for each cylinder-and-valve assembly model. Each cylinder-and-valve assembly must be installed in an upright position using the approved mounting bracket, except for the KVS-25H cylinder which may be mounted either horizontally or vertically using the approved mounting bracket.

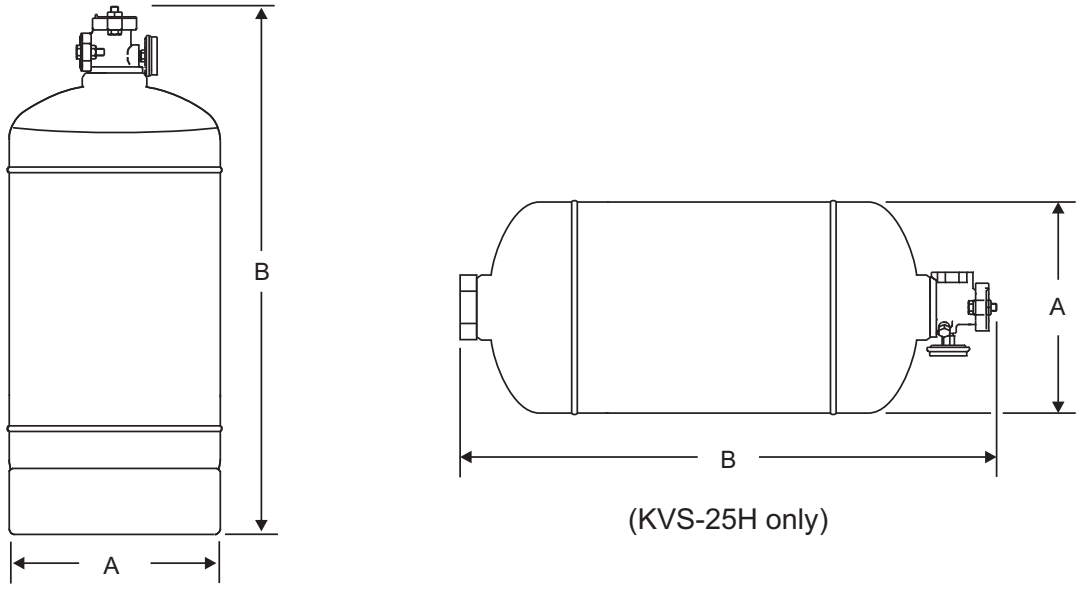

Figure 2-1. KVS Dry Chemical Cylinder and Valve Assembly

Table 2-1. Cylinder and Valve Assemblies

Cylinder / Valve Model	Part Number (P/N)	Type of Chemical	Charge or Fill Weight of Chemical (lbs.)	Nominal Diameter "A" (in.)	Overall Assembly Height "B" (in.)	Mounting Bracket P/N
KVS-21	83-131010-001	ABC	21	9	17.6	296189
KVS-25H	83-131014-001	ABC	25	9	18.5	296189
KVS-25H	83-131027-001	Purple K	25	9	18.5	296189
KVS-33	83-131013-001	ABC	33	9	23.7	296188
KVS-45	83-131011-001	ABC	45	9	30.8	296188
KVS-68	83-131012-001	ABC	68	12.3	30.2	83-131003-001

All cylinders are pressurized with nitrogen plus 15% helium to 360 psig at 70°F. If the ambient temperature is not 70°F, the pressure of the cylinder will vary (see Figure 2-2).

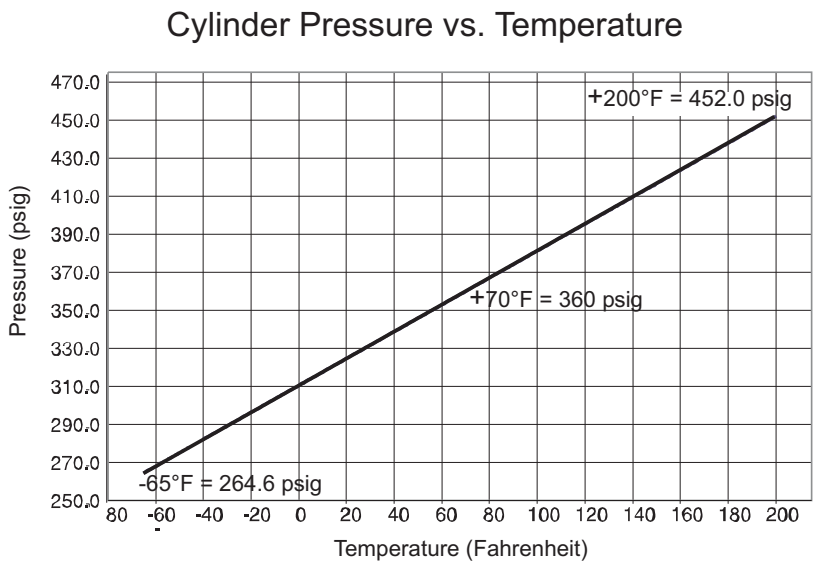

Figure 2-2. Temperature/Pressure Chart

Replacement labels, intended for field installation, are available for all the KVS cylinders. Kits include the main nameplate, as well as the French/Spanish option labels. Order replacement label kits as follows:

Table 2-2. Replacement Label Kits

Cylinder Model	Cylinder P/N	Replacement Label Kit P/N
KVS-21	83-131010-001	83-131072-001
KVS-25H ABC	83-131014-001	83-131072-005
KVS-25H Purple-K	83-131027-001	83-131072-006
KVS-33	83-131013-001	83-131072-004
KVS-45	83-131011-001	83-131072-002
KVS-68	83-131012-001	83-131072-003

2-2.1.2 SUPPRESSION AGENT

The suppression agent is either a dry chemical agent suitable for suppression of Class A, B and C fires, or Purple K® dry chemical agent suitable for suppression of Class B and C fires. These agents are nonconductive, physiologically inert and nonabrasive. They will not harm most materials and may be brushed, blown, vacuumed or washed from vehicles.

2-2.1.3 MOUNTING BRACKET KITS, P/NS 296189, 296188, AND 83-131003-001

A mounting bracket kit is used for mounting each cylinder-and-valve assembly. The kit consists of a steel bracket with a shelf to support the cylinder. Cylinder straps are used to secure the cylinder to the bracket. Prior to installation, ensure that the mounting surface will support the recommended load specified in Table 2-3. Mount the bracket to the surface using four (4) 1/2-inch, SAE Grade 8 bolts.

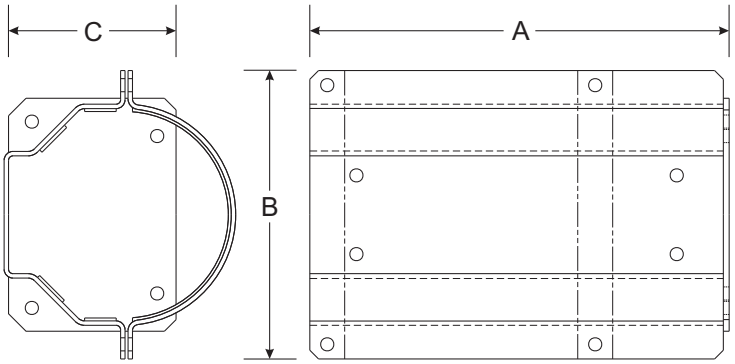

Figure 2-3. Mounting Bracket, P/N 296188 shown

Table 2-3. Mounting Bracket Kits

Mounting Bracket P/N	For Cylinder/Valve Model	Dim. A	Dim. B	Dim. C	Recommended Support Load
296189	KVS-21	11-3/4 in. (298 mm)	12-3/8 (314 mm)	7-3/16 in. (183 mm)	80 lb. (36.3 Kg)
296189	KVS-25H	11-3/4 in. (298 mm)	12-3/8 (314 mm)	7-3/16 in. (183 mm)	80 lb. (36.3 Kg)
296188	KVS-33	18-1/2 in. (470 mm)	12-3/8 (314 mm)	7-3/16 in. (183 mm)	160 lb. (72.6 Kg)
296188	KVS-45	18-1/2 in. (470 mm)	12-3/8 (314 mm)	7-3/16 in. (183 mm)	160 lb. (72.6 Kg)
83-131003-001	KVS-68	17-3/4 (451 mm)	15-7/8 (397 mm)	9-7/8 in. (251 mm)	277 lb. (125.6 Kg)

2-2.2 Detection Components

KVS weather-tight spot detection, linear heat sensor cable detection, infrared detection, or some combination of these types of detection may be used.

2-2.2.1 IR-1 INFRARED DETECTOR FOR KVS-2025 AND EM-2, P/N 83-132001-001

The IR-1 Infrared Flame Detector (P/N 83-132001-001) for the KVS-2025 and EM-2 provides fast, safe and reliable fire detection for vehicles and heavy mobile machinery. The IR-1 provides false alarm immunity by sensing *two* frequency ranges of IR radiation. These detectors are rated to NEMA 4X. The IR-1 should always be installed using the P/N 83-131060-001 Mounting Bracket Kit. For detailed information on the design and installation of the IR-1, see KVS 2025 manual P/N 83-132036-001.

Note: For FM Global insured equipment, the model IR-1 (IR) infrared detector, P/N 83-132001-001 must be used in conjunction with thermal heat detection to comply with FM Global Operating Standard 7-40, Heavy Duty Mobile Equipment. This is due to no "Through Lens Supervision" on this infrared detector. Acceptable secondary heat detection devices are KVS Detect-A-Fire Heat Detector, P/N 83-131034-XXX and Linear Heat Sensor Cable, P/N 83-100003-001.

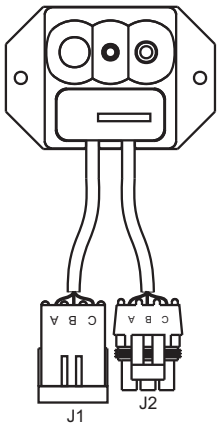

Figure 2-4. IR-1 Flame Sensor, P/N 83-132001-001

2-2.2.2 KVS DETECT-A-FIRE HEAT DETECTOR, P/N 83-131034-XXX

The KVS Detect-A-Fire, utilizes the same sensing element and explosion-proof stainless steel tubing of the standard heat detectors, and include weathertight shrink wrap sleeving and watertight connections. In addition, the orientation of the contacts are identified by the Fenwal logo. This allows for mounting in any orientation. The KVS Detect-A-Fire heat detector is provided with a mounting bracket so the assembly may be bolted to the vehicle.

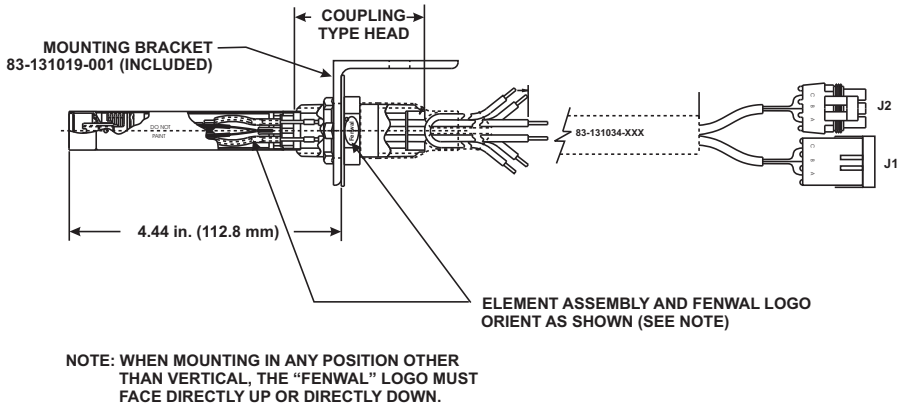

Figure 2-5. KVS Detect-A-Fire Heat Detector, P/N 83-131034-XXX

Table 2-4. KVS Detect-A-Fire Heat Detectors

Part Number	Temperature
83-131034-275	275°F (135°C)
83-131034-360	360°F (182°C)
83-131034-450	450°F (232°C)
83-131034-600	600°F (316°C)

2-2.2.3 LINEAR HEAT SENSOR CABLE, P/N 83-100003-001

The Linear Heat Sensor Cable is a small diameter cable capable of detecting heat from a fire over its entire length. The sensor cable consists of a twisted pair of 19 AWG copper coated steel conductors covered by a temperature sensitive insulation and protected by an outer sheath. The operating temperature is 350°F (176°C).

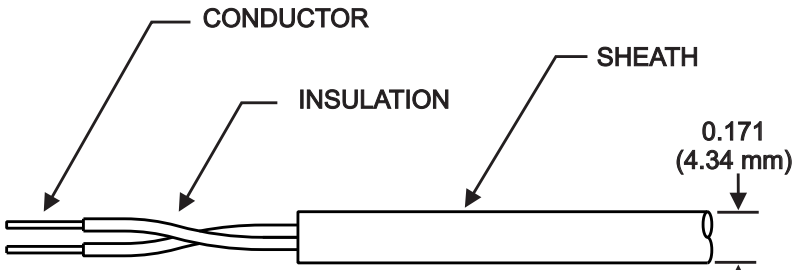

Figure 2-6. Linear Heat Sensor Cable, P/N 83-100003-001

2-2.3 Actuation Components

2-2.3.1 MANUAL MECHANICAL OPERATOR, P/N 876992

The manual mechanical operator is a single lever operated plunger which mounts directly to the cylinder and valve assembly. The mechanical operator is covered with a rubber boot to prevent dirt and moisture from entering the operator or cylinder valve. The manual operator is shown in Figure 2-7.

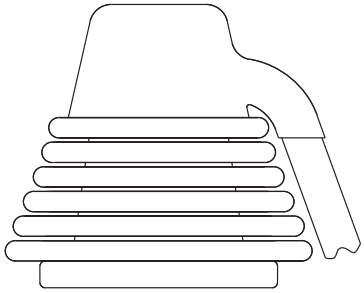

Figure 2-7. Manual Mechanical Operator, P/N 876992

2-2.3.2 NITROGEN CYLINDER, P/N 878508

The nitrogen cylinder is used with Mechanical Actuator (P/N 897392) or Electro-Mechanical Actuator (P/N 897391). The nitrogen cylinder (P/N 878508) supplies the pressure charge for Pneumatic System Valve Actuator (P/N 87-120042-001). This is a 15 cubic inch steel cylinder with a gold-plated disc bushing to contain the nitrogen at a pressure of 1800 psig at 70°F.

The cylinder is seven inches long by two inches in diameter. The neck is threaded to mate with the actuators. Figure 2-8 shows the nitrogen cylinder.

The nitrogen cylinder has a safety cap which should be in place at all times except when an actuator is installed on the cylinder.

Figure 2-8. Nitrogen Cylinder, P/N 878508

Replacement labels, intend for field installation, P/N 83-131071-001, are available for the nitrogen cylinder.

2-2.3.3 BRACKETS–NITROGEN CYLINDER

There are two different brackets used to mount the actuator and nitrogen cylinder assembly. One is a short bracket used to mount the cylinder inside the vehicle. The other is a long bracket and cover used to mount the cylinder on the outside of the vehicle.

2-2.3.3.1 Indoor Nitrogen Bracket (Short), P/N 844726

This short bracket is used to hold the actuator with the nitrogen cylinder screwed onto the actuator. This provides easy access to the cylinder for removal and replacement.

The short nitrogen cylinder mounting bracket is made of zinc plated steel. The bracket may be bolted or welded to the vehicle. Figure 2-9 shows the short nitrogen bracket.

This bracket may be used to mount either the electromechanical actuator (P/N 897391) or the mechanical actuator (P/N 897392) inside the vehicle.

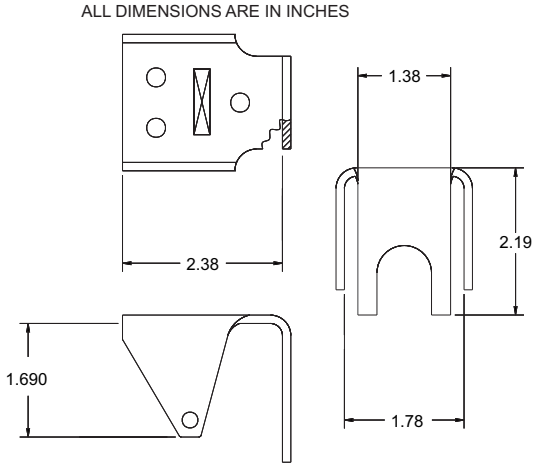

Figure 2-9. Indoor (Short) Nitrogen Cylinder Bracket, P/N 844726

2-2.3.3.2 Outdoor Nitrogen Bracket And Cover (Long), P/N 844725

The long nitrogen cylinder mounting bracket and cover are used only with the mechanical actuator (P/N 897392) and is for outdoor use. Figure 2-10 shows the long nitrogen bracket and cover.

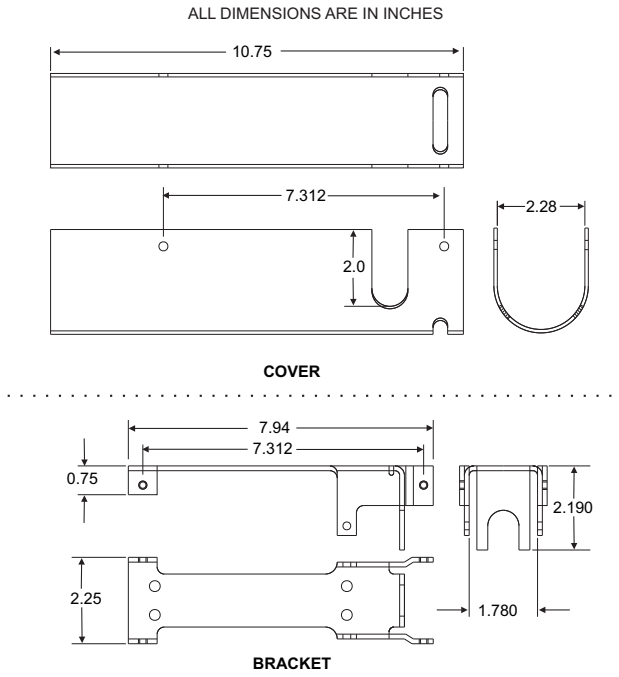

Figure 2-10. Outdoor (Long) Nitrogen Cylinder Bracket And Cover, P/N 844725

The bracket and cover are made of zinc plated steel. The cover has a slot to facilitate the removal of the locking pin. The bracket may be bolted or welded to the vehicle. The cover is bolted to the bracket.

2-2.3.4 CHECK VALVE, P/N 259404

The check valve has a male thread on one end. If more than one remote mechanical, or electromechanical, actuator is used, there can be no more than 125 feet of 1/4-inch hose from the nitrogen cartridge to each actuator, inclusive. Check valves must be inserted in the 1/4-inch line just before the tee connecting the two actuators to the dry chemical cylinder. Figure 2-11 shows the check valve.

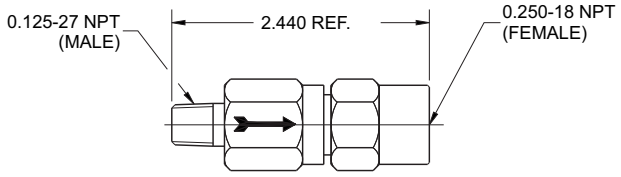

Figure 2-11. Check Valve, P/N 259404

2-2.3.5 PNEUMATIC SYSTEM VALVE ACTUATOR, P/N 87-120042-001

The pneumatic system valve actuator is mounted to every dry chemical cylinder valve assembly, when using pneumatic actuation. The pneumatic system valve actuator has inlet and outlet ports for connecting multiple cylinders in series, and is also equipped with a spring loaded plunger that locks the piston in the discharged position, ensuring complete discharge of the cylinder(s) contents. The pneumatic actuator is connected to the mechanical/electro-mechanical actuator via a maximum of 125 ft. (38 m) of 1/4-inch hose. A total of six actuators can be activated from each nitrogen cylinder (P/N 878508).

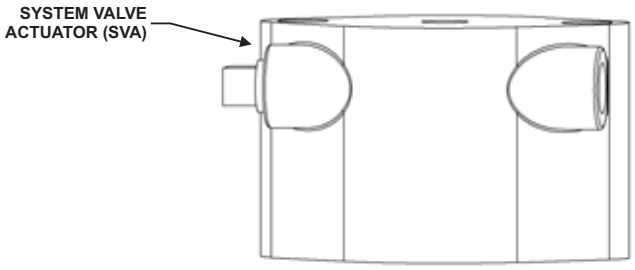

Figure 2-12. Pneumatic System Valve Actuator, P/N 87-120042-001

2-2.3.6 VENT CHECK (OPTIONAL), P/N 877810

The vent check has an aluminum body and a spring-loaded nylon ball to act as the vent check. The vent check screws into the pneumatic actuator (P/N 877806) mounted on the cylinder valve. It is used as a safety device to bleed off pressure to the pneumatic actuator. It can also be used to relieve pressure in the 1/4-inch hose, after a dry chemical discharge. If several pneumatic actuators are used, install the vent check in the last actuator in the series. Figure 2-13 shows the vent check.

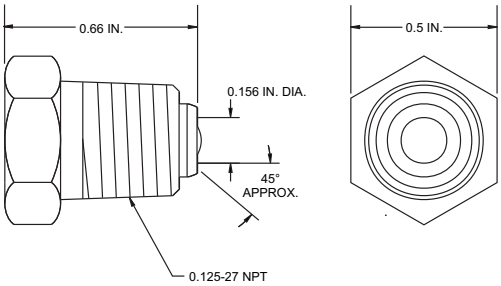

Figure 2-13. Vent Check, P/N 877810

2-2.3.7 ELECTRIC OPERATED CONTROL HEAD, P/N 83-131080-001

The electric operated control head is used for opening the dry chemical cylinders directly. The control head is bolted to the top of the cylinder valve and is used in lieu of the pneumatic actuator (P/N 877806) and its accessories.

The control head operates using a field replaceable electric actuator. When electrically fired, it produces the necessary force to depress the control head piston, opening the dry chemical cylinder valve.

The actuator will maintain its internal pressure and the control head piston self-locks in the operated position. With both the actuator and the control head locking, a complete dry chemical discharge is ensured.

The actuator utilizes an environmentally sealed connector, Deutsch P/N DT04-2P. The mating connector is Deutsch P/N DT06-2S. This connector withstands extreme temperature and moisture conditions.

The control head can be used on any type of machine or vehicle. It is used in conjunction with any of the Kidde Fire Systems Control Panels including: KVS-2000 Control Panel (see Paragraph 2-2.3.7.2), KVS-2025 Protection Panel (see Paragraph 2-2.3.7.3), EM-2 Expansion Module (see Paragraph 2-2.3.7.4), and Circuit Monitor (see Paragraph 2-2.5.4)

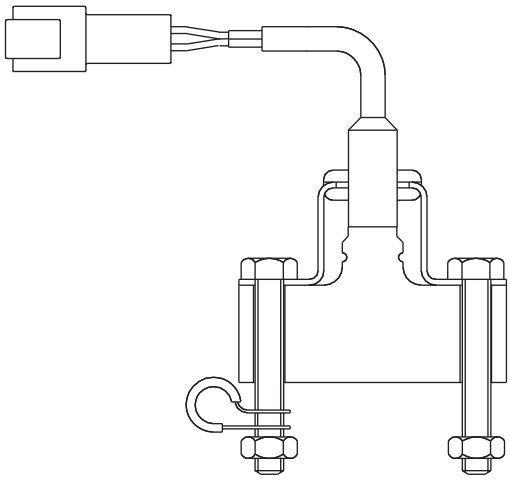

Figure 2-14. Electric Operated Control Head, P/N 83-131080-001

2-2.3.7.1 Replacement Electric Actuator, P/N 83-131082-001

The replacement electric actuator must be used anytime that the system has been fired or after five years of field service. The shelf life (environmentally controlled) is ten years. If the typical ambient temperature exceeds 150°F it is recommended that the actuator be replaced annually.

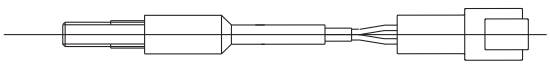

Figure 2-15. Replacement Electric Actuator, P/N 83-131082-001

2-2.3.7.2 KVS-2000 Control Panel, P/N 83-100000-0XX

The KVS-2000 Control Panel is a versatile panel for control of a fire detection and releasing system on vehicles and heavy mobile machinery. Utilizing solid state circuitry, it is available in a variety of time delay configurations. The panel is made of rugged polymer and is sealed against moisture and dust. For ordering time delay options, change the "XX" suffix to the appropriate numbers. For more information on the design and installation of the KVS-2000, see the KVS-2000 manual P/N 83-100033-001.

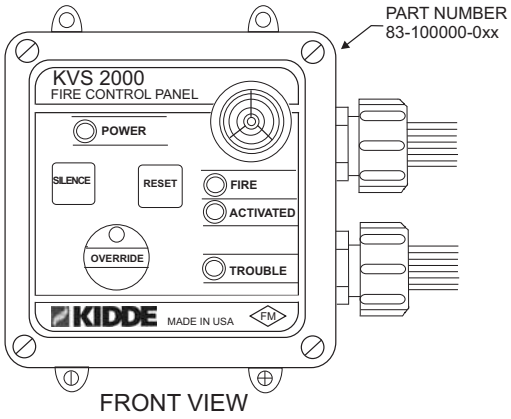

Figure 2-16. KVS-2000 Control Panel, P/N 83-100000-0XX

2-2.3.7.3 KVS-2025 Control Panel, P/N 83-132034-001

The KVS-2025 Control Panel is a versatile panel for control of a fire detection and releasing system on vehicles and heavy mobile machinery. The KVS-2025 utilizes DIP switches for adjustment of time delay, engine shutdown and releasing features. The expansion options of the panel are virtually unlimited. This panel is approved for use with the IR-1 infrared detector and EM-2 expansion module. For more information on the design and installation of the KVS-2025, see the KVS-2025 manual P/N 83-132036-001.

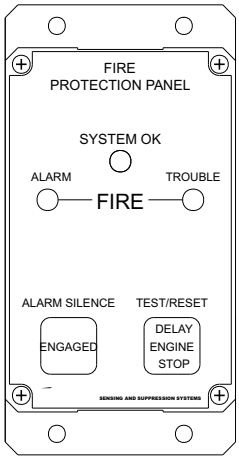

Figure 2-17. KVS-2025 Control Panel, P/N 83-132034-001

2-2.3.7.4 EM-2 Expansion Module for KVS-2025, P/N 83-132035-001

The EM-2 Expansion Module for the KVS-2025 Protection Panel provides virtually unlimited expansion options for the KVS-2025. It is used for additional controls on the KVS-2025 fire detection and releasing system on vehicles and heavy mobile machinery. The EM-2 utilizes DIP switches for adjustment of time delay, engine shutdown and releasing options. The EM-2 Expansion Module is approved for use with the IR-1 infrared detector. For more information on the design and installation of the EM-2, see the KVS-2025 manual P/N 83-132036-001.

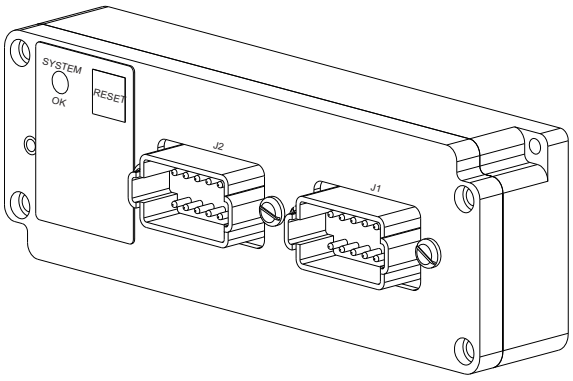

Figure 2-18. EM-2 Expansion Module, P/N 83-132035-001

2-2.3.8 MECHANICAL ACTUATOR, P/N 897392

The mechanical actuator has a brass body and contains a stainless steel cutter pin assembly attached to a stainless steel stem which has a knob on the end. The cutter pin can be moved up and down manually by moving the stem knob up or down. Figure 2-19 shows the mechanical actuator. It can be mounted indoors using bracket (P/N 844726), or outdoors using bracket (P/N 844725).

The actuator bottom opening is threaded to mate with the nitrogen cylinder (P/N 878508). The knob and stem are enclosed in a rubber boot to prevent debris from entering the actuator. To operate the actuator, remove the locking pin and strike the knob toward the cylinder.

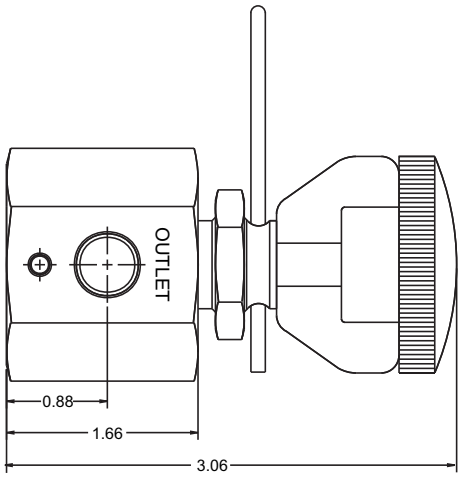

Figure 2-19. Mechanical Actuator, P/N 897392

2-2.3.9 ELECTROMECHANICAL ACTUATOR, P/N 897391

The electromechanical actuator is similar to the mechanical actuator with the exception that the knob and stem are spring-loaded. An activating cartridge screws into the actuator body. This actuator can be operated automatically if an electrical signal from a detection device powers the cartridge, releasing pressure to depress the cutter pin pneumatically. This actuator can also be operated manually, by pulling the locking pin and striking the knob forcefully downward. Figure 2-20 shows the electromechanical actuator.

This actuator body is threaded to mate with the nitrogen cylinder. It must always be mounted indoors, using indoor bracket (P/N 844726).

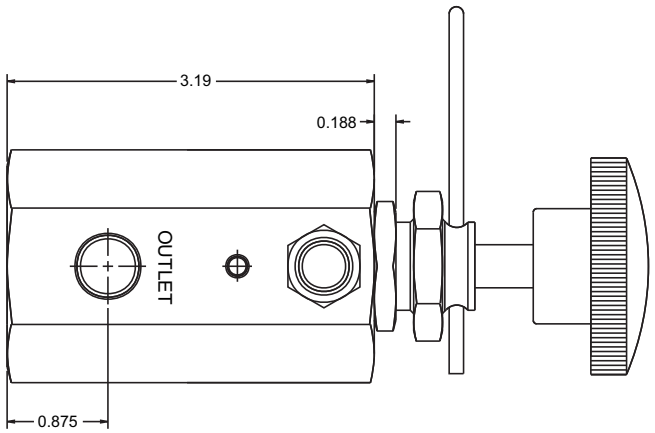

Figure 2-20. Electromechanical Actuator, P/N 897391

2-2.3.9.1 Cartridge and Connector, P/Ns 844712, 844710

The cartridge (P/N 844712) is made of cadmium-plated steel (see Figure 2-21). One end is threaded to screw into the electromechanical actuator. The other end mates with a connector and cable (P/N 844710).

The cartridge is equipped with a safety shunt wire in the electrical connector end. This wire must be removed before the connector is attached. The cartridge has an operating range of -65° (-54°C) to 200°F (+93°C). The cartridge momentarily drains 7 Amperes of current when actuated.

The cartridge has a shelf life of 10 years when stored at 70°F (21°C) and 5 years when stored at 200°F (+93°C). The cartridge should be stored at 70°F (21°C) in a dry environment. Figure 2-21 shows the cartridge and Figure 2-22 shows the connector cable.

Note: Cartridge must be replaced after system is fired.

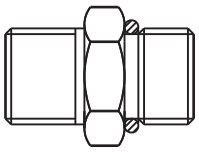

Figure 2-21. Cartridge, P/N 844712

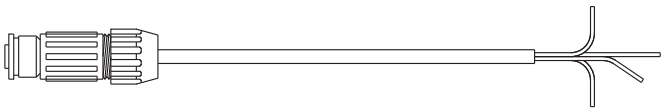

Figure 2-22. Connector and Cable, P/N 844710

2-2.4 Delivery Components

Delivery components consist of nozzles, hydraulic hoses, support brackets and distributors.

2-2.4.1 NOZZLES

There are two types of nozzles available for use with the KVS Fire Suppression System. One is a cone type nozzle, the other is a fan nozzle.

2-2.4.2 CONE NOZZLE, P/N 844714

The cone nozzle is made of plated steel and contains a 45° steel cone, causing the nozzle to disperse a cone shaped spray of dry chemical. This nozzle has a black neoprene rubber protective cap that is blown off by the dry chemical discharge. Figure 2-23 shows the cone nozzle and cap. Figure 2-24 shows the nozzle and spray pattern.

This nozzle may be used in two ways: for total flooding applications for an enclosed volume or for overhead local application for an unenclosed area.

Nozzle coverage and placement is detailed in Chapter 3 of this manual.

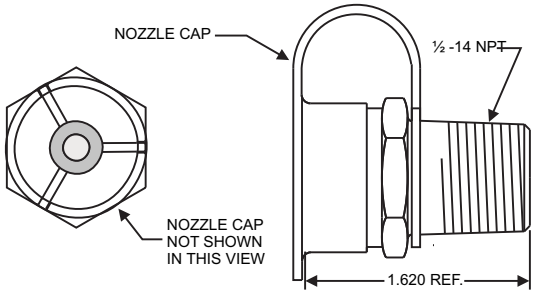

Figure 2-23. Cone Nozzle, P/N 844714

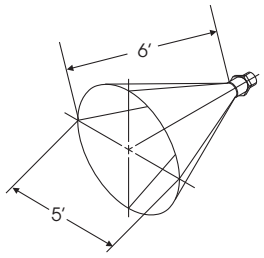

Figure 2-24. Typical Cone Nozzle Spray Pattern

Replacement protective caps for the P/N 844174 nozzle are available. The protective caps were redesigned in May 2005 to improve performance. Because of the location of the cap-retaining groove on the nozzle body was changed, it is important to note that:

- The new cap is not compatible with the older design nozzles manufactured prior to May 2005.
- The older cap is not compatible with the newer design nozzles manufactured after May 2005.

The replacements caps are easy to tell apart: the older style cap is gray silicone, and the new style cap is black neoprene. When ordering replacement caps, it is important to remember:

- The old-style replacement cap, P/N 26494302, will replace gray caps in the field, and are sold individually.
- The new-style replacement cap, P/N 83-131071-001, will replace black caps in the field, and are sold in bags of 10.

2-2.4.3 FAN NOZZLE, P/N WK-259072-001

The fan nozzle is a plated steel nozzle with a semicircular slot which delivers a 180° fan-shaped stream of dry chemical. This nozzle can be used for local applications and can cover a larger area than the cone nozzle. Figure 2-25 shows the fan nozzle. Figure 2-26 shows the nozzle and spray pattern.

This nozzle has a neoprene rubber protective cap that is blown off by the dry chemical discharge.

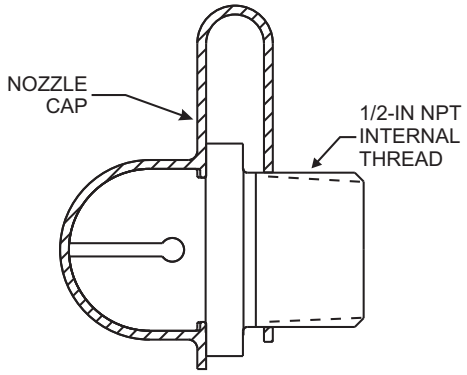

Figure 2-25. Fan Nozzle, P/N WK-259072-001

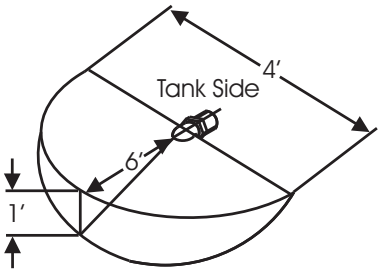

Figure 2-26. Typical Fan Nozzle Spray Pattern

2-2.4.4 HOSE, P/N 83-131035-00X

Hoses for the KVS Fire Suppression System (83-131035-00X) meet SAE 100 R1 AT minimum specifications, USBM flame resistance requirements as specified in MSHA 2G and all other SAE requirements including an operating range of -65°F (-54°C) to +200°F (+93°C) (see Table 2-5 for available hoses).

The following SAE standards should be used for reference:

- SAE J516 Hydraulic Hose Fitting Standard
- SAE J517A Hydraulic Hose Standard
- SAE J343 Standard

Fittings shall be used, as necessary, where hose is connected to nozzles, cylinders, tees or distributors. Swivel hose couplings may be used at any location.

Fittings should be hydraulically crimped type.

The recommended fittings for the Kidde hose are any of the Goodyear fittings recommended for the GR1SN series hose.

The Goodyear website lists all hydraulic fittings that are compatible. Please visit http://www.hydraulics.goodyear.com/cfmx/web/hosesearch/search_attribute_fit.cfm for more information.

Table 2-5. KVS Hydraulic Hoses

Part Number	Description	Hose Length
83-131035-001	Hose - Actuation, 1/4-inch I.D.	100 ft. (38 m)
83-131035-004	Hose, Agent, 1/2-inch I.D.	150 ft. (46 m)
83-131035-006	Hose, Agent, 3/4-inch I.D.	150 ft. (46 m)
83-131035-008	Hose, Agent, 1-inch I.D.	100 ft. (38 m)

Note: 7/8-inch ID hose meeting the above specifications can be used for agent delivery, but is not available from Kidde.

2-2.4.5 NOZZLE BRACKETS

There are three specially designed brackets used to mount the nozzles and direct the discharge; 90° bracket without coupling, 90° bracket with coupling, and a bracket and 45° elbow. These brackets may be bolted or welded to the vehicle.

2-2.4.5.1 Bracket, P/N 83-131019-00

This bracket consists of a 2 in. x 2 in. x 1/8-inch steel 90° angle bracket. The bracket should be painted by the user to prevent rusting. Figure 2-27 shows the nozzle bracket.

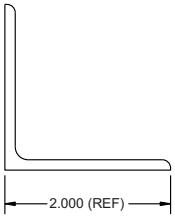

Figure 2-27. Nozzle Bracket, P/N 83-131019-001)

2-2.4.5.2 Bracket and Coupling, P/N 263363

This bracket consists of a 2 in. x 2 in. x 1/8-inch steel 90° angle bracket with a Schedule 40 black iron coupling welded to it. The coupling has a 1/2-inch NPT female thread. Figure 2-28 shows the bracket and coupling. The bracket should be painted by the user, before installation, to prevent rusting.

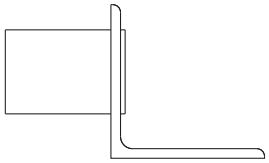

Figure 2-28. 90° Bracket and Coupling, P/N 263363

2-2.4.5.3 45° Bracket and Elbow, P/N 263362

This bracket is also a 2 in. x 2 in. x 1/8-inch steel 90° angle bracket welded to a Schedule 40 black iron 45° elbow. The 45° elbow has a 1/2-inch NPT female thread. Figure 2-29 shows the 45° bracket and elbow. The bracket should be painted by the user, before installation, to prevent rusting.

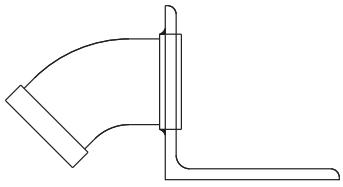

Figure 2-29. 45° Bracket and Elbow, P/N 263362

2-2.4.6 DISTRIBUTOR, P/N 283067

Some means must be provided to distribute the dry chemical agent to the 4, 6 or 8 nozzles. This can be done by means of ordinary tee fittings or by means of a specially designed distributor (P/N 283067). These distributors can be bolted or welded in place.

This steel distributor has four 1/2-inch NPT female thread outlet ports at right angles to each other. The distributor also has a 3/4-inch NPT female thread inlet port. The distributor should be painted by the user, before installation, to prevent rusting.

One or more distributors may be used alone or in combination with tees, as explained in Chapter 3 of this manual. Figure 2-30 shows the distributor.

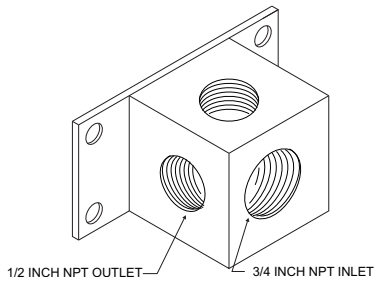

Figure 2-30. Distributor (P/N 283067)

2-2.5 Accessories

2-2.5.1 CYLINDER DISCHARGE ADAPTER KIT, P/N 844908

The discharge adapter kit consists of a threaded 3/4-inch NPT M brass adapter, mounting flange, O-ring and related hardware. The adapter is used to make hose connections to the cylinder outlet (see Figure 2-31).

Note: Nuts and bolts used to secure the anti-recoil plate to the discharge valve should be retained and used for mounting the discharge adapter to the valve outlet.

The discharge adapter can also be used as a recharge adapter to pressurize the cylinder with nitrogen after filling with dry chemical.

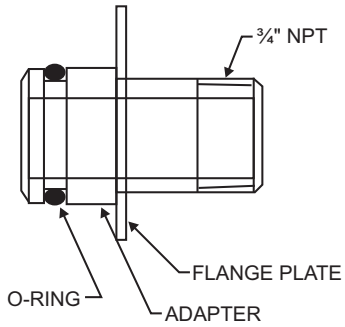

Figure 2-31. Discharge Adapter Kit, P/N 844908

2-2.5.2 GAUGE SHIELD, P/N 83-131024-001

The Gauge Shield is used to protect the gauge from damage. The shield is a separate part that attaches to the bottom of the cylinder valve flange. There is an opening on the front of the shield for easy reading of the gauge. The shield is designed to “bottom out” on the neck of the cylinder (see Figure 2-32).

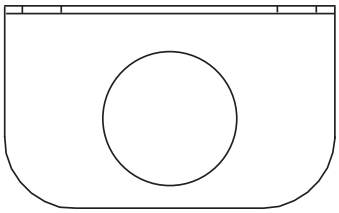

Figure 2-32. Gauge Shield, P/N 83-131024-001

2-2.5.3 RECHARGING ADAPTER, P/N 279262

The recharging adapter is screwed into the discharge port of the dry chemical cylinder valve to allow the cylinder to be repressurized after being refilled with dry chemical from the recharge pail (P/N 806411). Figure 2-33 shows the recharge adapter.

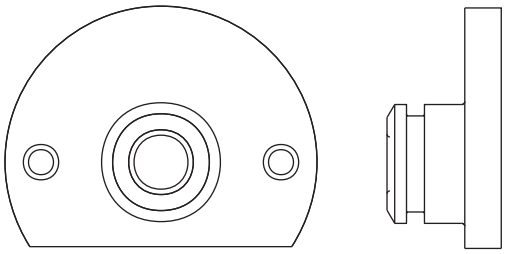

Figure 2-33. Recharge Adapter, P/N 279262

2-2.5.4 CIRCUIT MONITOR, P/N 486322

The circuit monitor is used to supervise the detection and releasing circuit of the fire protection system. A green light indicator shows that the circuit is intact. The red light indicator shows that a fire detector has closed. If both lights are out, either the squib has been fired or there is an open line in the circuit. This device should be mounted in the operator's cabin where it can easily be seen. (See Figure 2-34.)

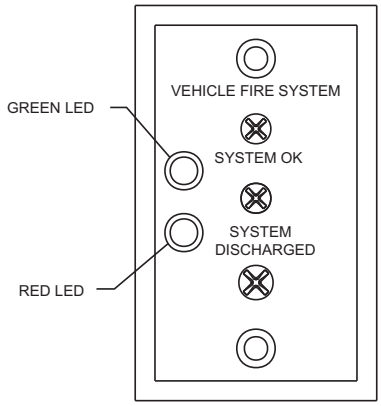

Figure 2-34. Circuit Monitor, P/N 486322

2-2.5.5 KVS MANUAL PULL STATION, P/N 83-132090-00X

The KVS Manual Pull Stations provide means for manual system activation both in the operators cabin, and on the exterior of the vehicle. KFS requires that a NEMA-4 enclosure be used when the manual pull stations are mounted on the exterior of the vehicle. (See Figure 2-35 and Table 2-6.)

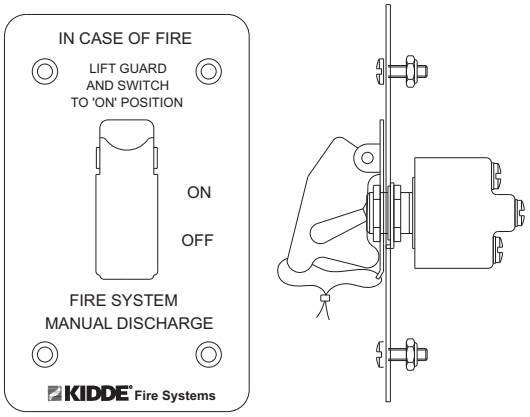

Figure 2-35. Manual Pull Station, P/N 83-132030-00X

Table 2-6. Manual Pull Station Part Numbers

Part Number	Specifications	
83-132030-001	2 poles	24 Vdc
83-132030-002	4 poles	24 Vdc

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CHAPTER 3
SYSTEM DESIGN

3-1 INTRODUCTION

This chapter is intended for system designers and installers. It outlines the steps needed to design the system including the limitations imposed on the design by the system hardware. The second part of this chapter explains equipment installation.

3-2 NOZZLE COVERAGE

3-2.1 Nozzle Types

There are two types of nozzles:

- Cone Nozzle (See Figure 2-23) - for use with either ABC or Purple K.
- Fan Nozzle (See Figure 2-25) - for use with ABC dry chemical only.

Note: Nozzle types MUST NOT be mixed on any one cylinder.

Table 3-1. Number of Nozzles Per System

System	Number of Nozzles	
	Maximum	Minimum
KVS-21	4	4
KVS-25H	6	2
KVS-33	6	6
KVS-45	8	6
KVS-68	8	8

3-2.1.1 NOZZLE APPLICATION

There are three methods of application:

- Total flooding for enclosed areas
- Local application, cone nozzles
- Local application, fan nozzles

3-2.1.2 NOZZLE COVERAGE

Each nozzle provides a module of protection, either a volume or an area:

- Total Flooding, enclosed areas
  Volume: 216 cubic feet (6 ft. x 6 ft. x 6 ft.)
- Local application, cone nozzles
  Overhead
  Area: 900 square inches (30 in. x 30 in.)
- Local application, fan nozzles
  Area: 1764 square inches (42 in. x 42 in.)

3-2.1.3 NOZZLE PLACEMENT

- Total flooding for enclosed areas
  Center of top plane of volume
- Local application, cone nozzles
  Overhead: 35-45 inches above center of area
- Local application, fan nozzle
  center of one side of area

Note: Slit must be over area and parallel to surface.

Figure 3-1 shows nozzle placement and volume coverage for total flooding.

Figure 3-2 shows nozzle placement and area coverage for local overhead application.

Figure 3-3 shows nozzle placement and area coverage for local fan application.

Table 3-1 gives total volume coverage for four, six and eight nozzle systems.

Table 3-2 gives total area coverage for local overhead, and local fan, four, six and eight nozzle systems.

Figure 3-4 shows an example of multi-nozzle coverage where the volumes are adjacent.

Figure 3-5 shows an example of multi-nozzle coverage of nonadjacent volumes.

Volumes and areas may be arranged in any configuration as long as total coverage and hose lengths are not exceeded.

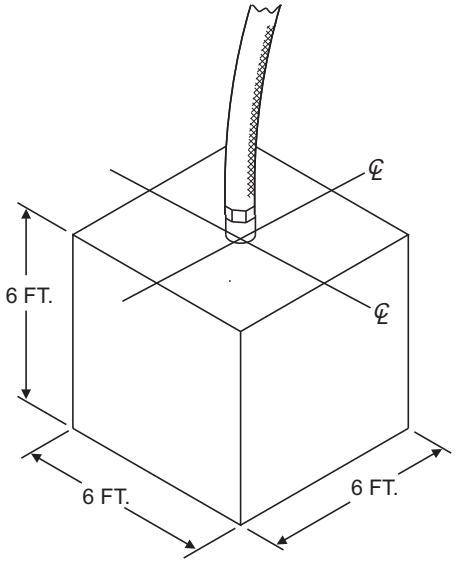

Figure 3-1. Volume Coverage Per Nozzle, KVS Total Flooding Application

When protecting a vehicle with a KVS system, there will be hidden or “shadow” areas, i.e., areas that are hard to reach or partially obstructed by some part of the vehicle. When planning hazard protection, examine all possible hazard areas to determine if planned coverage of dry chemical will reach all of these hidden areas. If there is any doubt, include extra nozzles to be sure of reaching all shadow areas.

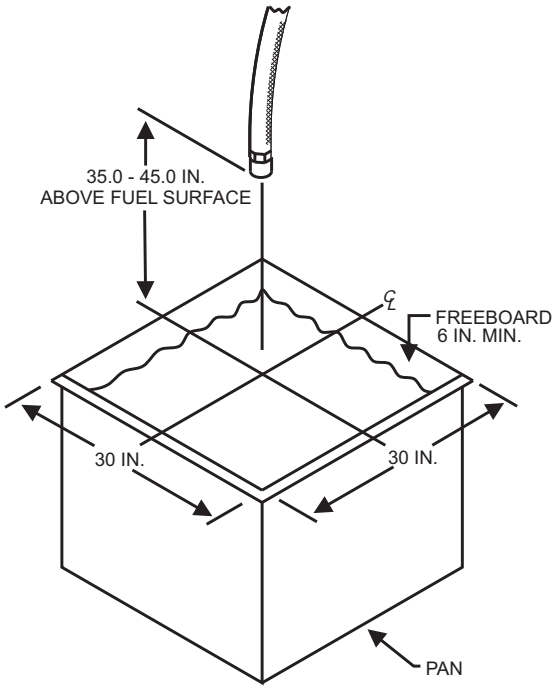

Figure 3-2. Area Coverage Per Nozzle, KVS Local Overhead Application

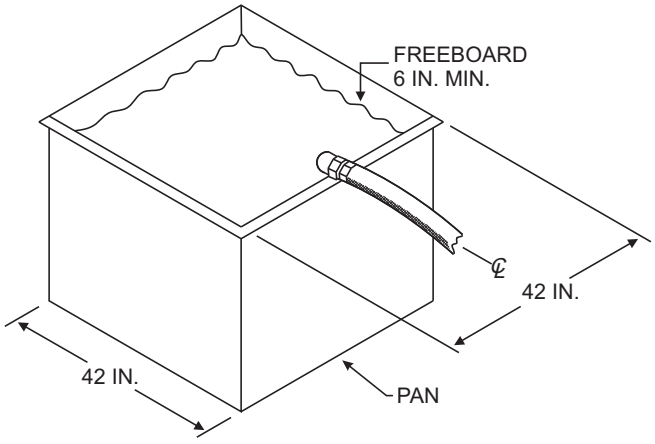

Figure 3-3. Area Coverage Per Nozzle, KVS Local Fan Application

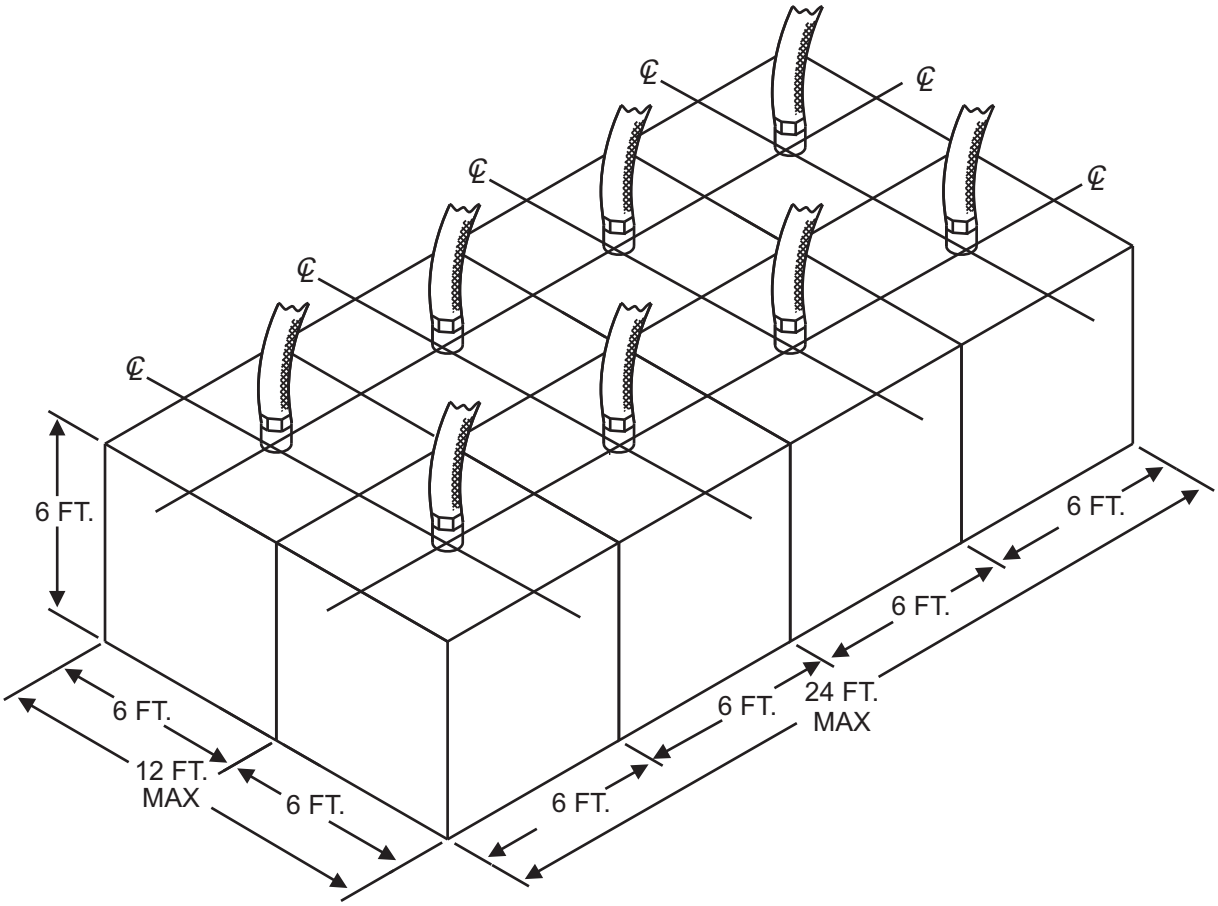

Figure 3-4. Multi-Nozzle, Total Flooding of Adjacent Nozzles

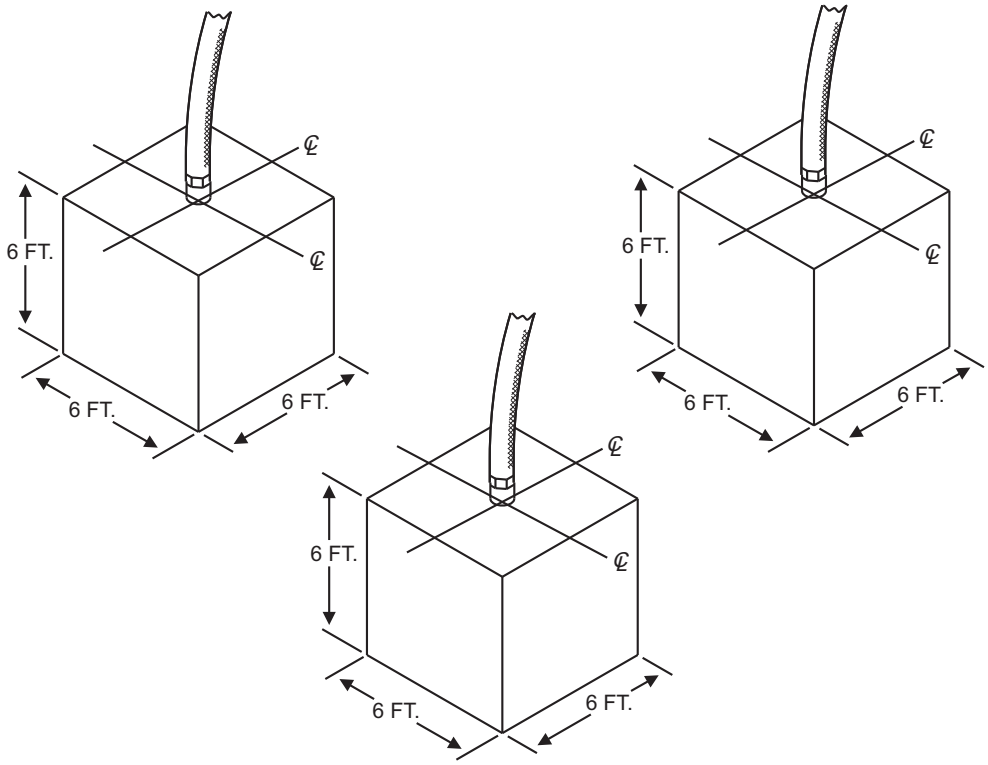

Figure 3-5. Multi-Nozzle, Total Flooding of Non-Adjacent Nozzles

Table 3-2. Total Flooding Application Volume Coverage, One Nozzle Only

Cylinder Size and Number of Nozzles	Total Volume (Cu. Ft.)
KVS-21	
4 Nozzles	864
KVS-25H	
2 Nozzles	432
3 Nozzles	648
4 Nozzles	864
5 Nozzles	1080
6 Nozzles	1296
KVS-33	
6 Nozzles	1296
KVS-45	
6 Nozzles	1296
8 Nozzles	1728
KVS-68	
8 Nozzles	1728

Table 3-3. Local Application Area Coverage

Cylinder Size and Number of Nozzles	Total Area			
	Cone		Fan	
	in^2	$ft.^2$	in^2	$ft.^2$
KVS-21				
4 Nozzles	3600	25.0	7056	49.0
KVS-25H				
2 Nozzles	1800	12.5	*	*
3 Nozzles	2700	18.75	*	*
4 Nozzles	3600	25.0	*	*
5 Nozzles	4500	31.25	*	*
6 Nozzles	5400	37.5	*	*
KVS-33				
6 Nozzles	5400	37.5	10,584	73.5
KVS-45				
6 Nozzles	5400	37.5	10,584	73.5
8 Nozzles	7200	50.0	14,112	98.0
KVS-68				
8 Nozzles	7200	50.0	14,112	98.0
Note: Fan nozzles are not approved for use with KVS-25H systems.				

3-2.2 Hose Limitations

3-2.2.1 INTRODUCTION

KVS dry chemical cylinders are available in five sizes. The KVS-21 cylinder has a capacity of 21 pounds of dry chemical agent, the KVS-25H cylinder has a 25 pound capacity, the KVS-33 has a 33 pound capacity, the KVS-45 has a 45-pound capacity, and the KVS-68 cylinder holds 68 pounds.

The KVS-21 system must use four nozzles, and the KVS-33 must use six nozzles, while the KVS-45 system may use either six or eight nozzles. The KVS-68 system must use eight nozzles. The KVS-25H must use a minimum of two nozzles and a maximum of six nozzles.

The hydraulic hose routes the dry chemical agent to the nozzles; however, each nozzle must receive an adequate quantity of dry chemical agent. This can be accomplished by using a system of tees, or by using one or more, specially designed Kidde distributors (see Chapter 3), or by some combination of these distributors and tees.

In each of these systems, there is a maximum total hose length between the cylinder and all nozzles. There is also a system minimum total hose length between the cylinder and any one nozzle.

The maximum total hose length will vary from system to system. However, the system minimum hose length for all systems is 10 feet. It is important to remember this when using the tables. Each branch of a system may have a zero minimum but the total minimum hose between the cylinder and any one nozzle must be 10 feet. Therefore, all branches cannot be zero at once.

These hose length maximums and minimums must be strictly observed. If the system maximum hose length is exceeded, the pressure will be reduced too much to allow the nozzles to receive adequate dry chemical agent.

Note: All hose can be run with any number of bends in any direction.

Each system will be discussed in detail.

3-2.2.2 KVS-21

3-2.2.2.1 Four-Nozzle Systems

The four nozzle system can be installed exclusively with either tees or with one distributor. Figure 3-6 shows a maximum KVS-21 four nozzle system, using tees. Table 3-4 gives the hose size at each location, plus the maximum and minimum hose length and quantity of elbows at each location. It also gives the maximum and minimum total hose between the cylinder and each nozzle. Figure 3-7 shows a maximum KVS-21 system using a distributor.

3-2.2.3 KVS-25H

3-2.2.3.1 Two-Nozzle Systems

The KVS-25H two nozzle system can only be piped using one tee. Figure 3-8 shows a KVS-25H two nozzle system. Table 3-6 gives the hose size at each location, plus the maximum and minimum hose length and quantity of elbows at each location. It also gives the maximum and minimum total hose between the cylinder and each nozzle.

3-2.2.3.2 Three-Nozzle Systems

The KVS-25H three nozzle system can only be piped using one distributor. In this configuration, one of the outlet ports of the distributor is blocked with a 1/2-inch plug. Figure 3-9 shows a KVS-25H three nozzle system. Table 3-7 gives the hose size at each location, plus the maximum and minimum hose length and quantity of elbows at each location. It also gives the maximum and minimum total hose between the cylinder and each nozzle.

3-2.2.3.3 Four-Nozzle Systems

The KVS-25H four nozzle system can be installed either exclusively with tees or with one distributor. Figure 3-10 shows a KVS-25H four nozzle system using tees. Table 3-8 gives the hose size at each location, plus the maximum and minimum hose length and quantity of elbows at each location. It also gives the maximum and minimum total hose between the cylinder and each nozzle. Figure 3-11 shows a KVS-25H system using a distributor. Figures 3-18 and 3-19 show examples of maximum balanced and unbalanced four nozzle systems.

3-2.2.3.4 Five-Nozzle Systems

The KVS-25H five nozzle system can only be piped using one distributor and two tees. In this configuration, one of the outlet ports of the distributor is blocked with a 1/2-inch plug. Figure 3-12 shows a KVS-25H five nozzle system. Table 3-10 gives the hose size at each location, plus the maximum and minimum hose length and quantity of elbows at each location. It also gives the maximum and minimum total hose between the cylinder and each nozzle.

3-2.2.3.5 Six-Nozzle Systems

The KVS-25H six nozzle system can only be piped using one distributor and three tees. In this configuration, one of the outlet ports of the distributor is blocked with a 1/2-inch plug. Figure 3-13 shows a KVS-25H six nozzle system. Table 3-11 gives the hose size at each location, plus the maximum and minimum hose length and quantity of elbows at each location. It also gives the maximum and minimum total hose between the cylinder and each nozzle.

3-2.2.4 KVS-33

3-2.2.4.1 Six-Nozzle Systems

The KVS-33 six nozzle system can only be piped using one distributor and three tees. In this configuration, one of the outlet ports of the distributor is blocked with a 1/2-inch plug. Figure 3-14 shows the six nozzle balanced system. Table 3-12 gives the hose size at each location and the maximum and minimum hose length and quantity, of elbows at each location. It also gives the maximum and minimum hose between the cylinder and any one nozzle.

3-2.2.5 KVS-45

3-2.2.5.1 Six-Nozzle Systems

The KVS-45 six-nozzle system can only be piped using one distributor and three tees. In this configuration, one of the outlet ports of the distributor is blocked with a 1/2-inch plug. Figure 3-15 shows the six-nozzle balanced system.

Note: All 7/8-inch hose utilizes 3/4-inch fittings.

Table 3-13 gives the hose size at each location and the maximum and minimum hose length and quantity, of elbows at each location. It also gives the maximum and minimum hose between the cylinder and any one nozzle.

3-2.2.5.2 Eight-Nozzle Systems

The KVS-45 eight-nozzle system is piped, using two distributors. Figure 3-16 shows a maximum KVS-45, eight-nozzle system, using two distributors. Table 3-14 gives the hose size at each location an the maximum and minimum hose length and quantity and minimum hose between the cylinder and any one nozzle.

Note: All 7/8-inch hose utilizes 3/4-inch fittings.

3-2.2.6 KVS-68

The KVS-68 system is similar to the KVS-45, but delivers a greater quantity of dry chemical agent. The KVS-68 is intended for eight-nozzle installations only.

3-2.2.6.1 Eight-Nozzle Systems

The KVS-68 eight-nozzle system is piped using two distributors. Figure 3-17 shows a maximum KVS-68 eight-nozzle system, using two distributors. Table 3-15 gives the hose size at each location an the maximum and minimum hose length and quantity and minimum hose between the cylinder and any one nozzle.

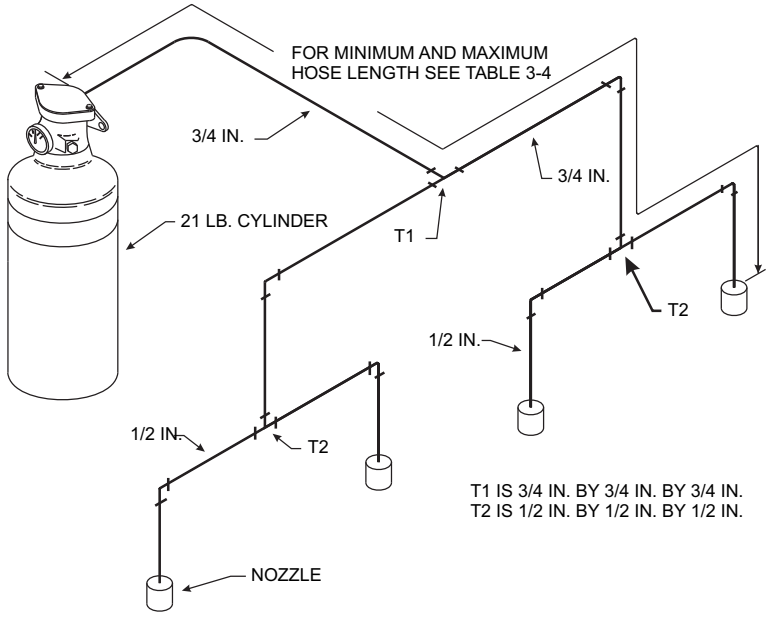

Figure 3-6. KVS-21 Four-Nozzle System Using All Tees

Table 3-4. KVS 21 Hose and Elbow Limitations, Four-Nozzle System Using Tees

Location	Hose ID (in.)	Hose Length		Number of Elbows/ Hose Length	
		Max.	Min.	Max.	Min.
Cylinder to T1	3/4	45 ft. (14 m)	0	1	0
T1 to T2	3/4	20 ft. (6 m)	0	1	0
T2 To Each Nozzle	1/2	15 ft. (5 m)	0	1	0
Cylinder to Each Nozzle	-	50 ft. (15 m)	10 ft. (3 m)	-	-
All 3/4-in. Hose	-	45 ft. (14 m)	5 ft. (2 m)	-	-
All 1/2-in. Hose	-	60 ft. (18 m)	0	-	-
This system may be unbalanced in a maximum ratio of 3:1 at any one tee.					

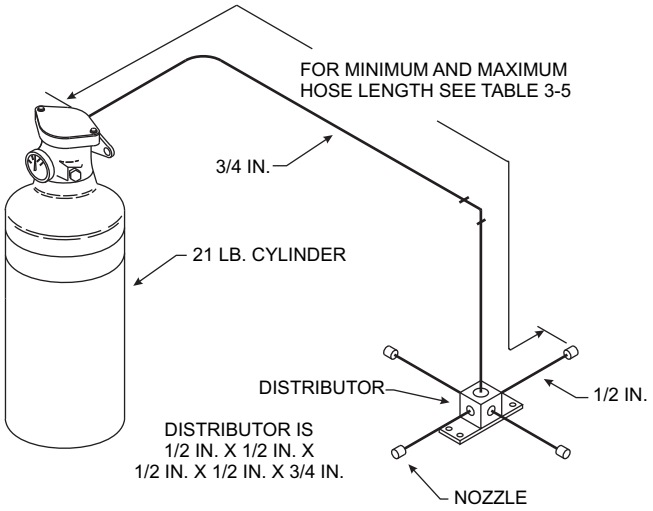

Figure 3-7. KVS-21 Four-Nozzle System Using a Distributor

Table 3-5. KVS-21 Hose and Elbow Limitations Four-Nozzle System Using a Distributor

Location	Hose ID	Hose Length		Number of Elbows/ Hose Length	
		Max.	Min.	Max.	Min.
Cylinder to Distributor	3/4-inch	45 ft. (14 m)	0	1	0
Distributor to Each Nozzle	1/2-inch	15 ft.* (5 m)	5 ft. (2 m)	1	0
Cylinder To Each Nozzle	-	60 ft. (8 m)	10 ft. (3 m)	-	-
All 3/4-in. Hose	-	45 ft. (14 m)	5	-	-
All 1/2-in. Hose	-	60 ft. (18 m)	0	-	-
*This system can be unbalanced in a maximum ratio of 3:1 at the distributors or T1.					

These maximums pertain to the maximum limits for a balanced system. These values can be exceeded for the unbalanced system provided that all other limits are not exceeded.

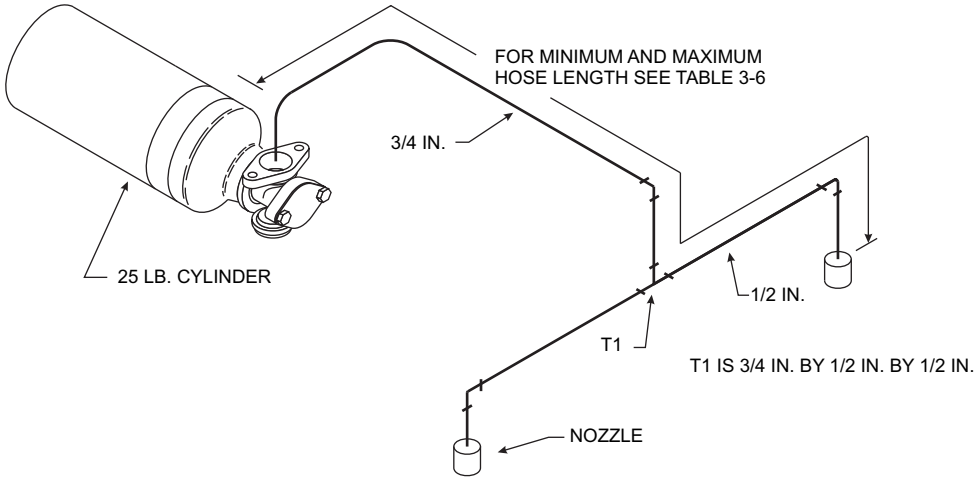

Figure 3-8. KVS-25H Two-Nozzle System

Table 3-6. KVS-25H Hose Limitations, Two-Nozzle System

Location	Hose ID	Hose Length		Number of Elbows/ Hose Length	
		Max.	Min.	Max.	Min.
Cylinder to T1	3/4-inch	30 ft. (9 m)	0	1	0
T1 to each Nozzle	1/2-inch	15 ft.* (5 m)	0	1	0
Cylinder to each Nozzle	--	45 ft. (14 m)	10 ft. (3 m)	--	--
Total quantities of hose (do not mix hose sizes)	3/4-inch	30 ft. (9 m)	5 ft. (2 m)	--	--
	1/2-inch	45 ft. (14 m)	0	--	--
*This system can be unbalanced in a maximum ratio of 2:1 at T1.					

These maximums pertain to the maximum limits for a balanced system. These values can be exceeded for the unbalanced system provided that all other limits are not exceeded.

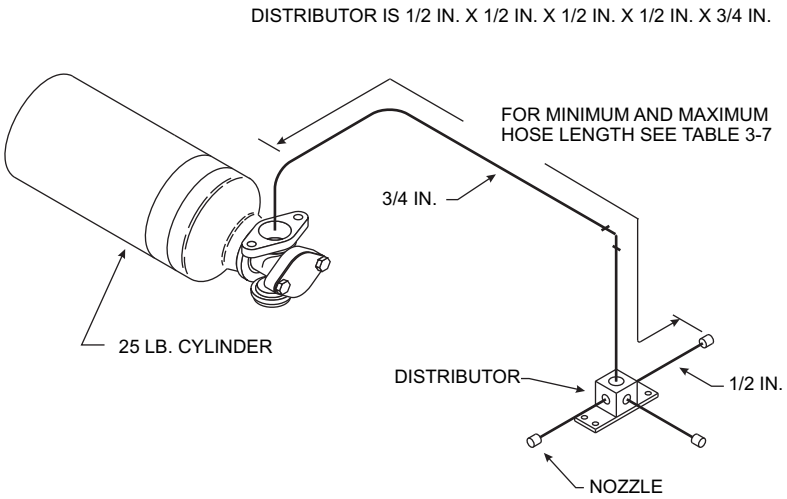

Figure 3-9. KVS-25H Three-Nozzle System

Table 3-7. KVS-25H Hose Limitations, Three-Nozzle System

Location	Hose ID	Hose Length		Number of Elbows/ Hose Length	
		Max.	Min.	Max.	Min.
Cylinder to Distributor	3/4-inch	30 ft. (9 m)	0	1	0
Distributor to each Nozzle	1/2-inch	15 ft.* (5 m)	0	1	0
Cylinder to each Nozzle	--	45 ft. (14 m)	10 ft. (3 m)	--	--
Total quantities of hose (do not mix hose sizes)	3/4-inch	30 ft. (9 m)	5 ft. (2 m)	--	--
	1/2-inch	45 ft. (14 m)	0	--	--
*This system can be unbalanced in a maximum ratio of 2:1 at the distributor.					

These maximums pertain to the maximum limits for a balanced system. These values can be exceeded for the unbalanced system provided that all other limits are not exceeded.

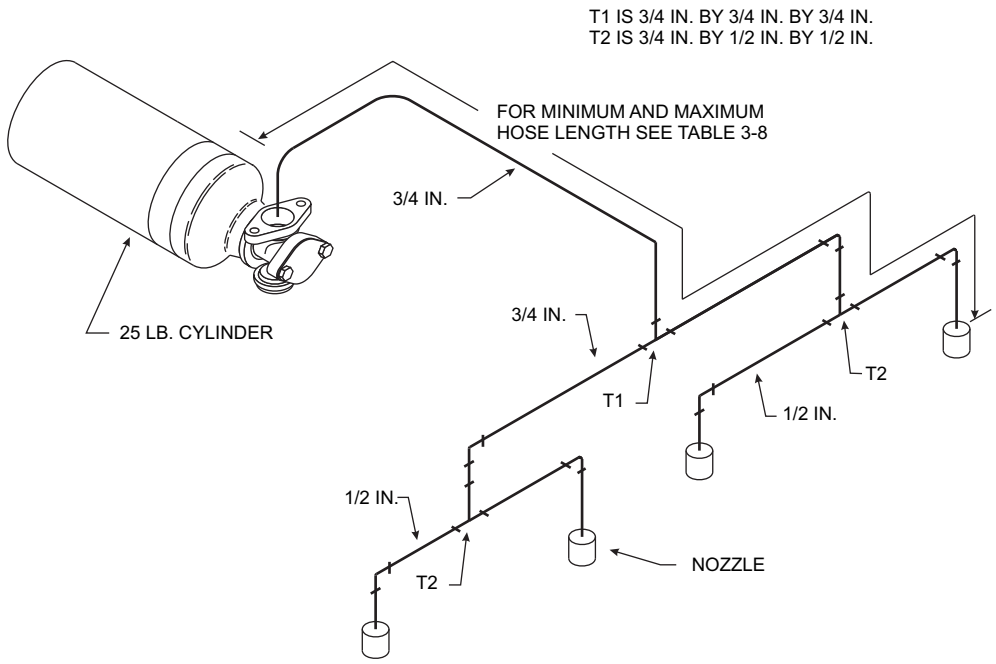

Figure 3-10. KVS-25H Four-Nozzle System (Tee)

Table 3-8. KVS-25H Hose Limitations, Four-Nozzle System (Tee)

Location	Hose ID	Hose Length (ft.)		Number of Elbows/ Hose Length	
		Max.	Min.	Max.	Min.
Cylinder to T1	3/4-inch	45 ft. (14 m)	0	1	0
T1 to T2	3/4-inch	20 ft.* (6 m)	0	1	0
T2 to each Nozzle	1/2-inch	15 ft.* (5 m)	0	1	0
Cylinder to each Nozzle	--	50 ft. (15 m)	10 ft. (3 m)	--	--
Total quantities of hose (do not mix hose sizes)	3/4-inch	45 ft. (14 m)	5 ft. (2 m)	--	--
	1/2-inch	60 ft. (18 m)	0	--	--
*This system can be unbalanced in a maximum ratio of 3:1 at either T.					

These maximums pertain to the maximum limits for a balanced system. These values can be exceeded for the unbalanced system provided that all other limits are not exceeded.

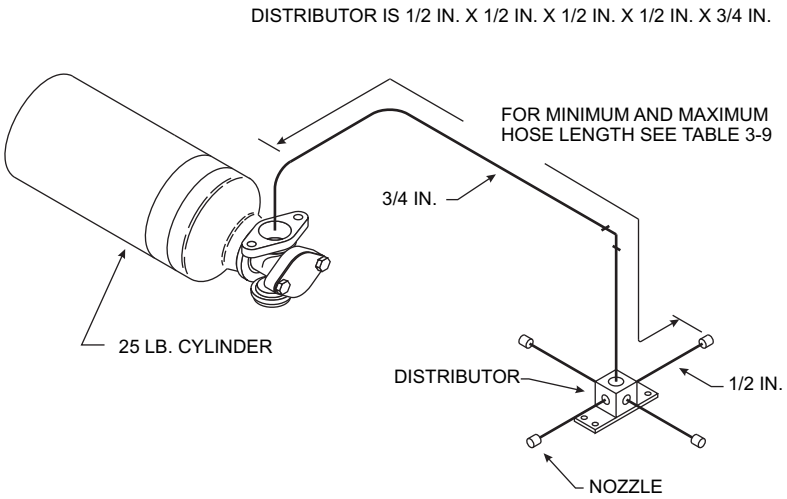

Figure 3-11. KVS-25H Four-Nozzle System (Distributor)

Table 3-9. KVS-25H Hose Limitations, Four-Nozzle System (Distributor)

Location	Hose ID	Hose Length		Number of Elbows/ Hose Length	
		Max.	Min.	Max.	Min.
Cylinder to Distributor	3/4-inch	45 ft. (14 m)	0	1	0
Distributor to each Nozzle	1/2-inch	15 ft.* (5 m)	0	1	0
Cylinder to each Nozzle	--	60 ft. (18 m)	10 ft. (3 m)	--	--
Total quantities of hose (do not mix hose sizes)	3/4-inch	45 ft. (14 m)	5 ft. (2 m)	--	--
	1/2-inch	60 ft. (18 m)	0	--	--
*This system can be unbalanced in a maximum ratio of 3:1 at the distributor.					

These maximums pertain to the maximum limits for a balanced system. These values can be exceeded for the unbalanced system provided that all other limits are not exceeded.

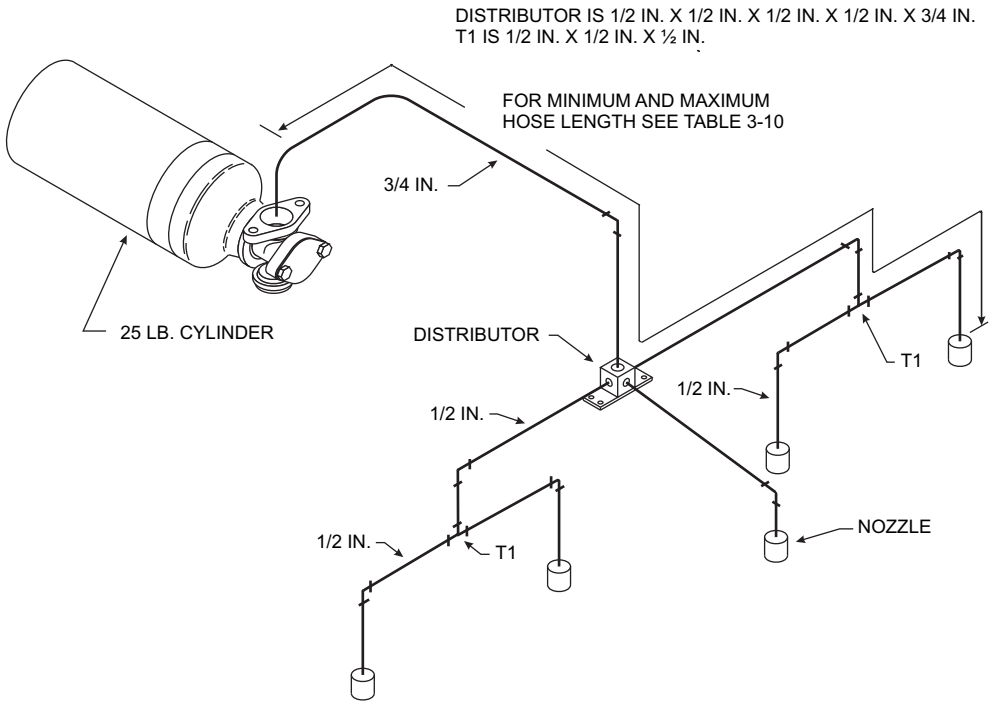

Figure 3-12. KVS-25H Five-Nozzle System

Table 3-10. KVS-25H Hose Limitations, Five-Nozzle System

Location	Hose ID	Hose Length		Number of Elbows/ Hose Length	
		Max.	Min.	Max.	Min.
Cylinder to Distributor	3/4-inch	30 ft. (9 m)	0	1	0
Distributor to T1	1/2-inch	10 ft.* (3 m)	0	1	0
T1 to each Nozzle	1/2-inch	10 ft.* (3 m)	0	1	0
Cylinder to each Nozzle	--	40 ft. (12 m)	10 ft. (3 m)	--	--
Total quantities of hose (do not mix hose sizes)	3/4-inch	30 ft. (9 m)	5 ft. (2 m)	--	--
	1/2-inch	50 ft. (15 m)	0	--	--
*This system can be unbalanced in a maximum ratio of 2:1 at the distributor or T1.					

These maximums pertain to the maximum limits for a balanced system. These values can be exceeded for the unbalanced system provided that all other limits are not exceeded.

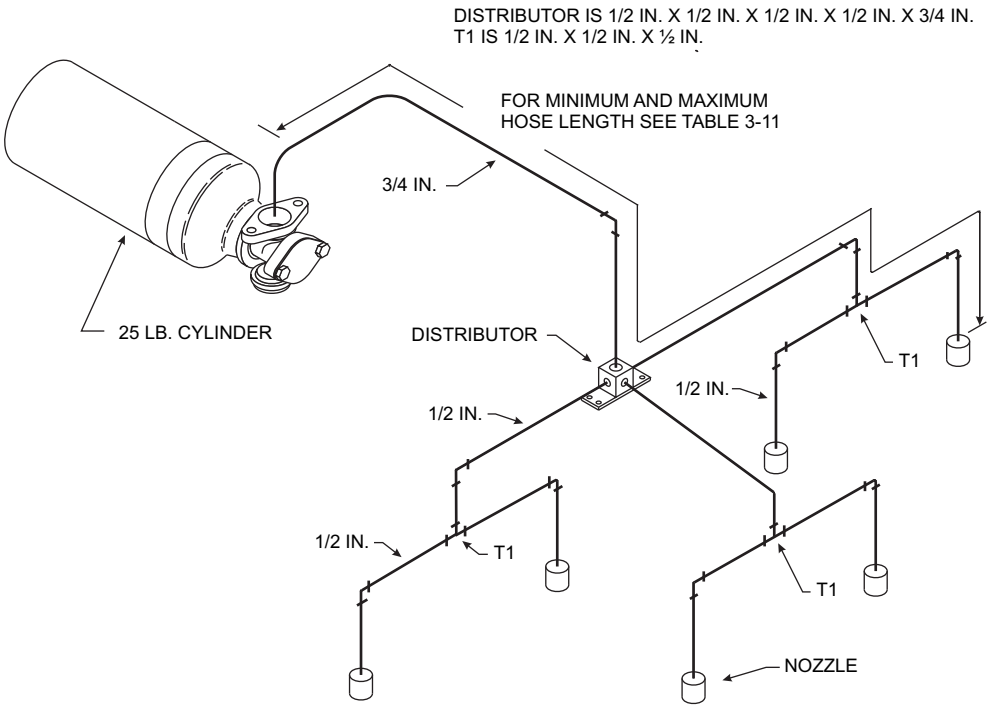

Figure 3-13. KVS-25H Six-Nozzle System

Table 3-11. KVS-25H Hose Limitations, Six-Nozzle System

Location	Hose ID	Hose Length		Number of Elbows/ Hose Length	
		Max.	Min.	Max.	Min.
Cylinder to Distributor	3/4-inch	15 ft. (5 m)	0	1	0
Distributor to T1	1/2-inch	5 ft.* (2 m)	0	1	0
T1 to each Nozzle	1/2-inch	5 ft.* (2 m)	0	1	0
Cylinder to each Nozzle	--	30 ft. (9 m)	10 ft. (3 m)	--	--
Total quantities of hose (do not mix hose sizes)	3/4-inch	15 ft. (5 m)	5	--	--
	1/2-inch	45 ft. (14 m)	0	--	--
*This system can be unbalanced in a maximum ratio of 2:1 at the distributor or T1.					

These maximums pertain to the maximum limits for a balanced system. These values can be exceeded for the unbalanced system provided that all other limits are not exceeded.

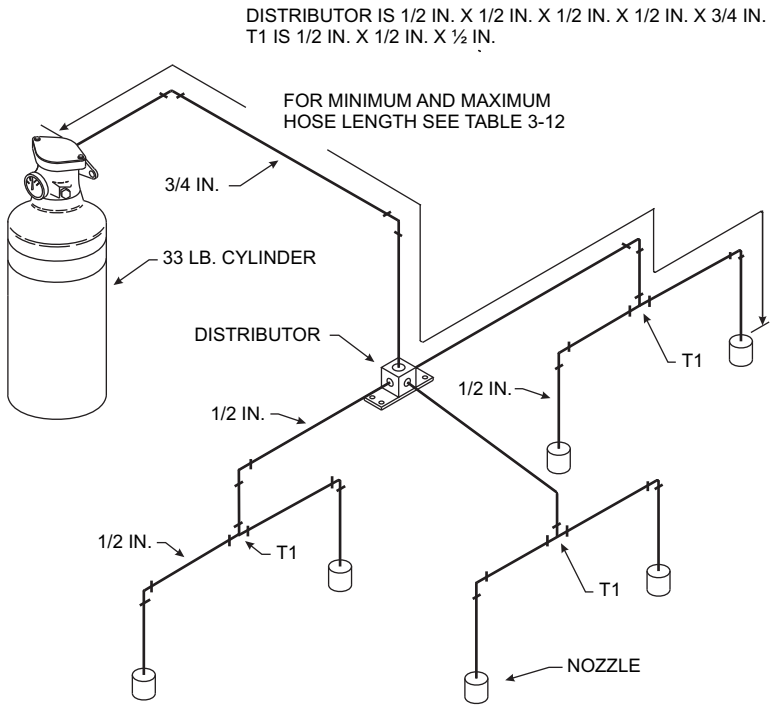

Figure 3-14. KVS-33 Six-Nozzle System Using a Distributor

Table 3-12. KVS-33 Hose Limitations, Six-Nozzle System

Location	Hose ID	Hose Length		Number of Elbows/ Hose Length	
		Max.	Min.	Max.	Min.
Cylinder to Distributor (do not mix hose sizes)	3/4-inch	40 ft. (18 m)	5	2	0
Distributor to T1	1/2-inch	20 ft.* (6 m)	0	1	0
T1 to Each Nozzle	1/2-inch	11 ft.* (3 m)	0	1	0
Cylinder to Each Nozzle (do not mix hose sizes)	3/4-inch supply 1/2-inch nozzle branch	56 ft. (17 m)	10 ft. (3 m)	--	--
Total quantities of hose (do not mix hose sizes)	3/4-inch	40 ft. (18 m)	5	--	--
	1/2-inch	66 ft. (18 m)	0	--	--
*This system can be unbalanced in a maximum ratio of 3:1 at the distributors or T1.					

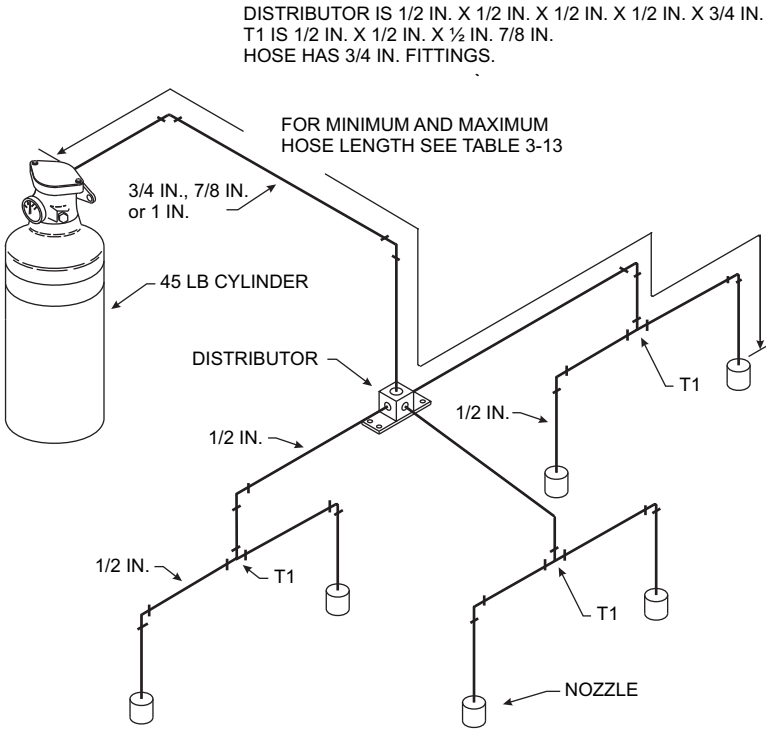

Figure 3-15. KVS-45 Six-Nozzle System Using a Distributor

Table 3-13. KVS-45 Hose Limitations, Six-Nozzle System

Location	Hose ID	Hose Length		Number of Elbows/ Hose Length	
		Max.	Min.	Max.	Min.
Cylinder to Distributor (do not mix hose sizes)	1-inch	45 ft. (14 m)	5	2	0
	7/8-inch	45 ft. (14 m)	5	2	0
	3/4-inch	20 ft. (6 m)	5	2	0
Distributor to T1	1/2-inch	15 ft.* (5 m)	0	1	0
T1 to Each Nozzle	1/2-inch	11 ft. (3 m)*	0	1	0
Cylinder to Each Nozzle (do not mix hose sizes)	1-inch supply 1/2-inch nozzle branch	56 ft. (17 m)	10 ft. (3 m)	--	--
	7/8-inch supply 1/2-inch nozzle branch	56 ft. (17 m)	10 ft. (3 m)	--	--
	3/4-inch supply 1/2-inch nozzle branch	31 ft. (9 m)	10 ft. (3 m)	--	--

Table 3-13. KVS-45 Hose Limitations, Six-Nozzle System

Location	Hose ID	Hose Length		Number of Elbows/ Hose Length	
		Max.	Min.	Max.	Min.
Total quantities of hose (do not mix hose sizes)	1-inch	45 ft. (14 m)	5 ft. (2 m)	--	--
	7/8-inch	45 ft. (14 m)	5 ft. (2 m)	--	--
	3/4-inch	20 ft. (6 m)	5 ft. (2 m)	--	--
	1/2 -inch	66 ft. (20 m)	0	--	--
*This system can be unbalanced in a maximum ratio of 3:1 at the distributors or T1.					

These maximums pertain to the maximum limits for a balanced system. These values can be exceeded for the unbalanced system provided that all other limits are not exceeded.

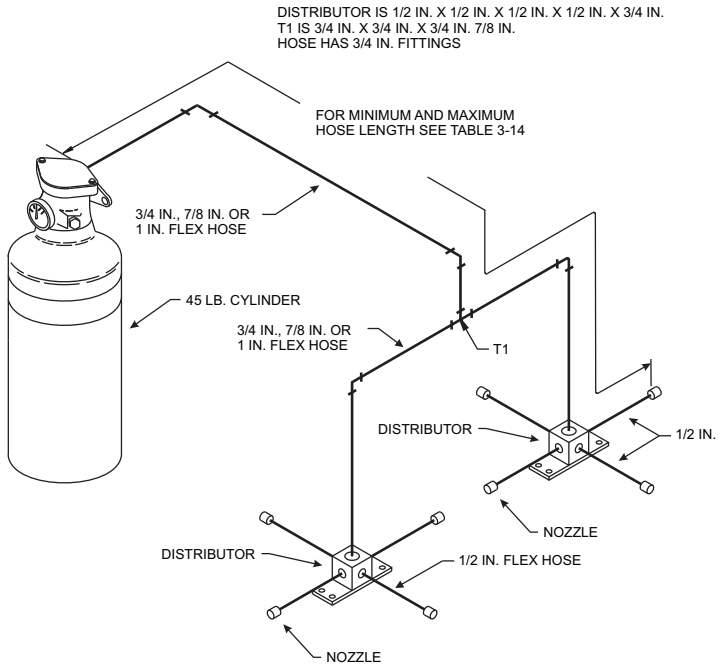

Figure 3-16. KVS-45 Eight-Nozzle System Using Two Distributors

Table 3-14. KVS-45 Hose Limitations, Eight-Nozzle System

Location	Hose ID	Hose Length		Number of Elbows / Hose Length	
		Max.	Min.	Max.	Min.
Cylinder to T1 (do not mix hose sizes)	1-inch	40 ft. (12 m)	0	2	0
	7/8-inch	40 ft. (12 m)	0	2	0
	3/4-inch	18 ft. (5 m)	0	2	0
T1 to Each Distributor (do not mix hose sizes)	1-inch	20 ft.* (6 m)	0	1	0
	7/8-inch	20 ft.* (6 m)	0	1	0
	3/4-inch	9 ft.* (3 m)	0	1	0
Distributor to Each Nozzle	1/2-inch	11 ft.* (3 m)	0	1	0
Cylinder to Each Nozzle (do not mix hose sizes)	1-inch supply 1/2-inch nozzle branch	60 ft. (18 m)	10 ft. (3 m)	--	--
	7/8-inch supply 1/2-inch nozzle branch	60 ft. (18 m)	10 ft. (3 m)	--	--
	3/4-inch supply 1/2-inch nozzle branch	29 ft. (9 m)	10 ft. (3 m)	--	--

Table 3-14. KVS-45 Hose Limitations, Eight-Nozzle System

Location	Hose ID	Hose Length		Number of Elbows/ Hose Length	
		Max.	Min.	Max.	Min.
Total quantities of hose (do not mix hose sizes)	1-inch	45 ft. (14 m)	5 ft. (2 m)	--	--
	7/8-inch	45 ft. (14 m)	5 ft. (2 m)	--	--
	3/4-inch	20 ft. (6 m)	5 ft. (2 m)	--	--
	1/2-inch	88 ft. (27 m)	0	--	--
*This system can be unbalanced in a maximum ratio of 3:1 at the distributors or T1.					

These maximums pertain to the maximum limits for a balanced system. These values can be exceeded for the unbalanced system provided that all other limits are not exceeded. See Figure 3-21 for an example of a maximum unbalanced configuration using maximum hose lengths.

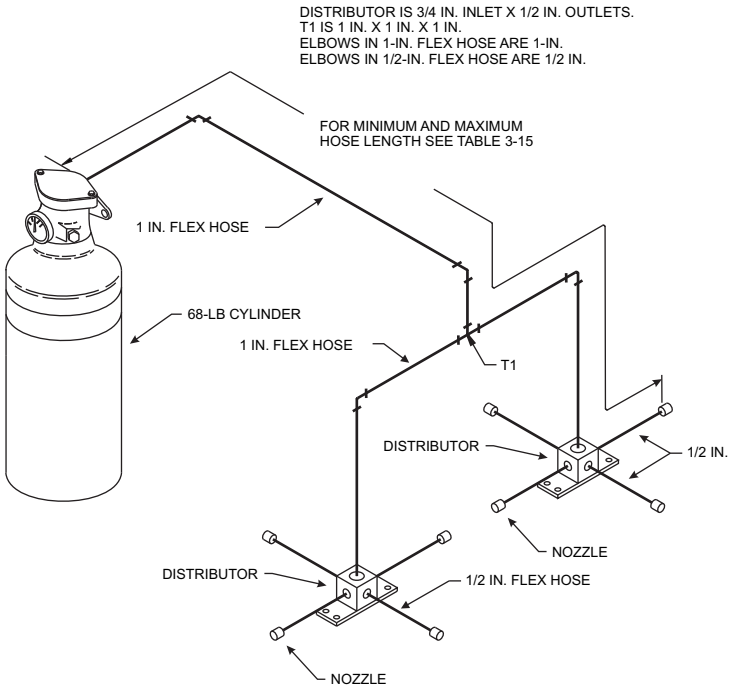

Figure 3-17. KVS-68 Eight-Nozzle System Using Two Distributors

Table 3-15. KVS-68 Hose Limitations, Eight-Nozzle System

Location	Hose ID	Hose Length		Number of Elbow / Hose Length
		Max.	Min.	Max.
Cylinder to T1	1-inch	40 ft. (12 m)	0	2
T1 to Each Distributor	1-inch	20 ft.* (6 m)	0	1
Distributor To Each Nozzle	1/2-inch	11 ft.* (3 m)	0	1
Cylinder to Each Nozzle	-	73 ft. (22 m)	10 ft. (3 m)	
All 1-in. Hose	-	50 ft. (15 m)	5 ft. (2 m)	-
All 1/2-in. Hose	-	88 ft. (27 m)	0	-
*This system can be unbalanced in a maximum ratio of 3:1 at the distributors or T1.				

These maximums pertain to the maximum limits for a balanced system. These values can be exceeded for the unbalanced system provided that all other limits are not exceeded. See Figure 3-23 for an example of a maximum unbalanced KVS-68 configuration.

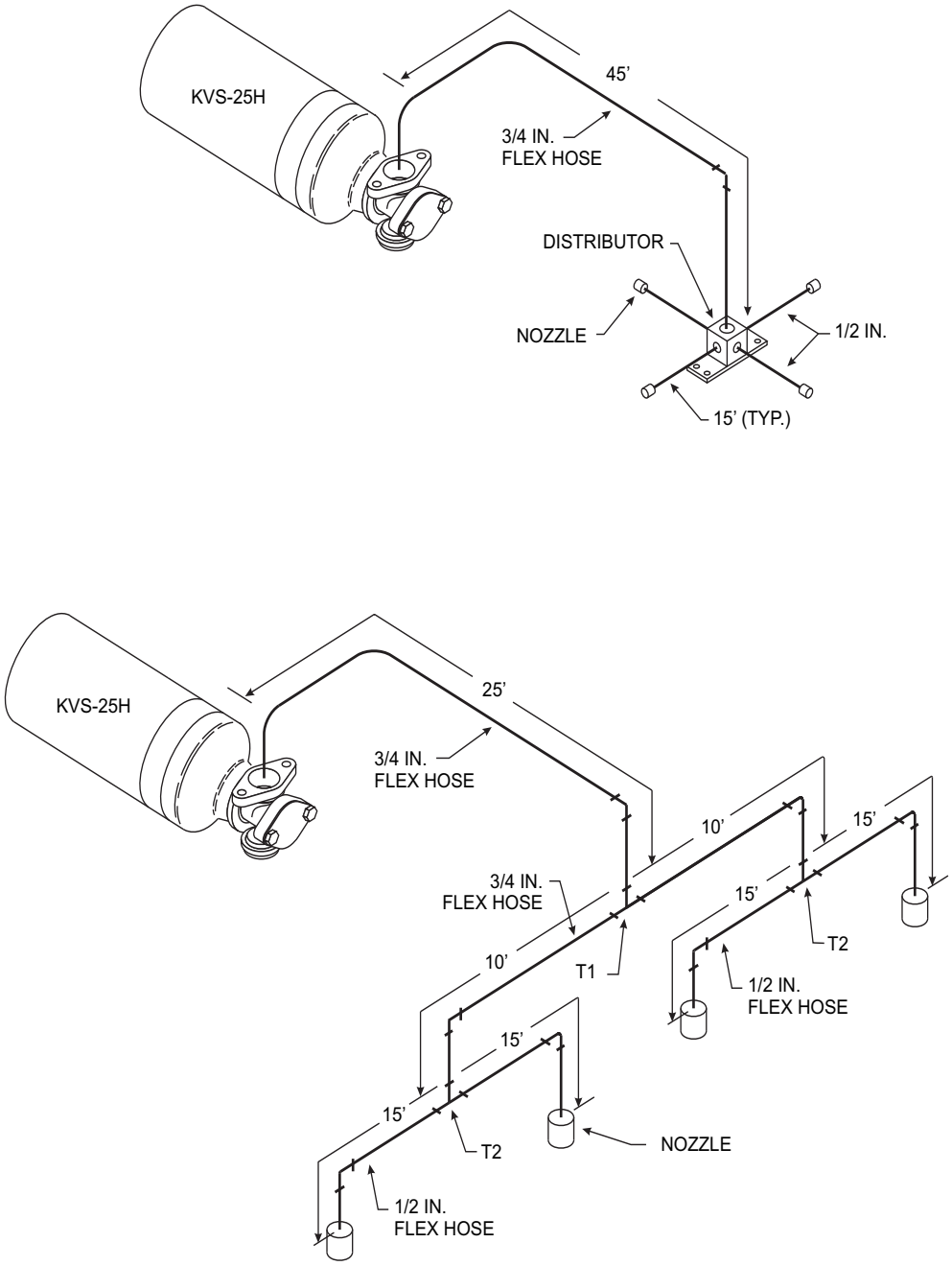

Figure 3-18. Examples of Maximum Balanced KVS-25H Systems, Four Nozzles (Distributor and Tee Configurations)

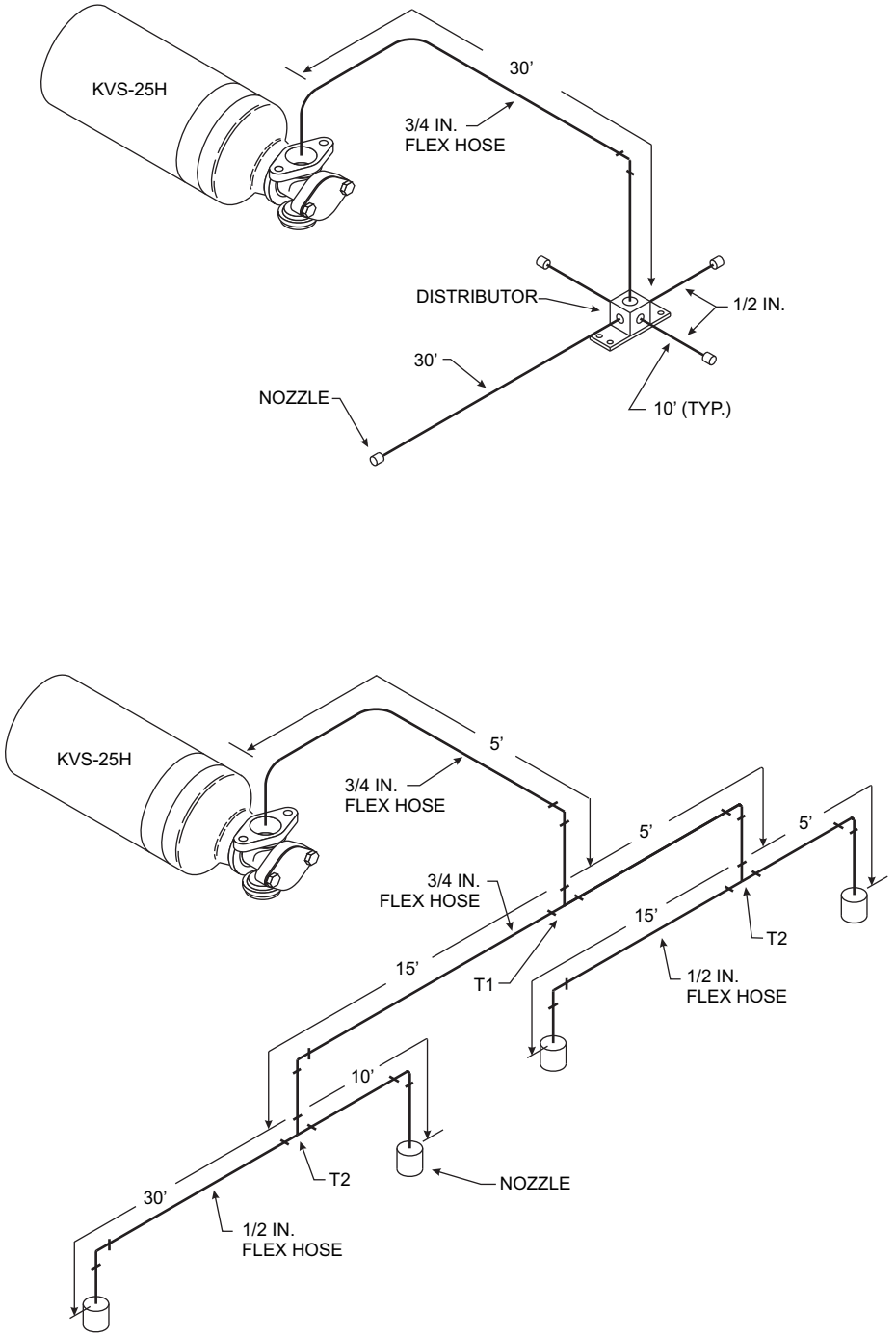

Figure 3-19. Examples of Maximum Unbalanced KVS-25H Systems, Four Nozzles (Maximum Unbalance Ratio 3:1)

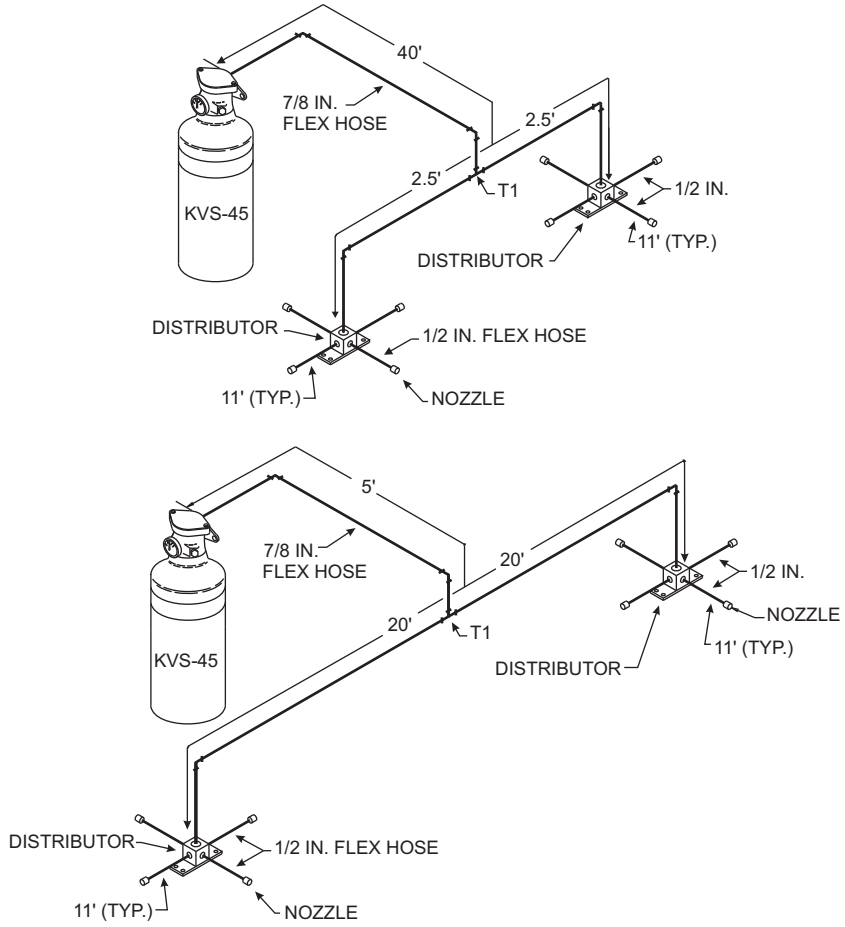

Figure 3-20. Examples of Maximum Balanced KVS-45 Systems, Eight Nozzles Using 7/8-inch and 1-inch Supply Hose

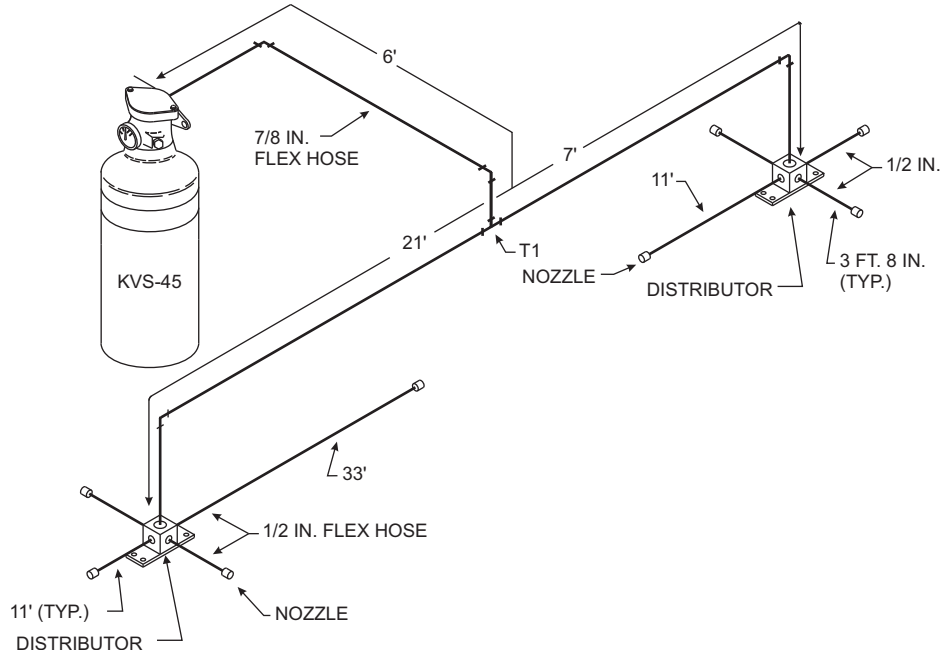

Figure 3-21. Example of a KVS-45 Maximum Unbalanced System, Eight Nozzles using 7/8-inch and 1-inch Supply Hose (Maximum Unbalance Ratio 3:1)

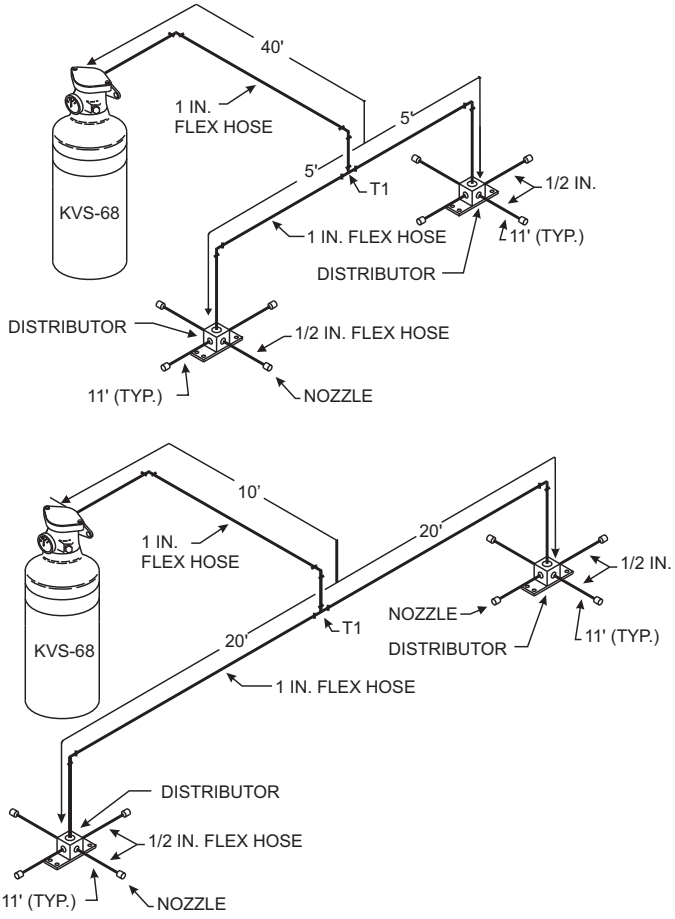

Figure 3-22. Examples of Maximum Balanced KVS-68 Systems, Eight Nozzles

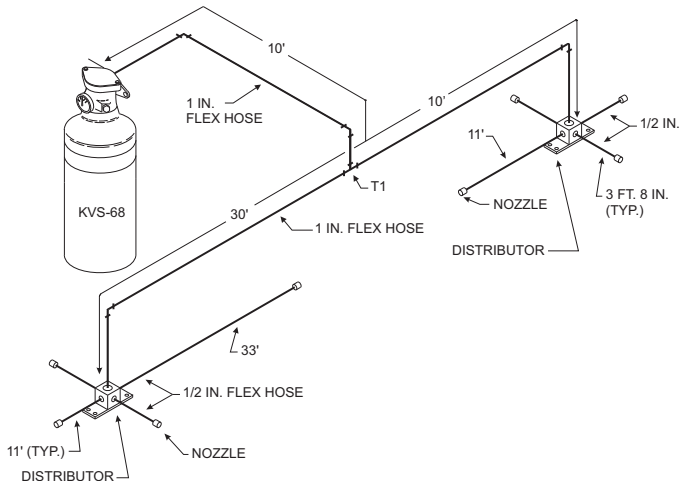

Figure 3-23. Example of a KVS-68 Maximum Unbalanced System, Eight Nozzles (Maximum Unbalance Ratio 3:1)

3-3 SYSTEM DESIGN

To design a KVS Dry Chemical Fire Suppression System properly, for a given vehicle, it is necessary to do two things:

1. Perform a vehicle hazard analysis.
2. Select the proper system in terms of nozzle coverage, agent capacity and detection.

3-3.1 Hazard Analysis

The following should be carefully analyzed:

- Fuel areas and heat sources are hazards, particularly where they overlap.
- The environment in which the vehicle is used adds hazards.
- Modifications to the vehicle to adapt it for different applications may alter hazards. For example, a bulldozer used for landfill may present different hazards from an identical bulldozer used in a forestry application.
- Typical fuel hazards are gasoline, diesel fuel, engine oil, lubricating oil and hydraulic fluid. Wood, cloth and plastic are other fuel hazards. Leaves, coal dust, and other foreign objects represent hazards caused by the environment.
- Typical sources of heat are areas containing brakes, bearings, gears and transmissions. Auxiliary equipment such as pumps, turbochargers, electric motors, torque converters and other sources of heat, or sparks.
- Areas where fuel hazards and heat sources both exist, are prime hazard areas.
- Vehicle fire history is very important. The equipment installer should discuss this with the end user.
- The installer should document the hazard areas requiring protection.

3-3.2 Fire Suppression

Having identified the hazard areas, several points should be considered in planning fire protection.

Examine each hazard area and answer the following questions:

1. What is the hazard? Is it an essentially open or an essentially closed area? This determines the type of coverage. Total flooding is used in essentially enclosed areas, local application in essentially open areas.
2. What are the dimensions of the hazard area? This determines the basic nozzle coverage.
3. Could a liquid fuel leak spread fire to other areas? If so, additional nozzles may be required.
4. Are there “shadow” areas, i.e., areas blocked by vehicle components that would prevent the dry chemical from reaching that area? If so, additional nozzles may be required. Also, care must be taken to position the nozzle so that the dry chemical will reach the shadow area.
5. Will the normal airflow from fans, etc. affect the chemical discharge? This will affect the nozzle placement and discharge direction. Place the nozzle to take advantage of the airstream. The airflow should be used to assist the dry chemical coverage of the hazard area.

6. Determination of the detection system required for each hazard must consider the following:
   - Desired speed of fire detection
   - Value of process being protected (down time)
   - Value of vehicle
   - Obstructions in the hazard area
   - Sight lines and predicted convection currents
   - Using a combination of detection methods may provide the best protection
7. What is the required actuation method? What are the panel requirements? What are the best locations for manual pull stations, portable extinguishers and visual and audible annunciation?

   Note: For FM Global insured equipment, the Model IR-1 infrared detector, p/n 83-132001-001, must be used in conjunction with thermal heat detection to comply with FM Global Operating Standard 7-40, Heavy Duty Mobile Equipment. This is due to no "Through Lens Supervision" on this infrared detector. Acceptable secondary heat detection devices are KVS Detect-A-Fire Detector, P/N 83-131034-XXX and Linear Heat Sensor Cable, P/N 83-100003-001.

3-3.3 Summary of System Design

There are several system options, and several methods of system actuation and detection available. Each will be presented starting with the simplest and progressing to the most complex.

1. The hazard analysis, including related factors, will provide the required system parameters, as follows:
   a. Number of nozzles
   b. Type of nozzles
   c. Size of cylinders
   d. No. of cylinders
   e. Type of detection and if manual actuation should be added,
   f. Number of actuators
   g. Type and number of controls
   h. Panel requirements
   i. Quantity and location of portable extinguishers
2. Plan system layout as follows, by deciding on:
   a. Position of nozzles
   b. Aiming of nozzles
   c. Location of actuators
   d. Location of dry chemical cylinders
   e. Hose lengths
   f. Orientation of dry chemical cylinders, vertical or horizontal (KVS-25H)
3. Lay system out on paper.

Note: In planning the layout, make sure there is enough room to mount each component at the desired spot and that it is readily accessible. Also, make sure that there is enough flat surface available to mount the component securely.

3-3.4 Designing a Dry Chemical System Using Electric Operated Control Head (P/N 83-131080-001)

The control head can be used on any type of machine or vehicle. The voltage range is 11-27 volts DC for the KVS-2000 and 9-32 volts DC for the KVS-2025 and the EM-2 expansion module. A minimum of 1 Ampere is required to fire a single actuator and 3 Amperes to fire up to five actuators in series.

The Electric Operated Control Head was tested and approved for use with the following:

- The control head can be used in series for multiple cylinder firing (see Figure 3-24). In a 12 volt system, up to two actuators can be fired in series. In a 24 volt system up to five actuators can be fired in series, provided the overall releasing circuit resistance does not exceed 8.5 ohms.
- When using the KVS-2025 control panel and the optional EM-2 expansion module, the control system may be configured in a variety of ways to meet the requirements of virtually any system. Options include single-shot or two-shot release with adjustable time delay, multiple detection zones with cross-zoned operation, or multiple independent hazards. See the KVS-2025 manual (P/N 83-132036-001) for detailed design information.

Note: In all cases, 14 AWG wire is required for the releasing circuit.

CAUTION

When designing and installing a dry chemical system using the Electric Operated Control Head (P/N 83-131080-001), overall releasing circuit resistance should be measured as a last step and verified not to exceed 8.5 ohms. Failure to comply with this requirement may result in system failure.

Table 3-16. Parameters for Installation of Electric Operated Control Head

Parameter	Requirement
Electric Actuator Service Life (-65°F to 150°F)	5 Years
Electric Actuator Service Life (temperature exceeding 150°F)	1 Year*
Minimum Temperature	-65°F
Maximum Temperature	200°F*
Maximum Number of Control Heads for 12 volt System	2
Maximum Number of Control Heads for 24 volt System	5
Maximum Resistance of Releasing Circuit for Series Firing (Measured)	8.5 ohm
Minimum Wire Size	14 AWG
Maximum Wire Length	200 ft.
* If the ambient temperature exceeds 150°F, it is recommended that the actuator be replaced annually.	

Note: Minimum wire size for the releasing circuit is 14 AWG (14 gauge). When using the KVS-2000 control panel, shielded cable should be used in accordance with the KVS-2000 manual (P/N 83-100033-001). When using the KVS-2025 protection panel, shielded cable is not necessary.

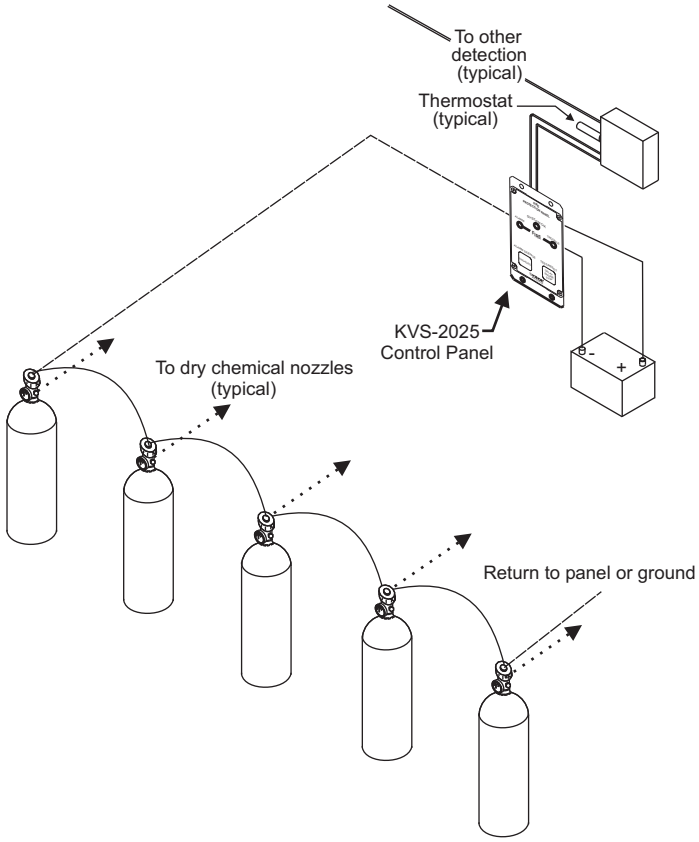

Figure 3-24. Example of Electrical Actuation, Series Firing, Using Protection/Control Panel

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CHAPTER 4
INSTALLATION

4-1 INSTALLATION

4-1.1 Equipment Location

4-1.1.1 DRY CHEMICAL CONTAINER

The dry chemical container must be located in a clean, dry protected area away from the hazard area.

4-1.1.2 SWITCH BOX, CONTROL BOXES

Locate the boxes in accessible convenient locations away from the hazard areas.

4-1.1.3 ACTUATORS

The mechanical actuator (P/N 897392) can be located either inside or outside the vehicle in any accessible, convenient location away from hazards. The electromechanical actuator (P/N 897391) must be located inside the vehicle in a protected location.

4-1.2 Installation Procedure

A summary of the installation procedures is given below. Detailed installation procedures for each section of the system follows. The steps are:

1. Install brackets by bolting or welding to vehicle.
2. Mount dry chemical cylinders and nitrogen actuators to their respective brackets.
3. Install distributors, connectors, and clamps.
4. Install flexible hose.
5. Blow dry air or nitrogen through hose.
6. Install nozzles.
7. Install switch boxes and control boxes.
8. Install KVS Detect-A-Fire heat detector, Linear Heat Sensor Cables, and IR-1 Infrared flame detectors.
9. Make electrical connections (see Chapter 2) except for the releasing connectors (Figure 2-22) to the actuating cartridge (Figure 2-21). This procedure is covered in Steps 10 through 13 of the assembly procedures.

4-1.3 Attachment of Components to Vehicle

- KVS cylinder brackets (see Figure 2-3). These brackets are furnished with mounting holes. Bolt or weld brackets in place.
- Nitrogen cylinder actuator brackets (see Figure 2-9 and Figure 2-10). These brackets are furnished with mounting holes. Bolt or weld brackets in place.
- Nozzle bracket, Nozzle bracket and coupling, and nozzle bracket and elbow (see Figure 2-27, Figure 2-28 and Figure 2-29). These brackets are furnished with mounting holes. Bolt or weld in place.
- Distributor (see Figure 2-30). The distributor is furnished with mounting holes. Bolt or weld distributor in place.
- Paint bare metal as required.

4-1.4 Assembly

4-1.4.1 PROCEDURE FOR KVS-21, -33, -45, AND -68

1. Mount KVS cylinder on bracket (see Figure 2-1 and Figure 2-3).
2. Remove anti-recoil shipping plate. Attach discharge adapter (see Figure 2-31) to cylinder valve assembly (P/N 877488) using mounting screws.
3. Remove valve actuator plate. Assemble manual operator (see Figure 2-7), pneumatic system valve actuator (see Figure 2-12) or electric operated control head (see Figure 2-14) to KVS cylinder valve.
4. Blow hoses out to clear any obstructions.
5. Assemble hose to hose couplings or tees, elbows, couplings and distributors.
6. Screw in nozzles and hose couplings to brackets; cap cone nozzles with nozzle caps. Orient tankside nozzle with slit over area and parallel to surface (see Figure 2-23, Figure 2-25, Figure 2-27, Figure 2-28, Figure 2-29).

CAUTION

Make sure actuator knobs are in set position with safety pin installed and seal wire intact.

7. Weigh nitrogen cartridge (see Figure 2-8) with its anti-recoil cap in place. If the weight is more than 3.5 grams (0.12 oz.) under the full weight stamped on the cartridge, replace cartridge.
8. Assemble nitrogen cylinder to mechanical actuator (Figure 2-19) or electromechanical actuator (Figure 2-20). Remove safety cap. Insert gasket (P/N 263413) and screw nitrogen cylinder into actuator. Hand tighten.
9. Assemble actuator assembly to bracket (Figure 2-9 or Figure 2-10).
10. Attach vent check (Figure 2-13) to pneumatic system valve actuator (Figure 2-12). If several pneumatic system valve actuators are used, connect with 1/4-inch hose and install vent check in the last actuator in the series.

Note: Make certain the shunt wire on the electromechanical actuator cartridge (Figure 2-21) is installed at all times until the system connector and cable (Figure 2-22) is attached to the cartridge.

WARNING

Do not remove cartridge from the actuator. Bodily injury may result if the actuator is energized without the cartridge in place.

11. When connector is to be assembled, remove the protection cap from the actuator cartridge on the electromechanical actuator (Figure 2-20).

CAUTION

The shunt wire prevents accidental actuation of the cartridge. The wire is meant to carry the current from the hot pin to the ground pin rather than to energize the actuator.

Make sure the electrical power is off before attaching the connector to the cartridge.

Be careful not to damage the electrical pins of the cartridge when removing the shunt wire.

12. Remove the coiled safety shunt wire from inside the electrical connector end of the actuator cartridge.
13. Attach the connector (Figure 2-22) finger tight.

Note: In an electrically actuated automatic system consisting of thermostat detectors and cartridge only, no current flows through the systems for supervision. Automatic actuation, in this instance, is by one or more thermostats closing when heated to their closure temperature. The thermostats are all connected in parallel. The systems may, of course, also be manually actuated by mechanical means. In a system actuated by thermostats and electrical switches only, the thermostat wiring and actuator wiring is supervised.

4-1.4.2 PROCEDURE FOR KVS-25H ONLY

Note: The mounting bracket (P/N 296189) for the KVS-25H cylinder has two possible mounting positions for the lower strap. The position that is closest to the upper strap must be used when mounting the KVS-25H.

1. If KVS cylinder is to be mounted vertically, mount in bracket. (see Figure 2-1 and Figure 2-3)
2. If KVS cylinder is to be mounted horizontally, mount in bracket with gauge facing downward only. (see Figure 4-1)

CAUTION

The cylinder must be mounted such that:
1. The long axis of the cylinder is horizontal, and
2. The gauge faces down (toward the ground).

Failure to install the cylinder in this orientation will result in incomplete discharge of dry chemical.

3. Remove anti-recoil shipping plate. Attach discharge adapter (see Figure 2-31) to cylinder valve assembly (P/N 877488) using mounting screws.
4. Remove valve actuator plate. Assemble manual operator (see Figure 2-7), pneumatic system valve actuator (see Figure 2-12) or electric operated control head (see Figure 2-14) to KVS cylinder valve.
5. Blow hoses out to clear any obstructions.
6. Assemble hose to hose couplings or tees, elbows, couplings and distributors.
7. Screw in nozzles and hose couplings to brackets; cap cone nozzles with nozzle caps. Orient tankside nozzle with slit over area and parallel to surface (see Figure 2-23, Figure 2-25, Figure 2-27, Figure 2-28, Figure 2-29).

CAUTION

Make sure actuator knobs are in set position with safety pin installed and seal wire intact.

8. Weigh nitrogen cartridge (see Figure 2-8) with its anti-recoil cap in place. If the weight is more than 3.5 grams (0.12 oz.) under the full weight stamped on the cartridge, replace cartridge.
9. Assemble nitrogen cylinder to mechanical actuator (Figure 2-19) or electromechanical actuator (Figure 2-20). Remove safety cap. Insert gasket (P/N 263413) and screw nitrogen cylinder into actuator. Hand tighten.
10. Assemble actuator assembly to bracket (Figure 2-9 or Figure 2-10).

11. Attach vent check (Figure 2-13) to pneumatic system valve actuator (Figure 2-12). If several pneumatic system valve actuator are used, connect with 1/4-inch hose and install vent check in the last actuator in the series.

Note: Make certain the shunt wire on the electromechanical actuator cartridge (Figure 2-21) is installed at all times until the system connector and cable (Figure 2-22) is attached to the cartridge.

WARNING

Do not remove cartridge from the actuator. Bodily injury may result if the actuator is energized without the cartridge in place.

12. When connector is to be assembled, remove the protection cap from the actuator cartridge on the electromechanical actuator (Figure 2-20).

CAUTION

The shunt wire prevents accidental actuation of the cartridge. The wire is meant to carry the current from the hot pin to the ground pin rather than to energize the actuator.

Make sure the electrical power is off before attaching the connector to the cartridge.

Be careful not to damage the electrical pins of the cartridge when removing the shunt wire.

13. Remove the coiled safety shunt wire from inside the electrical connector end of the actuator cartridge.
14. Attach the connector (Figure 2-22) finger tight.

Note: In an electrically actuated automatic system consisting of thermostat detectors and cartridge only, no current flows through the systems for supervision. Automatic actuation, in this instance, is by one or more thermostats closing when heated to their closure temperature. The thermostats are all connected in parallel. The systems may, of course, also be manually actuated by mechanical means. In a system actuated by thermostats and electrical switches only, the thermostat wiring and actuator wiring is supervised.

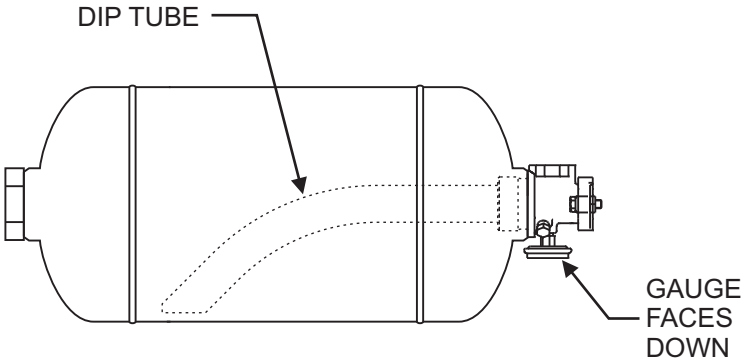

Figure 4-1. KVS-25H Horizontal Mounting

4-1.5 Installing a Dry Chemical System Using Electric Operated Control Head (P/N 83-131080-001)

The control head can be used on any type of machine or vehicle. The voltage range is 11-27 volts DC for the KVS-2000 and 9-32 volts DC for the KVS-2025 and the EM-2 expansion module. A minimum of 1 Ampere is required to fire a single actuator and 3 Amperes to fire up to five actuators in series.

The Electric Operated Control Head was tested and approved for use with the following:

- The control head can be used in series for multiple cylinder firing (see Figure 4-2). In a 12 volt system, up to two actuators can be fired in series. In a 24 volt system up to five actuators can be fired in series, provided the overall releasing circuit resistance does not exceed 8.5 ohms.
- When using the KVS-2025 control panel and the optional EM-2 expansion module, the control system may be configured in a variety of ways to meet the requirements of virtually any system. Options include single-shot or two-shot release with adjustable time delay, multiple detection zones with cross-zoned operation, or multiple independent hazards. See the KVS-2025 manual (P/N 83-132036-001) for detailed design information.

Note: In all cases, 14 AWG wire is required for the releasing circuit.

CAUTION

When designing and installing a dry chemical system using the Electric Operated Control Head (P/N 83-131080-001), overall releasing circuit resistance should be measured as a last step and verified not to exceed 8.5 ohms. Failure to comply with this requirement may result in system failure.

Table 4-1. Parameters for Installation of Electric Operated Control Head

Parameter	Requirement
Electric Actuator Service Life (-65°F to 150°F)	5 Years
Electric Actuator Service Life (temperature exceeding 150°F)	1 Year*
Minimum Temperature	-65°F
Maximum Temperature	200°F*
Maximum Number of Control Heads for 12 volt System	2
Maximum Number of Control Heads for 24 volt System	5
Maximum Resistance of Releasing Circuit for Series Firing (Measured)	8.5 ohm
Minimum Wire Size	14 AWG
Maximum Wire Length	200 ft.
* If the ambient temperature exceeds 150°F, it is recommended that the actuator be replaced annually.	

Note: Minimum wire size for the releasing circuit is 14 AWG (14 gauge). When using the KVS-2000 control panel, shielded cable should be used in accordance with the KVS-2000 manual (P/N 83-100033-001). When using the KVS-2025 protection panel, shielded cable is not necessary.

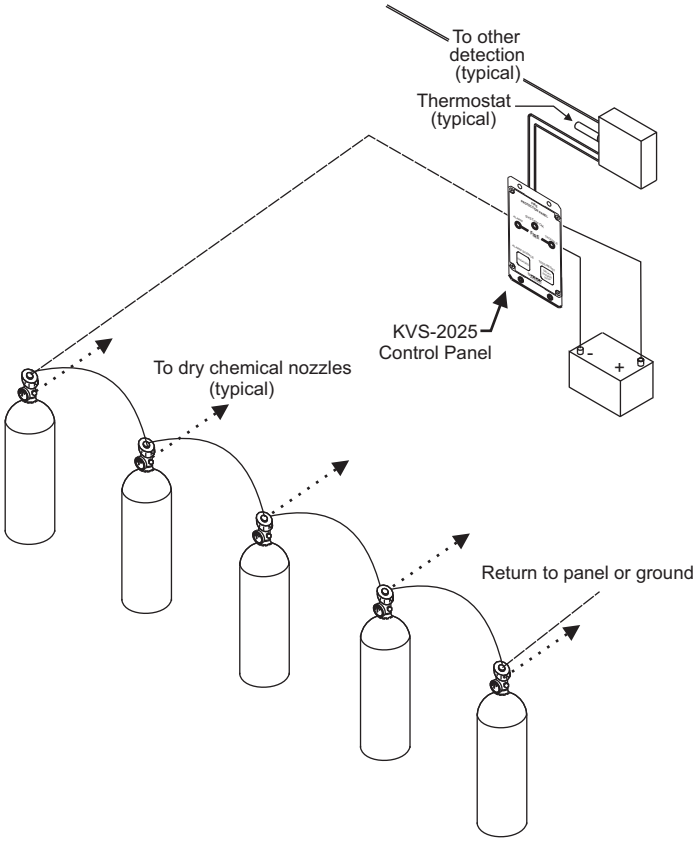

Figure 4-2. Example of Electrical Actuation, Series Firing, Using Protection/Control Panel

CHAPTER 5
OPERATION

5-1 INTRODUCTION

This chapter provides an operational overview of the KVS-21, 25H, 33, 45, and 68 Fire Suppression Systems.

WARNING

Do not run actuation hoses through protected area.

Fire could damage actuation hoses causing the system not to operate properly resulting in death or serious personal injury and/or property damage.

5-2 DETECTION

Determination of the required detection method should be identified during the vehicle assessment phase. The following methods are available.

5-2.1 Infrared

Infrared flame detection is the fastest and most reliable form of fire detection. It is the method of choice for identifying a fire during the incipient stage. This method requires the use of the KVS 2025 Control Panel.

Note: For FM Global insured equipment, the IR detector must be used in conjunction with DAF detectors or LHS cable.

5-2.2 Heat Detectors/LHS Cable

Heat detectors and/or Linear Heat Sensing (LHS) cable may also be used. These methods operate by creating a short in the system when the ambient temperature reaches pre-specified limits, causing system actuation.

Note: If LHS cable is to be used in conjunction with infrared detections, it must be used after the last detector and before the EOL resistor.

5-3 CONTROL PANEL

The control panel monitors the detection and/or release circuits for open or shorted conditions. If an open condition occurs, the panel indicates a trouble condition. When a panel receives a shorted condition from a detector, it initiates an alarm condition. Panels can be pre-programmed to initiate the suppression system and/or engine shut-down immediately or on a time delay. Time delays may be programmed for various periods, based on 15 second increments.

5-4 ACTUATION

Suppression system actuation can be performed via an electric or pneumatic control head. The electric control head provides the fastest system actuation and also initiates the protractor and piston self-lock, allowing for complete system discharge.

5-5 FIRE SUPPRESSION AND DELIVERY

The fire suppression agent is stored in pressurized dry chemical cylinders and contained using a valve assembly. When the discharge valve is actuated, the fire suppression agent discharges through the valve outlet and is directed through the distribution hose to the nozzles. The nozzles provide the proper flow rate and distribution of agent.

5-6 SYSTEM CONSIDERATIONS

Manual pull stations and portable fire extinguishers should be placed along emergency egress routes. Fire warning and system annunciation devices should be provided to ensure complete vehicle evacuation.

5-7 SYSTEM SERVICE

System maintenance/reset services and cylinder recharge must be performed by an authorized Kidde distributor.

System service and maintenance shall be performed in accordance with the manufacturer's Design, Installation, and maintenance manual as well as applicable NFPA Standards.

System service & maintenance shall be performed at intervals not greater than 1000 hours of machine operation or six months which ever is less.

CHAPTER 6
MAINTENANCE

6-1 INTRODUCTION

This chapter contains maintenance instructions for the KVS Dry Chemical Fire Suppression Systems. These procedures must be performed regularly in accordance with regulations. If problems arise, corrective action must be taken.

6-2 MAINTENANCE

Refer to cylinder nameplate for maintenance instructions

6-2.1 Inspection

6-2.1.1 DAILY BY VEHICLE OWNER

1. Inspect cylinder gauges. Verify operating pressure at 360 psi @ 70°F.

Note: Cylinder gauges must be in the green operating range.

2. Inspect portable fire extinguisher gauges. Verify operating pressure at 175 PSI @ 70°F.

Note: Extinguisher gauges must be in the green operating range.

3. Inspect tamper indicators on pull stations and fire extinguishers.
4. Verify that KVS-2020 panel green LED light is on.
5. Verify system panel trouble light is off.

6-2.1.2 WEEKLY BY VEHICLE OWNER

1. Perform daily inspection.
2. Inspect IR detectors. Verify that all sensor status lights are illuminated.

Note: A steady green light should be evident.

3. Inspect all IR detectors for window contamination.
4. Wipe IR windows with soft non-abrasive cloth & water.
5. Examine expansion module. Verify system status light on module.
6. Inspect all system components for noticeable signs of damage.
7. Examine fire extinguisher supply hoses (red, with Kidde logo).
8. Ensure there are no abrasions or disconnected fittings.

6-2.1.3 MONTHLY BY VEHICLE OWNER

1. For KVS-25H, if mounted horizontally, ensure the correct orientation of cylinder and valve as shown in Figure 6-1 (gauge downward).

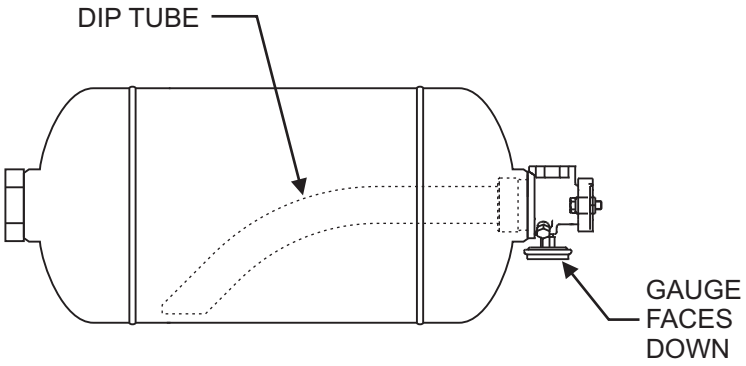

Figure 6-1. KVS-25H Horizontal Mounting

2. Check all parts of system for physical damage, rust, corrosion, e.g., hoses, nozzles, cylinder(s), elbows, auxiliary equipment.
3. Check detection equipment. If it is coated with mud, grease or dirt, wipe in place with a clean dry cloth. Check for corrosion or mechanical damage.
4. Check seal wires on the pull rings of the manual release lever and remote cable pull handle. If seal wires have been broken, check carefully to make certain that the system has not been tampered with.
5. Verify control panels, expansion modules and Infra-Red sensors are in system status normal (solid green).
6. Verify cylinder gauges are within the normal operating range. Check hoses, couplings, nozzles and nozzle caps are intact.

Note: Make monthly inspections to make certain that the system has not been tampered with, and that nothing has been placed where it would interfere with the operation of the system.

Any service (other than that on electric control boxes) that is required as result of monthly inspections or semi-annual inspections must be done only by an authorized Kidde Fire Systems Wolfpack distributor.

6-2.1.4 SEMI-ANNUAL OR EVERY 1000 HOURS

Note: To be performed by an authorized Kidde Fire Systems Wolfpack distributor.

Kidde Fire Systems recommends that the fire protection system be inspected and maintained every 1000 hours of machine operation or six months, whichever is less.

WARNING

Never use water or oxygen to blow piping out. Moisture could cause corrosion, resulting in a blockage. The use of oxygen is extremely dangerous. Even a minute quantity of oil could cause an explosion if contacted by oxygen. Failure to follow these instructions could result in death or serious personal injury and/or property damage.

1. Check the flexible piping or hose for obstructions. Remove cylinder and valve. Blow piping out with clean dry air or nitrogen.

2. Check the cylinder for leakage. If pressure is below normal, remove cylinder from service, repair and recharge (see Figure 6-2 for a chart of Pressures/Temperatures).

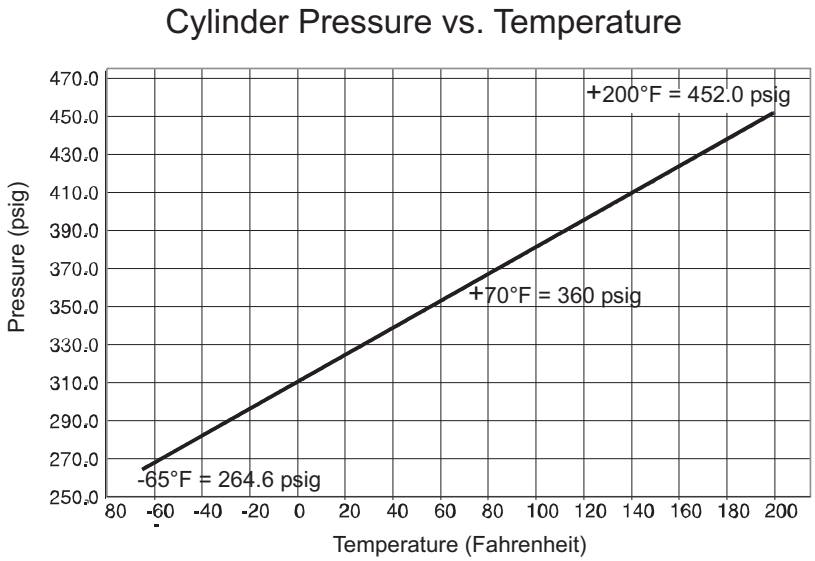

Figure 6-2. Temperature/Pressure Chart

3. Examine all nitrogen cylinders (P/N 878508) for nicks and corrosion. Replace if cylinder is nicked or corroded. Unscrew the nitrogen cylinder from actuator assembly. Install the anti-recoil cap with gasket onto the cylinder and weigh. Replace if the weight is not within 0.12 oz. (3.5 grams) of the weight stamped on the cartridge.
4. Disconnect electrical control heads from cylinders.
5. Perform all of daily and weekly inspections.
6. Inspect cylinder for rust/corrosion in accordance with Compressed Gas Association pamphlet C-6.
7. Inspect & record cylinder date of manufacture or last hydro-test date.

Note: Cylinder requires complete teardown and internal inspection every six years.

8. Blow out system hoses using dry nitrogen.
9. Inspect all thermostats/spot detectors (if provided). Wipe down using a non-abrasive cloth.
10. Test all thermostats for proper function (if provided). Replace with those of like temperature settings if found to be non-functional or physically damaged.
11. Test each IR detector using IR simulator.

6-3 SERVICING/REPLACING THE ELECTRIC OPERATED CONTROL HEAD

Any time the system is being serviced or repaired, the control head must be removed from the cylinder valve assembly and the valve protection plate installed. If thedry chemical distribution hose/piping is removed from the cylinder, the discharge adapter kit must be removed from the valve outlet and the diffuser plate installed.

The electric actuator cannot be tested. The actuator is a one-time-usage device. If it is fired, it must be replaced with a new actuator (P/N 83-131082-001).

1. Loosen and remove the control head from the top of the cylinder valve.
2. Install the valve protection plate.
3. Disconnect the releasing circuit from the actuator.
4. Unscrew the actuator from the body of the control head.
5. Using a small screwdriver, or similar device, push down on the piston through the port for the actuator. The piston should easily depress and lock in the operated position.
6. Reset the piston by pushing in on the spring loaded plunger while pushing the piston back into the body of the head.
7. Remove O-ring from the old actuator threads and install it onto the new actuator.
8. Screw the actuator back into the head.
9. Ensure that the actuator assembly is tightened into the body of the control head. The nylon body of the actuator must be tight against the top of the actuator body. Turning it hand-tight will suffice.
10. Check the piston of the head assembly. If it is pushed out, reset it by pushing in the spring loaded plunger and pushing the piston into the body of the head. If the piston cannot be pushed in, the actuator has been fired.
11. Plug the releasing circuit into the actuator connector. Ensure that the actuator did not release by checking that the piston of the head is still inside the body.
12. Inspect condition of O-Ring seal in the body of the control head where it mates with the valve flange (see Figure 6-3). Replace if necessary. Lubricate with Dow Corning 55M grease or equivalent.
13. Remove the valve protection plate and place the control head onto the top of the valve flange.
14. Using the stainless steel bolts and nuts supplied with the control head, thread a bolt through the actuator shield, control head body, valve flange and gauge shield. Loosely secure that bolt with the self-locking nut.
15. Using the stainless steel bolt and nut supplied, thread the bolt up through the actuator shield, control head body, valve flange, gauge shield and the cable clamp that is attached to the actuator assembly. It is acceptable to secure the cable clamp to either side of the valve, facing in any direction.
16. Secure both bolts tightly. The nuts are self-locking and wrenches will be required to secure and tighten the head to the valve flange (see Figure 6-3).

See manual part number 83-132036-001 for instructions on wiring with the KVS-2025 and EM-2. See manual part number 83-100033-001 for instructions on wiring with the KVS-2000.

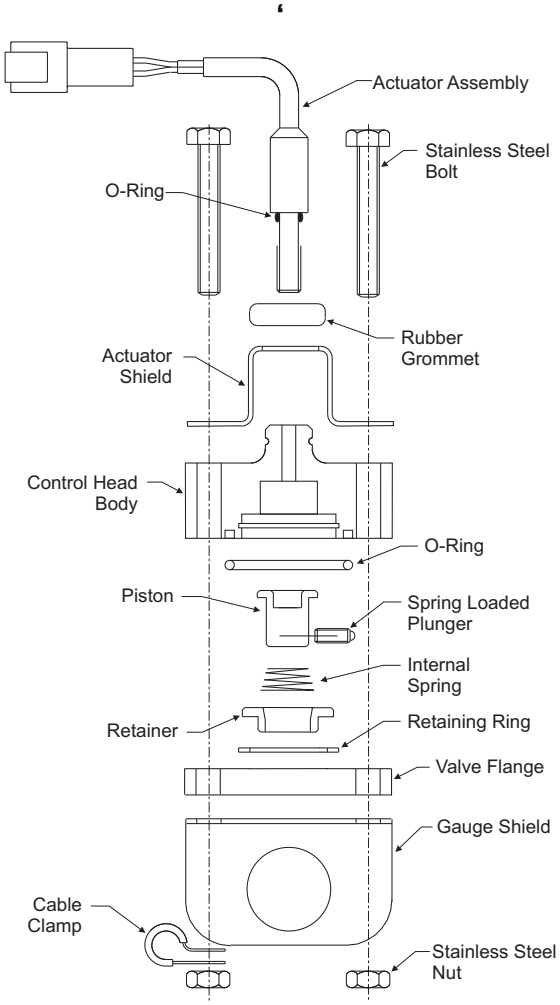

Figure 6-3. Exploded View of Electric Operated Control Head and Control Head Body

6-4 HYDROSTATIC TESTING

NFPA-17 states that “dry chemical systems of less than 150 pounds normal capacity shall be hydrostatically tested at an interval not to exceed twelve years.” Use test adapter (P/N 878453).

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CHAPTER 7
POST-DISCHARGE MAINTENANCE

7-1 INTRODUCTION

This chapter contains procedures to follow after the Kidde KVS Dry Chemical Fire Suppression System has been discharged.

7-2 SERVICING SYSTEM AFTER A FIRE

WARNING **Do not disturb the equipment until the system has cooled sufficiently. Working on the equipment before it has cooled could result in death or serious personal injury and/or property damage.**

7-2.1 General

1. Blow out piping system with dry air or nitrogen.
2. Inspect all piping. Replace any hose or fitting that was exposed to direct flame or subjected to excessive heating. The heat may have melted the galvanized coating which may have clogged the pipe restricting the flow of the dry chemical.
3. Remove discharged dry chemical with water as soon as possible after discharge. Dry Chemical may cause corrosion if not removed immediately.
4. Inspect all nozzles. Replace any damaged nozzles and protective caps.
5. Install cylinder following recharging procedure outlined above.
6. Check nitrogen cylinder and actuator.
   - Pressurize nitrogen line. Check for leaks. Nitrogen actuator system must be pressure tight.
   - Replace nitrogen cylinders as required.

7-2.2 Recharging KVS-21, -33, -45, and -68 Cylinders

CAUTION **Do not attempt to recharge any cylinder with out first checking for last hydrostatic test date. The U.S. Department of Transportation (DOT) has ruled that any pressurized container of the type used in dry chemical systems shall not be recharged or transported with out first being inspected internally and externally and hydrostatically tested if more than twelve (12) years have elapsed since the date of the last hydrostatic test. Regardless of previous inspection dates, it is illegal to refill any pressurized container that leaks, which bulges, has defective safety devices, bears evidence of physical abuse, fire or heat damage, or detrimental rusting or corrosion, until it is properly repaired and requalified as specified in DOT regulations. Remove the valve and siphon tube assembly from the discharged cylinder.**

1. Invert the cylinder and tap the threaded neck end on a wooden block to remove any residual dry chemical.
2. Blow any dry chemical residual from the valve, siphon tube and cylinder threads.
3. Visually inspect the entire inside and outside surface of the cylinder per CGA Pamphlet C-6.
4. Replace the valve stem (P/N 877343), the valve spring (P/N 217768), the spring retainer (P/N 253299), the retaining ring check (P/N 1849-0004), and the valve stem O-ring (P/N 6435-0006). Put a light coating of Dow Corning No. 55M grease, or equivalent, on the valve stem O-ring. Do not grease the bonded seal on valve check (see Figure 7-1).

5. Replace the valve-to-cylinder O-ring (P/N 5661-0327).

WARNING

Do not mix ABC (monoammonium phosphate base) with any other agent. Mixing agents in a pressurized cylinder may lead to a build up of pressure that can be dangerous. Failure to follow these instructions could result in death or serious personal injury and/or property damage.

6. Use a funnel to fill the cylinder. Fill cylinder with the appropriate weight of multipurpose ABC dry chemical as indicated on the cylinder nameplate. Use Kidde P/N 806411 for ABC dry chemical.

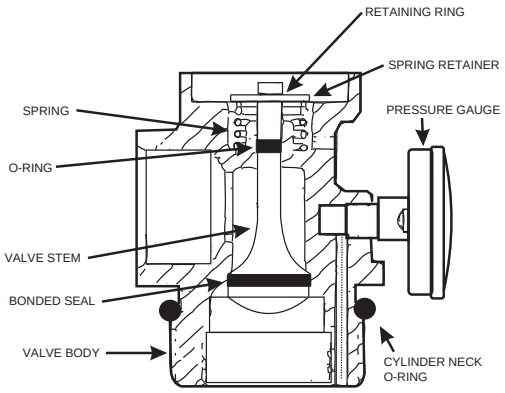

Figure 7-1. Valve Assembly

7. Reinstall the siphon tube and valve. Screw down hand-tight.
8. Install an O-ring (P/N 1080-1900) on a spare discharge adapter (P/N 844908).

WARNING

Under no circumstances while performing cylinder recharge should a charged cylinder be allowed to "free stand" without either the charging apparatus attached or the anti-recoil plate installed. Whenever these devices are not installed, a charged cylinder must be securely clamped to a rigid structure capable of withstanding the full thrust that would result should the valve inadvertently open. Failure to follow these instructions could result in death or serious personal injury and/or property damage.

9. Unbolt the anti-recoil plate and bolt the spare discharge adapter to the outlet port of the valve. Securely clamp the cylinder to a rigid structure.
10. Use nitrogen to pressurize the cylinder to 360 pounds per square inch (psig) at 70°F. Use a calibrated pressure gauge. **Do not rely on the pressure regulator or the cylinder pressure gauge to determine the container pressure** (see Figure 7-2 for a suggested recharging arrangement. See Figure 2-2 for Pressure/Temperature chart).
11. Remove the spare discharge adapter and check for leakage using a soap solution.
12. Bolt the anti-recoil plate, P/N 255681, to the valve outlet. Leave the protection plates in place until the cylinder is ready to be reinstalled.

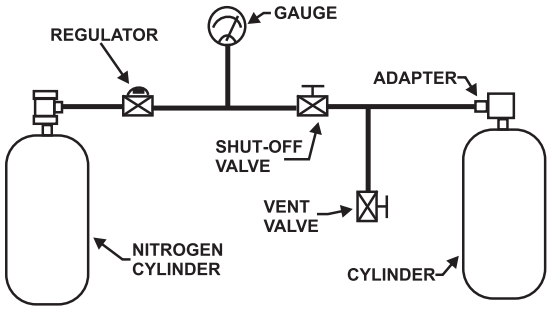

Figure 7-2. Recharge Hookup

7-2.3 Recharging KVS-25H Cylinders

CAUTION

Do not attempt to recharge any cylinder with out first checking for last hydrostatic test date. The U.S. Department of Transportation (DOT) has ruled that any pressurized container of the type used in dry chemical systems shall not be recharged or transported with out first being inspected internally and externally and hydrostatically tested if more than twelve (12) years have elapsed since the date of the last hydrostatic test. Regardless of previous inspection dates, it is illegal to refill any pressurized container that leaks, which bulges, has defective safety devices, bears evidence of physical abuse, fire or heat damage, or detrimental rusting or corrosion, until it is properly repaired and requalified as specified in DOT regulations. Remove the valve and siphon tube assembly from the discharged cylinder.

1. Remove the valve assembly and base plug from the cylinder.
2. Tap the threaded neck of the cylinder on a wooden block to remove any residual dry chemical.
3. Blow any dry chemical residual from the valve, siphon tube, bottom plug, and cylinder threads.
4. Visually inspect the entire inside and outside surface of the cylinder per CGA Pamphlet C-6.
5. Replace the valve stem (P/N 877343), the valve spring (P/N 217768), the spring retainer (P/N 253299), the retaining ring check (P/N 1849-0004), and the valve stem O-ring (P/N 6435-0006). Put a light coating of Dow Corning No. 55M grease, or equivalent, on the valve stem O-ring. Do not grease the bonded seal on valve check (see Figure 7-1).
6. Replace the valve-to-cylinder O-ring (P/N 5661-0327).
7. Apply Loctite primer N 7649 to the threads of the siphon tube. Allow to cure, then apply Loctite refrigerant sealant 554 around the same threads prior to assembly.
8. Screw the siphon tube in the valve body until bottomed-out, then unscrew siphon tube until the inlet face is parallel to the pressure gauge face. Allow Loctite to cure. See Figure 7-3 and Warning.

CAUTION

Failure to install the siphon tube as described above and shown in Figure 7-3 will result in incomplete discharge of dry chemical.

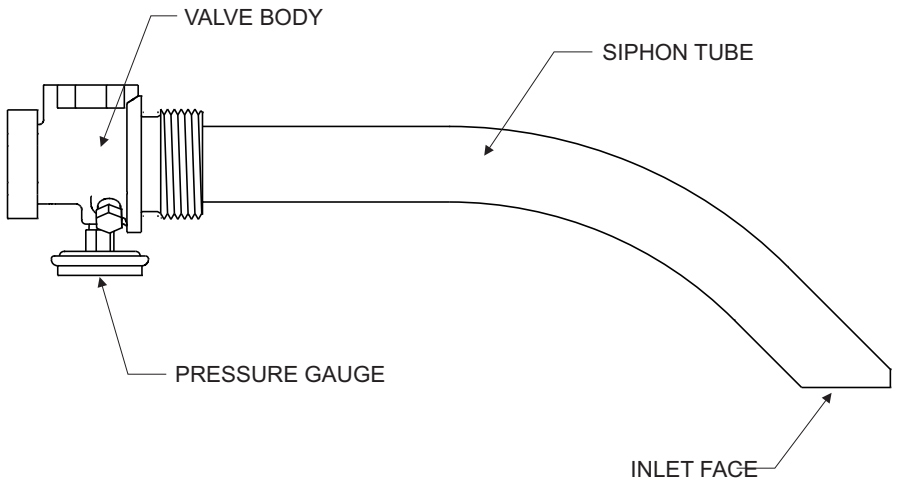

Figure 7-3. Siphon Tube Orientation

9. Reinstall the valve/ dip tube assembly into the cylinder neck where the DOT stampings are present. Torque valve to 50 +/- 1 ft. lb.

WARNING

Do not mix ABC (monoammonium phosphate base) or Purple K with any other agent. Mixing agents in a pressurized cylinder may lead to a build up of pressure that can be dangerous. Failure to follow these instructions could result in death or serious personal injury and/or property damage.

10. Invert the cylinder. Use a funnel to fill the cylinder through the bottom port. Fill the cylinder with 25 lbs. of the appropriate dry chemical agent as indicated on the cylinder label. Use Kidde P/N 806411 for ABC dry chemical or P/N 83-131031-001 for Purple K dry chemical.

WARNING

Under no circumstances should the valve assembly be reinstalled when the cylinder is full of dry chemical. Always install the valve first, then fill through the bottom port. Failure to follow these instructions could result in death or serious personal injury and/or property damage.

11. Replace the o-ring on the bottom plug. Put a light coating of Dow Corning No 55M grease, or equivalent, on the bottom plug o-ring.
12. Reinstall the bottom plug and torque to 50 +/- ft. lb.
13. Invert the cylinder.
14. Install an O-ring (P/N 1080-1900) on a spare discharge adapter (P/N 844908).

WARNING

Under no circumstances while performing cylinder recharge should a charged cylinder be allowed to "free stand" without either the charging apparatus attached or the anti-recoil plate installed. Whenever these devices are not installed, a charged cylinder must be securely clamped to a rigid structure capable of withstanding the full thrust that would result should the valve inadvertently open. Failure to follow these instructions could result in death or serious personal injury and/or property damage.

15. Unbolt the anti-recoil plate and bolt the spare discharge adapter to the outlet port of the valve. Securely clamp the cylinder to a rigid structure.
16. Use nitrogen to pressurize the cylinder to 360 pounds per square inch (psig) at 70°F. Use a calibrated pressure gauge. Do not rely on the pressure regulator or the cylinder pressure gauge to determine the container pressure (see Figure 7-2 for a suggested recharging arrangement. See Figure 2-2 for Pressure/Temperature chart).
17. Remove the spare discharge adapter and check for leakage using a soap solution.
18. Bolt the anti-recoil plate, P/N 255681, to the valve outlet. Leave the protection plates in place until the cylinder is ready to be reinstalled.

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CHAPTER 8
PARTS LIST

8-1 PARTS LIST

The table below, and on the following pages, provides a complete list of the Kidde KVS Dry Chemical Fire Suppression System parts and associated system equipment. In most situations, when ordering a system component, it will be easier to order by part number.

Description	Part Number
KVS Dry Chemical Cylinder Assemblies & Accessories	
KVS-21 Dry Chemical Cylinder, ABC	83-131010-001
KVS-25H Dry Chemical Cylinder, ABC	83-131014-001
KVS-25H Dry Chemical Cylinder, Purple K	83-131027-001
KVS-33 Dry Chemical Cylinder	83-131013-001
KVS-45 Dry Chemical Cylinder	83-131011-001
KVS-68 Dry Chemical Cylinder	83-131012-001
Gauge Shield (for all KVS Cylinders)	83-131024-001
Discharge Adapter Kit, DCS/LS Cylinder	83-844908-000
KVS Control Head Assemblies & Accessories	
System Valve Actuator	87-120042-001
Control Head, Electric with protractor	83-131080-001
Replacement protractor for Electric Control Head	83-131082-001
Replacement protractor for Pneumatic/Electric Control Head	83-132029-001
KVS Cylinder Brackets	
Bracket for KVS-21 or KVS-25H	WK-296189-000
Bracket, KVS-33 or KVS-45	WK-296188-000
Bracket for KVS-68	83-131003-001
KVS Nozzles & Distribution Accessories	
Nozzle, Cone (w/Cap)	83-844714-010
Nozzle, KVS Fan (w/Cap)	WK-259072-001
Bracket, Nozzle (45° elbow)	WK-263362-000
Bracket, Nozzle (90° coupling)	WK-263363-000
Bracket, Nozzle Angle	83-131019-001
Distributor, 3/4 x 1/2 x 1/2 x 1/2 x 1/2	83-131402-000
Tee, Two Way Check	83-896516-000

Description	Part Number
KVS Pressure Actuation	
Bracket, Mechanical Actuator Mounting	83-844726-000
Bracket & Cover, Mechanical Actuator Mounting	83-844725-000
Mechanical Actuator	83-897392-000
Cartridge, 15-cuin Nitrogen	WK-878508-000
Remote System Actuator, Manual/Electric (w/o Metron)	83-132514-000
Metron for Remote System Actuator	83-132500-500
Cable-Adapter, Squib Cable to Sentinel Metron	83-132483-710
Bracket, Remote System Actuator Mounting	83-132530-000
Second Shot Actuator, Pneumatic	83-132520-000
Bracket & Cover, Second Shot Actuator Mounting	83-132531-000
High Pressure Hose, 7.5-in	87-120045-001
Second Shot Actuation Delay	83-132524-000
Bracket, Second Shot Actuation Delay Mounting	83-132535-000
Electrical/Mechanical Actuator factory fitted with squib	83-897391-000
Connector Cable Assembly for Squib Type	83-844710-000
Replacement Squib Cartridge	83-844712-000
Vent Check	WK-877810-000
Check Valve, 1/8MNPT x 1/4FNPT	WK-259404-000
Pressure Switch, Normally Open	83-100002-001
Pressure Switch, Normally Closed	83-100007-001
Detectors & Accessories	
Infrared Detector	83-132700-000
Mounting Bracket, Infrared Detector	83-131060-001
Detect-A-Fire, 275° F, Weather tight, indexed (with mounting bracket)	83-132440-275
Detect-A-Fire, 325° F, Weather tight, indexed (with mounting bracket)	83-132440-325
Detect-A-Fire, 360° F, Weather tight, indexed (with mounting bracket)	83-132440-360
Detect-A-Fire, 450° F, Weather tight, indexed (with mounting bracket)	83-132440-450
Detect-A-Fire, 600° F, Weather tight, indexed (with mounting bracket)	83-132440-600
LHS Cable, 100 meters reel (328 feet), 350°F	83-100003-001
Base, LHS Cable	83-132454-000
Remote Electric Manual Release	83-132455-000
Maintenance Bypass Switch	83-132483-500
KVS Remote Manual Electric Actuator, 4 pole, 24VDC Systems	83-132030-002

Description	Part Number
Panel & Accessories	
KVS-2025 Control Panel, Two Releases	83-132034-001
EM-2 Expansion Module	83-132035-001
End-of-line Device, Vehicle 420498-2	83-132015-001
Backup Battery Assembly, KVS-2025 420423	83-132017-001
Circuit Monitor, 24 VDC	83-486322-000
Replacement 7.5AH Fuse for Circuit Monitor P/N 486322	WK-263428-000
Replacement LED for Circuit Monitor P/N 486322 (Green)	WK-263322-000
Replacement LED for Circuit Monitor P/N 486322 (Red)	WK-263321-000
Connector, Mating for KVS-2020 (12 Conductor) mating	83-132022-001
Connector Kit (3 Conductor) for KVS-2020 Detection Circuit	83-132023-001
Connector Kit (2 Conductor) for KVS-2020 Releasing Circuit	83-132024-001
Connector Kit for EM-1 (12 conductor grey, black) mating	83-132025-001
Crimping Tool for “Delphi” Connectors	83-132026-001
Connector Kit, Two-Pin I/O Cable	83-132488-000
Connector Kit, KVS Detection Cable (16/18 AWG) Adapter	83-132488-416
Wedge and contact removal tool for Deutsch Connectors	83-132028-001
Crimping Tool for Deutsch Connectors	83-132027-001
System Service & Maintenance	
Replacement Cap, Cone Nozzle (10 Pack)	WK-264943-030
Replacement Cap, KVS Fan Nozzle	06-235348-001
Complete Valve Assembly for KVS Cylinders	83-878767-000
Replacement Pressure Gauge for KVS Cylinder Valve	WK-283951-000
Rebuild Kit - KVS Cylinder Valve	87-120067-001
Diffuser Plate, KVS Cylinder Valve Outlet	06-237021-001
O-Ring, Discharge Adapter Kit (MOQ of 10)	WK-108019-000
Safety Relief Device	06-237466-001
Syphon Tube, KVS-21	WK-265018-000
Syphon Tube, KVS-25	06-236450-001
Syphon Tube, KVS-33	06-236378-001
Syphon Tube, KVS-45	WK-265019-000
Syphon Tube, KVS-68	06-235504-001
Recharge Adapter	83-279262-000
Hydrostatic Test Adapter	83-878453-000
Agent Recharge	
ABC Dry Chemical - 50 lb. Pail	WK-806411-000
Purple K Dry Chemical - 50 lb. Pail	83-131031-001

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