P/N 220423
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Dry Chemical Industrial and Open-Face Spray Booth Fire Suppression System

Design, Installation, Operation, and Maintenance Manual

LISTED
ULC EX2153/CEX515

LISTED
UL Listing File No. EX2153

FM
APPROVED

Kidde Fire Systems
A UTC Fire & Security Company

Foreword

Note: This Manual, P/N 220423, is to be used by qualified and factory-trained personnel, knowledgeable of NFPA standards, and any other applicable standards in effect.

This manual is intended to clearly and accurately describe the design, installation, operation and maintenance of Kidde Industrial Dry Chemical Fire Suppression Systems.

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 informational 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.

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Terms and Abbreviations

°C:	°Centigrade	in.:	Inch
°F:	°Farenheit	lb.:	Pound
AC:	Alternating Current	m:	Meter
ADA:	Americans with Disabilities Act	MAX.:	Maximum
AHJ:	Authority Having Jurisdiction	MIN.:	Minimum
AMP:	Ampere	mm:	Millimeter
AWG:	American Wire Gauge	NC:	Normally Closed
AC:	Alternating Current	NEC:	National Electrical Code
C:	Common	NFPA:	National Fire Protection Association
CGA:	Compressed Gas Association	NO:	Normally Open
CSA:	Canadian Standards Association	NPT:	National Pipe Thread
D/P:	Duct/Plenum	P/N:	Part Number
DC:	Direct Current	PSI:	Pounds per Square Inch
DIOM:	Design, Installation, Operation, and Maintenance Manual	QTY:	Quantity
DOT:	Department of Transportation	SVA:	System Valve Actuator
EMT:	Electrical Metallic Tubing	TC:	Transport Canada
FM:	Factory Mutual	TF:	Total-Flood
ft.:	Feet	UL/ULI:	Underwriters Laboratories, Inc.
HMIS:	Hazardous Materials Information System	ULC	Underwriters Laboratories, Canada
HP:	Horse Power	Vac:	Volts AC
HZ:	Hertz (Frequency)	Vdc:	Volts DC
		WHMIS:	Workplace Hazardous Materials Information System

Listings and Approvals

UL: Underwriters' Laboratories Listing File Number - EX2153

ULC: Underwriters' Laboratories Canada - EX2153/CEX515

FM: FM Approved

Safety Summary

Definitions

- **Note:** Notes are used to call out information that requires extra attention.
- **Caution:** Cautions are placed throughout the manual in areas where the possibility of property/equipment damage. The general cautions in the Safety Summary should be adhered to at all times when working with a Kidde Fire Systems IND Dry Chemical System.
- **Warning:** Warnings are placed throughout the manual in areas where the possibility of severe property/equipment damage, system failure, personal injury, and in some cases, death could occur. The general warnings in the Safety Summary should be adhered to at all times when working with a Kidde Fire Systems IND Dry Chemical System.

General Warnings

WARNING

- Protective eye wear must always be worn when working with pressurized cylinders. Never service the Cylinder and Valve Assembly unless the Anti-Recoil Plate (P/N 255681) and Shipping Inspection Plate (P/N 255096) are installed. Death, serious injury or property damage could occur.
- 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.
- It is likely that industrial applications involving flammable or combustible liquids will be enclosed within or surrounded by areas that will be classified as Class-I or Class-II, Division-1 or Division-2 locations (Zone 1 or Zone 2). Dry chemical system electrical components, such as heat detectors, located within these areas shall be rated for use in classified areas, and all wiring to these components shall conform to the provisions of NFPA 70, National Electric Code, for Class-I or Class-II, Division-1 or Division-2 locations (Zone 1 or Zone 2). Any system with a Microswitch must be rated for use in a classified area.
- Do not use water or oxygen to blow out piping. Moisture will cause blockage. The use of oxygen is very dangerous as the possible presence of even a minute quantity of oil may cause an explosion, thereby causing death, serious injury and/or property damage.
- The system uses high pressure. Safety goggles or glasses must be worn. Loosen the fitting slowly and carefully. Bleed all pressure out gradually. Failure to observe these cautions could result in bodily injury.
- The braided High-Pressure Nitrogen Tubing, is required on all installations in which the *XV* Control System is connected to a System Valve Actuator (SVA). Use of a different type of connection in such an installation could result in serious personal injury and/or malfunction of the system.
- Never dispose of a pressurized cartridge. Cartridges must be discharged before discarding. Filled gas cartridges may be dangerous if not handled properly. Do not heat cartridges above 120°F (49°C). Death, serious injury and/or property damage could occur. Pressurized cartridges that become overheated can explode, and thereby cause property damage, severe personal injury, and possibly death.

General Cautions

CAUTION

- Where electric detection and/or actuation is provided, supervision shall be provided in accordance with NFPA 17. Alarms and indicators, along with a supervisory power source, shall be provided in accordance with NFPA 72, National Fire Alarm Code. Electrical wiring and equipment shall be provided in accordance with NFPA 70, National Electric Code. All installations are subject to the approval of the Authority Having Jurisdiction (AHJ).
- A System Nitrogen Cartridge, P/N 87-120043-001, is required for final system set up. Using any other cartridge could cause malfunction or non-function of the system.
- System owners should refer to the IND Dry Chemical Owners Manual, P/N 83-INDMA-001. No other action shall be taken by the system owner other than visual. If further maintenance is determined necessary as a result of owner inspection, contact an authorized Kidde Distributor.
- Do not attempt to recharge any cylinder with out first checking for last hydrostatic test date. The U.S. Department of Transportation (DOT) and Transport Canada (TC) 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 five (5) 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 and TC regulations. For more information, refer to Compressed Gas Association (CGA) Pamphlet C-6.

GENERAL PRECAUTIONS

The following general safety precautions are to be observed at all times:

1. All electrical components associated with equipment shall be installed and grounded in accordance with NEC and local regulatory requirements.
2. Special precautionary measures are essential to prevent applying power to equipment at any time maintenance work is in progress.
3. Before working on electrical equipment, use a voltmeter to ensure that system is not energized.
4. When working near electricity, do not use metal rulers, flashlights, metallic pencils, or any other objects having exposed conductive material.
5. When connecting a meter to terminals for measurement, use a voltage range higher than expected voltage to be measured.

Pressurized Cylinders

Kidde IND™ Dry Chemical fire suppression systems use 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 Kidde IND Dry Chemical equipment and follow the instructions used in this manual and on the cylinder nameplate.

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 property/equipment damage, serious personal injury, and even death.

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 death, serious personal injury, and/or property damage.

Before handling Kidde system products, all personnel must be thoroughly trained in the safe handling of the cylinders as well as in the proper procedures for installation, removal, filling, and connection of other critical devices, such as System Valve Actuators (SVAs).

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 Cylinders: Cylinders 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: Cylinders must not be dropped or permitted to strike violently against each other or other surfaces.

Storage: Cylinders must be stored standing upright where they are not likely to be knocked over, or the cylinders 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

SUBJECT: SAFE CYLINDER HANDLING PROCEDURES FOR 360 PSI KIDDE IND DRY CHEMICAL 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 System Valve Actuators (SVAs).

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.

Anti-Recoil Plate

a. Each Kidde IND Dry Chemical cylinder is factory equipped with a Anti-Recoil Plate installed on the valve outlet to prevent loss. This device is a safety feature, and will provide controlled safe discharge when installed if the cylinder is actuated accidentally.
b. The valve diffuser plate must be installed in the valve outlet AT ALL TIMES except when the cylinders are connected into the system piping or being filled, at which time the cylinders shall be securely attached to bracket mounts.

Valve Protection Plate/Shipping Cap

A Valve Protection Plate/Shipping Cap is factory installed on the actuation port to prevent loss. The Valve Protection Plate/Shipping Cap is attached to the actuation port to prevent tampering or depression of the actuating pin. No attachments (e.g., System Valve Actuators) are to be connected to the actuation port during shipment, storage or handling.

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CHAPTER 1
GENERAL INFORMATION

1-1 INTRODUCTION

The Kidde® IND™ Dry Chemical System provides fire protection for a variety of special hazard applications.

The IND system holds UL listings and FM Approvals as a pre-engineered system.

Systems shall be designed and implemented according to the following:

- NFPA Standard 17, “Standard for Dry Chemical Systems”,
- NFPA Standard 33, "Standard for Spray Applications Using Flammable or Combustible Material",
- Other applicable NFPA standards as required for a particular application and design, including, but not limited to, NFPA 70 (NEC) and NFPA 72, Fire Alarm Standard.
- This Design, Installation, Operation, and Maintenance Manual.
- Any other standards enforced by a local Authority Having Jurisdiction (AHJ).

Configurations in Chapter 3, System Design, are tested and listed to Underwriters Laboratories (UL) Standard 1254, and FM Approved. Open-Face Spray Booth configurations (Section 3-2.3) are tested and listed to UL Standard 1254.

1-2 CLASSIFICATION OF FIRE

The classification of fire is defined as the following:

- Class A: Surface Type Fires; wood or other cellulose-type material (ordinary combustibles)
- Class B: Flammable liquids
- Class C: Energized electrical equipment
- Class D: Combustible metals (such as magnesium, sodium, zirconium, potassium, and titanium)
- Class K: Combustible cooking media (vegetable or animal oils and fats)

Note: Kidde IND Dry Chemical is not suited for Class D and Class K type of fires.

1-3 GENERAL CHARACTERISTICS OF THE KIDDE IND SYSTEM

The Kidde IND System is a dry chemical fire suppression system with two types of agent. The system is capable of encompassing a wide variety of application requirements.

The system utilizes stored pressure agent cylinders. Stored pressure cylinders:

- Remain free of contamination
- Reduce the packing of the agent
- Provide a smooth flow throughout the discharge

The cylinders are powder-coated, welded mild-steel shell conforming to DOT 4BW or 4BA construction. The valve is forged brass with chrome-nickel plating. The plating and cylinder coating help to make the assemblies corrosion resistant.

The system can be activated mechanically from manual release, thermo-bulb links, and fusible links.

The system can be activated electrically, using a tested and listed 24 Vdc control panel. Both automatic detection devices and manual release can be used on control panels.

Cylinders are actuated from stored high-pressure nitrogen. Automatic and manual actuation are available for the Kidde IND System.

Other actuations are available, such as:

- Mechanical gas valve closure
- Dry contacts for annunciation and electrical shutdown

1-4 SYSTEM DESCRIPTION

The Kidde IND Dry Chemical System is a fixed dry chemical system consisting of a supply of dry chemical stored in one or more Cylinder and Valve Assembly. Each cylinder is pressure activated by a System Valve Actuator.

The system can be actuated either automatically and/or manually, using mechanical, electrical, or pressure actuation devices. Upon actuation, the dry chemical is discharged through agent distribution piping and specially designed nozzles positioned throughout the protected area.

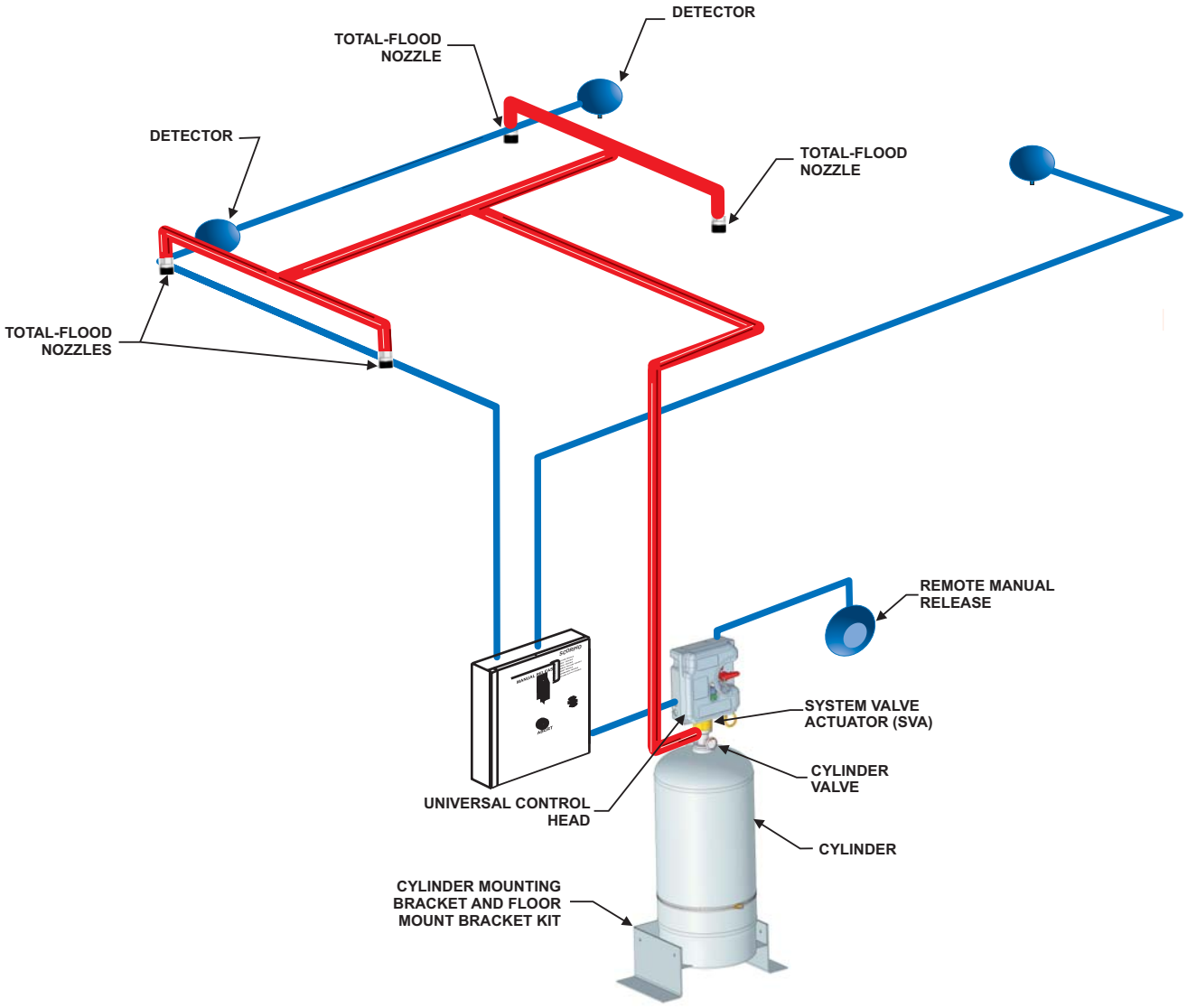

Figure 1-1. Typical Kidde® IND™ Dry Chemical System.

1-5 OPERATIONAL SEQUENCE

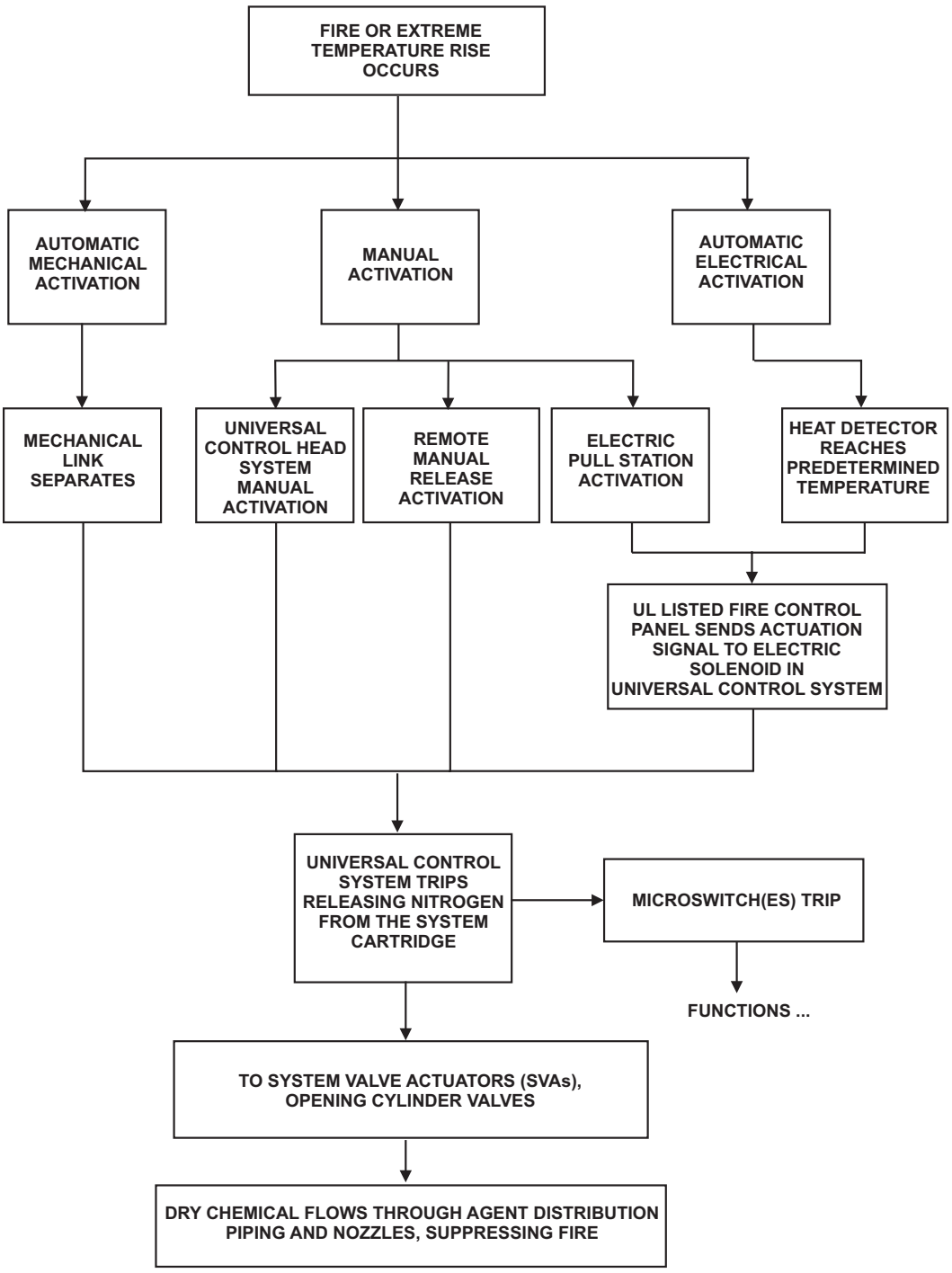

Figure 1-2. Operational Sequence Flow Chart

1-6 APPLICATIONS

There are two general types of applications for dry chemical systems: Total-Flood and Local- Application. In addition, the Kidde IND System is UL Listed for protection of Industrial Open-Front Spray Paint Booths.

1-6.1 Total-Flooding

Total-Flood refers to a volumetric area that is completely enclosed. The Kidde IND System is UL Listed and FM approved with uncloseable opening(s) up to 5% of the total area of the walls, floor, and ceiling.

In total-flooding, a predetermined amount of dry chemical is discharged through fixed piping and nozzles into an enclosed space or enclosure around the hazard. Total-flooding is applicable only when the hazard is totally enclosed or when all openings surrounding a hazard can be closed automatically when the system is discharged. Total-flooding can be used only where no re-ignition is anticipated. System is listed up to 5% of the hazard having uncloseable openings.

See Chapter 3 for total-flood design parameters.

Note: Dry Chemical Systems do not inert the atmosphere of a total-flood application. They are affective during discharge.

1-6.2 Local-Application

Local-Application refers to areas that are not enclosed.

In a local-application system, the nozzles are arranged to discharge directly into the fire. Local-application is practical in those situations where the hazard can be isolated from other hazards so that fire will not spread beyond the area protected, and where the entire hazard can be protected. The principal use of local-application systems is to protect open tanks of flammable liquids. Local-application is ineffective unless extinguishment can be immediate and there are no re-ignition sources.

See Chapter 3 for local-application design parameters.

1-6.3 Industrial Open-Front Spray Paint Booth

UL considers the Industrial Open-Front Spray Paint Booth a total-flood type of application, but enforces a specific test standard for that application. The design parameters included in “Industrial Open-Front Spray Paint Booth” on page 5 were arrived at by testing to this standard.

An Open-Front Spray Paint Booth has no doors on the front of the booth. During painting operations, the front remains open. A properly designed ventilation system will prevent overspray from escaping out of the booth.

The UL 1254 standard requires that the open-front be “screened” while the work area is being flooded. In addition, all parts of the ventilation system (plenum and duct) are also protected. Both ABC and BC dry chemicals are permitted in the work area and plenum of an Open-Front Spray Paint Booth. Only BC dry chemical is used in the duct.

See Chapter 3 for open-front spray paint booth parameters.

1-7 APPLICATIONS AND LIMITATIONS OF DRY CHEMICAL SYSTEMS

"Multipurpose" (ABC) agent is used for areas where some sort of "ordinary combustibles," such as wood and paper are present. One example is a furniture factory in which the wood furniture is being used. Since wood is a class "A" combustible, the Open-Front Spray Booth in which the furniture is being finished would have ABC dry chemical protection for the work area and plenum.

"Regular Dry Chemical" (BC) agent is used for areas where there are no "ordinary combustibles." One example is a dip tank in which metal parts are being coated. While in process, the coating is combustible or flammable. The most affective agent is BC, for fast flame knockdown.

Other applications include, but not limited to:

- Open-Front Paint Spray Booths
- Spill Areas
- Hazardous Storage Buildings
- Dip Tanks
- Electrical Motors
- Pumps
- Switchgear Rooms
- Flammable Liquid Storage Facilities

The dry chemicals used in the Kidde IND Dry Chemical System are stable at both low and high temperatures. Various additives are mixed with the base materials to improve their storage, flow, and water-repellency characteristics. The upper storage temperature limit for the system is 120°F (49°C). The lower temperature limit is -40°F (-40°C).

WARNING **Upon system alarm notification, all personnel must evacuate the protected space. Failure to do so may result in temporary respiratory difficulties, disorientation, and/or personal injury.**

1-7.1 Extinguishing Properties

When introduced into the combustion zone, dry chemical causes almost immediate flame suppression. Smothering, cooling and radiation shielding contribute to the extinguishing efficiency of dry chemical, but the principal mechanism for the flame extinguishment is the chemical chain-breaking properties of the dry chemicals.

When ABC dry chemical is discharged, the decomposed monoammonium phosphate leaves a sticky residue. This residue seals oxygen from the burning material, thus providing fire suppression and inhibiting re-ignition.

1-7.2 Limitations of Dry Chemicals

Dry chemicals do not inert or secure after discharge is complete. If securement is required, either an extended discharge is required, or a different choice of agents, or both, is necessary.

Dry Chemical system protection is not recommended, however, for delicate electrical equipment, such as:

- Telephone switchboards
- Electronic computers

Such equipment is subject to damage by dry chemical deposit and, because of the insulating properties of the dry chemical, may require excessive cleaning to restore operation.

1-8 HAZARDOUS MATERIALS INFORMATION SYSTEM (HMIS^{SM})

The HMIS rating for regular (BC, sodium bicarbonate base), and multi-purpose (ABC, monoammonium phosphate base) dry chemical is as follows:

- Health (H) = 1
- Flammability (F) = 0
- Reactivity (R) = 0

CAUTION

Dry chemical fire extinguishing agents are considered nontoxic, but are classified as a nuisance dust irritant, and may cause temporary irritation to the eyes, skin, or respiratory system. Avoid unnecessary exposure.

Refer to http://www.kiddefiresystems.com web site for latest MSDS information.

1-9 CLEAN-UP

After discharge, the dry chemical should be removed from any valuable equipment to prevent a possible reaction between materials in the presence of moisture. Personnel in contact with the agent should remove the dry chemical from their skin with tap water.

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CHAPTER 2
COMPONENTS

2-1 FIRE SUPPRESSION SYSTEM COMPONENTS

The Kidde® IND™ Dry Chemical Fire Suppression System consists of the following major components:

- Suppression (Agent storage cylinders distribution piping, nozzles, and detection devices (mechanical and electrical)
- Controls
- Auxiliary Components

Cylinder and Valve Assembly

The IND Dry Chemical Fire Suppression System utilizes six sizes of cylinders. The cylinders consist of a factory-filled dry chemical agent and valve assembly. The cylinders conform to DOT specification 4BW-4BA and NFPA standards.

Distribution Piping

The distribution piping (not supplied by Kidde) is designed to distribute the dry chemical agent to the hazard areas. In the Kidde IND pre-engineered system, pipe sizes, minimum and maximum pipe lengths and number of pipe fittings are predetermined. See Chapter 3 for more details.

Nozzles

There are five types of nozzles for the IND Dry Chemical Fire Suppression System. Each type of nozzle has been designed and tested for specific applications and areas of coverage. The nozzles are:

- Local-Application (low overhead, high overhead, and tankside)
- Total-Flooding
- Duct/Plenum

Detection Devices

There are two methods of detection that can be employed in the system: mechanical or electrical.

Mechanical detection uses fusible-link or thermo-bulb link detectors to provide reliable performance. The detectors are designed to separate at a specific temperature and release tension on the detection cable which causes the release mechanism to activate. Fusible-link detectors are available in four temperature ratings, and the thermo-bulb detectors are available in six temperature ratings.

Electrical detection uses heat detectors that are equipped with self-restoring, normally-open contacts which close when a predetermined temperature is reached. Heat detectors are available in six set points.

XV Control System

The *XV* Control System is used for actuating the Kidde IND Cylinder and Valve Assembly. The *XV* Control System can be mounted directly on the cylinder or to a wall. The *XV* Control System can be operated with:

- Automatic mechanical detection (fusible-links and thermo-bulb links),
- Automatic electrical operation, and
- Remote and local manual operation.

2-2 SUPPRESSION COMPONENTS

2-2.1 Cylinder and Valve Assembly

Kidde offers six different models of IND Dry Chemical Systems. Cylinders are filled with either regular (BC, sodium bicarbonate base), or multi-purpose (ABC, monoammonium phosphate base) dry chemical. Table 2-1 outlines the fill weights of agent, dimensions and agent type for each Cylinder and Valve Assembly model.

The Cylinder and Valve Assembly:

- Conforms to DOT Specification 4BW4BA
- Cylinder and Valve Assemblies are pressurized with nitrogen to 360 PSIG (24.8 bar) at 70°F (21°C).

WARNING

Protective eye wear must always be worn when working with pressurized cylinders. Never service the Cylinder and Valve Assembly unless the Anti-Recoil Plate (P/N 255681) and Valve Protection Plate (P/N 255096) are installed. Death, serious injury and/or property damage could occur as the cylinder may be violently propelled. Refer to the Safety Summary for more information regarding pressurized cylinders.

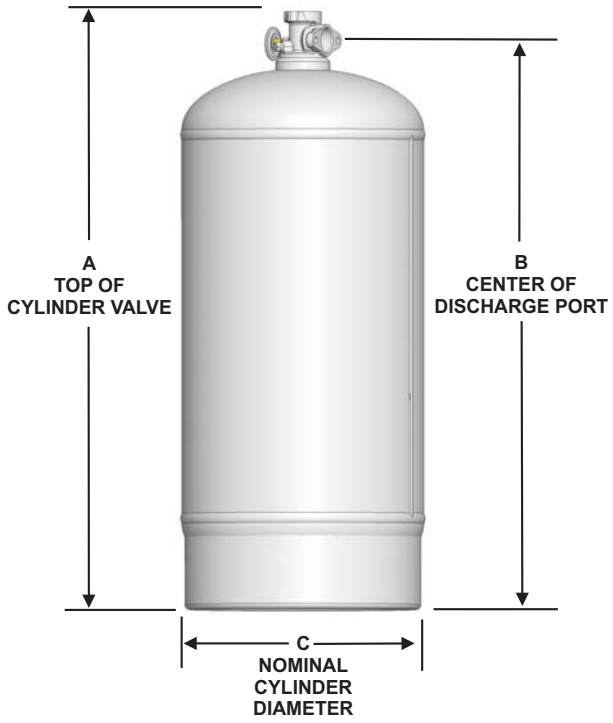

Figure 2-1. Dimensions of Cylinder and Valve Assembly

Table 2-1. Cylinder and Valve Assembly Specifications

Cylinder and Valve Assembly Part Number	Model	Application	Agency Approval	Agent Type	Fill Weight of Agent	Dimensions		
						A	B	C
486573	IND-21	Total-Flood	UL/ULC, FM	ABC	21 lb.	17-1/2 in. (447 mm)	16-1/8 in. (409 mm)	9 in. (229 mm)
486574	IND-45	Total-Flood	UL/ULC, FM	ABC	45 lb.	30-3/4 in. (782 mm)	29-1/4 in. (744 mm)	9 in. (229 mm)
83-100018-001	IND-70	Open-Front Spray Booth	UL/ULC	ABC	68 lb.	30-1/4 in. (768 mm)	28-1/2 in. (724 mm)	12-1/4 in. (312.4 mm)
486570	IND-25	Total-Flood Open-Front Spray Booth	UL/ULC, FM	BC	25 lb.	17-1/2 in. (447 mm)	16-1/8 in. (409 mm)	9 in. (229 mm)
486571	IND-50	Total-Flood Open-Front Spray Booth Local-Application	UL/ULC, FM UL/ULC UL/ULC	BC	50 lb.	30-3/4 in. (782 mm)	29-1/4 in. (744 mm)	9 in. (229 mm)
83-100019-001	IND-75	Open-Front Spray Booth	UL/ULC	BC	75 lb.	30-1/4 in. (768 mm)	28-1/2 in. (724 mm)	12-1/4 in. (312.4 mm)

2-2.1.1 WALL MOUNTING BRACKET, P/NS 486487, 486488, OR 87-100009-001

Mounting brackets are used for mounting all Cylinder and Valve Assembly. A cylinder strap is used to secure the cylinder to the bracket. The bracket is mounted to the wall using three (3) 3/8-inch diameter bolts or screws of suitable length and type. See Figure 2-2 and Table 2-2 for dimensions and load information.

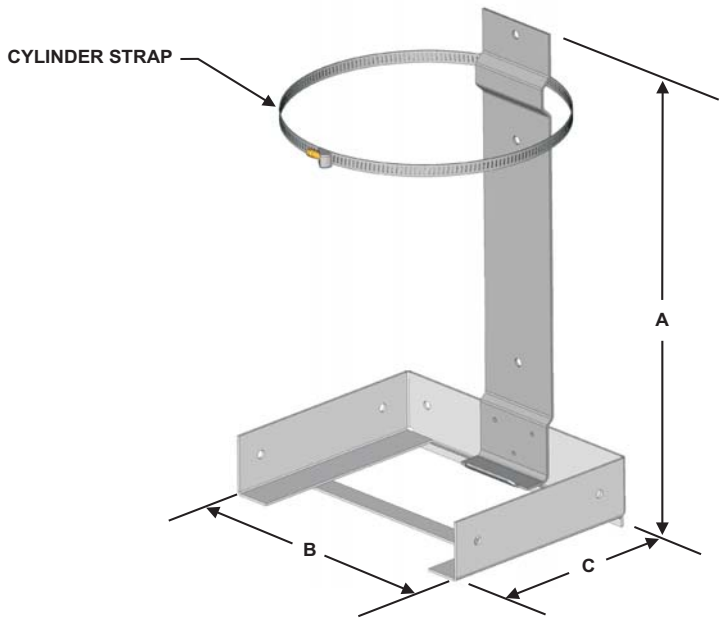

Figure 2-2. Wall Mounting Bracket

Table 2-2. Wall Mounting Bracket Specifications

Wall Mounting Bracket P/N	Model	Dimensions			Recommended Wall Support Load
		A	B	C	
486487	IND-21 IND-25	13-1/8 in. (333 mm)	9-3/4 in. (248 mm)	6-3/4 in. (171 mm)	65 lb. (30 kg)
486488	IND-45 IND-50	19-5/8 in. (498 mm)	9-3/4 in. (248 mm)	6-3/4 in. (171 mm)	130 lb. (59 kg)
87-100009-001[1]	IND-70 IND-75	21 in. (533 mm)	13-1/4 in. (337 mm)	10-1/4 in. (257 mm)	225 lb. (102 kg)
87-100010-001[1,2]	IND-70 IND-75	—	—	—	—

[1] UL Listed Only

[2] Bracket P/N 87-100010-001 is a floor mounting kit for the Model IND-70 or IND-75, and requires P/N 87-100009-001. See Paragraph 2-2.1.1.1.

2-2.1.1.1 Floor Mount Bracket Kit, P/N 87-100010-001

A Floor Mount Bracket Kit is used for mounting the IND-70 or IND-75 cylinder to the floor. The Floor Mount Bracket Kit requires Wall Mounting Bracket P/N 87-100009-001. Use 3/8-inch diameter bolts (with nuts) of suitable length and type to attach to the Wall Mounting Bracket. See Figure 2-3.

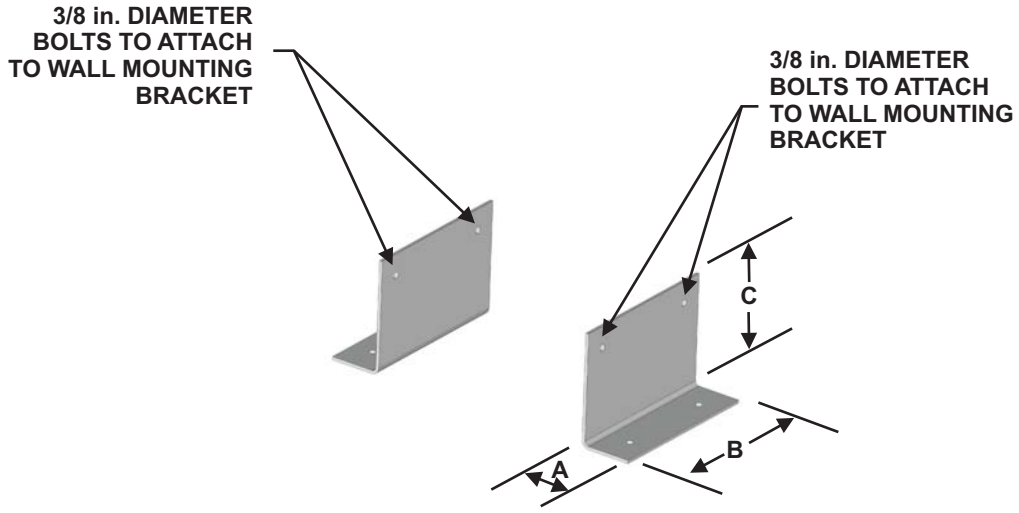

Figure 2-3. Floor Mount Bracket Kit

Table 2-3. Floor Mounting Kit Specifications

Dimension A	Dimension B	Dimension C
3 in. (76 mm)	9-5/8 in. (245 mm)	6-9/16 in. (168 mm)

2-2.1.2 DISCHARGE ADAPTER KIT, P/N 844908

The Discharge Adapter provides a means to connect discharge pipe to any Kidde IND Dry Chemical Cylinder and Valve Assembly.

The Discharge Adapter Kit consists of a 3/4-inch NPT adapter and a steel flange plate (see Figure 2-4).

Note: The 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.

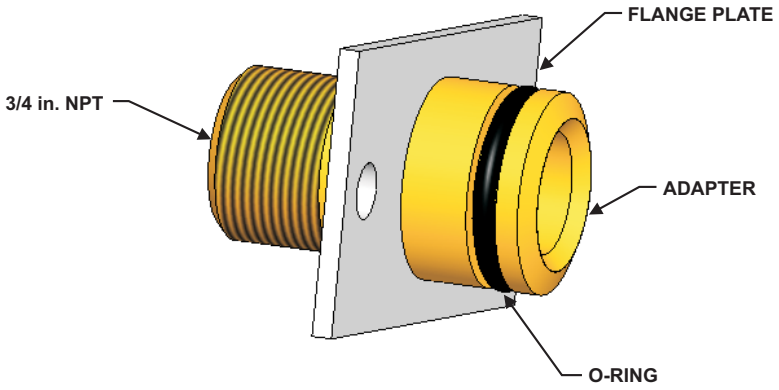

Figure 2-4. Discharge Adapter Kit, P/N 844908

2-2.2 Discharge Nozzles

2-2.2.1 LOCAL-APPLICATION NOZZLES

There are two types of nozzles used for local-application systems; overhead and tankside.

Overhead nozzles are designed to discharge a solid cone of dry chemical down onto a protected area from a fixed location above the protected area. There are two different overhead nozzles; low-overhead and high-overhead.

The low-overhead nozzle, shown in Figure 2-5, uses a screen at the nozzle outlet to reduce the velocity of the Dry Chemical discharge. This allows the nozzle to be positioned within six to eight feet from the surface of a flammable liquid.

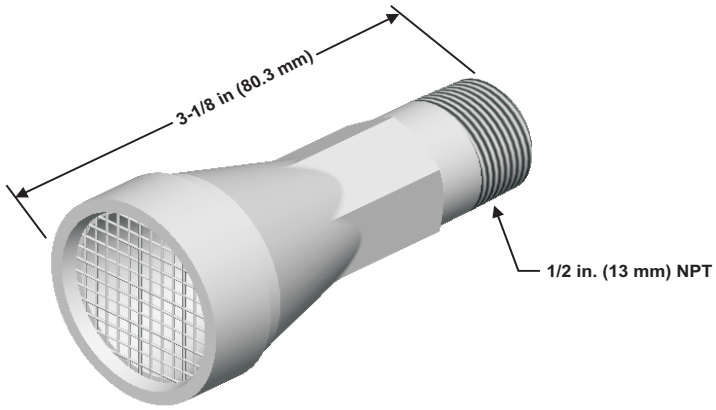

Figure 2-5. Low-Overhead Nozzle, P/N 844258

The high-overhead nozzle, shown in Figure 2-6, can be used at greater heights above the surface of the flammable liquid.

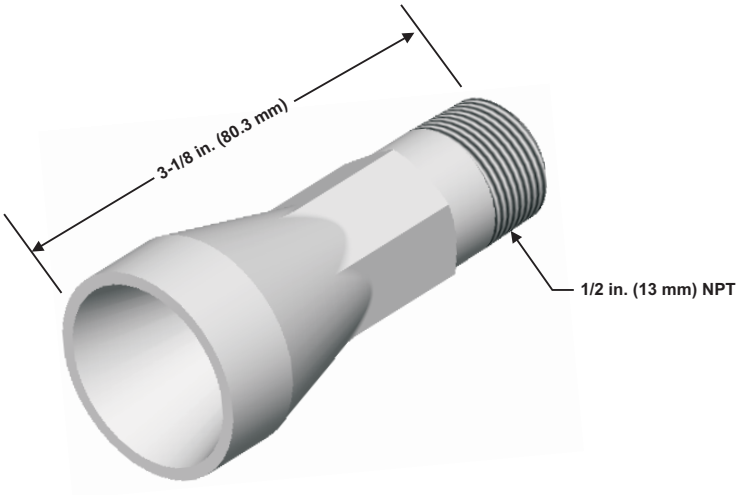

Figure 2-6. High-Overhead (or Screening) Nozzle, P/N 259270

2-2.2.2 TANKSIDE NOZZLE, P/N 259072

The tankside nozzle, shown in Figure 2-7, is designed to discharge a flat, semicircular blanket of Dry Chemical over the surface of a flammable liquid.

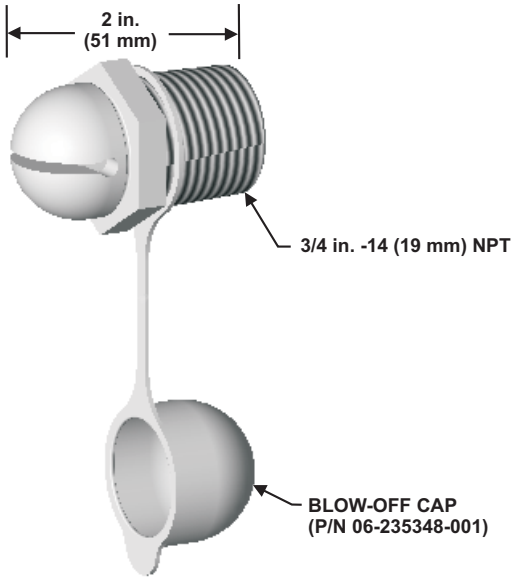

Figure 2-7. Tankside Nozzle, P/N 259072

2-2.2.3 TOTAL-FLOODING NOZZLE, P/N 83-100005-001

The Total-Flooding (TF) Nozzle, shown in Figure 2-8, is designed to discharge dry chemical throughout an enclosed area. The TF Nozzle is used for non-spray type applications as well as enclosed and open-face applications.

Each TF Nozzle is factory-equipped with a blow-off cap (P/N 06-250099-067) to protect the nozzle orifices from clogging and physical damage.

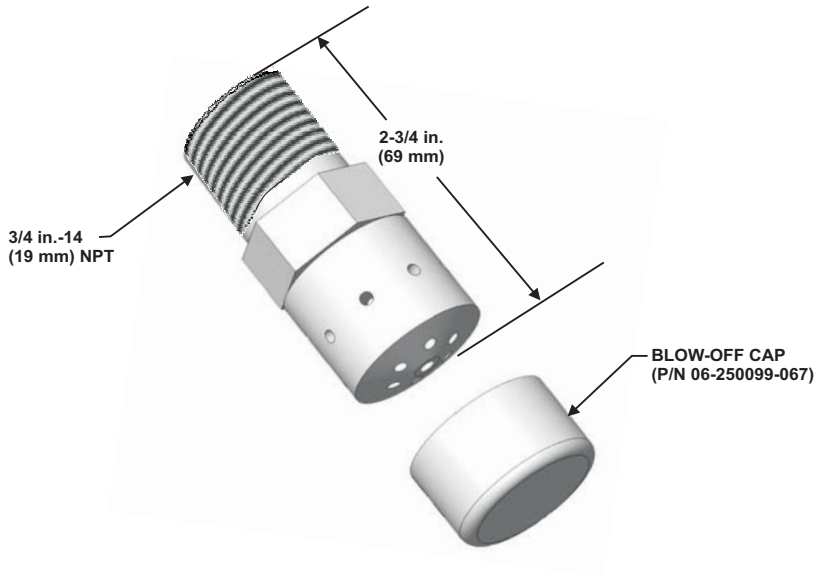

Figure 2-8. Total-Flooding Nozzle, P/N 83-100005-001

2-2.2.4 DUCT/PLENUM (DP) NOZZLE, P/N 83-100006-001

The Duct/Plenum (DP) Nozzle, shown in Figure 2-9, is designed to discharge dry chemical throughout an exhaust duct or plenum.

Each DP Nozzle is factory-equipped with a blow-off cap (P/N 264742) to protect the nozzle orifices from clogging and physical damage.

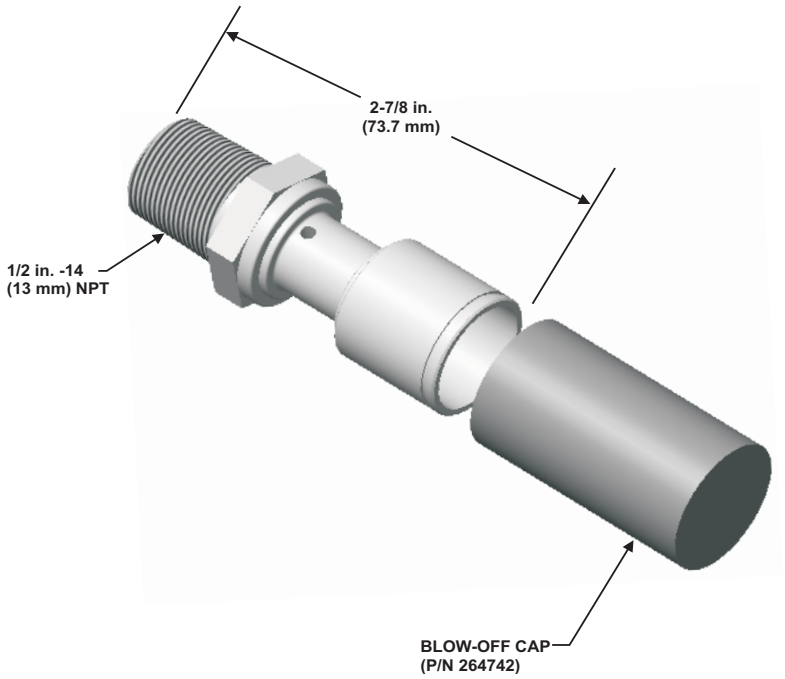

Figure 2-9. Duct/Plenum (DP) Nozzle, P/N 83-100006-001

2-2.2.5 MAIN/RESERVE SYSTEM COMPONENT

2-2.2.5.1 Two-Way Check Tee, P/N 896516

The two-way check tee, shown in Figure 2-10, is used for main and reserve cylinders that share a common piping system. The check tee prevents loss of dry chemical upon discharge when one of the cylinders is removed for refilling, maintenance, or repair.

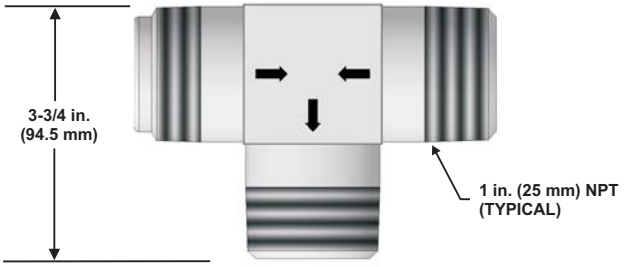

Figure 2-10. Two-Way Check Tee, P/N 896516

2-3 CONTROLS

2-3.1 *XV*™ Control System, P/N 87-120099-001

The *XV* Control System, P/N 87-120099-001, is used for actuating the Kidde IND Cylinder and Valve Assembly. The *XV* Control System can be attached to the System Valve Actuator, P/N 87-120042-001 for direct cylinder mounting, or to a wall for remote mounting. Knockouts are provided to accommodate either type of mounting. The controller can be operated with:

- Automatic mechanical detection (fusible-links and thermo-bulb links),
- Automatic electrical operation, and
- Remote and local manual operation.

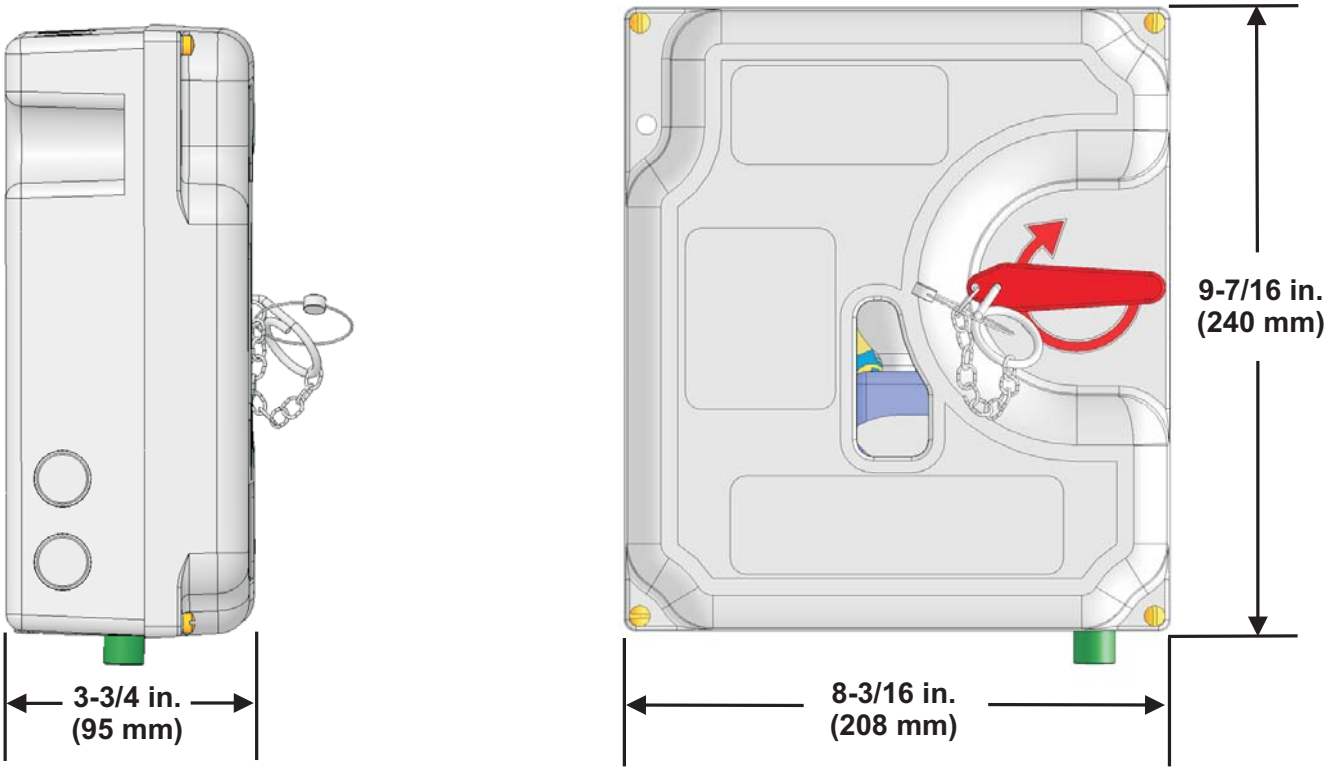

Figure 2-11. *XV* Control System

2-3.1.1 SYSTEM NITROGEN CARTRIDGE, P/N 87-120043-001

The *XV* Control System uses a nitrogen cartridge for actuating the IND dry chemical cylinders and is charged with dry nitrogen (see Figure 2-12). The System Nitrogen Cartridge is mounted inside the *XV* Control System to protect it from tampering and provides the date of manufacturing and space (gray band) for recording of the installation date.

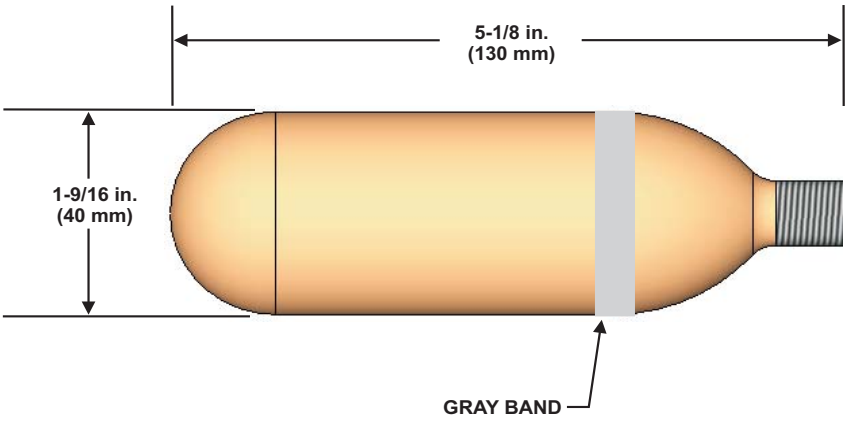

Figure 2-12. System Nitrogen Cartridge, P/N 87-120043-001

2-3.1.2 TEST CARTRIDGE, P/N 87-120044-001

The Test Cartridge is used for testing of the Kidde IND Dry Chemical System. The Test Cartridge has a red band around it with a label “TEST CARTRIDGE” as shown in Figure 2-13.

Note: The System Nitrogen Cartridge P/N 87-120043-001 is required for actuation and full discharge or "puff" tests.

CAUTION

The Test Cartridge (P/N 87-120044-001) must be removed and the System Nitrogen Cartridge (P/N 87-120043-001) must be installed at the completion of any work done on the system. Failure to do so will result in malfunction of the system.

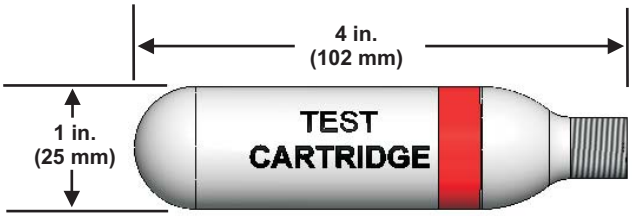

Figure 2-13. Test Cartridge, P/N 87-120044-001

2-3.1.3 SYSTEM VALVE ACTUATOR (SVA), P/N 87-120042-001

A System Valve Actuator (SVA) is mounted to every dry chemical cylinder valve assembly located on the system (see Figure 2-14). The SVA has ports for low profile tubing runs, 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.

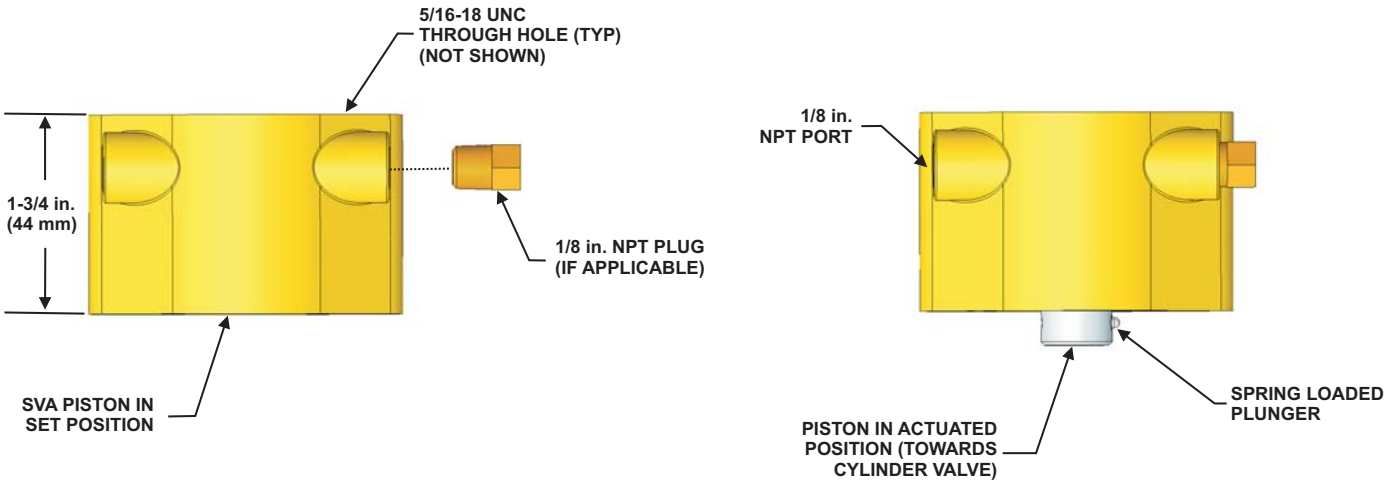

Figure 2-14. System Valve Actuator (SVA), P/N 87-120042-001

2-3.1.4 HIGH-PRESSURE NITROGEN TUBING, P/N 87-120045-001

WARNING

The braided High-Pressure Nitrogen Tubing, is required on all installations in which the *XV* Control System is mounted to a dry chemical cylinder. Use of another hose in such an installation could result in serious personal injury and/or malfunction of the system.

The High-Pressure Nitrogen Tubing is used to connect the *XV* Control System to the SVA (see Figure 2-15). A 1/8-inch NPT (male) x 3/8-24 JIC Adapter is included with the High-Pressure Nitrogen Tubing.

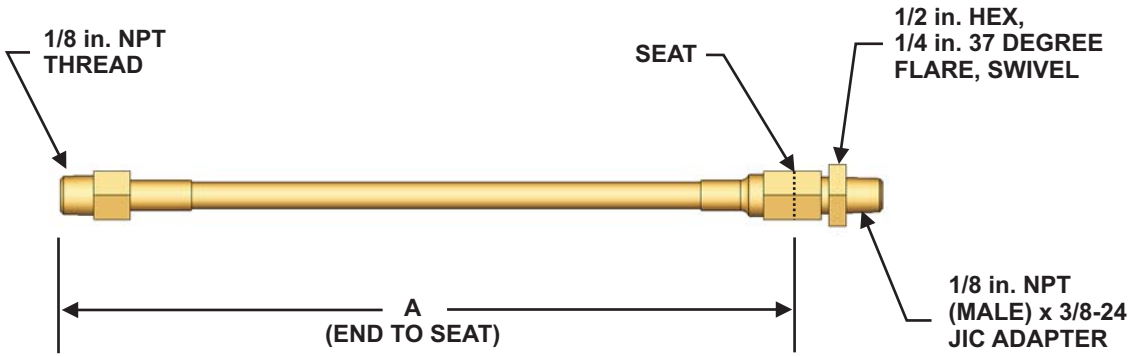

Figure 2-15. External Tubing for *XV* Control System

2-3.1.5 SOLENOID, P/N 83-100034-001

Note: Where electric detection and/or actuation is provided, supervision shall be provided in accordance with NFPA 72. Alarms and indicators, along with a supervised power source, shall be provided in accordance with NFPA 72, National Fire Alarm Code. Electrical wiring and equipment shall be provided in accordance with NFPA 70, National Electric Code. All installations are subject to the approval of the Authority Having Jurisdiction (AHJ).

An optional Solenoid can be installed into the *XV* Control System, just under the actuation latch. The Solenoid operates directly on the actuation latch to activate the system. This installation allows simultaneous usage of mechanical detection lines, or the lines can be locked out. The Solenoid includes two mounting bolts, the bracket and a push plate which mounts onto the Solenoid body (see Figure 2-16). The Solenoid coil is 24 Vdc while the current drain is 1.5 Amp at 24 Vdc and at 70°F (21°C).

Note: When actuating the *XV* Control System with an optional Solenoid, a UL Tested and Listed fire control panel with a proper back-up power supply is required. For example:

- Scorpio
- Aries

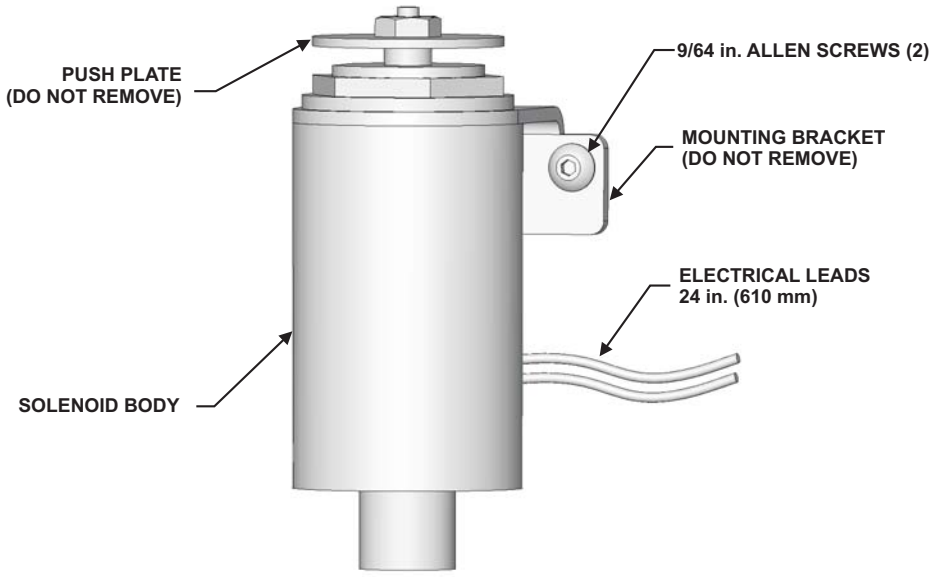

Figure 2-16. Solenoid, P/N 83-100034-001

2-3.1.6 MICROSWITCH KIT, P/N 87-120039-001

The Microswitch Kit is a single pole, double-throw switch (see Figure 2-17 and Table 2-4). Included in the kit is the microswitch, pigtail assembly and four mounting screws (two short and two long).

The wire leads are 24-inches (610 mm) in length. Four Microswitch Kits can be mounted in the *XV* Control System. There are two mounting locations to accommodate the four Microswitch kits (two stacked at each mounting location), with EMT ports for each mounting location. This allows for the use of two electrical junction boxes for separation of signal lines and AC lines. See Figure 2-18 for the microswitch wiring diagram.

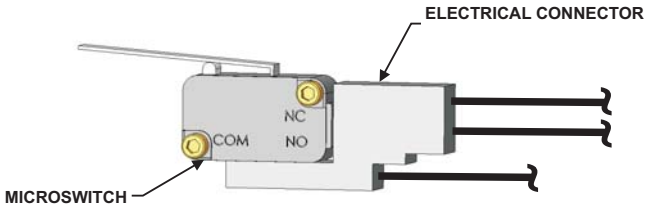

Figure 2-17. Microswitch Kit, P/N 87-120039-001

Table 2-4. Electrical Ratings

125/250 Vac	20-1/2 Amps
250 Vac	1-1/2 HP
125 Vac	1/2 HP

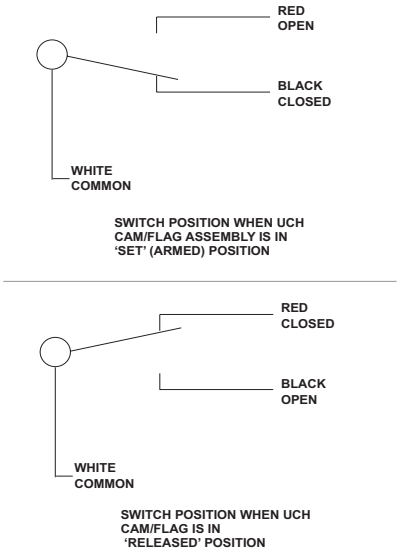

Figure 2-18. Microswitch Wiring Diagram for the *XV* Control System

2-3.1.7 TERMINAL TYPE MICROSWITCH KIT, P/N 87-120047-001

The Microswitch Kit is a single pole, double-throw switch (see Figure 2-19).

Note: Use the Terminal Type Microswitch when using the *XV* Control System for alarm and release functions.

Four Microswitch Kits can be mounted in the *XV* Control System. There are two mounting locations to accommodate the four Microswitch kits (two stacked at each mounting location), with EMT ports for each mounting location. This allows for the use of two electrical junction boxes for separation of signal lines and AC lines.

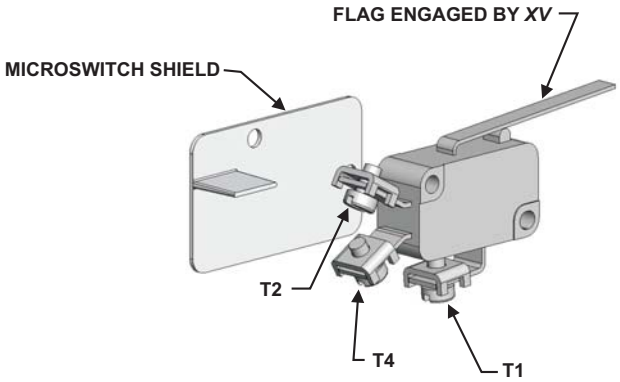

Figure 2-19. Terminal Type Microswitch, P/N 87-120047-001

Table 2-5. Electrical Ratings

250 Vac	15 Amps
250 Vac	1/2 HP
125 Vac	1/2 HP

2-3.1.8 AUTOMATIC DETECTORS AND ACCESSORIES

2-3.1.8.1 Detector Housing Kit, P/N 804548

The Detector Housing Kit, shown in Figure 2-20 and Table 2-6, consist of the following:

Table 2-6. Detector Housing Kit, P/N 804548

Item	Quantity
7-9/16 in. (192 mm) Detector Housing	1
1/2-inch EMT	2
Crimp Sleeves	4
“S” Hooks	1

These items are used to attach the detectors to the 1/16-inch cable leading to the *XV* Control System. The Detector Housing can be configured as an End-of-Line or In-Line bracket.

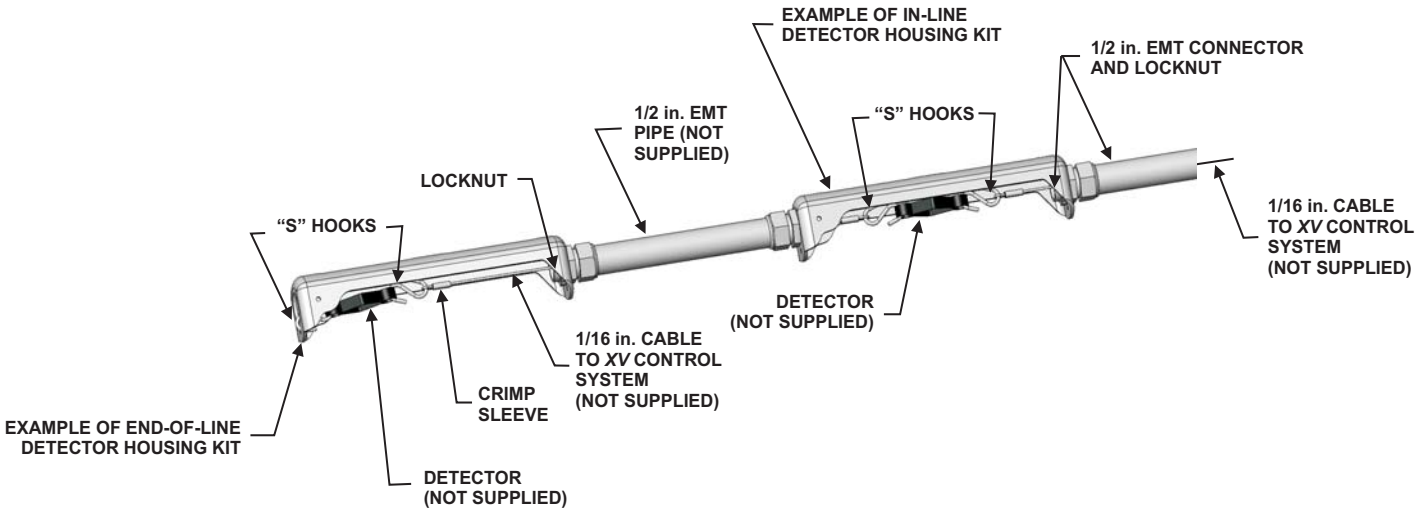

Figure 2-20. Detector Housing Kit, P/N 804548

2-3.1.8.2 Universal-Link Housing Kit, P/N 87-120064-001

The Universal-Link Housing Kit, shown in Figure 2-21, and consists of the following:

Table 2-7. Detector Housing Kit, P/N 87-120064-001

Item	Quantity
11-1/2 in. (292 mm) Detector Housing	1
Crimp Sleeves	2
"S" Hooks	2

The items above are used to attach the Fusible-Link or Thermo-Bulb Links to the 1/16-inch cable leading to the *XV* Control System. The Universal-Link Housing can be configured as an End-of-Line or In-Line bracket.

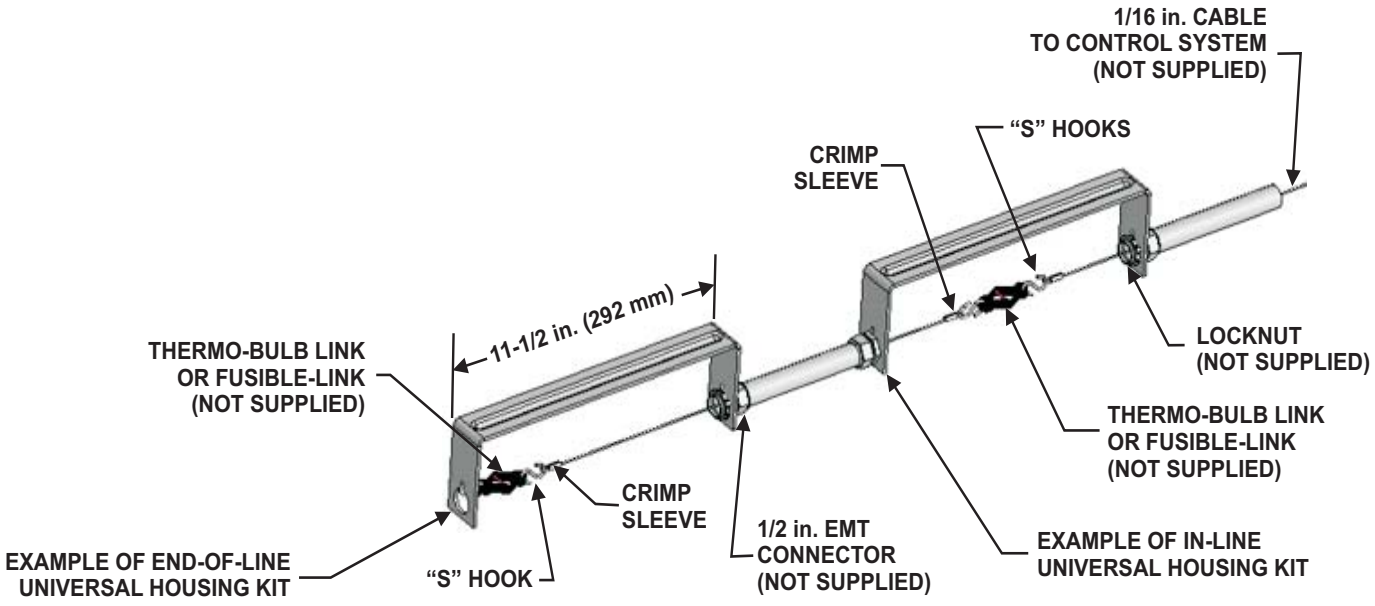

Figure 2-21. Universal-Link Housing Kit, P/N 87-120064-001

2-3.1.8.3 Thermo-Bulb Links, P/N 87-12009X-XXX

UL Listed and FM Approved Thermo-Bulb Links, shown in Figure 2-22, are used in conjunction with Universal-Link Housing Kits (P/N 87-120064-001) and/or Detector Housing Kits (P/N 804548). The links are held together with a liquid-filled glass tube (Thermo-Bulb), which bursts at a predetermined temperature, allowing the two halves of the link to separate. The types of Thermo-Bulb links are:

- Rapid Response
- Standard Response

These Thermo-Bulb links are available in various temperature ratings with a minimum/maximum load rating of 0 lb./50 lb. (0 kg/23kg).

Figure 2-22. Thermo-Bulb Link, P/N 87-12009X-XXX

2-3.1.8.4 Fusible-Links (Model KML), P/Ns 282661, 282662, 282664 and 282666

UL Listed and FM Approved Fusible-Links, shown in Figure 2-23, are used in conjunction with the Fusible-Link Housing Kit. The Fusible-Links are held together with a low melting alloy that melts at a predetermined temperature, allowing the two halves of the link to separate.

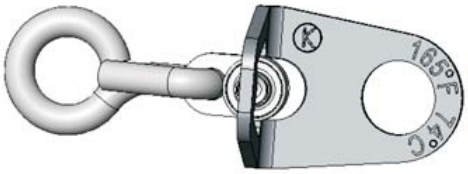

Figure 2-23. Fusible-Link, P/N 28266X

Fusible-Links are available in various temperature ratings with a minimum/maximum load rating of 10 lb./40 lb. (5 kg/18 kg) (see Table 2-8).

Table 2-8. Fusible-Link Temperature Ratings

Fusible-Link Rating	Maximum Exposure Temperature	Part Number
165°F (74°C)	100°F (38°C)	282661
212°F (100°C)	150°F (65°C)	282662
360°F (182°C)	300°F (149°C)	282664
500°F (260°C)	440°F (226°C)	282666

There are two temperature designations which apply to Fusible-Links (refer to Table 2-8). One temperature is called the rating temperature, and the other is called the maximum exposure temperature.

The rating temperature, which is stamped on the Fusible-Link, is the temperature at which the link will separate when new. However, continual exposure to cycling ambient temperatures may cause a degradation of the link over time.

2-3.1.8.5 Fusible-Link (Model KFA), P/N 87-120060-001

Fusible-Links are available with a minimum/maximum load rating of 5 lb. — 45 lb. (2.3 Kg — 20.4 Kg). See Table 2-9.

Table 2-9. Fusible-Link (Model KFA) Temperature Ratings

Fusible-Link Rating	Maximum Exposure Temperature	Part Number
360°F (182°C)	440°F (227°C)	87-120060-001

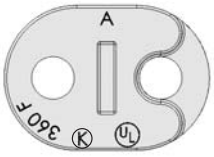

Figure 2-24. Fusible-Link, P/N 87-120060-001

2-3.1.9 REMOTE MANUAL RELEASE, P/N 875572

The Remote Manual Release, shown in Figure 2-25, is provided as a means of manually actuating the system from a remote location. The Remote Manual Release is attached to the *XV* Control System with 1/16-inch control cable. To actuate the system at the Remote Manual Release, pull out the safety pin and pull hard on the handle.

Each Remote Manual Release is supplied with a separate nameplate. This nameplate must be attached to the mounting surface 1-inch above or below the Remote Manual Release.

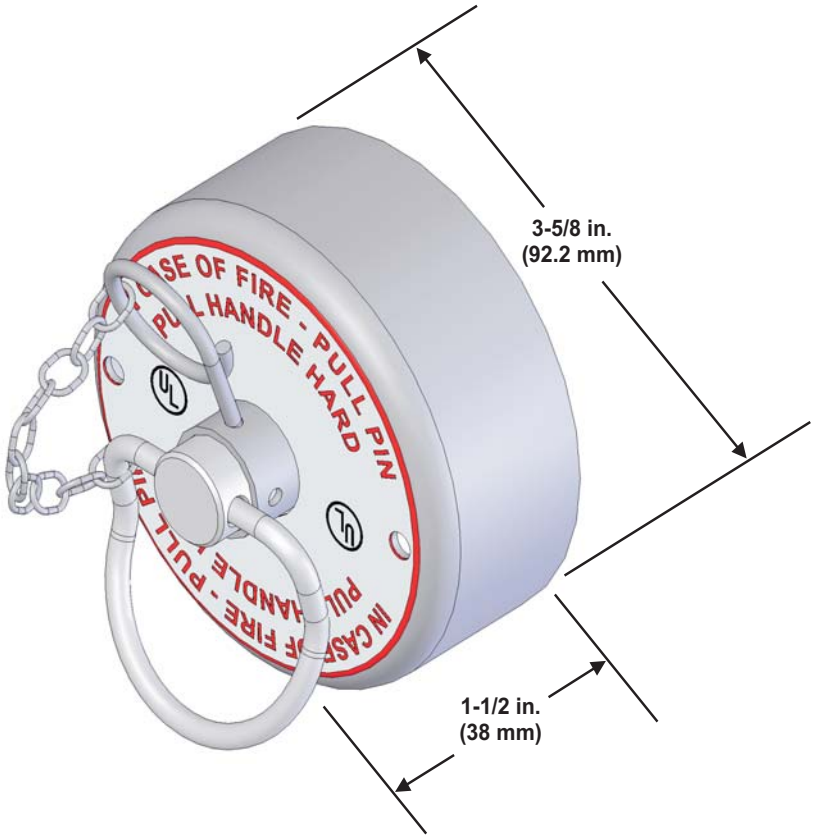

Figure 2-25. Remote Manual Release, P/N 875572

2-3.1.10 REMOTE MANUAL RELEASE PULL STATION, P/N 87-120110-001

The Remote Manual Release Pull Station, shown in Figure 2-26, is provided as a means of manually actuating the system from a remote location. The Remote Manual Release is attached to the *XV* Control System or the KRS-50 Control Box, with 1/16-inch control cable. The Remote Manual Release Pull Station is available for use in both the "un-tensioned" Pull-to-Trip and "tensioned" Release-to-Trip lines. To actuate the system at the Remote Manual Release Pull Station, pull out the safety pin and pull hard on the handle.

In the Pull-to-Trip mode (*XV* ONLY), tension will be applied to the cable, allowing the *XV* Control System to activate the Cylinder and Valve Assembly.

In the Release-to-Trip mode, removing the safety pin will release tension from the cable, allowing the *XV* Control System or KRS-50 Control Box to activate the Cylinder and Valve Assembly.

The Remote Manual Release Pull Station may be mounted in a recess or surface mount configuration. The assembly is packaged with all necessary components needed to install in either configuration. Mounting hardware is not included.

Each Remote Manual Release Pull Station is supplied with a choice of labels. The proper label must be attached to the faceplate so as to be easily read after installation. Applying the label after installation allows for vertical or horizontal mounting of the Remote Manual Release Pull Station.

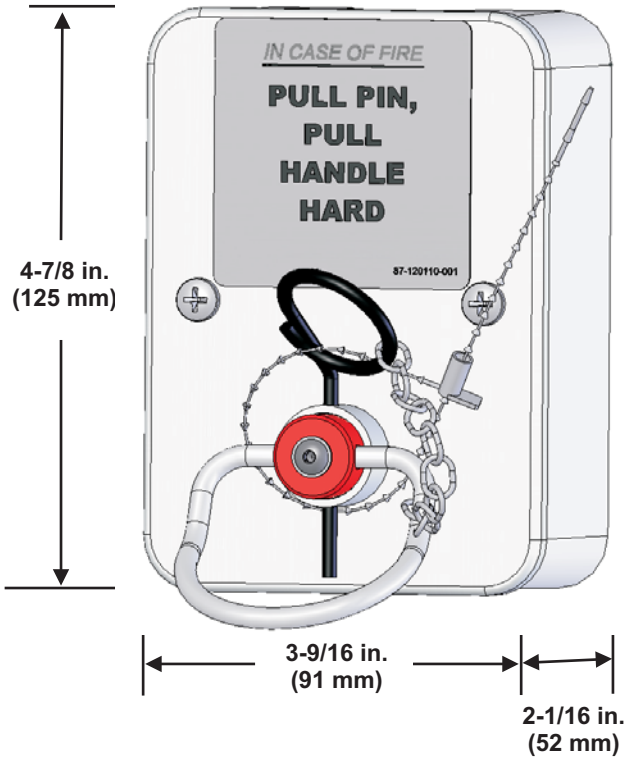

Figure 2-26. Remote Manual Release Pull Station, P/N 87-120110-001

2-3.1.11 CORNER PULLEY, P/N 844648

The Corner Pulley is used to change the direction of the control cable runs. The cable's protective conduit (1/2-inch EMT) is attached to the Corner Pulleys with the coupling nuts provided. The Corner Pulley is equipped with a ball-bearing pulley for minimum resistance to the cable travel.

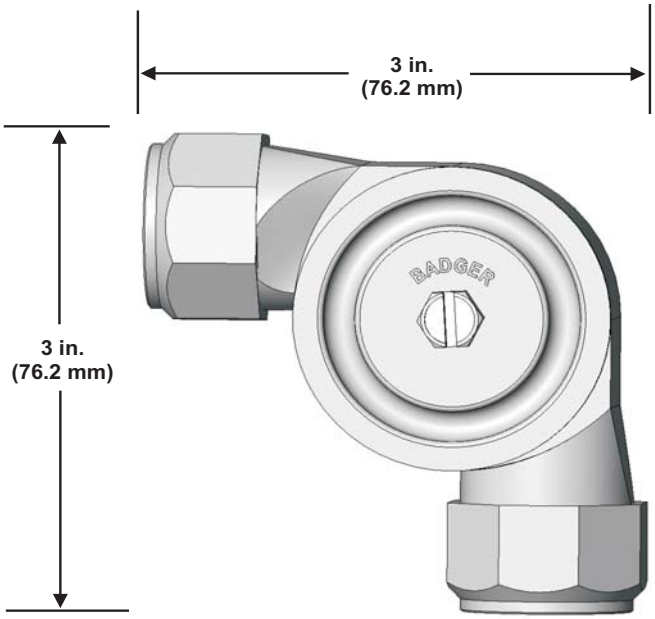

Figure 2-27. Corner Pulley, P/N 844648

2-3.1.12 TEE PULLEY, P/N 843791

The Tee Pulley is required when more than one Remote Manual Release (P/N 875572) or 2 Gas Valves are used in the same system.

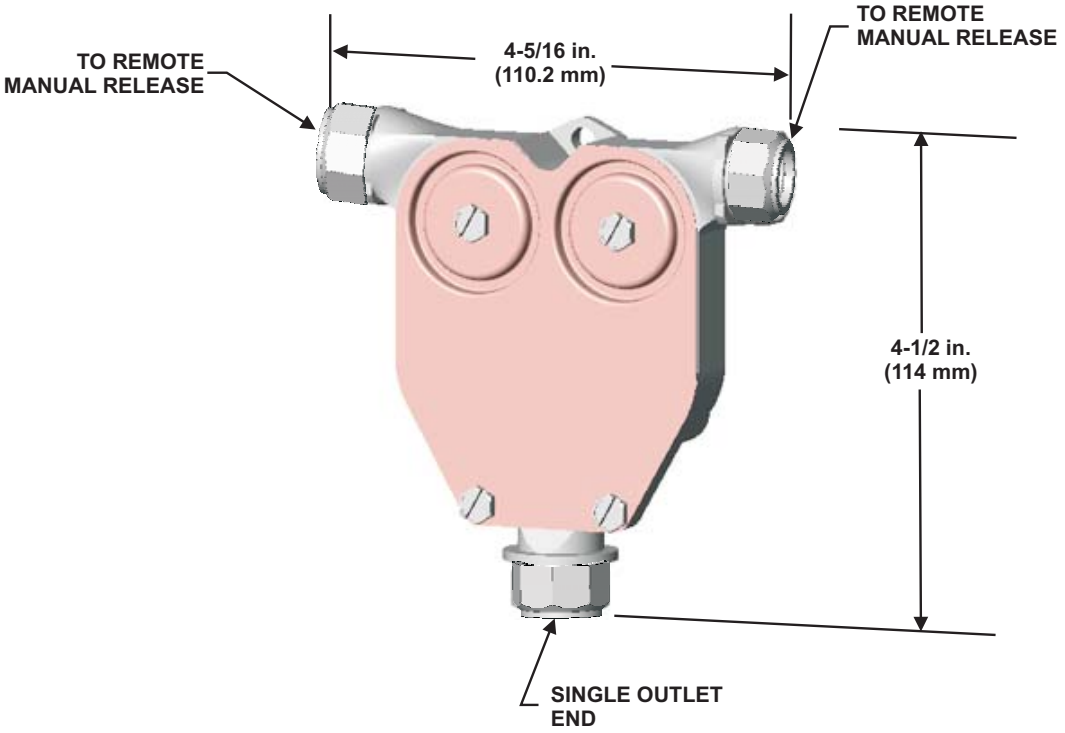

Figure 2-28. Tee Pulley, P/N 843791

2-3.2 Auxiliary Items

2-3.2.1 DETECT-A-FIRE®, MODEL 27121-0

DETECT-A-FIRE Heat Detectors are equipped with self-restoring, normally-open contacts which close when a predetermined temperature is reached. DETECT-A-FIRE Heat Detectors are designed with rate compensation. DETECT-A-FIRE Heat Detectors are available with different set points (see Table 2-10).

Note: The last digit of the part number identifies the temperature setting.

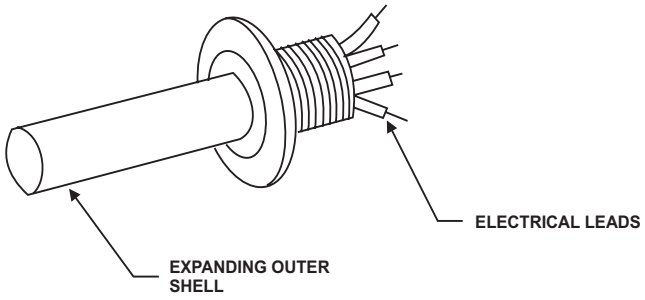

Figure 2-29. DETECT-A-FIRE Heat Detector, Model 27121-0

Table 2-10. DETECT-A-FIRE (Model 27121-0) Heat Detector Set Points

Part Number	Set Point	Tolerance	Maximum Exposure Temperature
12-E27121-000-02	140°F (60°C)	+7°F/-8°F	80°F (27°C)
12-E27121-000-03	160°F (60°C)	+7°F/-8°F	100°F (38°C)
12-E27121-000-04	190°F (88°C)	+7°F/-8°F	100°F (38°C)
12-E27121-000-05	225°F (107°C)	+7°F/-8°F	125°F (52°C)
12-F27121-000-06	325°F (163°C)	±10°F	225°F (107°C)
12-G27121-000-07	450°F (232°C)	±15°F	350°F (177°C)
12-H27121-000-08	600°F (316°C)	±20°F	500°F (260°C)
12-F27121-000-10	270°F (316°C)	±10°F	175°F (79°C)
12-F27121-000-07	360°F (316°C)	±10°F	260°F (127°C)
12-H27121-000-07	725°F (316°C)	±25°F	625°F (329°C)
12-G27121-000-08	500°F (316°C)	±15°F	400°F (204°C)
12-E27121-000-06	210°F (316°C)	+7°F/-8°F	110°F (43°C)

2-3.2.2 PRESSURE OPERATED SWITCH, P/N 486536

Pressure Operated Switches can connected to the nitrogen actuation lines of the *XV* Control System (maximum of two) and/or to the agent distribution piping. The Pressure Operated Switches can be operated manually be pulling up on the stem. Pressure Operated Switches are used to:

- enunciate alarms,
- shut down ventilation and/or other electrical equipment.

Each Pressure Operated Switch, (three pole, single-throw switch), must be manually reset, by pushing down on the stem to return the switch to the set position.

Table 2-11. Pressure Operated Switch Electrical Ratings

125 Vac	15 Amp
250 Vac	10 Amp
125-480 Vac	3/4 HP 1-2-3 Phase

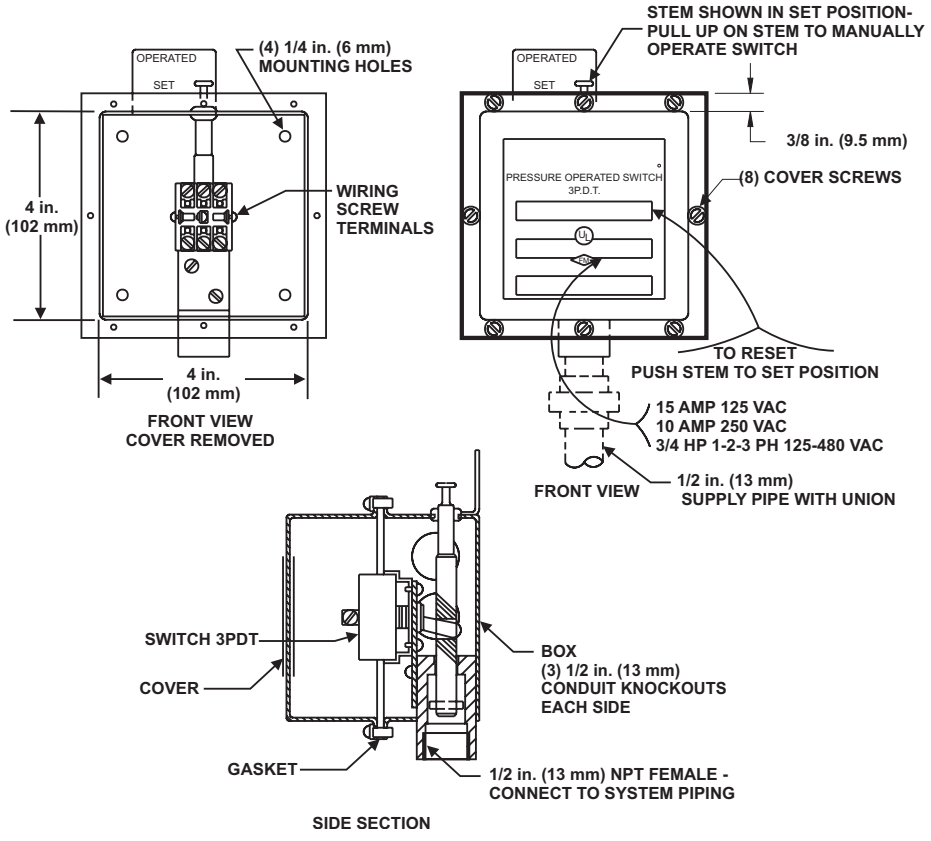

Figure 2-30. Pressure Operated Switch, P/N 486536

2-3.2.3 PRESSURE OPERATED RELEASE, P/N 874290

The Pressure Operated Release, shown in Figure 2-31, can be used to isolate the protected spaces upon system discharge. Pressure Operated Release can be used to release dry chemical gas valves, operate self-closing units for doors, windows, dampers, etc.

When a system discharges, pressure on the piston within the Pressure Operated Release causes the piston to move, thereby retracting a normally protruding pin.

Table 2-12. Pressure Operated Release Load Rating

Maximum Load	Minimum Pressure
100 lb. (45 Kg)	75 PSIG (5.17 bar)

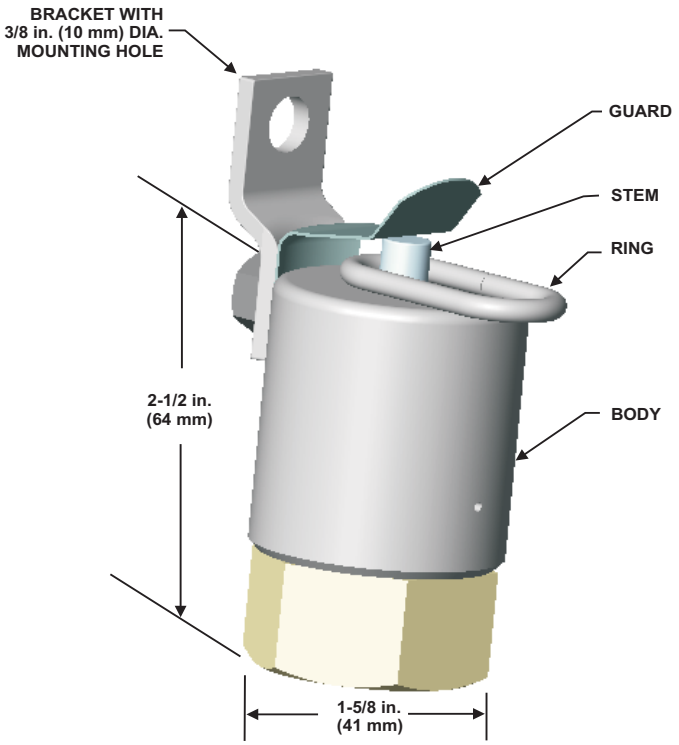

Figure 2-31. Pressure Operated Release, P/N 874290

2-3.2.4 MECHANICAL GAS VALVE, P/N 87-100001-XXX

A Mechanical Gas Valve is required on systems used to protect gas-fueled appliances. Upon system actuation, the control stem closes, stopping the gas flow to the appliance(s).

Note: Only Mechanical Gas Valves that are specifically UL listed and identified by part number in this manual may be used with the KIDDE system.

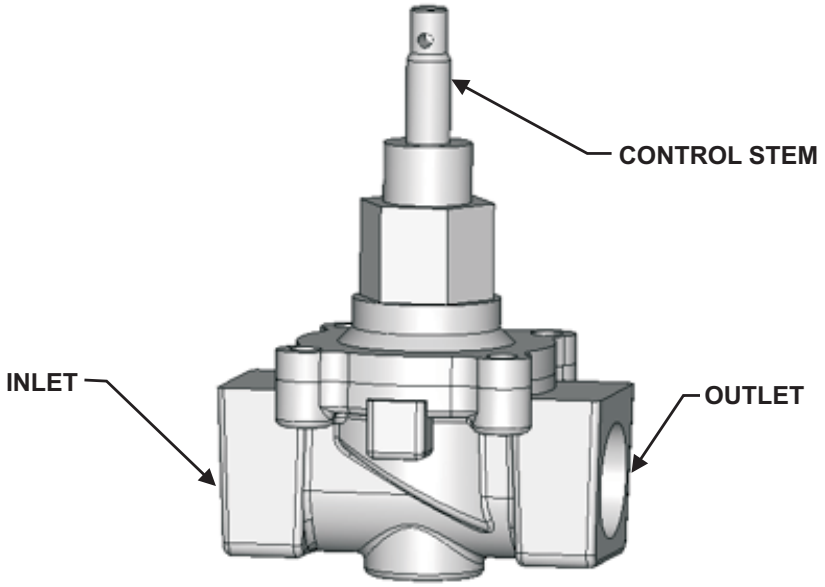

Figure 2-32. Mechanical Gas Valve

Table 2-13. Mechanical Gas Valve Sizes

Pipe Size	Part Number
3/4 in. (19 mm)	87-100001-001
1 in. (25.4 mm)	87-100001-002
1-1/4 in. (32 mm)	87-100001-003
1-1/2 in. (38 mm)	87-100001-004
2 in. (51 mm)	87-100001-005
2-1/2 in. (64 mm)	87-100001-006
3 in. (76 mm)	87-100001-007

2-3.2.5 ELECTRIC GAS VALVE

Electric Gas Valve (Figure 2-33) operates on (120V, 60 Hz) which powers an electric solenoid holding the valve open. This valve is controlled by a pressure switch or microswitch and the Manual Reset Relay Box (P/N 60-9101735-000). Upon system actuation, the valve is closed, stopping the gas flow to the appliance(s). A loss of electrical power will also cause the Electric Gas Valve to close.

See Table 2-14 for a list of the electric gas valve sizes.

All Electric Gas Valves must be installed horizontally with the solenoid up.

Note: The electric gas valve and the Manual Reset Relay must be specifically UL listed for use with the KIDDE system.

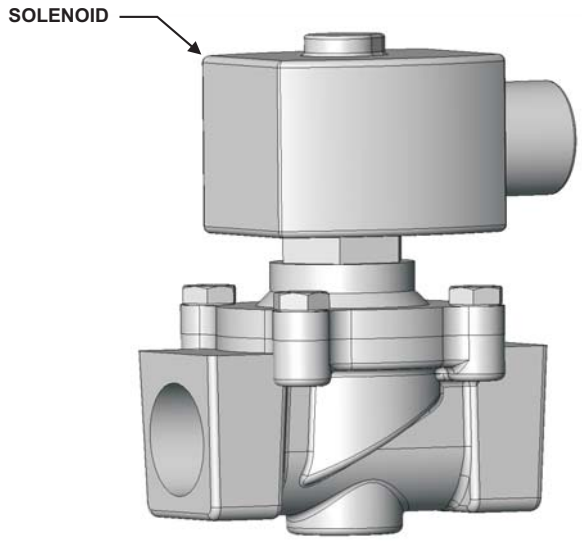

Figure 2-33. Electric Gas Valve

Table 2-14. Electric Gas Valve Sizes

Size	Part Number
1/2 in. (13 mm)	60-9197017-000
3/4 in. (19 mm)	60-9197018-000
1 in. (25 mm)	60-9197019-000
1-1/4 in. (32 mm)	60-9197020-000
1-1/2 in. (38 mm)	60-9197021-000
2 in. (51 mm)	60-9197022-000
2-1/2 in. (64 mm)	60-9197444-000
3 in. (76 mm)	60-9197445-000

2-3.2.6 MANUAL RESET RELAY FOR ELECTRIC GAS VALVE, P/N 60-9101735-000

The manual reset relay box (Figure 2-34) provides DPDT contacts rated for 6 amps at 115 Vac and prevents immediate reopening of the Electric Gas Valve to eliminate accidental escape of gas through open hand-operated gas valves and unlit pilots after a power failure.

Note: The Electric Gas Valve and the Manual Reset Relay must be specifically UL listed for use with the KIDDE system.

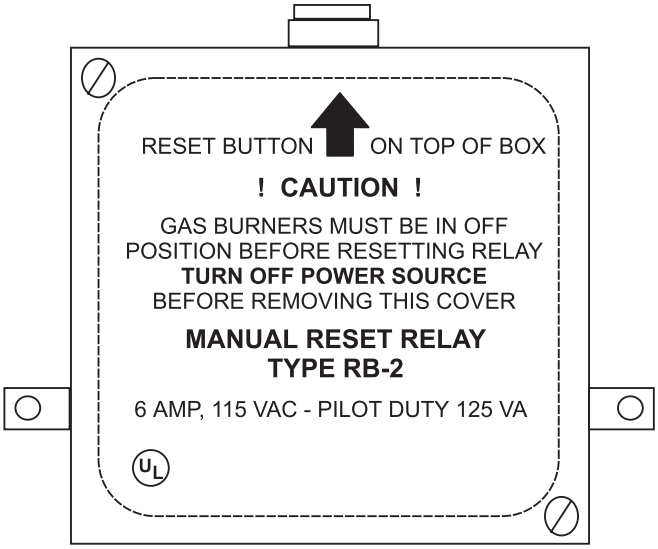

Figure 2-34. Manual Reset Relay Box P/N 60-9101735-000

2-3.2.7 MAIN-TO-RESERVE TRANSFER SWITCH, P/N 802398

The main-to-reserve transfer switch is installed on electrically activated systems using connected reserve cylinders. The switch is normally placed in the “main” position, but, in the event of a main extinguishing system discharge, the switch is placed in the “reserve” position to provide uninterrupted fire protection while the main system is being recharged.

CAUTION

Never place the main-to-reserve transfer switch in the “RESERVE” position following a main-extinguishing-system actuation unless the actuating detector or manual station has reset or been reset and the system control unit (if used) has been cleared of all alarm conditions. This will avoid inadvertent discharge of agent.

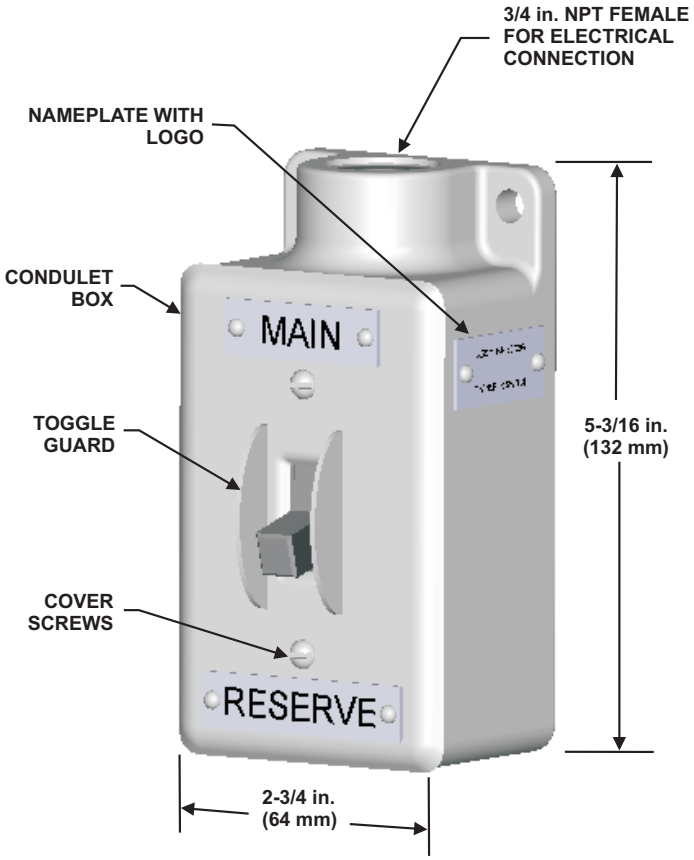

Figure 2-35. Main-to-Reserve Transfer Switch, P/N 802398

2-3.2.8 EMT AND O-RING CONNECTOR KIT, P/N 87-120058-001

If using more than the three EMT connectors supplied with the *XV* Control System, you must use EMT Connector and O-Ring Connector Kit.

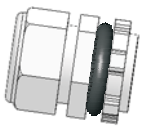

Figure 2-36. EMT and O-Ring Connector Kit

2-3.2.9 1/16-inch CONTROL CABLE, P/N 219649

The Control Cable used in the system is stainless-steel, 1/16-inch O.D., 7x7 stranded cable. The control cable runs from the various system devices, through 1/2-inch EMT conduit, to the *XV* Control System.

Table 2-15. 1/16-inch Control Cable

Part Number	Description
219649	1/16, 7x7 Cable, Stainless Steel, Reel of 500 ft. (152 m)

2-3.2.10 CRIMP SLEEVE, P/N 214951

In order to ensure that a crimp sleeve is secure, the cable must always be looped so that there are two lengths of cable inside the Crimp Sleeve before crimping. Cable must not be spliced anywhere along its length.

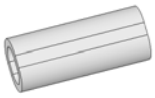

Figure 2-37. Crimp Sleeve

Table 2-16. Crimp Sleeve

Part Number	Description
214951	Cable Crimp Sleeve (order in package of 50 only)
60-9197288-000	Cable Crimp Sleeve (package of 50 of 214951)

2-3.2.11 “S” HOOKS, P/N 60-9189413-000

"S" hook (P/N 60-9187287-000) is used to attach the Fusible-Link to the 1/16-in. cable leading to the *XV* Control System.

Figure 2-38. “S” Hook

Table 2-17. “S” Hook

Part Number	Description
60-9189413-000	“S” Hook (order in package of 50 only)
60-9187287-000	“S” Hook (package of 50 of 60-9189413-000)

2-3.2.12 CRIMPING TOOL, P/N 253538

The Crimping Tool (P/N 253538), shown in Figure 2-39, is used in conjunction with Crimp Sleeves. Wherever the system 1/16-inch Control Cable must be looped or terminated, the Crimp Sleeves and Crimping Tool must be used.

Note: Splicing of the 1/16-inch Control Cable is not permitted. Other Crimping Tools are not authorized.

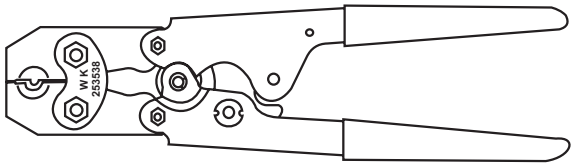

Figure 2-39. Crimping Tool, P/N 253538

2-3.2.13 SYSTEM RECHARGE

For recharge purposes, select the Dry Chemical powder (see Table 2-18) that fits your application. These powders are available in 50-pound pails.

Table 2-18. Dry Chemical Powder

Part Number	Dry Chemical
804904	Regular BC Dry Chemical powder (sodium bicarbonate base)
806411	Multi-purpose ABC Dry Chemical powder (monoammonium phosphate base)

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CHAPTER 3
SYSTEM DESIGN

3-1 INTRODUCTION

This chapter introduces the designer and installer to the design process. It outlines the process, introduces the parameters imposed on design by system hardware, as well as those mandated by performance considerations.

As the designer becomes familiar with this material, they should remember that analysis and design is a careful, step-by-step process. All steps must be followed, none can be omitted, and all unique aspects of a given application must be taken into account if the resulting fire-suppression system is to deliver the desired results.

Systems shall be designed and implemented according to the following:

- NFPA Standard 17, “Standard for Dry Chemical Systems”,
- NFPA Standard 33, "Standard for Spray Applications Using Flammable or Combustible Material",
- Other applicable NFPA standards as required for a particular application and design, including, but not limited to, NFPA 70 (NEC) and NFPA 72, Fire Alarm Standard.
- This Design, Installation, Operation, and Maintenance Manual.
- Any other standards enforced by a local Authority Having Jurisdiction (AHJ).

Configurations in this chapter are tested and listed to Underwriters Laboratories (UL) Standard 1254, and FM Approved. Open-Face Spray Booth configurations (Section 3-4.2) are tested and listed to UL Standard 1254.

3-2 APPLICATION TYPES

There are relatively few generic types of Dry Chemical fire suppression system applications. They vary from each other in terms of the nature, NFPA Class designation, and physical layout of the hazard, the flammable materials involved, whether or not the area to be protected is enclosed, whether there are associated ducts, plenums, and/or forced ventilation systems, whether there is auxiliary equipment which must be controlled as part of any fire-suppression action, and in other ways. The main application types are:

- Total-Flooding Systems
- Open-Face Spray-Booth Systems
- Local-Application Systems
- Combination Systems

3-2.1 Total-Flooding Systems

Total-Flood refers to a volumetric area that is completely enclosed.

In total-flooding, a predetermined amount of dry chemical is discharged through fixed piping and nozzles into an enclosed space or enclosure around the hazard. Total-flooding is applicable only when the hazard is totally enclosed or when all openings surrounding a hazard can be closed automatically when the system is discharged. Total-flooding can be used only where no re-ignition is anticipated. System is listed up to 5% of the hazard having uncloseable openings.

See Section 3-4.1 for total-flood design parameters.

Note: Dry Chemical Systems do not inert the atmosphere of a total-flood application. They are affective during discharge.

3-2.2 Local-Application Systems (For Indoor Use Only)

Local-Application refers to areas that are not enclosed.

In a local-application system, the nozzles are arranged to discharge directly into the fire. Local-application is practical in those situations where the hazard can be isolated from other hazards so that fire will not spread beyond the area protected, and where the entire hazard can be protected. The principal use of local-application systems is to protect open tanks of flammable liquids. Local-application is ineffective unless extinguishment can be immediate and there are no re-ignition sources.

See Section 3-4.3 for local-application design parameters.

3-2.3 Open-Face Spray Booth Systems

UL considers the Industrial Open-Front Spray Paint Booth a total-flood type of application, but enforces a specific test standard for that application. The design parameters included in “Open-Face Spray Booths (Only UL Listed)” on page 11 were arrived at by testing to this standard.

An Open-Front Spray Paint Booth has no doors on the front of the booth. During painting operations, the front remains open. A properly designed ventilation system will prevent overspray from escaping out of the booth.

The UL 1254 standard requires that the open-front be “screened” while the work area is being flooded. In addition, all parts of the ventilation system (plenum and duct) are also protected. Both ABC and BC dry chemicals are permitted in the work area and plenum of an Open-Front Spray Paint Booth. Only BC dry chemical is used in the duct.

See Paragraph 3-4 and Paragraph 3-5 for complete design parameters.

Note: Dry chemical systems for vehicle spray booths are covered in a separate manual, P/N 83-100036-001.

3-2.4 Combination Systems

Some applications combine features of total-flooding and local-application. For example, an oil-quenching system with an associated conveyor belt might require both forms of coverage in order to control combustion at the surface of the quenching bath (local- application), and along the length of the conveyor system (total-flooding). In the case of spray booths which vary widely in design, attention must be paid both to the requirements of the booth itself, as well as to associated ductwork or plenums. Sometimes the requirements of the booth may differ from the needs of the associated Duct/Plenum(s), and the analysis-design process must take this into account. Each segment of the combination system uses separate system cylinders, nozzles and distribution piping.

3-3 DESIGN PROCEDURE

3-3.1 General Design Procedure

Analysis and design should be approached as a methodical process, and performed step by step. Only when all the steps are followed is the resulting system likely to perform as desired. If any step is omitted, it is probable that the system will not function as well as it should. The steps in the analysis and design process are:

- Hazard analysis
- Suppression-system selection
- Nozzle selection, number and location
- Tankage, (Number, size, and location of cylinders)
- Detector selection
- Piping layout
- Auxiliary requirements

3-3.1.1 HAZARD ANALYSIS

Determine the NFPA Class and severity of the hazard. Analysis also includes:

- Determining the physical layout of the hazard,
- Manner and speed with which the fire might propagate, and the
- Likelihood of its spreading into adjacent areas.

The classification of flammable liquids can be found in NFPA 30: “Flammable and Combustible Liquid Code.”

Flammable liquid characteristics can be obtained from sources of reference such as safety data sheets and NFPA 325M: “Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids.”

The severity of the fire hazard generally relates to the possibility of explosive conditions created by the flammable materials within the confines of the protected area. This danger can usually be mitigated by safeguards such as:

- Adequate ventilation,
- Explosion-proof wiring and fixtures, and
- Product containerization.

CAUTION **With dry chemicals, it is important to remember that there is no inerting of the protected space following fire extinguishment.**

3-3.1.2 SUPPRESSION-SYSTEM SELECTION

Determine whether total-flooding or local-application, or both are required. Total-flooding systems are used if there is an enclosure around the hazard. Local-application techniques are used in situations where the hazard is unenclosed, but isolated from other hazards and can be protected by a Dry Chemical discharge directed at it.

3-3.1.3 NOZZLE SELECTION AND LOCATION

Select the number and type(s) of nozzle(s) needed and locate them so that the entire hazard is covered. Use the coverage/distribution specifications for each nozzle type to determine the number of discharge nozzles required to deliver the necessary quantity of dry chemical given nozzle placement appropriate to the hazard. The nozzle types are:

- Total- flooding nozzles
- High or low overhead nozzles for local-application
- Tankside nozzles for local-application
- Duct/Plenum (D/P) nozzles for use in the exhaust ducts and plenums

3-3.1.4 TANKAGE DETERMINATION (NUMBER, SIZE, AND LOCATION OF CYLINDER(S))

Determine the number of nozzles required, whether additional agent or nozzles may be needed, and select the tankage which will supply the needed amounts dry chemical. After determining the quantity and types of dry chemical needed to control the hazard itself, determine whether any special conditions necessitate additional dry chemical quantities and/or nozzles. For example, it may be necessary to adjust the agent discharge rate in order to offset the effects of ventilation, or it may be necessary to screen openings in an enclosure to prevent dry chemical leakage through those openings. Also, depending upon the criticality of the application and/or the potential for re-ignition, it may be necessary to provide a connected reserve supply of dry chemical.

3-3.1.5 DETECTOR SELECTION

Detector selection will depend on the response speed required, the probable heat level and rate of spread of the fire. The detectors sense the heat energy released by the combustion of fuel and oxygen. Upon detection of a fire, the detection system sends a signal to the system control head(s) which initiates the dry chemical discharge. The most commonly used detectors are the:

1. Fixed-temperature thermo-bulb or fusible link
2. Fixed-temperature rate-compensated thermostat

3-3.1.6 PIPING LAYOUT - BALANCED PIPING

Dry Chemical piping is balanced within ± 10% with the exception of open-front spray booths. Careful piping layout assures that the agent reaches the distribution nozzles appropriately, and that piping parameters are not exceeded. These parameters involve pipe lengths, the number of elbows, and other factors such as the allowable distances (equivalent/feet) from Cylinder and Valve Assembly. These parameters are discussed in detail in the design examples contained in the sections on application types.

3-3.1.6.1 Equivalent Length (Only UL Listed)

For the purposes of pressure drop calculations, it is convenient to replace a fitting with a section of straight pipeline. The length of the substituted piece of pipe is chosen so that the pressure drop across it equals the pressure loss through the fitting it replaced. In this sense, each type of fitting is equivalent to a certain length of straight pipeline, and each fitting is assigned an “equivalent length.” Substitutions of this type allow each point in the distribution system to be described by two numbers - one number being the actual linear length of pipe to that point, and the second number being the total equivalent length of pipe to that point, taking fittings into account.

The main supply line, the sub-supply lines (four-nozzle cylinders), and the nozzle branch lines are each rated for a maximum pipe length and a maximum equivalent pipe length.

Table 3-1. Equivalent Length of Pipe Fittings

Fitting Type	Pipe Size	
	3/4 inch	1 inch
90° Elbow	2.0	2.0
Tee	4.0	5.0

3-3.1.6.2 Flow Division

When the flow of a two-phase fluid changes in direction, such as at an elbow, the flow change can cause a separation of the nitrogen gas and the Dry Chemical powder. In order to ensure the proper flow division of dry chemical at each tee, certain minimum pipe lengths must be observed when approaching a tee following a change in flow direction. These minimum pipe lengths are shown in Figure 3-1.

Note: These minimum pipe lengths also apply to local-application systems.

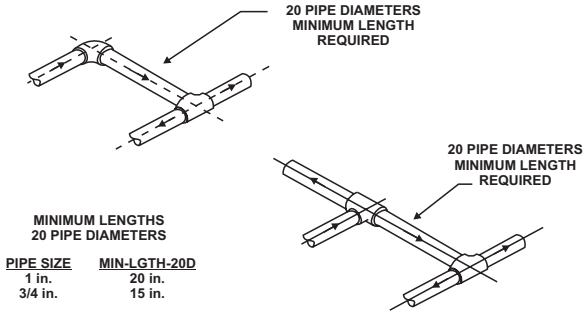

Figure 3-1. Distribution Systems Requiring Minimum Pipe Lengths

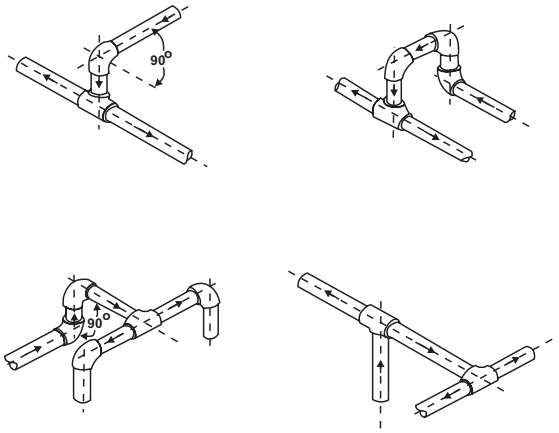

Figure 3-2. Distribution Systems Requiring No Minimum Pipe Length

3-3.1.6.3 Material for Pipe and Fittings

All piping must be Schedule 40, hot-dipped-galvanized steel pipe, and all fittings must be, at a minimum, standard weight (150-lb. class). Examples of acceptable fitting materials include hot-dipped-galvanized malleable iron, ductile iron, or steel. Couplings and unions may be used where necessary, and reducing bushings or reducing tees can be used for changes in pipe diameter.

Note: Black steel pipe and fittings can be used in relatively noncorrosive atmospheres.

3-3.1.7 AUXILIARY REQUIREMENTS

Controls are required to turn off forced-draft ventilation systems, fuel (or combustible-liquid) pumps, conveyers, and so on.

3-4 SYSTEM DESIGN: SUPPRESSION

3-4.1 Total-Flooding Systems

Total-flooding systems are used when there is an enclosure around the protected equipment or material. Total-flooding systems are designed to fill the enclosure with a concentration of Dry Chemical sufficient to extinguish a fire in the combustibles involved. All ventilation must be shut-down at the time of agent discharge and, if possible, all openings must be closed. Discharge of the Dry Chemical is through fixed, mounted nozzles connected to one or more cylinders.

Regular, BC (sodium-bicarbonate base) Dry Chemical is used to protect flammable or combustible liquid total-flooding hazards. Multi-purpose, ABC (monoammonium-phosphate base) dry chemical is used for total-flooding applications involving ordinary combustibles (Class A) and flammable or combustible liquids.

3-4.1.1 COVERAGE

The protected space is divided into modules. For applications with ceiling heights up to and including 12 feet, the maximum surface area coverage for each nozzle is 112.5 square feet subject to a longest side for rectangular areas not to exceed 15 feet. The maximum distance from the ceiling to the nozzle tip is 4.5 inches.

The maximum area and volume coverages are shown in Figure 3-3 and in Table 3-2. Each nozzle should be centered in its protected volume segment. For applications with ceiling heights from 12 feet up to 20 feet, the maximum volume is 1350 cubic feet subject to a longest side for rectangular areas not to exceed 15 feet.

Table 3-2. Total-Flooding Nozzle Coverage

Maximum Coverage per Nozzle			
Hazard Height (Feet)	**Longest Side (Feet)**	**Area (Square Feet)**	**Volume (Cubic Feet)**
5	15	112.5	562.5
6	15	112.5	675
7	15	112.5	787.5
8	15	112.5	900
9	15	112.5	1012.5
10	15	112.5	1125
11	15	112.5	1237.5
12	15	112.5	1350
13	15	103.85	1350
14	15	96.4	1350
15	15	90	1350
16	15	84.4	1350
17	15	79.4	1350
18	15	75	1350
19	15	71	1350
20	15	67.5	1350

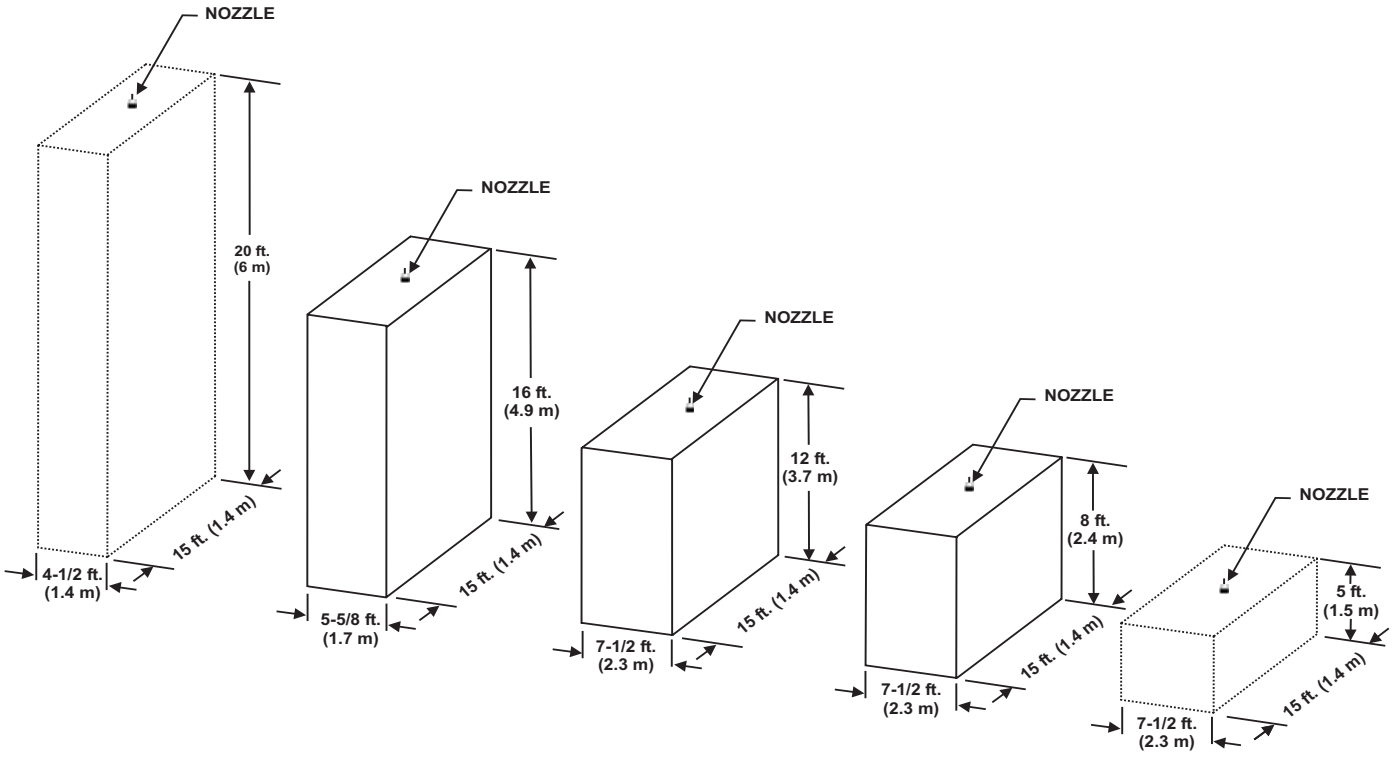

Figure 3-3. Single Nozzle Total-Flooding Module

3-4.1.1.1 Uncloseable Openings

Hazards with an uncloseable-opening area equal to 5% or less of the total enclosure surface area do not require any additional dry chemical.

The Kidde dry chemical extinguishing system units have not been evaluated by Underwriters Laboratories Inc. with respect to the total-flood protection of hazards incorporating uncloseable openings exceeding 5% of the total hazard surface area.

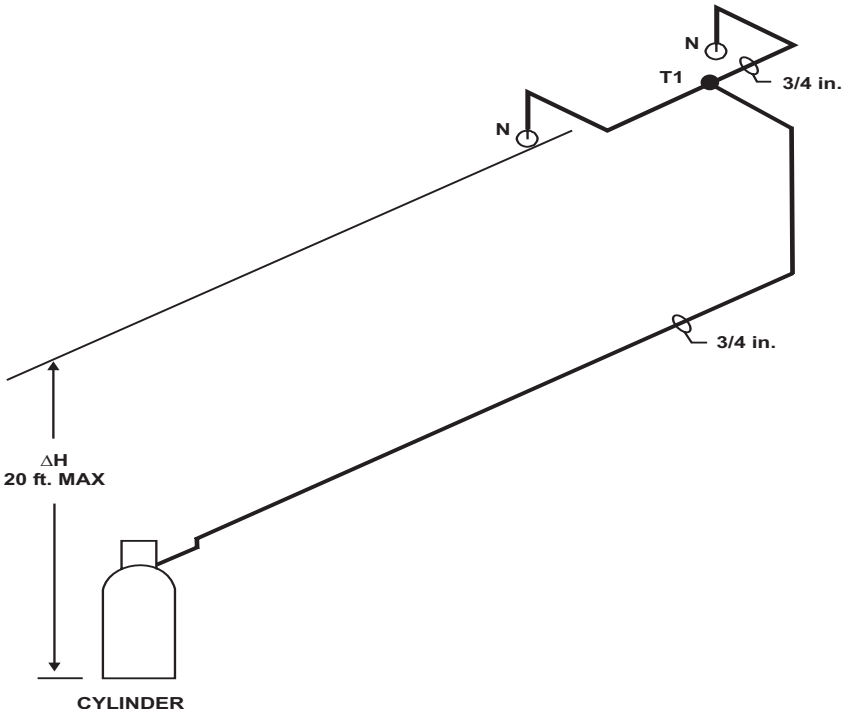

Figure 3-4. Piping Parameters, Total-Flooding Coverage, IND-25/IND-21

Table 3-3. Total-Flooding Piping Parameters (IND-25/IND-21)

Item	Maximum Limits					
	Cylinder to T1			T1 to Nozzle		
	Pipe Size	Quantity	Equiv. Length	Pipe Size	Quantity	Equiv. Length
Pipe	3/4 in.	75 ft.	75 ft.	3/4 in.	7 ft.	7 ft.
90° Ell	3/4 in.	7	14 ft.	3/4 in.	2	4 ft.
Tee	3/4 in.	1	4 ft.	3/4 in.	0	-
		Total Maximum	93 ft.		Total Maximum	11 ft.

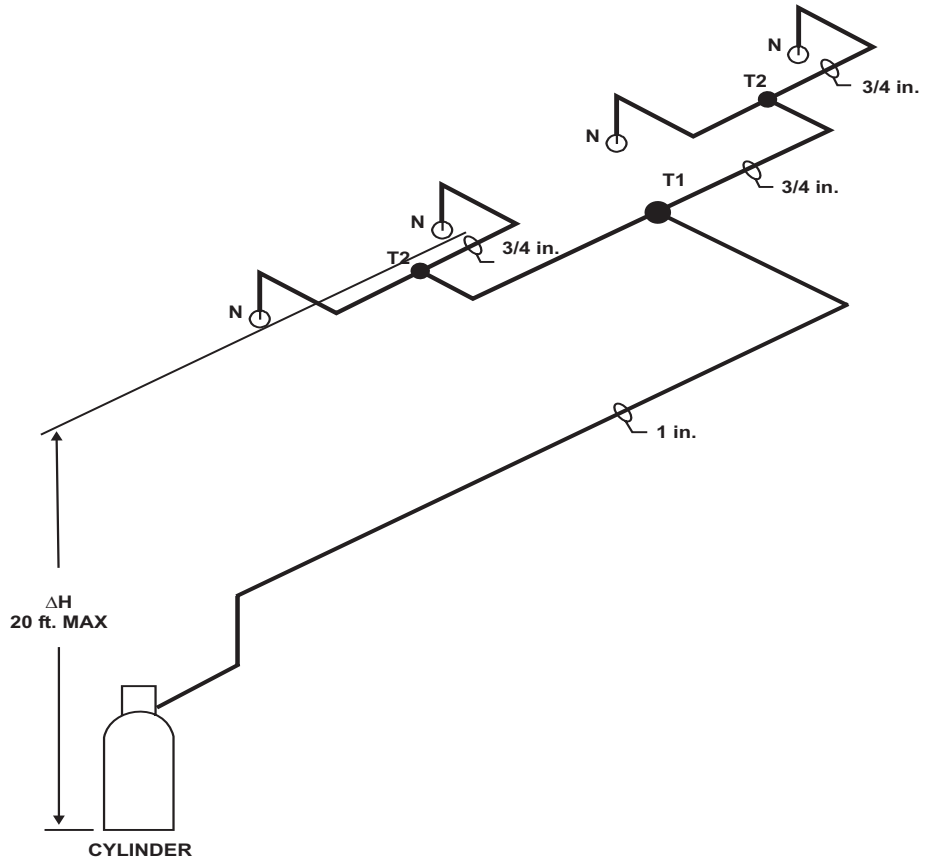

Figure 3-5. Piping Parameters, Total-Flooding Coverage, IND-50/IND-45

Table 3-4. Total-Flooding Piping Parameters (IND-50/IND-45)

Item	Maximum Limits								
	Cylinder to T1			T1 to T2			T2 to Nozzle		
	Pipe Size	Qty	Equiv. Length	Pipe Size	Qty	Equiv. Length	Pipe Size	Qty	Equiv. Length
Pipe	1 in.	60 ft.	60 ft.	3/4 in.	15 ft.	15 ft.	3/4 in.	7 ft.	7 ft.
90° Ell	1 in.	7	14 ft.	3/4 in.	1	2 ft.	3/4 in.	2 ft.	4 ft.
Tee	1 in.	1	5 ft.	3/4 in.	1	4 ft.	3/4 in.	0	-
Total Maximum			79 ft.	Total Maximum		21 ft.	Total Maximum		11 ft.

3-4.2 Open-Face Spray Booths (Only UL Listed)

Open-face spray booths are a unique hazard type for pre-engineered dry chemical systems. In response to the need for fire protection for this hazard Underwriters Laboratories (UL) has developed a specific test protocol within the UL 1254 (Pre-engineered Dry Chemical Extinguishing System Units) Standard. The system hardware and design included in this section meets the UL requirements for protection of open-face spray-booth applications. This design also meets the requirements of NFPA 17.

3-4.2.1 GENERAL DESCRIPTION

An open-face spray booth is an enclosure with one wall open (typically the front face) in which parts and equipment are sprayed with possible flammable or combustible material (i.e. paints, finishes, lacquers, etc.). When in operation, the booth is continually ventilated to remove the flammable vapors that are generated during spraying operations.

A typical open-face spray booth is usually divided into two sections by a large bank of filters that extends from the floor to the ceiling. The filters collect the over-spray of paint or other materials, and remove suspended droplets from the mixture of air and flammable vapors being exhausted.

The two sections of the spray booth are called the work area and the plenum. The work area is typically the larger of the two sections, and is the place where the parts and equipment are sprayed. The plenum is the space into which the exhaust gases flow after passage through the filter bank.

The vapors are exhausted from the spray booth by a forced ventilation system connected to the plenum by ductwork. The exhaust gases eventually discharge to atmosphere. The spray booth, shown in Figure 3-8 has an open-front face.

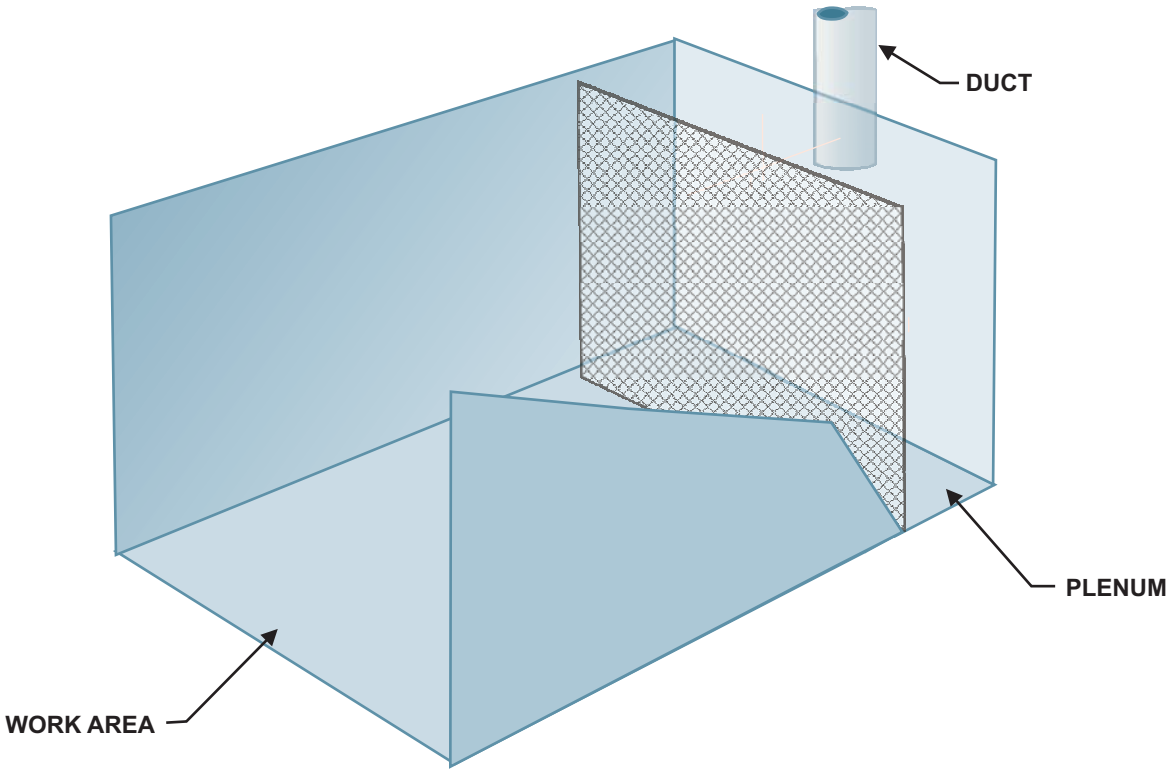

Figure 3-6. Open-Face Spray Booth

CAUTION

NFPA 33, standard for spray application using flammable and combustible materials, classifies the interior sections of paint spray booths, and certain areas adjacent to booth openings, as Class-I or Class-II, Division-2 locations. Dry chemical system electrical components, such as thermostats, located within these areas shall be rated for use in classified areas, and all wiring to these components shall conform to the provisions of NFPA 70, National Electrical Code, for Class-I or Class-II, Division-2 locations. Any industrial system control head with a microswitch is not suitable for use in a classified area.

3-4.2.2 SPRAY BOOTH PROTECTION

Open-face spray booths are specifically protected using the following design criteria. This design is UL Listed for protection of open-face spray booths.

The work area, plenum, and exhaust duct are separately analyzed to determine the total extinguishing system requirements. The IND-70 or IND-75 must be used to protect the front, work area, and plenum of the open-face spray booth. Maximum coverage and nozzle placement requirements for an open-face spray booth using one IND-75 are shown in Figure 3-7. For ABC applications, separate cylinders (IND-25 or IND-50) are required for protection of the exhaust duct.

3-4.2.2.1 Work Area

Protection for the work area is provided by total-flooding nozzles, P/N 83-100005-001.

For open-face spray booths, high overhead nozzles (P/N 259270) provide a “wall” of dry chemical across the open face. These nozzles are to be located as indicated in Figure 3-7 and Figure 3-8 and mounted at ceiling level, with the orifice tip pointed vertically down. The maximum distance from the ceiling of the work area to the screening nozzle is 4 inches. The maximum distance from the ceiling of the work area to the total-flooding nozzle is 3.75 inches.

One IND-70 or one IND-75 cylinder must use two high-overhead nozzles and two total-flooding nozzles. These four nozzles will provide coverage for the work area of an open-face spray booth with maximum dimensions of 10 feet wide by 10 feet deep by 10 feet high. For applications wider than 10 feet, multiple IND-70/75 cylinders are required (i.e. two IND-70 or IND-75 cylinders will protect an open-face spray booth up to 20 feet wide.

The maximum uncloseable work area opening using two high-overhead nozzles from one IND-70/75 cylinder is 100 square feet with 10 feet on the longest side.

Note: Care of Installation — As overspray of paint or other materials will, in time, accumulate on the detectors and discharge nozzles, making them inoperative or ineffective. It is required that the nozzle orifices be protected with “blow-off” caps on total-flood nozzles.

3-4.2.2.2 Plenum

Protection for the plenum is provided by the Duct/Plenum (D/P) nozzle, P/N 83-100006-001. This nozzle is to be centered in the plenum area and mounted at ceiling level, with the orifice tip pointed vertically down. The maximum distance from the plenum ceiling to the Duct/Plenum nozzle is 3.25 inches. One IND-70 or one IND-75 cylinder must use two Duct/Plenum nozzles. This nozzle will provide coverage for the plenum area of an open-face spray booth with maximum area of coverage of 31.5 square feet with the longest side of 10 feet. The maximum height is 10 feet. For plenum areas greater than 31.5 square feet or with a longest side greater than 10 feet an additional Duct/Plenum nozzle is required. See Figures 3-7, 3-8, and 3-10.

It is permissible to split the discharge from an IND-75 cylinder using Duct/Plenum nozzles in the plenum and exhaust duct. See Figures 3-7, and Figure 3-8.

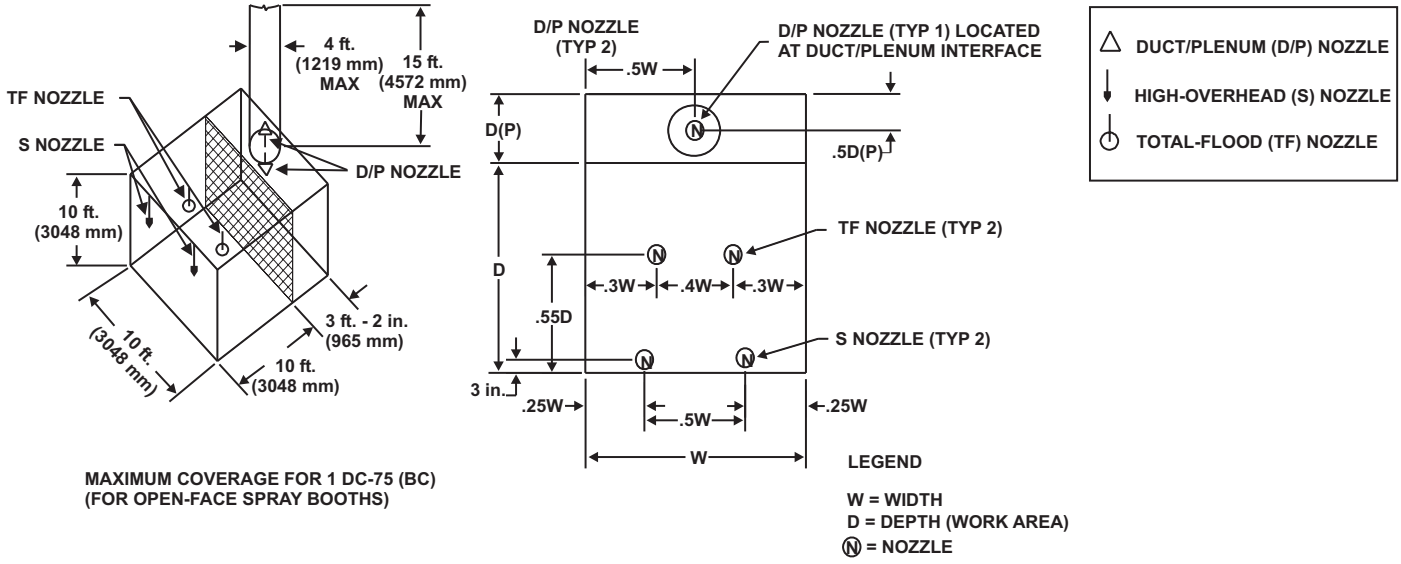

Figure 3-7. Spray Booth Parameters (1)

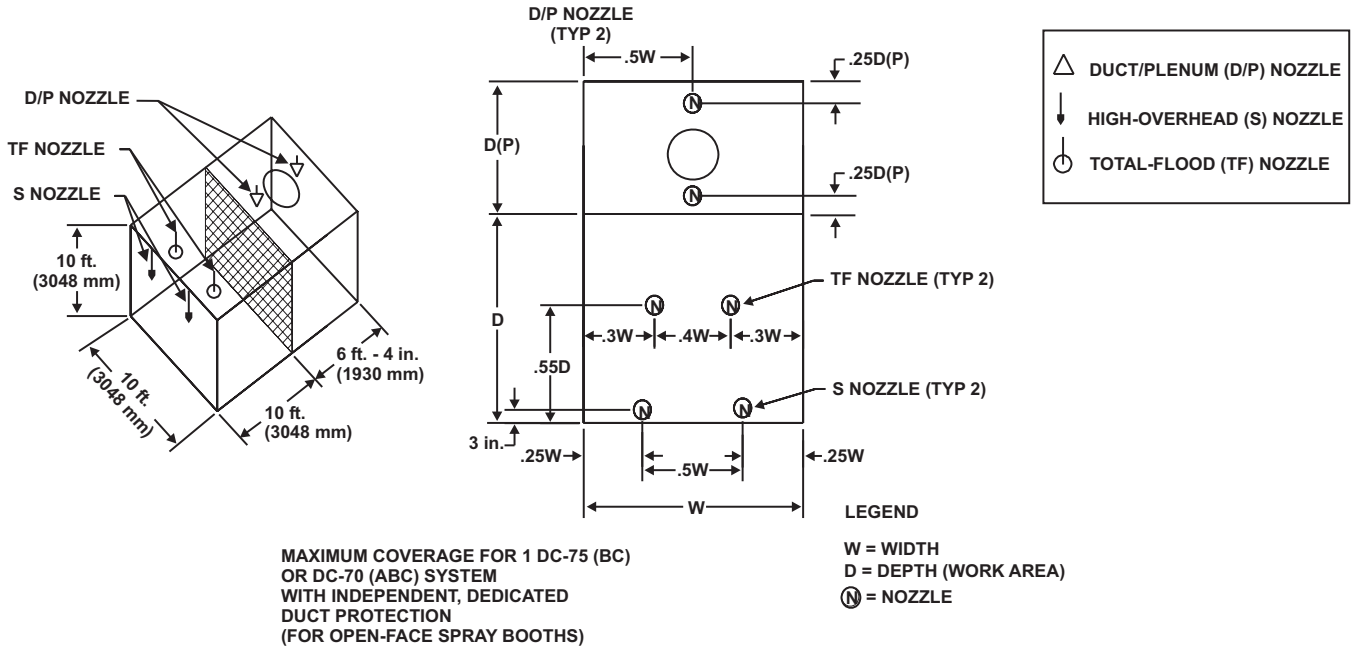

Figure 3-8. Spray Booth Parameters (2)

3-4.2.2.3 Exhaust Ducts (BC Only)

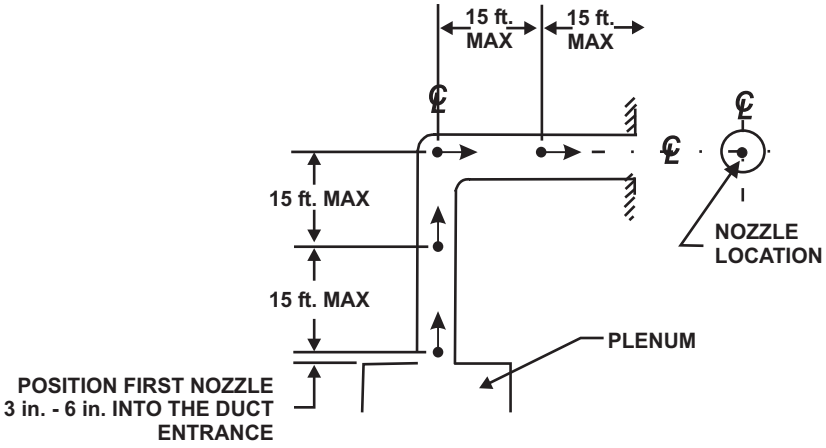

Figure 3-9. Exhaust-Duct Parameters (1)

Protection for the exhaust duct is provided by the Duct/Plenum (D/P) nozzle(s) utilizing regular BC agent only. When the work area and plenum are protected using multipurpose ABC agent, then IND-25 or -50 cylinders are required to supply the BC agent for the duct. Refer to Figures 3-12, and Figure 3-13 for piping parameters. See Table 3-5, for nozzle requirements for exhaust duct protection. See Table 3-6 for rectangular duct dimensions.

Table 3-5. Duct/Plenum (D/P) Parameters

Maximum Length of Protection per Nozzle	15 ft. (4.6 m)
Duct Maximum Diameter	48 in. (1219 mm)
First Nozzle	Positioned just inside the duct entrance from 3 in. to 6 in.
Additional Nozzles	Within 15 ft. (4.6 m) of each other
Nozzle Direction	Centered in the duct and aimed to discharge directly downstream (in the direction of air flow)

The Exhaust Duct is a fan-powered air channel that draws air through the work area, the plenum and out through the duct. The D/P Nozzle will protect either round or rectangular ducts up to 15 ft. (4.6 m) in length.

Any change in duct direction or additional length requires an additional D/P Nozzle. The duct nozzle must be centered at the duct entrance, and pointed in the direction of the air flow. The tip of the duct nozzle must be within 6 in. (152 mm) of the duct entrance. The maximum diameter of a round duct is 48-inches (1219 mm); the maximum perimeter for a rectangular duct is 150-3/4 inches (3830 mm) and the maximum diagonal is 48-inches (1219 mm). See Table 3-6 for rectangular duct dimensions.

Table 3-6. Rectangular Duct Dimensions

Side 1	Side 2 (Max.)
12.0 in. (305 mm)	46.4 in. (1179 mm)
14.0 in. (356 mm)	45.9 in. (1166 mm)
16.0 in. (406 mm)	45.2 in. (1148 mm)
18.0 in. (457 mm)	44.5 in. (1130 mm)
20.0 in. (508 mm)	43.6 in. (1107 mm)
22.0 in. (559 mm)	42.6 in. (1082 mm)
24.0 in. (610 mm)	41.5 in. (1054 mm)
26.0 in. (660 mm)	40.3 in. (1024 mm)
28.0 in. (711 mm)	38.9 in. (988 mm)
30.0 in. (762 mm)	37.4 in. (950 mm)
32.0 in. (813 mm)	35.7 in. (907 mm)
34.0 in. (864 mm)	33.8 in. (859 mm)
36.0 in. (914 mm)	31.7 in. (805 mm)
38.0 in. (965 mm)	29.3 in. (744 mm)
40.0 in. (1016 mm)	26.5 in. (673 mm)
42.0 in. (1067 mm)	23.2 in. (589 mm)
44.0 in. (1118 mm)	19.1 in. (485 mm)
46.0 in. (1168 mm)	13.7 in. (348 mm)

When exhaust-duct protection is provided using one Duct/Plenum nozzle off an IND-75 (BC) cylinder, the nozzle coverage provided is for the first 15 feet (4572 mm) of straight unobstructed duct. Supplemental coverage of the exhaust duct must be provided for exhaust ducts greater than 15 feet (4572 mm) in length or those with obstructions or changes in direction. The IND-25 (BC) or IND-50 (BC) shall be used for supplemental exhaust duct coverage. Refer to Figure 3-9 for nozzle placement in ducts with changes of direction.

CAUTION

Never place tin foil or plastic over nozzles.

Apply a thin coat of silicone grease on the outside surfaces of the thermostats. Fusible links must be changed at a minimum of every six months (more frequently if the link acquires a coating of paint or other materials). Clean the nozzles and detectors periodically to ensure there is no over-spray buildup on these parts; then re-grease or replace if necessary.

3-4.2.3 VENTILATION-SYSTEM SHUTDOWN

It is not required that the exhaust fan be stopped upon Dry Chemical discharge. Exhaust-duct protection has been tested both with and without airflow. It is recommended that the exhaust fan stay running in the event of Dry Chemical discharge. This will help to remove smoke and other airborne materials and gases from the hazard area in the event of a fire. Check with the Authority Having Jurisdiction for local requirements.

Forced (motorized fan) intake or make-up air shall be shutdown upon dry chemical discharge.

3-4.2.4 PIPING FOR OPEN-FACE SPRAY BOOTHS

Piping diagrams include parameters on pipe length and fittings. System piping must be balanced. Balanced piping is the difference between the shortest actual pipe length from any 3/4-inch tee to nozzle, and the longest actual pipe length from any 3/4-inch tee to nozzle does not exceed 10% of the longest actual pipe length from any 3/4-inch tee to nozzle. Piping runs from the 1-inch tee to each of the 3/4-inch tees, and must be equal in length. The number and type of fittings for all tees to nozzles must be equal.

All piping must be Schedule 40, hot-dipped-galvanized steel pipe, and all fittings must be, at a minimum, standard weight (150-lb. class). Examples of acceptable fitting materials include hot-dipped galvanized malleable iron, ductile iron, or steel. Couplings and unions may be used where necessary, and reducing bushings or reducing tees can be used for changes in pipe diameter.

Note: Black steel pipe and fittings can be used in relatively noncorrosive atmospheres.

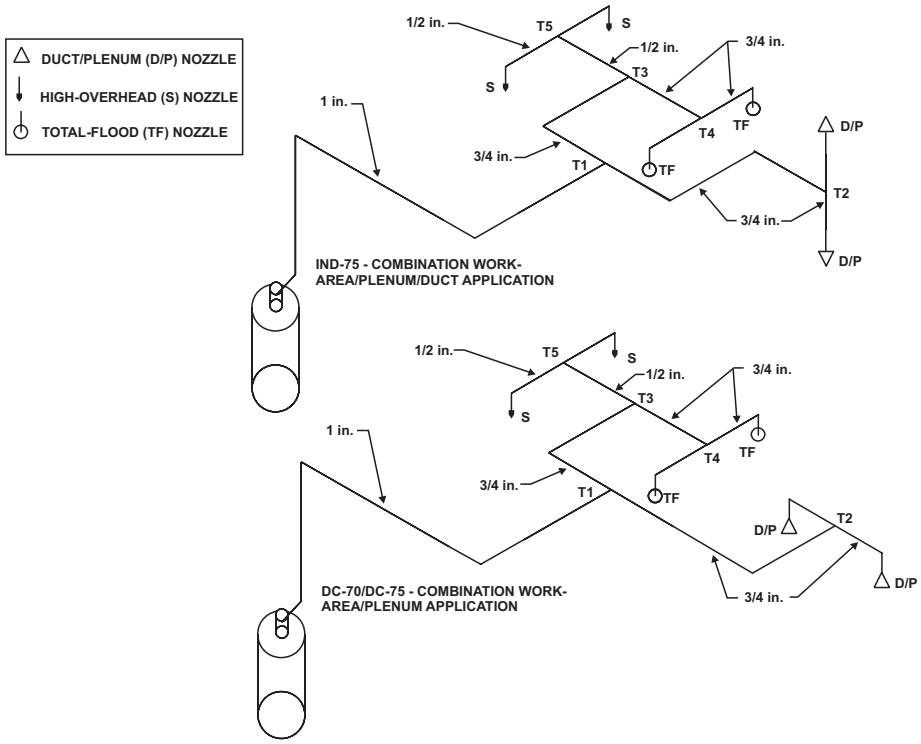

Figure 3-10. Open-Face Spray-Booth Piping

Table 3-7. Maximum Piping Parameters, IND-70/IND-75, Open-Face Spray-Booth Applications

	Cylinder to T1 - See Note 6			T1 to T2 to T3 - See Note 1			T2 to Duct/Plenum Nozzle - See Notes 2 and 7			T4 to Total-Flood Nozzle - See Notes 4 and 5			T5 to High-Overhead Nozzle - See Notes 3 and 5		
Item	**Pipe Size (in.)**	**Max. Qty**	**Equiv. Length (eq. ft.)**	**Pipe Size (in.)**	**Max. Qty**	**Equiv. Length (eq. ft.)**	**Pipe Size (in.)**	**Max. Qty**	**Equiv. Length (eq. ft.)**	**Pipe Size (in.)**	**Max. Qty**	**Equiv. Length (eq. ft.)**	**Pipe Size (in.)**	**Max. Qty**	**Equiv. Length (eq. ft.)**
Max. Pipe	1	41.9 ft.	41.9	3/4	10.5 ft.	10.5	3/4	2.6 ft.	2.6	3/4	5.5 ft.	5.5	1/2	5.5 ft.	5.5
Maximum 90° Ells	1	8	16.0	3/4	3	6.0	3/4	2	4.0	3/4	1	2.0	1/2	1	2.0
Max. Tees	1	1	5.0	3/4	1	4.0	3/4	1	4.0	3/4	1	4.0	1/2	1	4.0
Max. Equivalent Length			62.9			20.5			10.6			11.5			11.5
Max. Linear Length			41.9			10.5			2.6			5.5			5.5

Additional Guidelines for Piping:

1. Branch from Tee 1 to Tee 2 and Branch from Tee 1 to Tee 3 must be balanced.
2. The branches from Tee 2 to the Duct/Plenum (D/P) nozzles must be balanced.
3. The pipe must be balanced from Tee 5 to the two (2) High-Overhead (S) nozzles.
4. The pipe must be balanced from Tee 4 to the two (2) Total-Flooding (TF) nozzles.
5. The distance from Tee 3 to Tee 4 must be 1.2 times the distance of Tee 3 to Tee 5, not to exceed the maximums indicated in the above table.
6. Maximum elevation of supply piping above cylinder outlet must not exceed 8 feet.
7. Maximum elevation of Duct/Plenum (D/P) nozzle above Tee 2 must not exceed 2.6 feet.

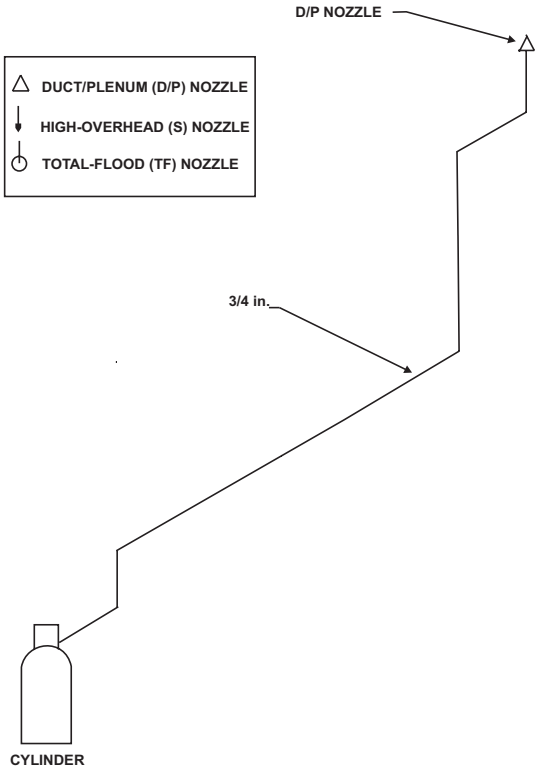

Figure 3-11. Maximum Piping Parameters (for Dedicated Duct Protection of Open-Face Spray Booths), IND-25, Single D/P Nozzle

Table 3-8. Maximum Piping Parameters IND-25, Single D/P Nozzle

Parameters	Cylinder to DP Nozzle
Required Pipe Size	3/4 in.
Maximum Linear Pipe	52 ft. 6 in. (16 m)
Maximum 90° Elbows	0-7
Delta H	38 ft. 6 in. (12 m)
Maximum Equivalent Length	66 ft. 6 in. (20 m)

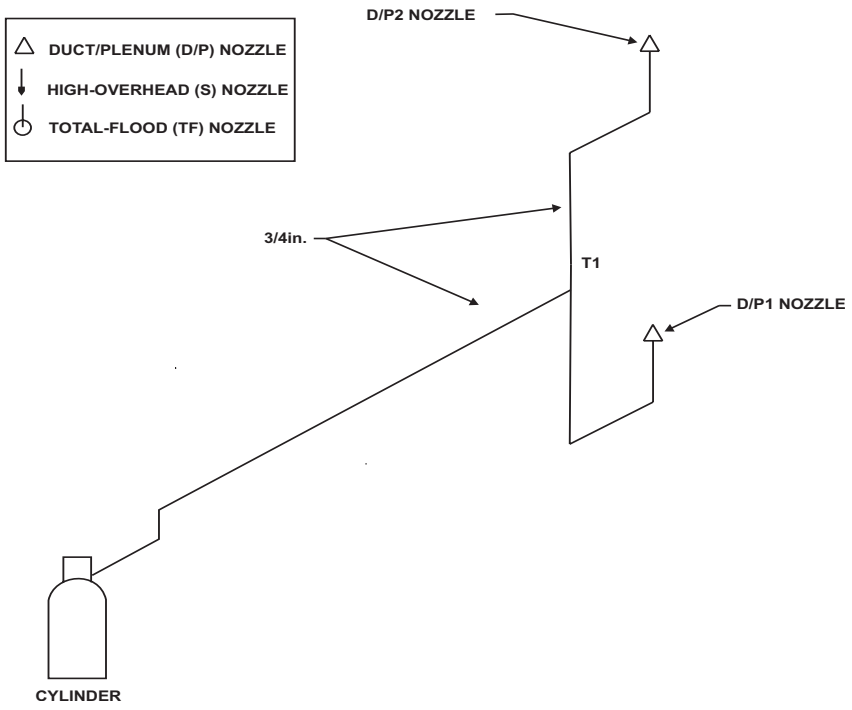

Figure 3-12. Maximum Piping Parameters (for Dedicated Duct Protection of Open-Face Spray Booths), IND-25, Two D/P Nozzles

Table 3-9. Maximum Piping Parameters, IND-25, Two D/P Nozzles

Parameters	Cylinder to T1	T1 to DP1	T1 to DP2
Required Pipe Size	3/4 in.	3/4 in.	3/4 in.
Maximum Linear Pipe	51 ft. 5 in. (16 m)	8 ft. 3 in. (3 m)	8 ft. 3 in. (3 m)
Maximum 90° Elbows	6	4	4
Maximum Tees	1	0	0
Delta H	31 ft. 6 in. (9 m)	-7 ft. 6 in. (-2 m)	7 ft. 6 in. (2 m)
Maximum Equivalent Length	67 ft. 5 in. (21 m)	16 ft. 3 in. (5 m)	16 ft. 3 in. (5 m)

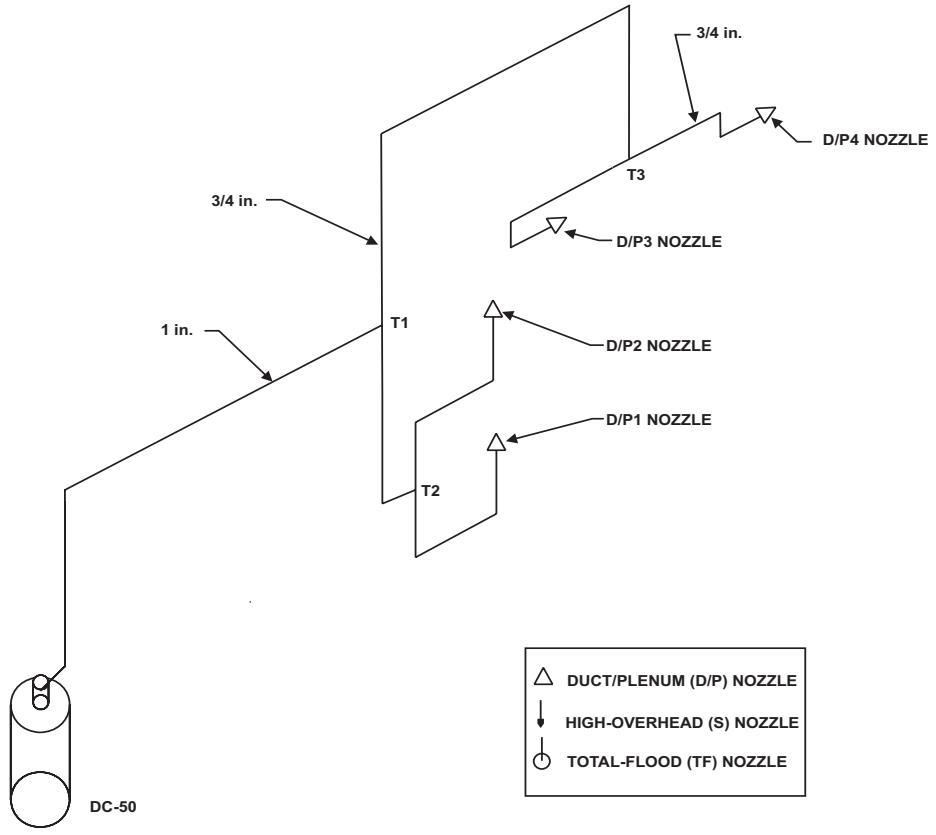

Figure 3-13. Maximum Piping Parameters (for Dedicated Duct Protection of Open-Face Spray Booths), IND-50, Four D/P Nozzles

Table 3-10. Maximum Piping Parameters, IND-50, Four D/P Nozzles

	Cylinder to T1	T1 to T2	T1 to T3	T2 to D/P1	T2 to D/P2	T3 to D/P3	T3 to D/P4
Required Pipe	1 in.	3/4 in.	3/4 in.	3/4 in.	3/4 in.	3/4 in.	3/4 in.
Maximum Linear Pipe	52 ft. 9 in. (16 m)	20 ft. 10 in. (m)	19 ft. 11 in. (6 m)	8 ft. 6 in. (2.6 m)	8 ft. 6 in. (2.6 m)	8 ft. 6 in. (2.6 m)	8 ft. 6 in.
Maximum 90° Elbows	8	4	4	4	4	4	4
Maximum Tees	1	1	1	0	0	0	0
Delta H	15 ft. 7 in. (5 m)	-11 ft. 3 in. (-3.5 m)	11 ft. 3 in. (3.5 m)	-7 ft. 6 in. (-2 m)	7 ft. 6 in. (2 m)	0	0
Maximum Equivalent Length	73 ft. 9 in. (22.5 m)	32 ft. 10 in. (10 m)	31 ft. 11 in. (10 m)	16 ft. 6 in. (5 m)	16 ft. 6 in. (5 m)	16 ft. 6 in. (5 m)	16 ft. 6in. (m)

3-4.3 Local-Application Systems

Local-application systems are used when there is no enclosure around the equipment or process being protected. In a local-application system, the dry chemical is discharged directly on an unenclosed hazard through fixed nozzles connected to one or more cylinders. Local-application protection is designed to cover a fixed piece of equipment such as a dip tank or a process in an indoor location.

The dry chemical can be locally applied either overhead with nozzles located over the hazard area, or in a tankside manner with nozzles located along the sides of a flammable or combustible liquid tank. The dry chemical is applied directly at and parallel to the surface of the flammable liquid, thus the dry chemical discharge is not affected by thermal updrafts.

Regular, BC (sodium bicarbonate base) dry chemical is used on all local-application hazards involving flammable or combustible liquids in depth. Shut down process and ventilation in the event of a dry chemical system discharge.

Note: For use only with IND-50 cylinder/valve assembly, P/N 486571. For indoor use only.

3-4.3.1 OVERHEAD NOZZLE COVERAGE, P/N 844258 AND 259270

The protected area is divided into area segments for coverage purposes. Each nozzle should be centered above its protected-area segment. The constraint that for rectangular areas the longest side shall not exceed 5 feet.

Table 3-11. Overhead Nozzle Coverage

Area	Low Overhead Nozzle P/N 844258	High Overhead Nozzle P/N 259270
Maximum Surface Coverage	18.75 square feet	18.75 square feet
Location	6 to 8 feet (1.8 m to 2.4 m)	8 to 11 feet (2.4 m to 3.4 m)
Flammable or Combustible Liquid Freeboard	6 inches (152.4 mm)	6 inches (154.2 mm)

One IND-50 cylinder must use four overhead nozzles (low or high, but not mixed on the same piping from one cylinder), providing a total area coverage of 75 square feet. The coverage obtainable with one IND-50 cylinder is shown in Figures 3-14 and 3-15.

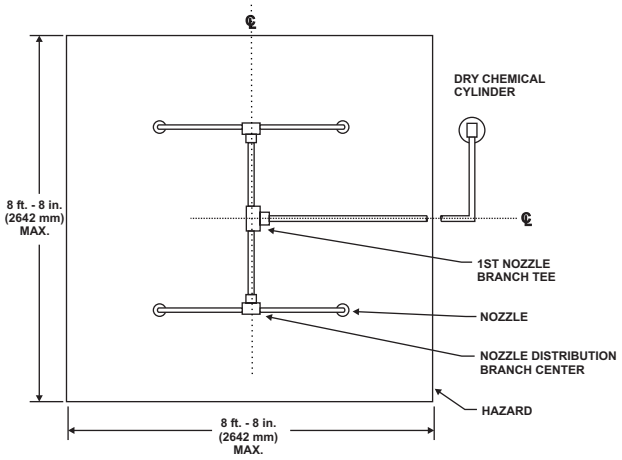

Figure 3-14. Overhead Local-Application Coverage (IND-50), Square Hazard Area

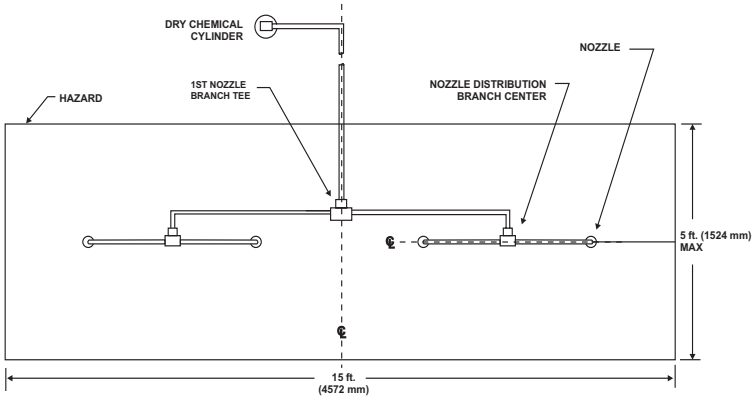

Figure 3-15. Overhead Local-Application Coverage (IND-50), Rectangular Hazard Area

3-4.3.2 TANKSIDE NOZZLE COVERAGE

Note: For use only with IND-50 cylinder/valve assembly, P/N 486571

Overhead discharge is hampered by the convection currents created by the fire.

The protected area is divided into area segments for coverage purposes. The maximum surface-area coverage for each tankside nozzle, P/N 259072, is 25 square feet, subject to the constraint that, for rectangular areas, the longest side shall not exceed 10 feet. Each nozzle should be centered on one side of its protected-area segment.

One IND-50 cylinder must use four tankside nozzles providing a maximum total area coverage of 100 square feet.

The tankside nozzle must be installed so that its discharge slit (or pattern) is horizontal to the flammable- or combustible-liquid surface and is directed to the opposite side of the tank. In addition, the nozzle must be located at least 4 inches above the highest liquid level in the tank. This allows the nozzle to be located at any desired distance below the lip of the tank, provided that the nozzle is positioned at least 4 inches above the highest liquid level. The coverages obtainable with one IND-50 cylinder are shown in Figures 3-16, 3-17, and 3-18.

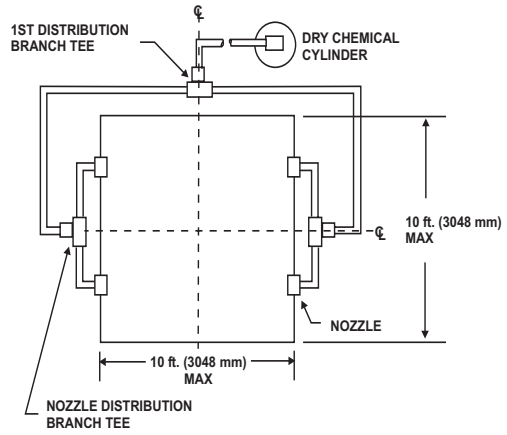

Figure 3-16. Tankside Nozzle (IND-50), Two-Sided Coverage, Square Hazard Area

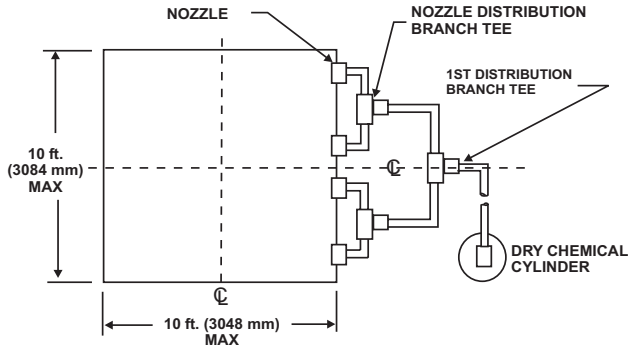

Figure 3-17. Tankside Nozzle (IND-50), Single-Sided Coverage, Square Hazard Area

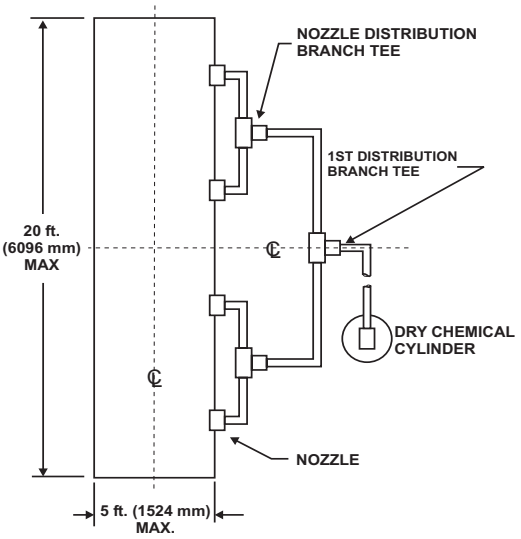

Figure 3-18. Tankside Nozzle (IND-50), Single-Sided Coverage, Rectangular Hazard Area

3-4.3.2.1 Overhead-System Piping Parameters

All IND-50 cylinders shall use four discharge nozzles for overhead local-application systems, subject to the parameters shown in Figure 3-19 and Table 3-12 for square hazards, and subject to the parameters in Figure 3-20 and Table 3-13 for rectangular hazards.

All piping shall be balanced, with an identical routing of pipe from the cylinder to each discharge nozzle. Actual pipe lengths and numbers of fittings shall be equal for each nozzle. When installing nozzles, a tolerance of + 2-1/2% of the final nozzle location dimension is permitted.

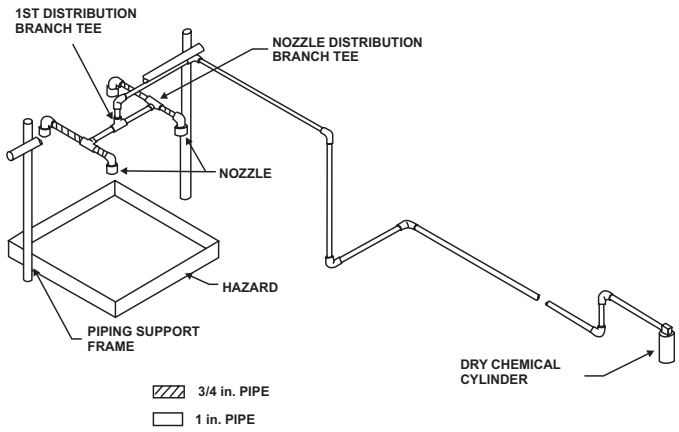

Figure 3-19. Overhead Local-Application System (IND-50), Square Hazard Area

Table 3-12. IND-50 Piping Parameters, Overhead Local-Application System, Square Hazard Area

Item	Pipe Size (Inches)	From	To	Low-Overhead Nozzle: 6 to 8 Feet		High-Overhead Nozzle: 8 to 11 feet	
				Max.	Min.	Max.	Min.
Pipe	1	Dry Chemical Cylinder	First Distribution Branch Tee	63 ft. 0 in. (19 m)	22 ft. 2 in. (7 m)	83 ft. 0 in. (25 m)	24 ft. 2 in. (7 m)
	3/4	First Distribution Branch Tee	Nozzles	15 ft. 6 in. (5 m)	5 ft. 0 in. (2 m)	15 ft. 6 in. (5 m)	5 ft. 0 in. (2 m)
Ell	1	Dry Chemical Cylinder	First Distribution Branch Tee	7	7	7	7
	3/4	First Distribution Branch Tee	Nozzles	4	4	4	4
Tee	3/4 x 3/4 x 1	1-inch Pipe	3/4-inch Pipe	1	1	1	1
	3/4	3/4-inch Pipe	3/4-inch Pipe	2	2	2	2

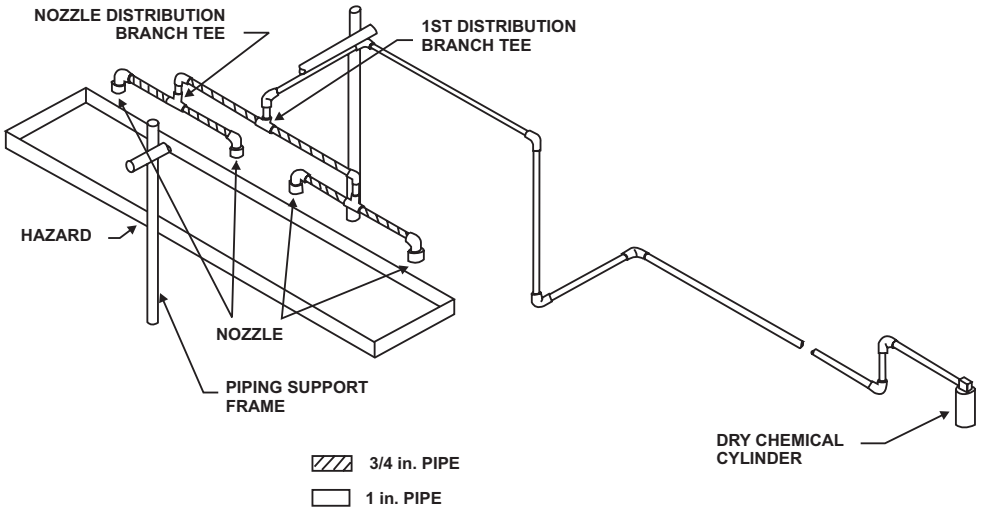

Figure 3-20. Overhead Local-Application System (IND-50), Rectangular Hazard Area

Table 3-13. IND-50 Piping Parameters, Overhead Local-Application System, Rectangular Hazard Area

Item	Pipe Size (Inches)	From	To	Low-Overhead Nozzle: 6 to 8 Feet		High-Overhead Nozzle: 8 to 11 feet	
				Max.	Min.	Max.	Min.
Pipe	1	Dry Chemical Cylinder	First Distribution Branch Tee	62 ft. 0 in. (19 m)	22 ft. 2 in. (7 m)	83 ft. 0 in. (25 m)	24 ft. 2 in. (7 m)
	3/4	First Distribution Branch Tee	Nozzles	15 ft. 6 in. (5 m)	5 ft. 0 in. (2 m)	15 ft. 6 in. (5 m)	5 ft. 0 in. (2 m)
Ell	1	Dry Chemical Cylinder	First Distribution Branch Tee	7	7	7	7
	3/4	First Distribution Branch Tee	Nozzles	6	6	6	6
Tee	3/4 x 3/4 x 1	1-inch Pipe	3/4-inch Pipe	1	1	1	1
	3/4	3/4-inch Pipe	3/4-inch Pipe	2	2	2	2

3-4.3.2.2 Tankside-System Piping Parameters

All IND-50 cylinders shall use four discharge nozzles for tankside local-application systems, subject to the parameters shown in Figure 3-21 and Table 3-14 for two-sided coverage of square hazards. Parameters for single-sided coverage of square hazards are shown in Figure 3-22 and Table 3-15, and the corresponding parameters are shown in Figure 3-23 and Table 3-16 for rectangular hazards.

All piping shall be balanced, with an identical routing of pipe from the cylinder to each discharge nozzle. Actual pipe lengths and numbers of fittings shall be equal for each nozzle. When installing nozzles, a tolerance of ± 2-1/2% of the final nozzle location dimension is permitted.

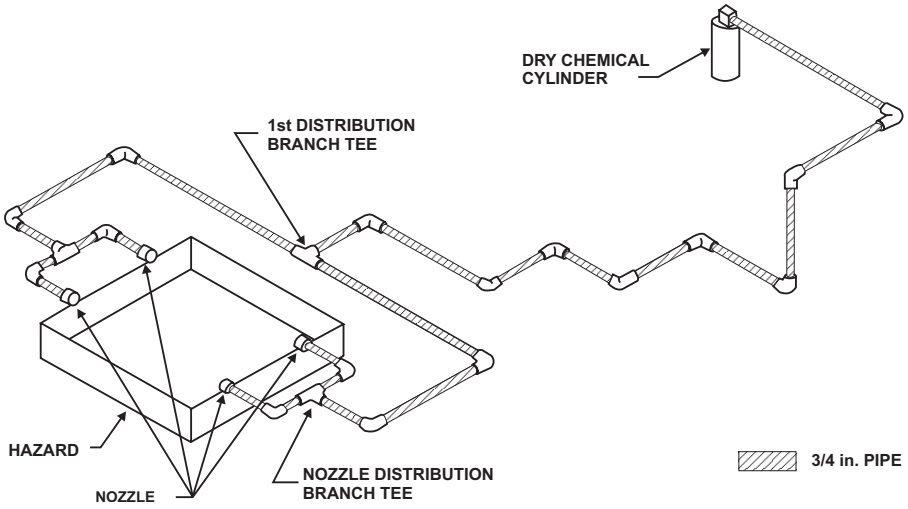

Figure 3-21. Tankside Local-Application System, Two-Sided Coverage, Square Hazard Area

Table 3-14. IND-50 Piping Parameters (Reference Figure 3-21)

Item	Pipe Size	From	To	Max.	Min.
Pipe	3/4 in.	Dry Chemical Cylinder	Nozzles	103 ft. 10 in. (32 m)	27 ft. 9 in. (8.5 m)
Ells	3/4 in.	Dry Chemical Cylinder	Nozzles	16	10
Tees	3/4 in.	Dry Chemical Cylinder	Nozzles	3	3

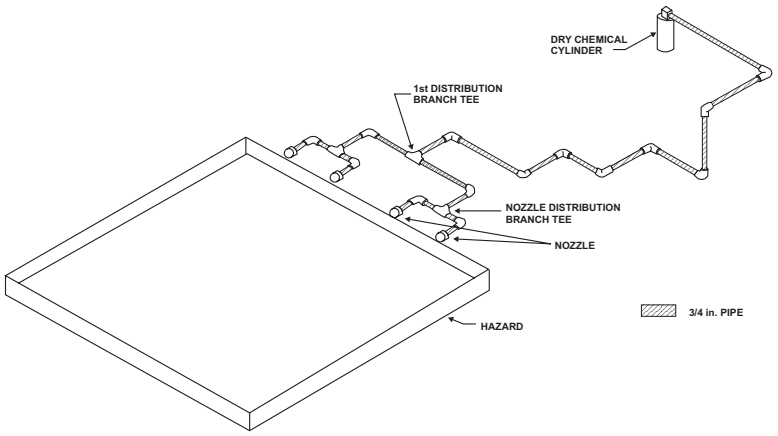

Figure 3-22. Tankside Local-Application System, Single-Sided Coverage, Square Hazard Area

Table 3-15. IND-50 Piping Parameters, Tankside Local-Application System, Two-Sided Coverage, Square Hazard Area, Four-Nozzle System (Figure 3-22)

Item	Pipe Size	From	To	Max.	Min.
Pipe	3/4 in.	Dry Chemical Cylinder	Nozzles	85 ft. 2 in. (26 m)	26 ft. 0 in. (2 m)
Ells	3/4 in.	Dry Chemical Cylinder	Nozzles	14	8
Tees	3/4 in.	Dry Chemical Cylinder	Nozzles	3	3

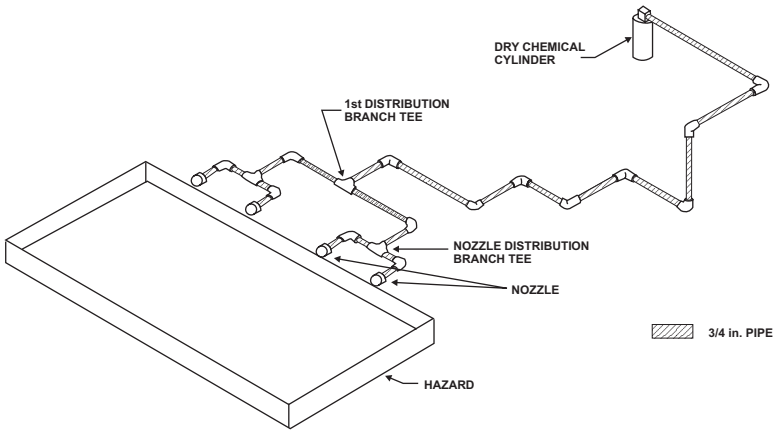

Figure 3-23. Tankside Local-Application System, Single-Sided Coverage, Rectangular Hazard Area

Table 3-16. Piping Parameters, Tankside Local-Application System, Single-Sided Coverage, Rectangular Hazard Area, Four Nozzle System (Figure 3-23)

Item	Pipe Size	From	To	Max.	Min.
Pipe	3/4 in.	Dry Chemical Cylinder	Nozzles	85 ft. 2 in. (26 m)	6 ft. 0 in. (2 m)
Ells	3/4 in.	Dry Chemical Cylinder	Nozzles	14	8
Tees	3/4 in.	Dry Chemical Cylinder	Nozzles	3	3

3-5 CONTROL SYSTEM DESIGN

3-5.1 *XV* Control System Considerations

This section describes the parameters and parameters for designing a system based on the *XV* Control System, including maximum and minimum lengths for tubing, maximum lengths and parameters for the cable runs and connection of the Electrical Solenoid and Actuation Ports.

3-5.1.1 DESCRIPTION OF KNOCKOUTS AND ACTUATION PORT OF THE *XV* CONTROL SYSTEM

Knockouts are provided for installation of all external devices (or operations).

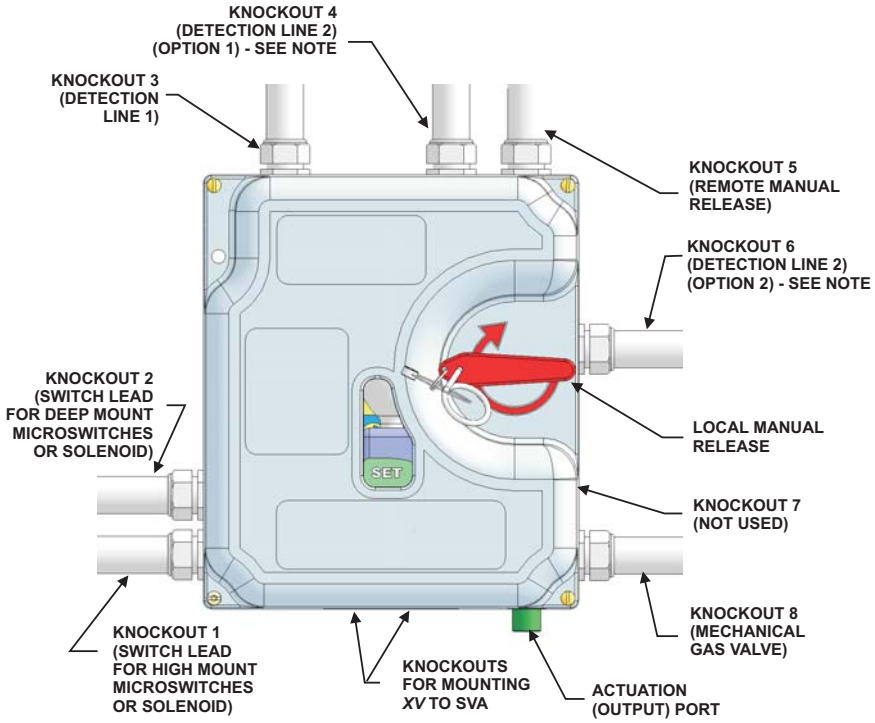

Figure 3-24. Pipe Connection Knockout Designations

Note: If using Detection Line 2, select Detection Line 2 (Option 1) **OR** Detection Line 2 (Option 2). You **cannot** use both Detection Line 2 knockouts.

3-5.1.2 OVERALL *XV* CONTROL SYSTEM CAPABILITY

See Figure 3-25 and Table 3-17.

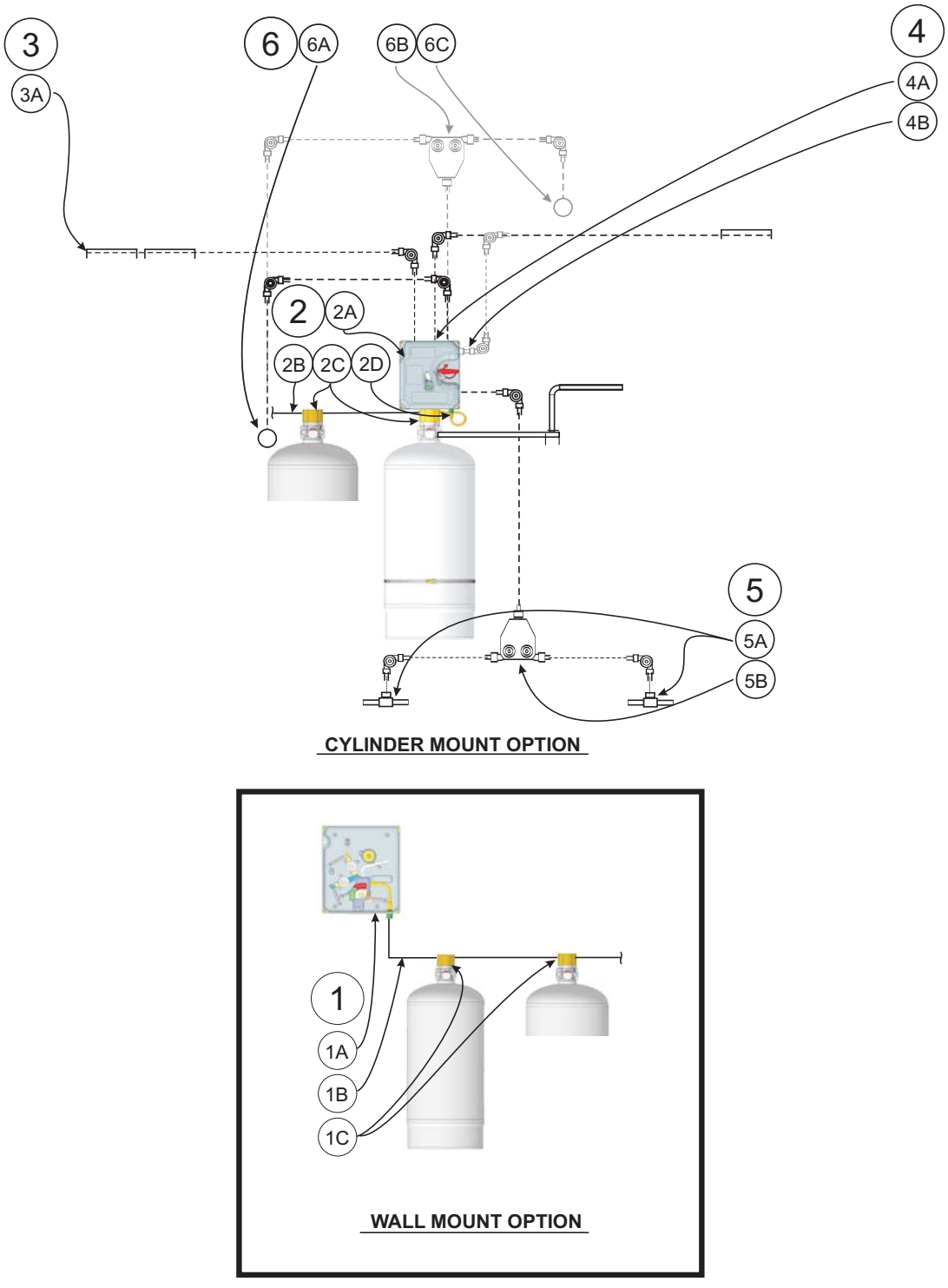

Figure 3-25. Overall *XV* Control System Capability

Table 3-17. Overall *XV* Control System Capability

Number	Letter	Description	P/N
1	**Wall Mount Option**		3
	A	Control System (wall mounted)	
	B	1/4 in. tubing to one or more cylinders	
	C	System Valve Actuator (SVA)	87-120042-001
2	**Cylinder Mount Option**		
	A	Control System (cylinder mounted)	
	B	1/4 in. tubing to other cylinders, if applicable	
	C	System Valve Actuator (SVA)	
	D	Required high-pressure hose (for cylinder mount)	
3	**Detection Line 1**		
	A	Detection Terminus	
4	**Detection Line 2**		
	A	"Detection Line 2, option "A" connection	
	B	"Detection Line 2, option "B" connection	
5	**Mechanical Gas Valve Release**		
	A	Dual gas valve trip from Control System	
	B	Tee Pulley for dual gas valve trip	843791
6	**Pull-to-Trip Remote Manual Release**		
	A	Pull-to-trip Remote Manual Release	875572
	B	Tee Pulley for dual Remote Manual Release	843791
	C	Pull-to-trip Remote Manual Release 2	875572

3-5.1.3 CONTROL CABLE PARAMETERS OF THE *XV* CONTROL SYSTEM

Table 3-18. Control Cable Parameters

Control Cable Line	Max. Cable Length	Max. Corner Pulleys	Max. Detectors	Max. Tee Pulleys (P/N 843791)
Detection Line 1	200 ft. (61 m)	50	40	–
Detection Line 2	200 ft. (61 m)	50	40	–
Remote Manual Release	100 ft. (31 m)	30	–	1*
Mechanical Gas Valve Release	100 ft. (31 m)	30	–	1*
*Note: Tee pulley (P/N 843791) counts as two corner pulleys. Maximum is from *XV* Control System, through tee pulley, to each device.				

WARNING

All changes in direction of control cable runs must be made using Kidde Corner Pulleys (P/N 844648) or Tee Pulleys (P/N 843791). No conduit pipe bends are allowed in any configuration. Failure to follow these instructions will prevent the system from operating as intended, and could result in death or serious personal injury and/or property damage.

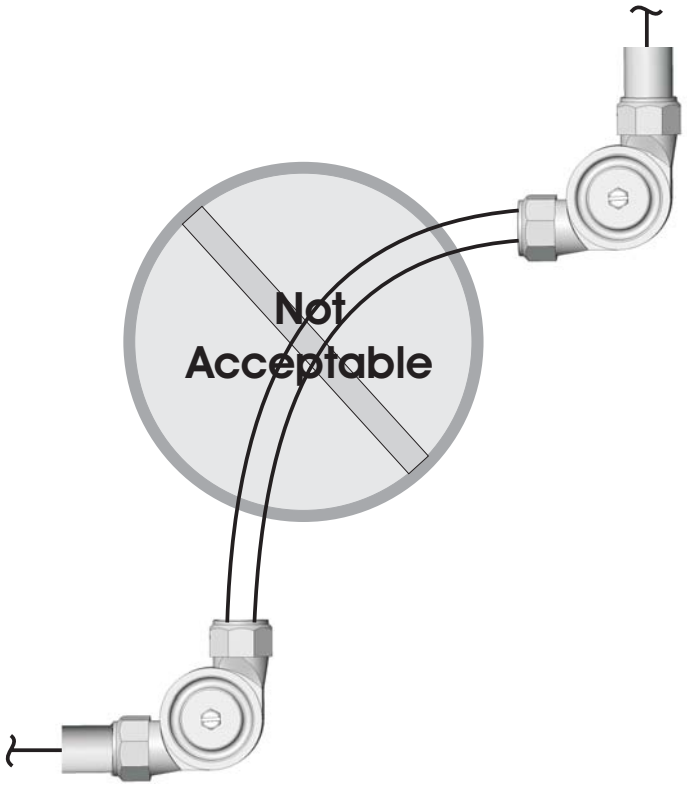

Figure 3-26. Unacceptable Cable Configuration

3-5.1.4 PRESSURE ACTUATION PARAMETERS

Table 3-19. Actuation Length Parameters

Number of Extinguishing System Cylinders	Maximum Total Length of 1/4 in. o.d. x .031 in. Wall High Pressure Tubing	Maximum Number of Pressure Switches (P/N 486536) in Actuation Line
1-14	5 ft. — 166 ft. (51 m)	2
15-20	5 ft. — 121 ft. (37 m)	2

Note: The following are additional notes and requirements regarding the copper tubing and High-Pressure Nitrogen Tubing:

WARNING

Failure to adhere to these instructions may result in system malfunction, and thereby cause death or serious personal injury and/or property damage.

- High-Pressure Nitrogen Tubing (P/N 87-120045-001) is required to connect the outlet of the *XV* Control System to the inlet of the SVA when cylinder mounted.
- Copper Tubing shall be 1/4 in. O.D. .031 wall thickness copper tubing.
- In every system, a 1/8 in. NPT plug or vent check (P/N 877810) shall be used in the outlet port of the last System Valve Actuator (SVA) in the actuation line.
- The minimum length of copper tubing in the actuation line is 5 ft. (1.5 m).
- Pressure switches (P/N 486536) may be placed anywhere in the copper tubing actuation line.

See Figures 3-27 and 3-28 and Tables 3-20 and 3-21.

3-5.1.4.1 Pressure Actuation Application

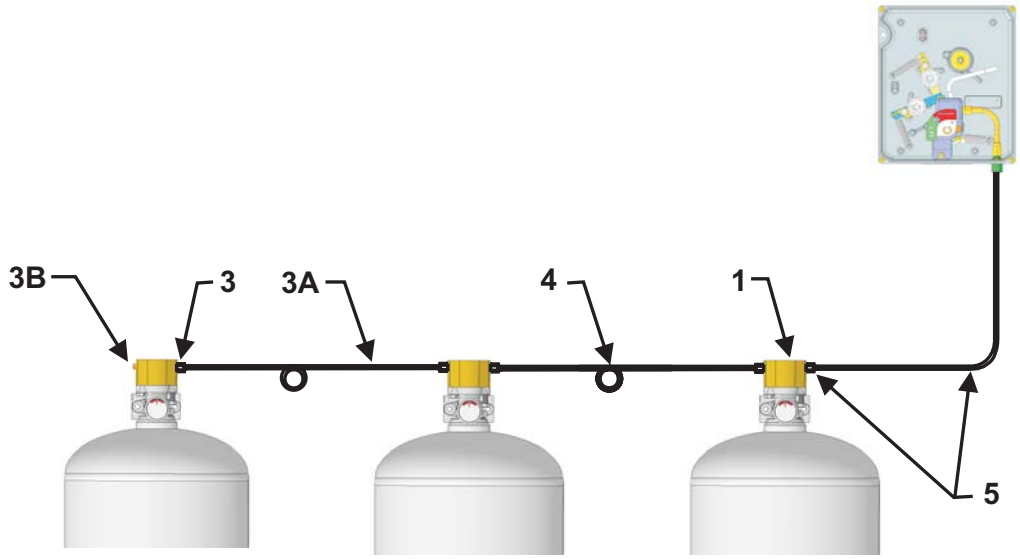

Figure 3-27. Pressure Actuation Application

Table 3-20. End Entrance to Actuation References

Number	Letter	Description
1		System Valve Actuator(s)
2		Cylinder and Valve Assemblies
3	--	Tubing Connections
	3A	1/8 in. NPT x 1/4 in. flare or high pressure compression fitting and 1/4 in. tubing if additional cylinders
	3B	1/8 in. NPT plug or Vent Plug (P/N 877810) if end-of-line
4		Tubing Loop, approximately 2-1/2 in. (63 mm) diameter (not required)
5		Tubing and Connections 1/8 in. NPT x 1/4 in. flare or high pressure compression fittings and tubing connecting to *XV* Control System

3-5.1.4.2 Pressure Actuation Tee In-line Entrance for Tubing

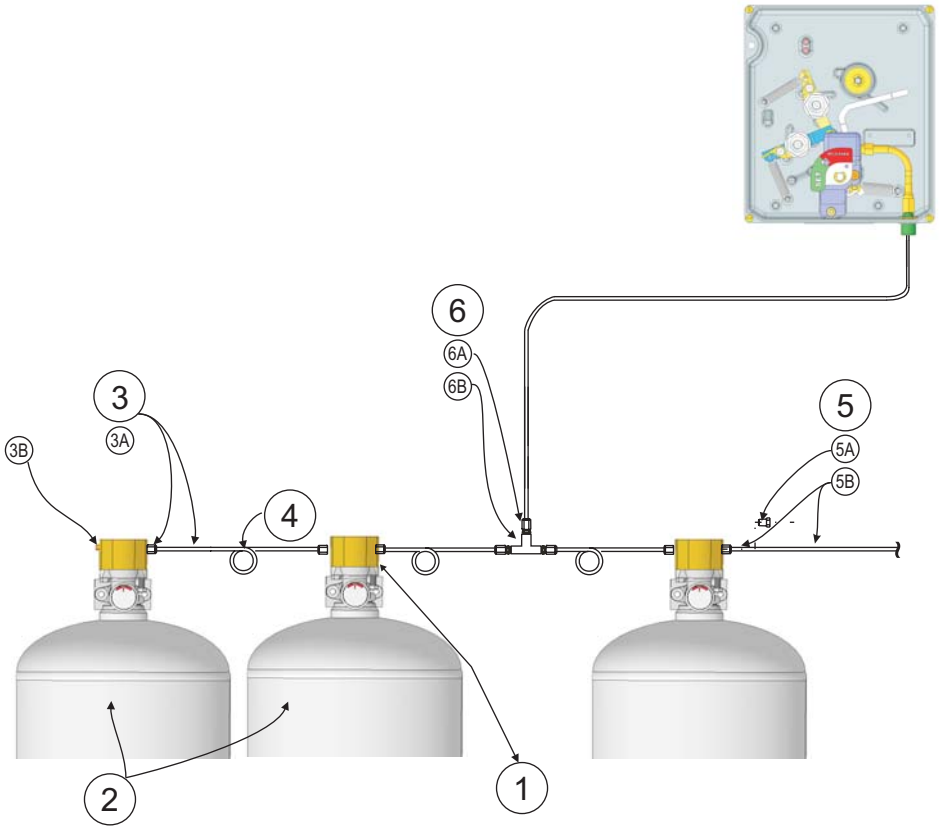

Figure 3-28. Tee In-Line Entrance to Actuation Manifold

Table 3-21. Description of Tee In-Line Entrance to Actuation

Number	Letter	Description
1		System Valve Actuator(s)
2		Cylinder and Valve Assemblies
3	--	Tubing Connections
	3A	1/8 in. NPT x 1/4 in. flare or high pressure compression fittings and 1/4 in. tubing if additional cylinders
	3B	1/8 in. NPT plug or Vent Plug (P/N 877810) if end of line
4		Tubing Loop, approximately 2-1/2 in. (63 mm) diameter (not required)
5	--	Tubing and Connections
	5A	1/8 in. NPT Plug or Vent Plug (P/N 877810) if end-of-line
	5B	1/8 in. NPT x 1/4 in. flare or high pressure compression fittings and 1/4 in. tubing if additional Cylinders
6	--	Tubing and Connections
	6A	1/8 in. NPT x 1/4 in. flare or high pressure compression fittings compression and Tubing Connecting to *XV* Control System
	6B	1/8 in. NPT x 1/4 in. flare or high pressure compression fittings compression and Tee with Tubing Connecting to Cylinders

3-5.2 Mechanical Detection

Selection of detection is based on detector spacing and temperature survey.

3-5.2.1 DETECTOR SELECTION BASED ON TEMPERATURE

For automatic actuation to occur during a fire, the detectors must be heated sufficiently to melt and cause actuation. Experience has shown that it may take several minutes for detectors to actuate, and actuation is dependent upon:

a. Fire intensity
b. Temperature rating
c. Spacing and location(s)

In order to minimize delays in detector response time, it is necessary to conduct a temperature survey at all locations where detectors will be installed. The survey must be conducted under maximum operating conditions (i.e., at the highest operating temperatures and airflows) to determine the optimum exhaust airflow locations and record the peak temperatures that are expected to occur. Once the survey is completed, select the lowest temperature-rated detector that can be used. Refer to Table 3-22.

Note: Make sure that the detectors are located in the exhaust airflow, not in dead air spaces. This will provide the fastest response.

Table 3-22. Detector Temperature Ratings

Detector Rating	Maximum Exposure Temperature	Part Number
165°F (74°C)	100°F (38°C)	282661
212°F (100°C)	150°F (65°C)	282662
360°F (182°C)	300°F (149°C)	282664
500°F (260°C)	440°F (226°C)	282666

CAUTION **To avoid accidental system discharge, detectors must have an exposure temperature rating greater than the maximum peak survey temperatures recorded. See Table 3-22 for detector maximum exposure temperatures.**

3-5.2.2 DETECTOR SELECTION BASED DETECTOR SELECTION

Where multiple detectors are used, they are connected to each other in series using 1/16-inch stainless steel cable to form a continuous chain as shown in Figure 3-29.

Kidde Rapid-Response Thermo-Bulb detectors (KGR) can be spaced every 20 feet for smooth ceilings up to 10 feet high. Consult NFPA 72 for reductions in spacing for ceiling heights in excess of 10 feet, and for spacing guidelines when different ceiling arrangements are encountered.

Note: For standard response mechanical detectors, Kidde requires reduction in spacing by 50%, or spacing every 10 ft. (3.1 m).

Potential fire hazards and/or fire development scenarios may require closer detector spacings. Consult the Authority Having Jurisdiction (AHJ) in these situations.

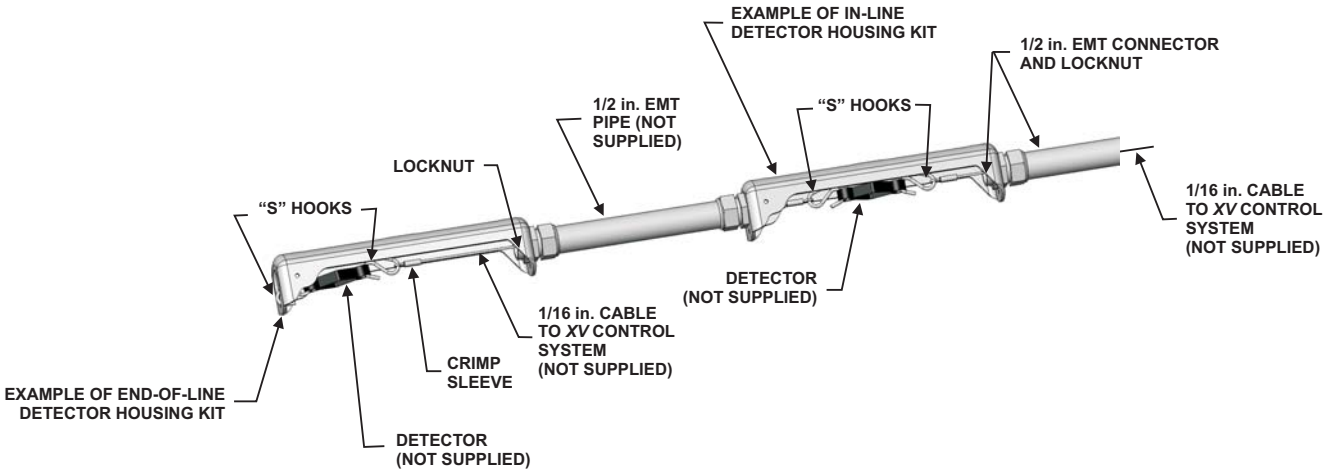

Figure 3-29. Typical Detector Configuration

WARNING **All detectors must be connected in series in order for the system to properly operate. Only one (1) terminating detector per line is permitted.**

3-5.3 Electrical Heat Detection Systems

All fire suppression systems using electrical heat detection and actuation shall be installed according to NFPA 72, and the DIOM for the tested and listed Control Panel being used.

CAUTION **It is likely that industrial applications involving flammable or combustible liquids will be enclosed within or surrounded by areas that will be classified as Class I or Class II, Division 1 or Division 2 locations. Dry Chemical system electrical components, such as thermostats, located within these areas shall be rated for use in classified areas, and all wiring to these components shall conform to the provisions of NFPA 70, National Electrical Code, for Class I or Class II, Division 1, or Division 2 locations. Any industrial system control head with a microswitch is not suitable for use in a classified area.**

3-5.3.1 THERMOSTAT SELECTION

The thermostat must be heated to its setpoint temperature for automatic actuation to occur during a fire. Automatic actuation is dependent upon:

a. Fire intensity
b. Thermostat setpoint
c. Thermostat spacing and location

In order to minimize delays in thermostat response, it is imperative that a temperature survey be conducted at all locations where thermostats will be installed. The survey must be conducted under maximum operating conditions (i.e., at the highest operating temperatures and airflows) to determine the optimum exhaust airflow locations and record the peak temperatures that are expected to occur. Once the survey is completed:

a. Select the thermostat with the lowest usable setpoint.
b. Make sure that there is approximately a 60°F to 100° F buffer between the thermostat setpoint and the maximum temperature obtained from the survey.

c. Make sure that the thermostats are located in the exhaust airflow, not in dead-air spaces. This will provide the fastest detector response.

3-5.3.2 THERMOSTAT SPACING

The number of thermostats required for a particular industrial application is a function of the size of the area being protected. Since the thermostat is an unpowered electrical component, there is no upper limit established for the maximum number of detectors that can be used for a given system. In practice, issues such as voltage drops caused by wiring resistance, impose certain parameters on the lengths of wiring that can be used. For applications that require control units, consult the appropriate control-unit installation manual for wiring parameters. When multiple thermostats are used, they are electrically connected in parallel.

Thermostats are spaced every 20 feet for smooth ceilings up to 10-feet high. Consult NFPA 72 for reductions in spacing for ceiling heights in excess of 10 feet, and for spacing guidelines when different ceiling arrangements are encountered.

3-5.4 Other Detection Systems

Although it is most common to use heat detectors for industrial fire protection systems, there may be some applications where another mode of detection, such as smoke, flame or radiation detection, is more appropriate. Any UL listed and/or FM approved detector may be used to actuate the extinguishing system, provided that the detector is appropriate to the type of combustibles involved, and is connected to a listed and compatible control unit. The control unit shall be tested, listed, and approved by UL and/or FM for releasing the Kidde IND Dry Chemical System.

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CHAPTER 4
INSTALLATION

4-1 INTRODUCTION

This chapter is intended for system installers. It outlines the steps needed to install the Kidde® IND™ Dry Chemical Fire Suppression System.

4-2 GENERAL INSTALLATION REQUIREMENTS

All components shall be installed in accordance with the appropriate NFPA standard:

- Extinguishing system per NFPA 17 and NFPA 33,
- Detection and alarm-control units (other than detectors) per NFPA 72,
- Electrical connections per NFPA 70, and
- Local Authority Having Jurisdiction (AHJ).

Only factory trained and authorized personnel shall be permitted to install or maintain Kidde Fire Systems IND™ Dry Chemical fire suppression systems.

4-3 INSTALLATION OF SUPPRESSION

1. Install the mounting brackets to hold the Cylinder and Valve Assembly. For wall mounting, see Paragraph 4-3.1. For floor mounting, see Paragraph 4-3.2.
2. Mount the Cylinder and Valve Assembly on mounting brackets.
3. Install agent distribution piping.
4. Install nozzles.

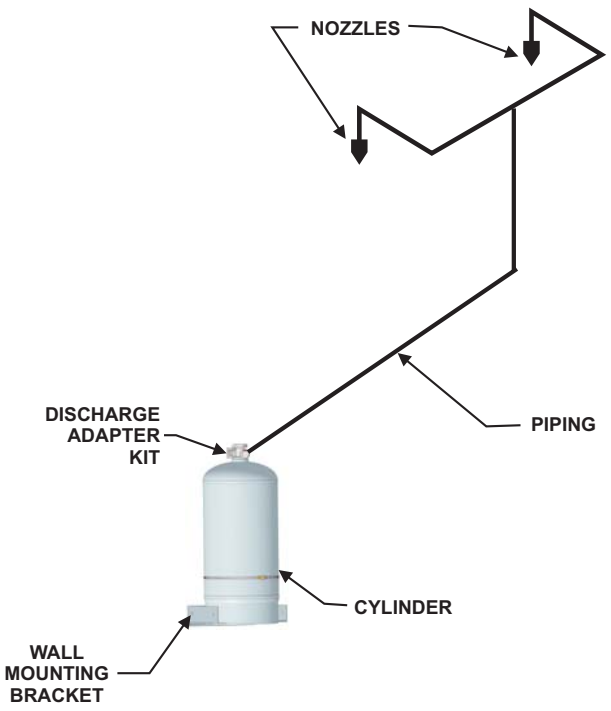


Figure 4-1. Installation of Suppression

4-3.1 Wall Mounting Bracket Installation, P/N 486487, 486488, 87-100009-001

The Wall Mounting Bracket is to be mounted vertically (plumb) with the Cylinder and Valve Assembly in the upright position. The mounting location shall be in a clean, dry and protected area where the ambient temperature is between -40°F (-40°C) and 120°F (49°C) and sufficiently away from the hazard(s) so as not to be exposed to process or fire temperatures in excess of 120°F (49ºC). The bracket must be mounted in such a way that no part of the assembly stands in water or other liquid. The Cylinder and Valve Assembly should be mounted at least 4 inches (102 mm) above the floor.

1. Determine the Wall Mounting Bracket mounting locations and mark the mounting holes for each bracket. Before drilling the mounting holes, be sure that the mounting surface will support the loads identified in Table 4-1.
2. Drill three holes for each Mounting Bracket and attach the bracket to the mounting surface with three (3) 3/8-inch diameter bolts or screws of suitable length and type. See Table 4-1 for dimensions and load bearing information.

Note: Use of other approved hardware is permitted.

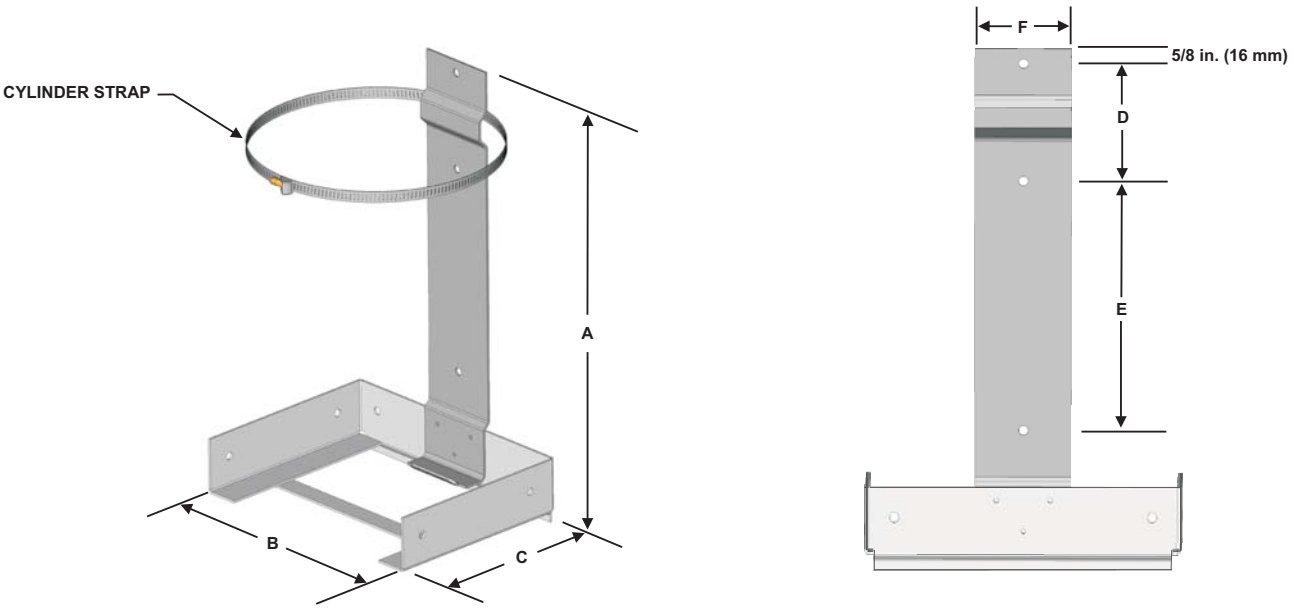


Figure 4-2. Wall Mounting Bracket

Table 4-1. Wall Mounting Bracket

Wall Mounting Bracket P/N	Model	Dimensions						Recommended Wall Support Load
		A	B	C	D	E	F	
486487	IND-21 IND-25	13-1/8 in. (333 mm)	9-3/4 in. (248 mm)	6-3/4 in. (171 mm)	3 in. (76 mm)	9-1/2 in. (241 mm)	3 in. (76 mm)	65 lb. (30 kg)
486488	IND-45 IND-50	19-5/8 in. (498 mm)	9-3/4 in. (248 mm)	6-3/4 in. (171 mm)	3 in. (76 mm)	16 in. (406 mm)	3 in. (76 mm)	130 lb. (59 kg)
87-100009-001 **UL Listed Only**	IND-70 IND-75	21 in. (533 mm)	13-1/4 in. (337 mm)	10-1/4 in. (257 mm)	5-5/8 in. (143 mm)	16-1/8 in. 422 mm)	4 in. (102 mm)	225 lb. (102 kg)

4-3.2 Floor Mount Bracket Kit Installation, P/N 87-100010-001

A Floor Mount Bracket Kit is used for mounting the IND-70 or IND-75 cylinder to the floor. The Floor Mount Bracket Kit requires Wall Mounting Bracket P/N 87-100009-001. See Figure 4-3.

1. Attach the Floor Mount Bracket Kit to the Wall Mounting Bracket using four (4) 3/8-inch diameter bolts of suitable length.
2. Determine the Floor Mount Bracket mounting locations and mark the mounting holes for each bracket.
3. Drill two holes for each Floor Mount Bracket and attach the bracket to the floor surface with four (4) 3/8-inch diameter bolts or screws of suitable length and type. See Table 4-1 for dimensions and load bearing information.

Note: Use of other approved hardware is permitted.

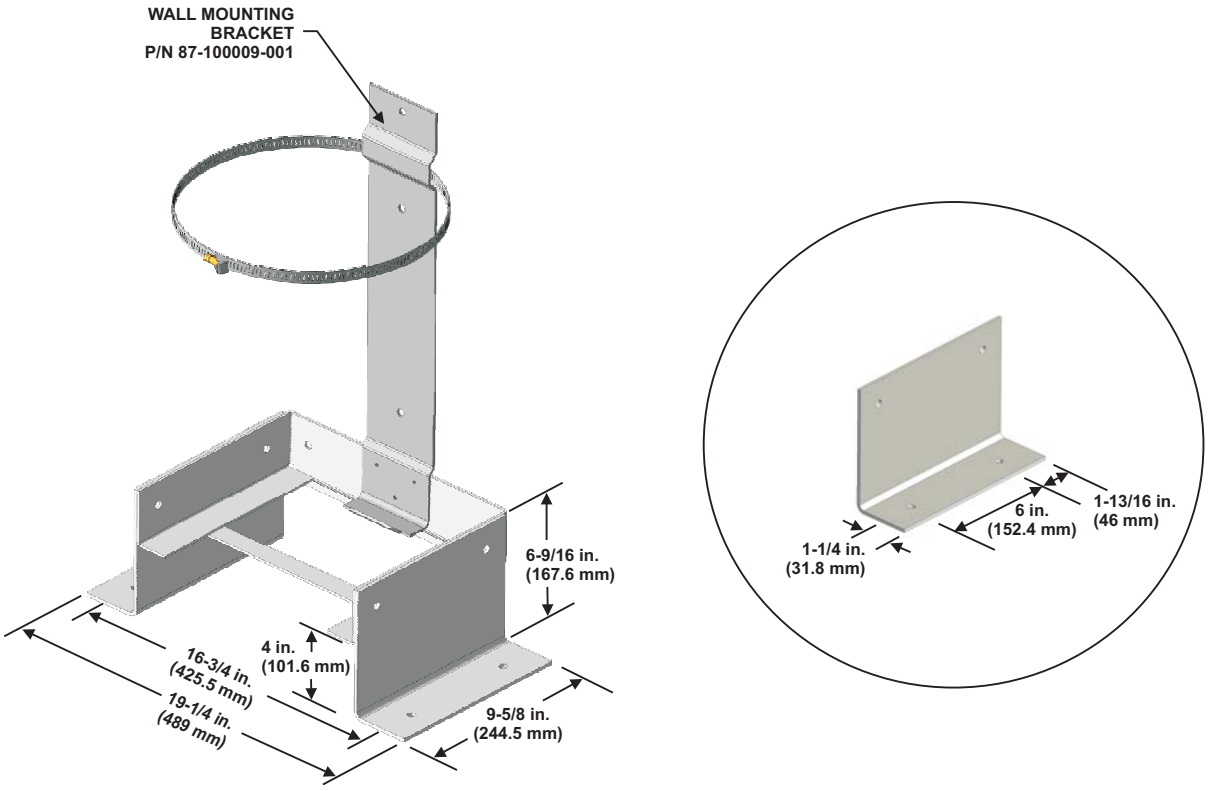


Figure 4-3. Floor Mount Bracket Kit Attached to Wall Mounting Bracket

4-3.3 Cylinder and Valve Assembly Installation

Upon removal of each Cylinder and Valve Assembly from its shipping carton, carefully check the following:

1. Ensure that the Anti-Recoil Plate and the Protection Cap are secured to the valve.

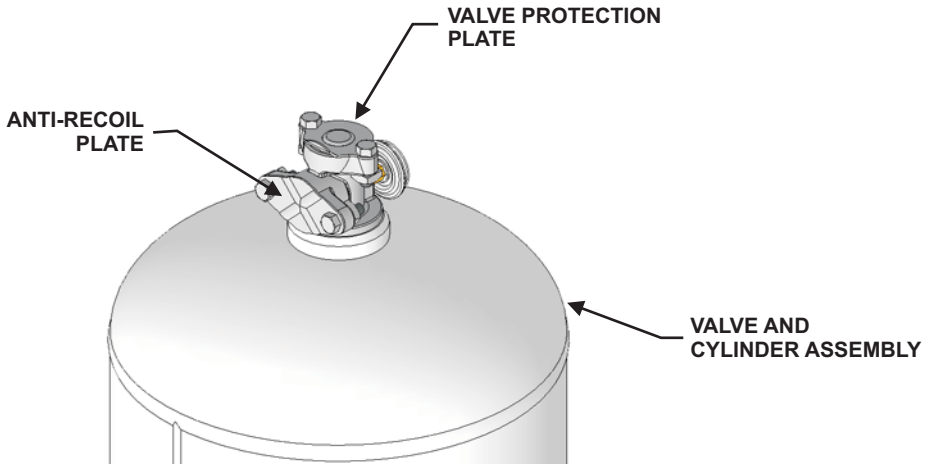


Figure 4-4. Anti-Recoil and Valve Protection Plates

WARNING

The Anti-Recoil Plate must remain installed on the valve outlet at all times except when the cylinder is mounted to a properly secured mounting bracket. The Protection Cap must remain on the valve until the System Valve Actuator (SVA) is installed. Refer to the Safety Summary for more information on pressurized cylinders.

WARNING

Pressurized (charged) cylinders are extremely hazardous and if not handled properly are capable of violent discharge. Failure to follow these instructions could result in death, serious personal injury, and/or property damage.

2. Check that the cylinder pressure is within the acceptable range shown on the pressure gauge. If not, replace with a properly charged cylinder.
3. Inspect the Cylinder and Valve Assembly for any signs of damage such as dents, nicks or scratches. Refer to Compressed Gas Association (CGA) pamphlet C-6 for cylinder inspection procedures.
4. Place each Cylinder and Valve Assembly on its bracket shelf, tighten the cylinder strap and check the mounting for proper fit. Make any necessary final adjustments.

4-3.4 Installing the Discharge Adapter Kit, P/N 844908

1. Remove the cylinder Anti-Recoil Plate. **Do not discard**.
2. Lubricate the O-ring (P/N 1080-1900) with a light coating of Dow Corning No. 55M grease, or equivalent. Do not grease the bonded seal on valve check. Place the O-ring in the groove near the inlet end of the Discharge Adapter.
3. Insert the Discharge Adapter through the hole in the flange plate (see Figure 4-5).
4. Install the Discharge Adapter into the valve outlet.
5. Install the two 5/16-18 x 1-inch bolts through the cylinder valve and flange adapter and tighten.

Each Cylinder and Valve Assembly must be installed in an upright position using the Mounting Bracket specified in Table 4-1. Each Cylinder and Valve Assembly will also utilize a Discharge Adapter Kit (P/N 844908).

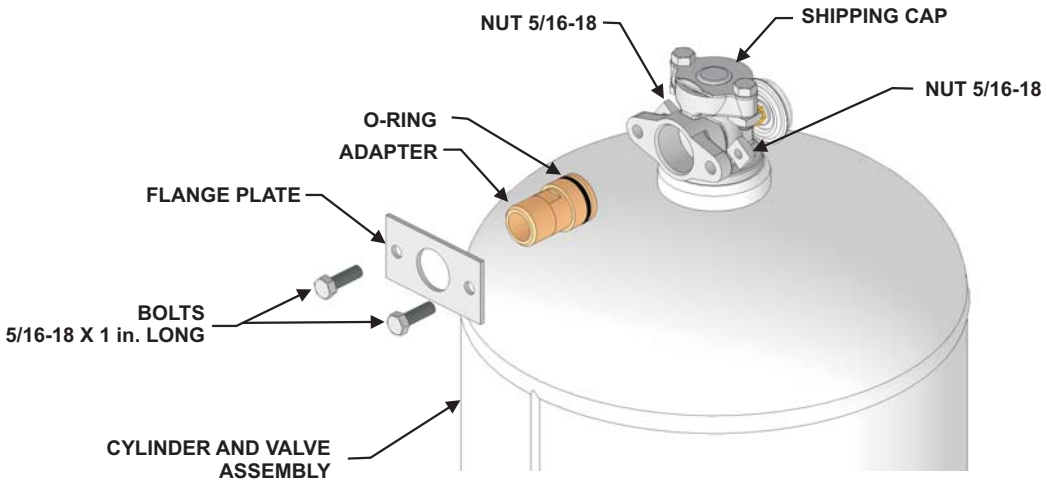


Figure 4-5. Installing the Discharge Adapter Kit, P/N 844908

4-3.5 Installation of Pipe/Tubing and Fittings

4-3.5.1 AGENT DISTRIBUTION PIPING

Note: If a Pressure Operated Release (P/N 874290) is to be used, refer to Paragraph 4-4.2.3.

Install the agent distribution piping as defined in Chapter 3, or enclosures being protected.

Note: Use of bushings is permitted.

CAUTION

Do not exceed the maximum pipe lengths, equivalent pipe lengths or pipe fitting parameters as defined in Chapter 3 or the system may not operate as intended.

All piping must be Schedule 40, hot dipped, galvanized steel pipe or Black Steel pipe is permissible in non-corrosive environments. All fittings shall be a minimum of 150 lb. class. Examples of acceptable fitting materials include hot dipped, galvanized malleable iron, ductile iron or steel. Couplings and unions may be used where necessary, and reducing bushings or reducing tees can be used for changes in pipe diameter. Refer to NFPA 17, latest edition.

Pipe hangers or pipe clamps shall be used for support as required. It is important to provide proper support close to the adapter fitting so that no damage will be done to this fitting when the test fixture is attached during system checkout and test.

WARNING

Do not use water or oxygen to blow out piping. Moisture will cause blockage. The use of oxygen is very dangerous as the possible presence of even a minute quantity of oil may cause an explosion, thereby causing death, serious personal injury and/or property damage.

Before installing the agent distribution piping, ensure that the inside of the pipe is clean and free of obstructions. Piping shall be reamed and cleaned before assembly. After the piping is installed, it must be blown clean with dry air or nitrogen. Pipe thread compound or tape shall not be used.

4-3.5.2 PRESSURE SWITCHES (IF APPLICABLE), P/N 486536

The Pressure Switch is screwed on the upper end of a 12 inches (305 mm) length of vertical 1/2-inch (13 mm) black pipe (riser). The vertical riser is fastened to a tee which may be located wherever convenient in the discharge pipe. The piping used to plumb the pressure switch must be included in the total volumetric calculation for the overall discharge piping and individual branch line.

The preferred mounting position is upright. The Pressure Switch has 1/2-inch NPT pressure inlets to connect to the piping. The electrical connections are either 1/2-inch conduit knockouts or 1-inch NPT fittings.

Note: Two Pressure Operated Switches can be installed on pressure actuation lines.

4-3.6 Installing Nozzles

CAUTION

Do not use Teflon tape or pipe compound when installing nozzles. Refer to NFPA 17.

The nozzles are made of brass. Use a wrench with non-marring teeth and tighten until snug. Do not overtighten.

Nozzles shall be installed in accordance with the guidelines and parameters. Refer to “Nozzles” on page 3-8.

4-4 INSTALLATION OF CONTROLS

4-4.1 *XV* Control System Installation

Remove the *XV* Control System from its shipping carton.

Use care when removing the knockouts as you can damage the *XV* Control System enclosure.

CAUTION

Ensure that the knockout pieces of the mounting holes do not remain inside the *XV* Control System (P/N 87-120099-001) enclosure. Failure to remove these could cause malfunction of the mechanism.

Identify the knockouts that will be used for cable connections to the *XV* Control System enclosure. It is easiest if these knockouts are removed before mounting the *XV* Control System enclosure. Refer to Figure 4-6 for knockout designations.

Note: If using more than the three EMT connectors supplied with the *XV* Control System, you must use EMT Connector and O-Ring Kit, P/N 87-120058-001.

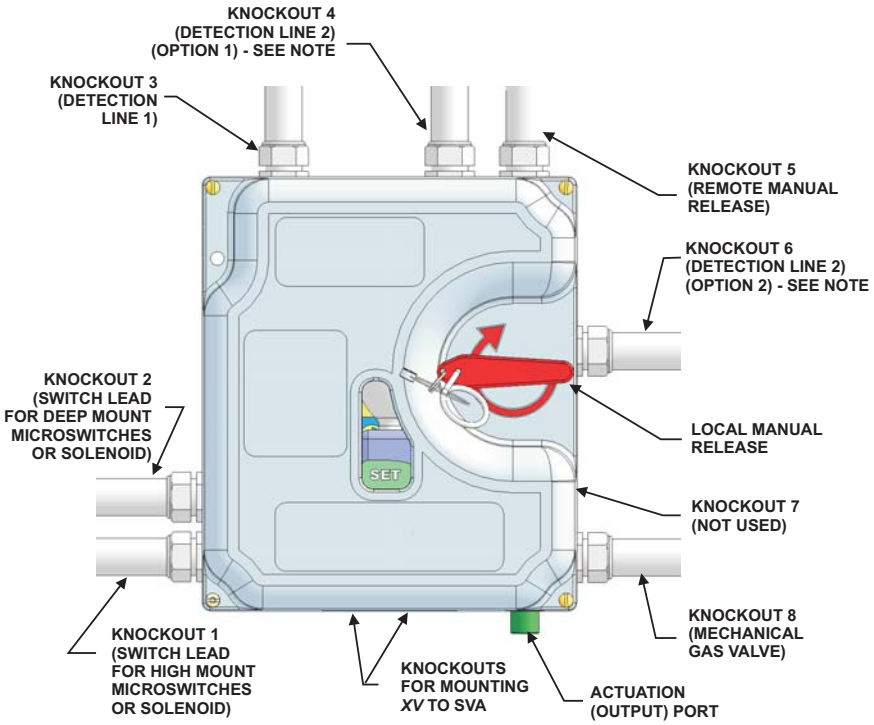


Figure 4-6. Pipe Connection Knockout Designations

Note: If using Detection Line 2, select Detection Line 2 (Option 1) **OR** Detection Line 2 (Option 2). You **cannot** use both Detection Line 2 knockouts.

Note: The knockouts are an integral part of the housing. Ensure that only required knockouts are broken out. Planning ahead and opening only the knockouts necessary for the system will help in keeping the box sealed from dirt, grease, water and other contaminants.

- If wall mounting, Paragraph 4-4.1.1.
- If cylinder mounting, Paragraph 4-4.1.2.

4-4.1.1 INSTALLING THE *XV* CONTROL SYSTEM (WALL MOUNT)

1. With the *XV* Control System cover removed, lay the box on its back. Locate the four mounting holes in the housing. Position the box so that the mounting holes are not flat on the work surface and break out the knockouts. See Figure 4-7 for location of mounting holes.

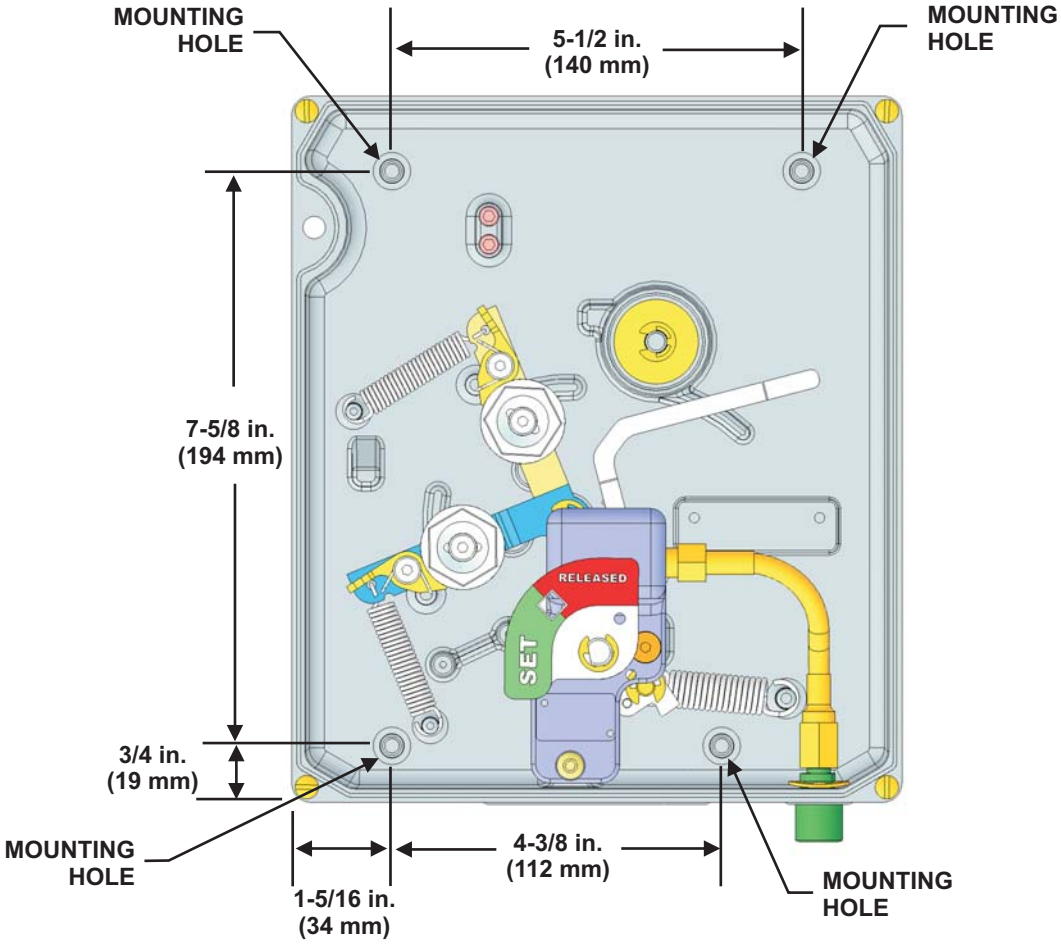


Figure 4-7. Location of Mounting Holes (Housing)

2. Using 1/4-20 x 3-inch long toggle bolts or equivalent hangers, mount the box to the wall making sure it is level. Attach the conduit fittings and other fittings to the box. Run cables and wiring as normal, within the parameters of the *XV* Control System.
3. Locate the System Valve Actuators (SVA).

4. Ensure the piston of the SVA is in the 'Set' position. See Figure 4-8.

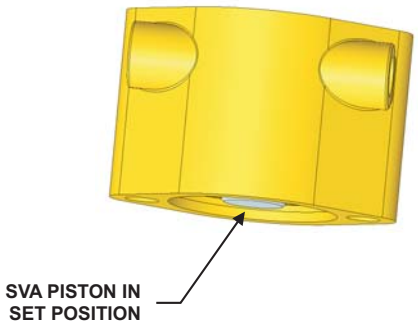


Figure 4-8. SVA in ‘Set’ Position

5. Remove the Valve Protection Plate from the top of the cylinder valve.
6. Install the SVAs onto each cylinder valve (the piston facing cylinder valve). Do not tighten them as they will be removed at a later time.
7. Install 1/8-inch NPT pipe plug (P/N 877810) or optional vent check on last SVA (end of line).
8. Install 1/8 NPT (M) x 1/4 copper tubing adapters. Compression type adapters are permissible.
9. Measure and install the 1/4 O.D. x 0.031 wall thickness copper tubing. A 2-1/2 inch (64 mm) loop between each cylinder and on the inlet tubing is recommended, but not required. See Figure 4-9. Ensure that each connection is secure.

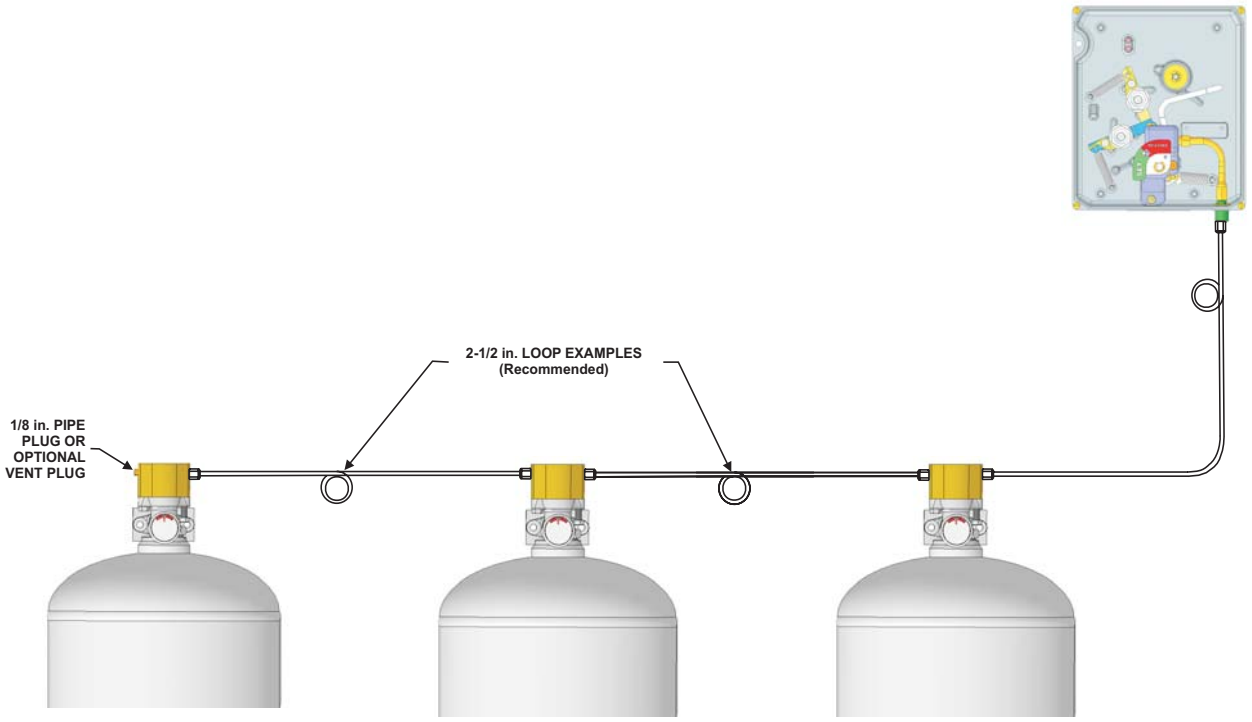


Figure 4-9. Example of Copper Tubing Loop Method

1. Remove the SVAs from the cylinder valves and re-install the Valve Protection Plates.

4-4.1.2 INSTALLING *XV* CONTROL SYSTEM (CYLINDER MOUNT)

1. Locate the System Valve Actuators (SVA).
2. Ensure the piston of the SVA is in the 'Set' position.

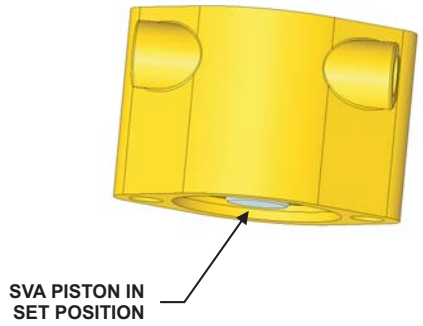


Figure 4-10. SVA in 'Set' Position

3. Remove the Valve Protection Plate from the top of the cylinder valve.
4. Install the SVAs onto each cylinder valve (the piston facing cylinder valve). The ports on the SVA should be positioned towards the discharge adapter. Do not tighten the SVA(s) as it will be removed at a later time.

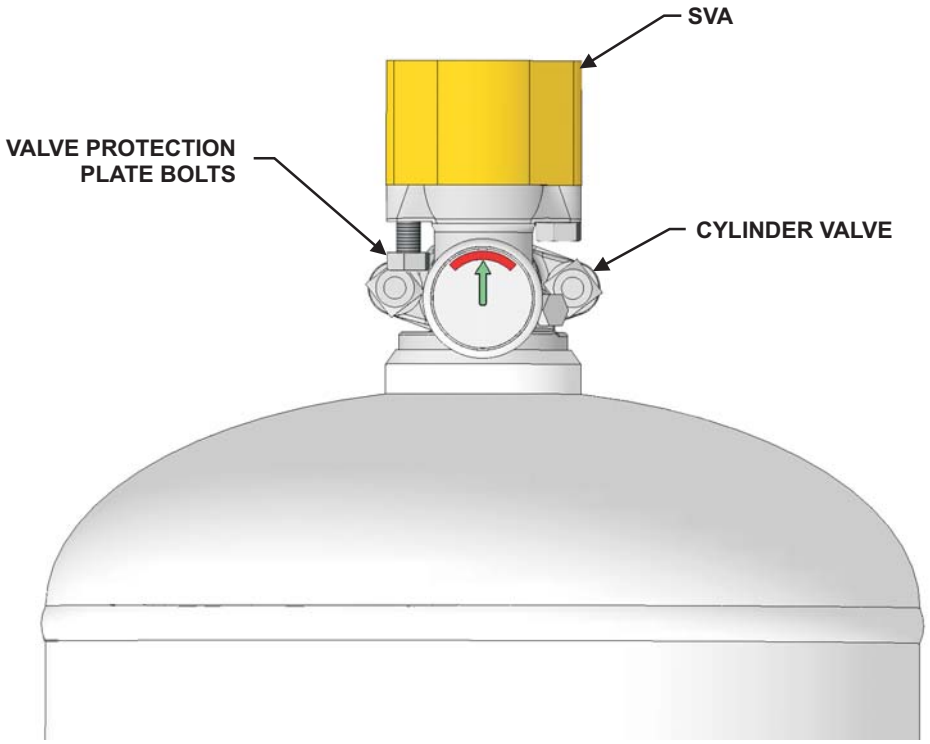


Figure 4-11. *XV* Control System (Cylinder Mount)

5. Install *XV* Control System onto the SVA.

6. Install SVA bolts through the bottom of the *XV* Control System into the SVA.

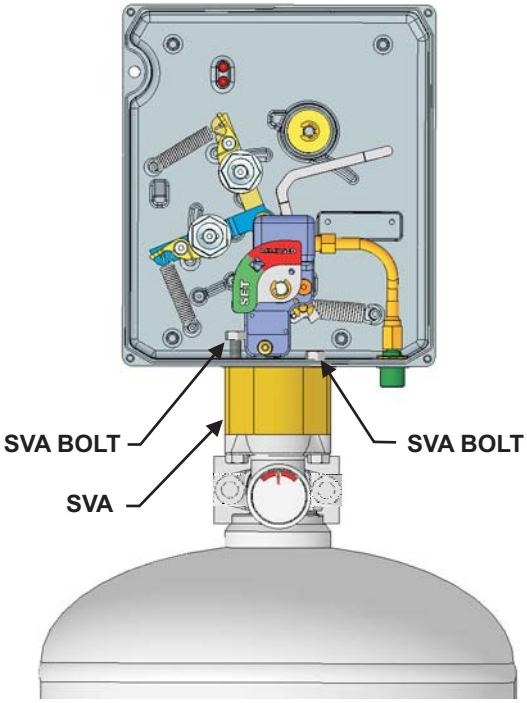


Figure 4-12. Mounting the *XV* Control System to the SVA

7. For multiple cylinder installations, install 1/8 NPT (M) x 1/4 copper tubing adapters. Compression type adapters are permissible.
8. For multiple cylinder installations, measure and install the 1/4 O.D. x 0.031 wall thickness copper tubing. A 2-1/2-inch (64 mm) loop between each cylinder and on the inlet tubing is recommended, but not required. See Figure 4-13. Ensure that each connection is secure.

Note: Minimum 5 ft. (1.2 m) copper tubing (total).

9. Install the 1/8 NPT (M) x 3/8-24 JIC flare adapter (included with the High Pressure Nitrogen Tubing P/N 87-120045-001) onto the outlet port of the *XV* Control System.

Note: Do not use Teflon tape.

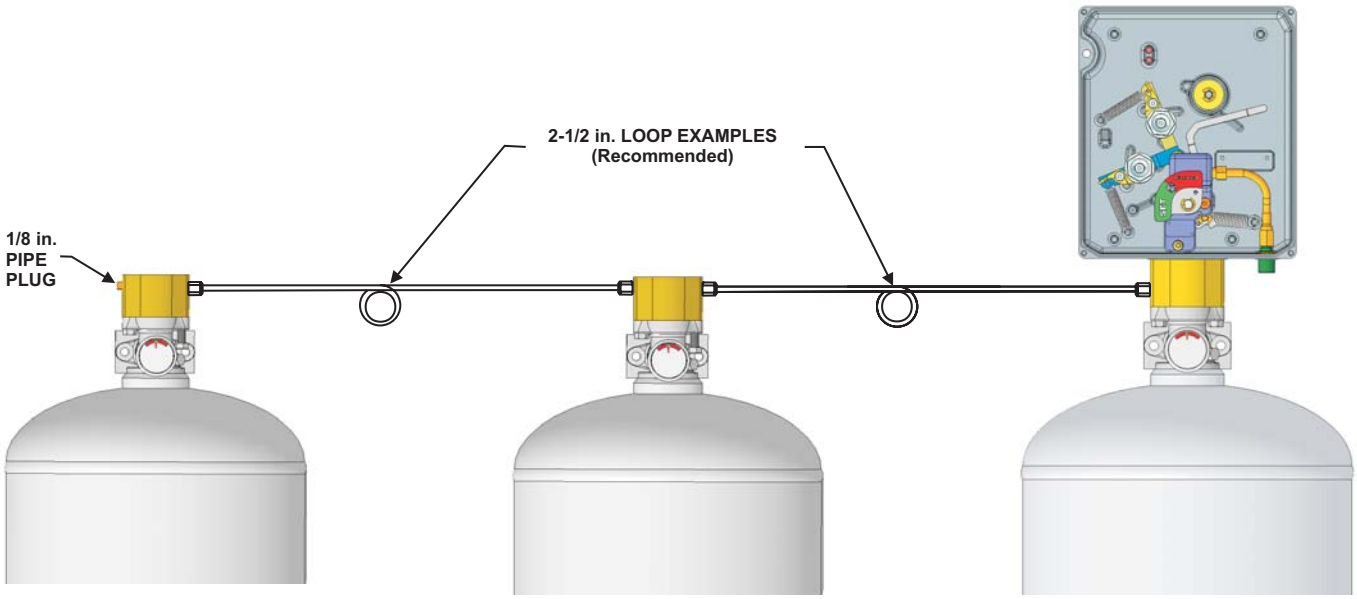


Figure 4-13. Example of Copper Tubing Loop Method

10. Secure the 3/16-inch braided High Pressure Nitrogen Tubing (P/N 87-120045-001) onto the SVA. Ensure the connection is tight.

CAUTION

The High Pressure Nitrogen Tubing is *required* between the *XV* Control System and the primary SVA on all cylinder mounted installations.

Note: Do not attach the swivel end of the hose onto the outlet of the *XV* Control System.

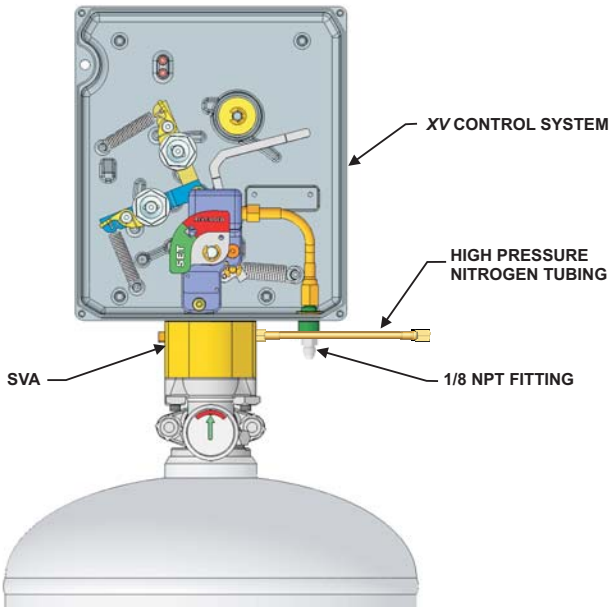
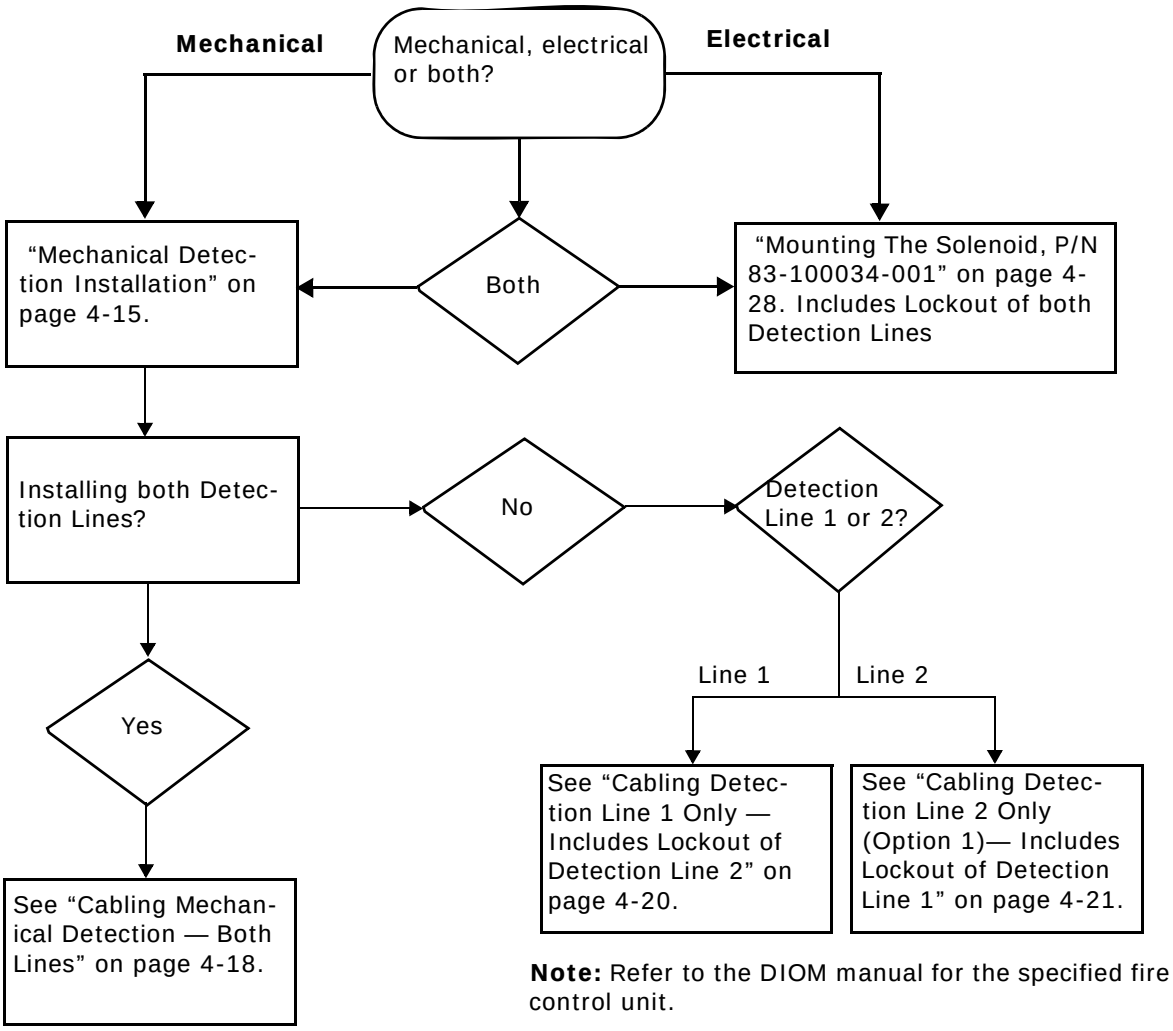


Figure 4-14. Installing High Pressure Nitrogen Tubing

11. Remove the SVAs from the cylinder valves and re-install the valve protection plates.

4-4.1.3 ACTUATION

The next step in the installation process is deciding what type of actuation to use. The *XV* Control System offers the use of mechanical, electrical or a combination of mechanical and electrical actuation. Mechanical actuation utilizes detectors (fusible, KGR and/or KGS) to detect heat, whereas electrical actuation utilizes heat detectors for detection. Mechanical and electrical actuation can be combined together when configured using a UL Listed fire control panel, such as the Kidde Scorpio™. Figure 4-15 illustrates the steps to follow when deciding what type of actuation to use.



Note: Refer to the DIOM manual for the specified fire control unit.

Figure 4-15. Decision Flow Chart for Actuation

4-4.1.4 MECHANICAL DETECTION INSTALLATION

Detectors are to be located in an anticipated path of convective heat flow from a fire, and spaced at a maximum on-center distance of 20 ft. (6.1 m) for Thermo-Bulb series detectors and 10 ft. (3.1 m) for standard response detectors, for ceiling heights up to 10 ft. (3.1 m) (refer to Chapter 3). The 1/16-inch cable is to be protected by 1/2-inch conduit or electrical metal tubing (EMT).

4-4.1.4.1 Installing Detection Components

1. Drill holes as necessary for installation of the Quick Seal Adapters (P/N 2649930X) or Compression Seal Adapters (P/N 2650460X).
2. Mount the detector brackets as required.

WARNING **Be sure mounting penetrations are liquid and grease tight.**

3. Install conduit from the *XV* Control System detector conduit knockout(s) (top or right side of the *XV* Control System) to the detector brackets using Corner Pulleys (P/N 844648) at all changes in direction.
4. Remove screws and covers from the Corner Pulleys and set aside for reuse later.

Note: No bends or offsets are permitted in conduit lines. Be sure the system is adequately supported.

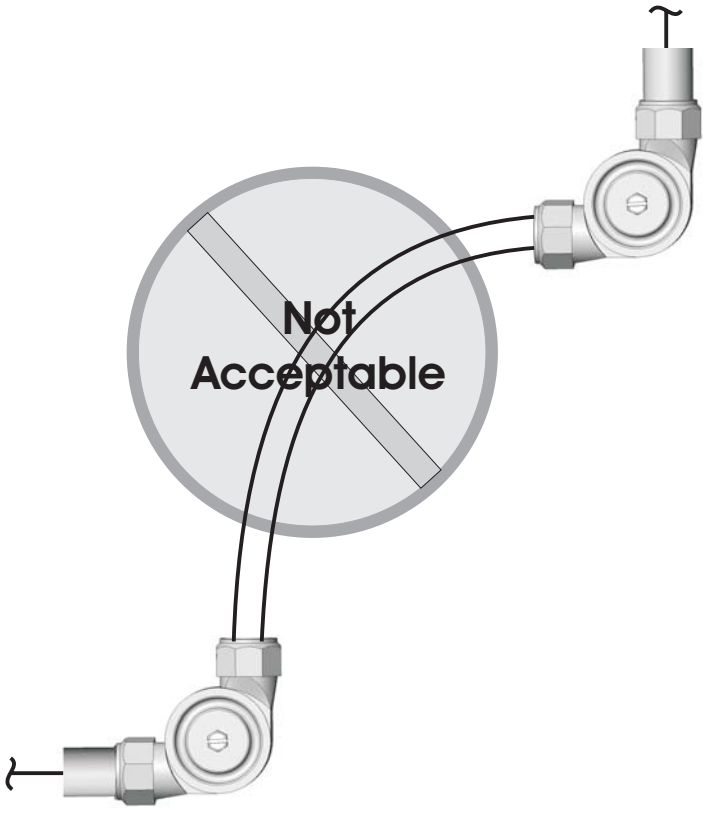


Figure 4-16. Unacceptable Cable Configuration

5. Run the 1/16-inch Control Cable from the various system devices, through 1/2-inch EMT conduit, to the *XV* Control System.

6. Install detectors of proper rating as described in Paragraph 2-3.1.8. To install detectors, follow the steps below. Always start detector installation at the last detector (see Figures 4-17 and 4-18).
7. To install detectors, create a cable loop using a Crimp Sleeve (P/N 214951), and Crimp Tool (P/N 253538).

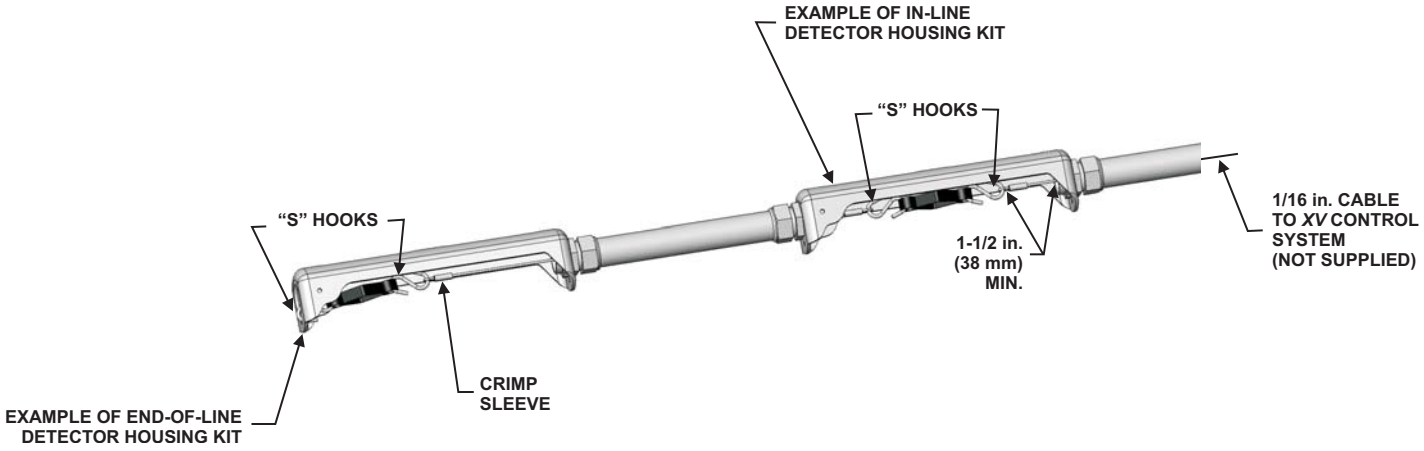


Figure 4-17. Detector Housing Kit, P/N 804548

WARNING **Use of a crimp tool besides P/N 253538 can cause malfunction and/or unwanted discharge of the system.**

Note: In order to ensure the crimp sleeve is secure, the cable must always be looped so that there are two lengths of cable inside the Crimp Sleeve before crimping. Cable must not be spliced anywhere along its length.

8. Place the Crimp Tool on the end of the sleeve. Ensure the flat of the sleeve rests in the saddle of the Crimp Tool jaw. Secure the sleeve in the tool carefully to ensure the sleeve does not shift in the saddle before pressing.
9. Squeeze the handles of the Crimp Tool until the tool releases itself. The tooth of the jaw is pressing on the wall of the sleeve without cracking the malleable copper. The first crimp is complete.
10. Remove the crimp from the tool.
11. Put the Crimp Tool onto the other end of the sleeve. The sleeve shall be 180° turned in the tool from the first crimp.

Note: This is pressing the loop end of the sleeve (opposite that of the first press).

12. Squeeze the handles of the Crimp Tool until the tool releases itself. The tooth of the jaw is pressing on the wall of the sleeve without cracking the malleable copper. The second crimp is complete.
13. Remove the crimp from the tool.

CAUTION **To ensure proper system operation, each detector must be installed so that at least 1-1/2 inches of cable movement toward the *XV* Control System is maintained.**

14. Attach an "S" hook (P/N 87-9189413-000) to the end of the last detector mounting bracket.

15. Attach proper detector onto the “S” hook.
16. Attach 1/16-inch cable to the hook at the other end of the detector, forming a cable loop held in place by a Crimp Sleeve.

Note: If only one detector is used, thread the cable back through the EMT conduit to the *XV* Control System. If additional detectors are used, attach the cable to each successive detector “S” hook, as described above. After attaching cable to last detector “S” hook, thread cable back through the EMT conduit to the *XV* Control System.

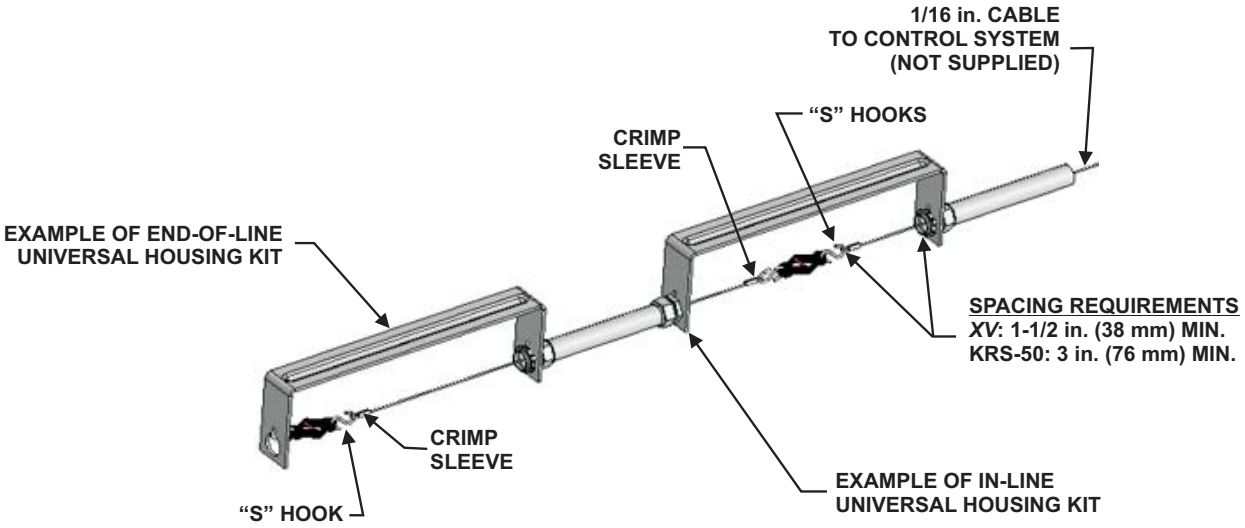


Figure 4-18. Detector Placement in Bracket

WARNING **Be sure mounting penetrations are liquid and grease tight.**

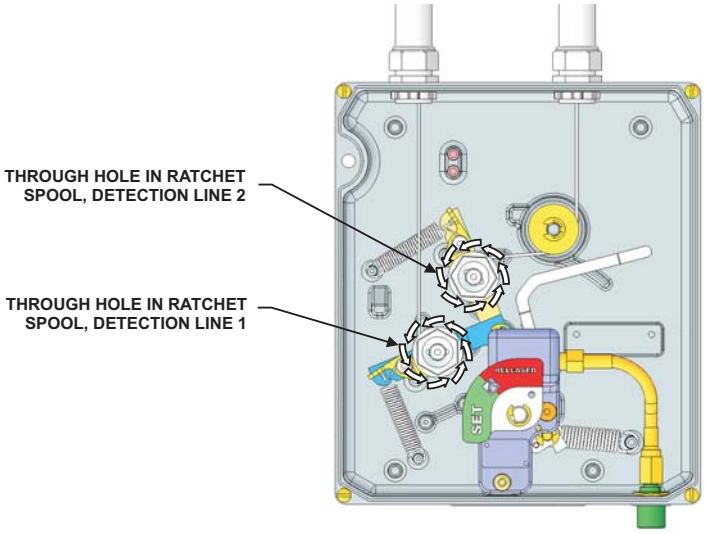
4-4.1.4.2 Cabling Mechanical Detection — Both Lines

If cabling Line 1 (knockout 3), turn ratchet wheel (counterclockwise) of detection beam until the cable through-hole is vertical (see Figure 4-19).

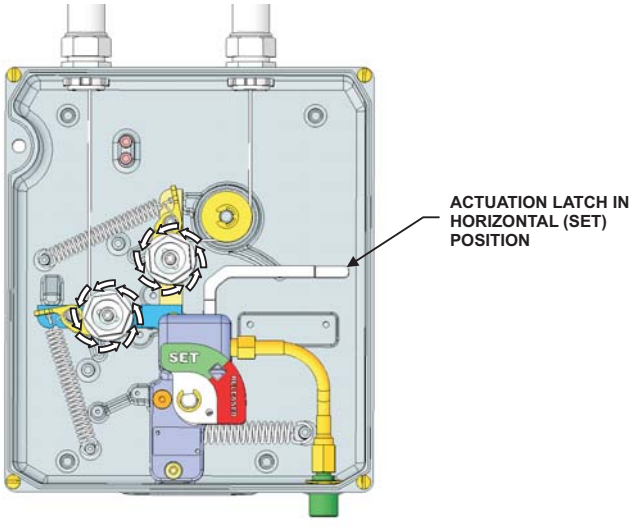
If cabling Line 2 (knockout 4/6), turn ratchet wheel of detection beam until the cable through-hole is horizontal.

Note: When cabling detection line 2, use either Knockout 4 or Knockout 6. See Figure 4-19.

1. Feed the end of the cable through the hole into the center of the ratchet wheel and pull the cable toward you. Leave approximately 6 inches (152 mm) of cable.
2. Slip a Crimp Sleeve (P/N 214951) over the end of the cable. Making a loop, slip the end back through the Crimp Sleeve.
3. Using Crimping Tool (P/N 253538) crimp the sleeve to the cable.



DETECTION BEAMS IN RELEASED POSITION



DETECTION BEAMS IN SET POSITION

Figure 4-19. Cabling Mechanical Detection

4. Cut the loop off of the crimped cable assembly. Cut any loose ends off as close to the Crimp Sleeve as possible.
5. Pull the ends of the crimped cable back through until the end of the cable seats inside the central chamber of the ratchet wheel.
6. By hand, turn the wheel until the cable wraps around the spool of the ratchet. The cable line is now ready to be set.

If the line is fully cabled, the detection line may be set.

Note: If using Detection Line 2, Knockout 4, the cable must go around the pulley wheel before going into the cable port of the ratchet wheel. When tightening the cable around the spool, it is important that the cable be seated in the bottom of the groove on the pulley wheel.

The cable may tend to wrap itself around other components in the *XV* Control System. Use caution in tightening the cable to ensure the proper path or a cable jam could occur resulting in the malfunction of the system.

CAUTION

Use care when tightening the cable. Tighten cable until the detection arm makes contact with the beam stop. Do not overtighten.

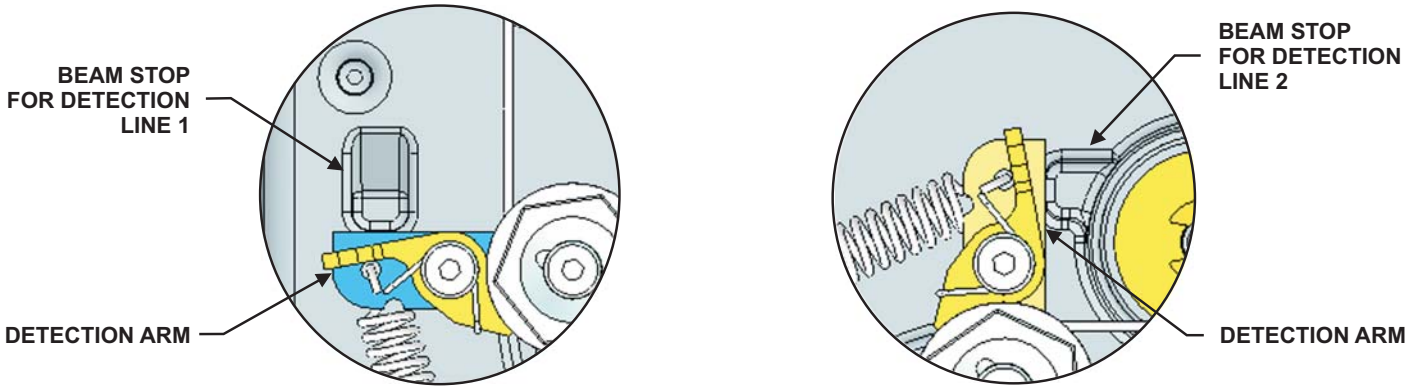


Figure 4-20. Close Up View of Detection Lines 1 and 2 Beam Stops

4-4.1.4.3 Cabling Detection Line 1 Only — Includes Lockout of Detection Line 2

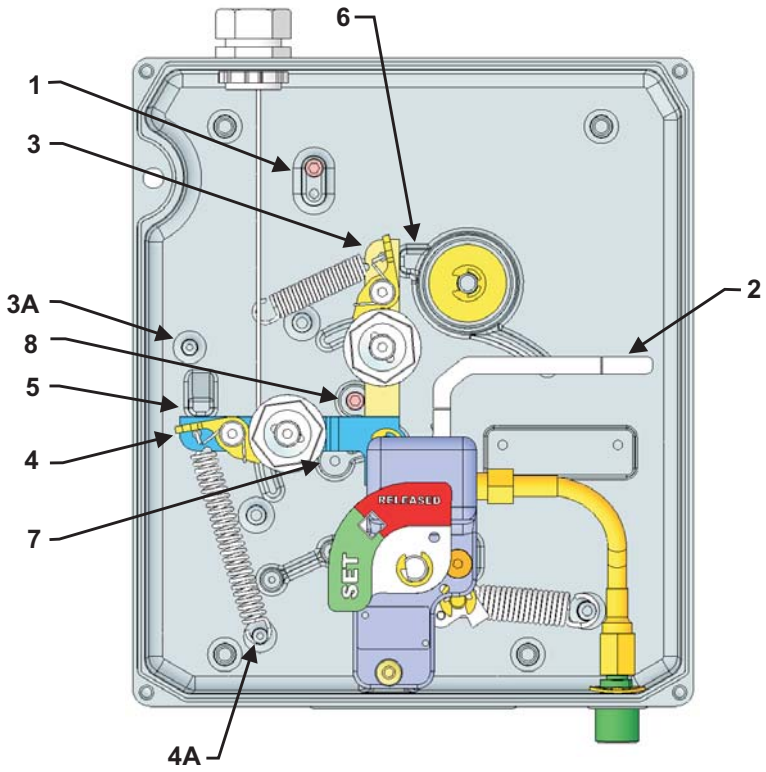


Figure 4-21. *XV* with Detection Line 2 Locked Out

Table 4-2. Cabling Detection Line 1 Only

Item	Description
1	Lockout screw pad (shown with one red lockout screw removed)
2	Actuation Latch
3	Spring and beam for Detection Line 2 (locked out)
3A	Spring Post for Detection Line 2 (spring removed)
4	Spring and beam for Detection Line 1 (set with cable)
4A	Spring Post for Detection Line 1
5	Beam Stop for Detection Line 1
6	Beam Stop for Detection Line 2
7	Lockout pad for Detection Line 1 (not used, line set)
8	Lockout pad for Detection Line 2 (red lockout screw inserted)

1. Ensure that nothing is armed or set in the *XV*.
2. With the *XV* completely disarmed, remove the spring from its respective post (item 3A, Detection Line 2). It is permissible to remove the spring from the detection beam.
3. Push the detection beam (item 3) against its respective beam stop (item 6).
4. Using a 9/64-inch allen key (hex) remove one of the red lockout screws from storage pad (item 1) and carefully thread into lockout pad (item 8).

4-4.1.4.4 Cabling Detection Line 2 Only (Option 1)— Includes Lockout of Detection Line 1

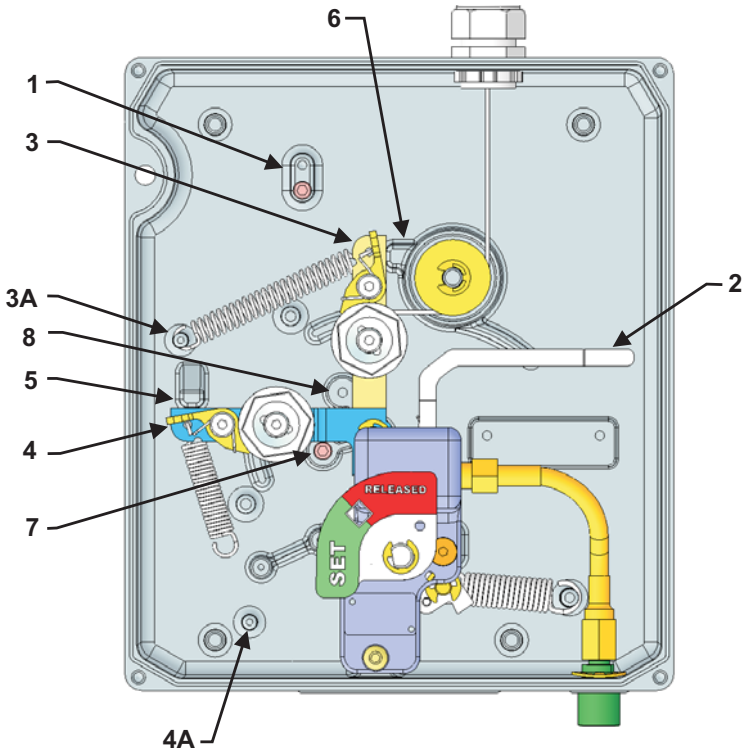


Figure 4-22. *XV* with Detection Line 1 Locked Out

Table 4-3. Cabling Detection Line 2 Only - Option 1

Item	Description
1	Lockout screw pad (shown with one red lockout screw removed)
2	Actuation Latch
3	Spring and beam for Detection Line 2 (set with cable)
3A	Spring Post for Detection Line 2
4	Spring and beam for Detection Line 1 (locked out)
4A	Spring Post for Detection Line 1 (spring removed)
5	Beam Stop for Detection Line 1
6	Beam Stop for Detection Line 2
7	Lockout pad for Detection Line 1 (red lockout screw inserted)
8	Lockout pad for Detection Line 2 (not used, line set)

1. Ensure that nothing is armed or set in the *XV*.
2. With the *XV* completely disarmed, remove the spring from its respective post (item 4A, Detection Line 1). It is permissible to remove the spring from the detection beam.
3. Push the detection beam (item 4) against its respective beam stop (item 5).
4. Using a 9/64-inch allen key (hex) remove one of the red lockout screws from storage pad (item 1) and carefully thread into lockout pad (item 7).

4-4.1.4.5 Cabling Detection Line 2 Only (Option 2)— Includes Lockout of Detection Line 1

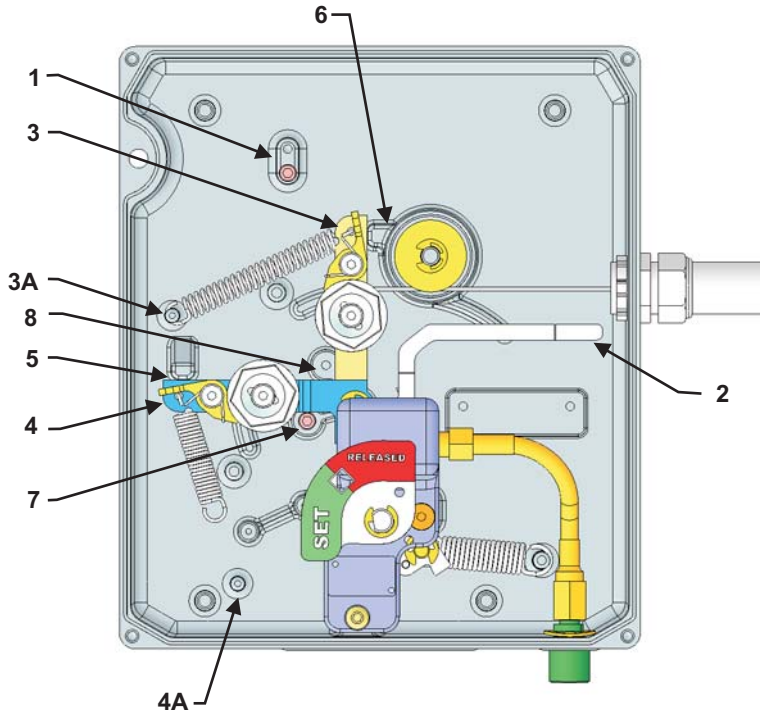


Figure 4-23. *XV* with Detection Line 1 Locked Out

Table 4-4. Cabling Detection Line 2 Only - Option 2

Item	Description
1	Lockout screw pad (shown with one red lockout screw removed)
2	Actuation Latch
3	Spring and beam for Detection Line 2 (set with cable)
3A	Spring Post for Detection Line 2
4	Spring and beam for Detection Line 1 (locked out)
4A	Spring Post for Detection Line 1 (spring removed)
5	Beam Stop for Detection Line 1
6	Beam Stop for Detection Line 2
7	Lockout pad for Detection Line 1 (red lockout screw inserted)
8	Lockout pad for Detection Line 2 (not used, line set)

1. Ensure that nothing is armed or set in the *XV*.
2. With the *XV* completely disarmed, remove the spring from its respective post (item 4A, Detection Line 1). It is permissible to remove the spring from the detection beam.
3. Push the detection beam (item 4) against its respective beam stop (item 5).
4. Using a 9/64-inch allen key (hex) remove one of the red lockout screws from storage pad (item 1) and carefully thread into lockout pad (item 7).

4-4.1.5 ATTACHING MICROSWITCHES, P/N 87-120039-001

4-4.1.5.1 High Mount Location for Microswitches

The High Mounted Microswitch mounts with the paddle(s) facing up into the Cam/Flag. When in the 'Set' position, the Cam/Flag pushes down on the paddle(s) of the microswitch. When the Cam/Flag is released, the microswitch(es) release and change position (see Figure 4-27 for wiring diagram, and Figure 4-24 for mounting).

The microswitches are best mounted when the system is in the 'Released' position. Two pairs of #4 screws are included with each microswitch kit: 5/8-inch long and 1-inch long x 3/32-inch Allen Key.

If mounting a single switch, use the 5/8-inch screws. If mounting two switches, use the 1-inch long screws.

After mounting the microswitch, turn the Cam/Flag to the 'Set' position to ensure the paddles move far enough down to change the phase of the microswitch. Use the included pigtail assembly to connect the microswitch to the circuit being monitored.

See Figures 4-26, 4-27, 4-28, and 4-29 for wiring diagrams.

Note: It is recommended that the pigtails be threaded into the port before attempting to plug it onto the microswitch contacts. All splices and connections should be made in a separate approved electrical box connected by EMT or other approved conduit. See NFPA 70 and NFPA 72 for proper wiring guidelines.

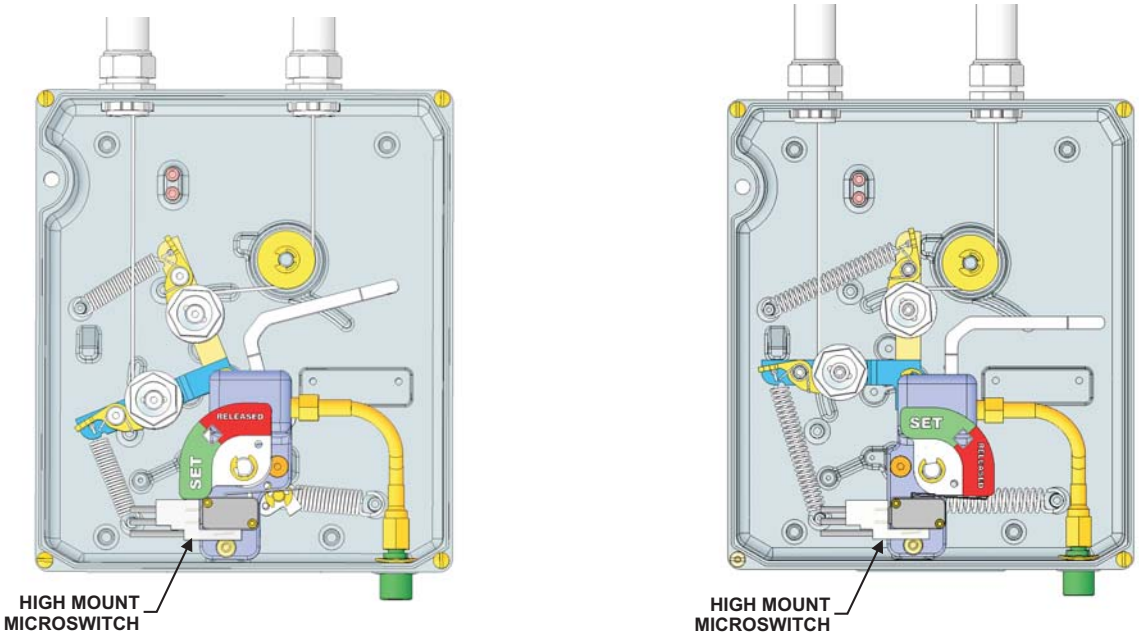


Figure 4-24. High Mount Microswitch, 'Released' and ‘Set’ Positions

4-4.1.5.2 Deep Mount Location for Microswitches

The Deep Mounted Microswitch mounts with the paddle(s) facing down, away from the Cam/Flag and trigger. When in the 'Set' position, the trigger pin pushes up on the paddle(s) of the microswitch. When the Cam/Flag is released, the microswitch(es) release and change position. See Figure 4-27 for wiring diagram. See Figure 4-25 for mounting information.

The microswitches should be mounted when the system is in the 'Released' position. Two pairs of #4 screws are included with each microswitch kit: 5/8-inch long and 1-inch long x 3/32-inch Allen Key.

If mounting a single microswitch, use the 5/8-inch screws. If mounting two microswitches, use the 1-inch long screws.

After mounting the microswitch, turn the Cam/Flag to the 'Set' position to ensure the paddles move far enough down to change the position of the microswitch. Use the included pigtail assembly to connect the Microswitch to the circuit being monitored.

See Figure 4-29 to see the terminal type microswitch positions when the *XV* Control System is in the Set and Released states.

See Figures 4-26, 4-27, 4-28, and 4-29 for general wiring diagrams. See Figures Figure 4-31 and Figure 4-32 for initiating and releasing wiring diagrams.

Note: It is recommended that the pigtails be threaded into the port before attempting to plug it onto the microswitch contacts. All splices and connections should be made in a separate electrical junction box connected by EMT or other approved conduit. See NFPA 70 and 72 for proper wiring guidelines. Mounting the microswitch with the pigtails attached and inserted into the outlet is recommended.

CAUTION

When setting the Cam/Flag, make sure the trigger pin turns under the microswitch paddle(s) and pushes up to set the microswitch. If the trigger pin is "above" or between the paddle and the microswitch, the microswitch will not change position upon actuation of the *XV* Control System which could result in system malfunction.

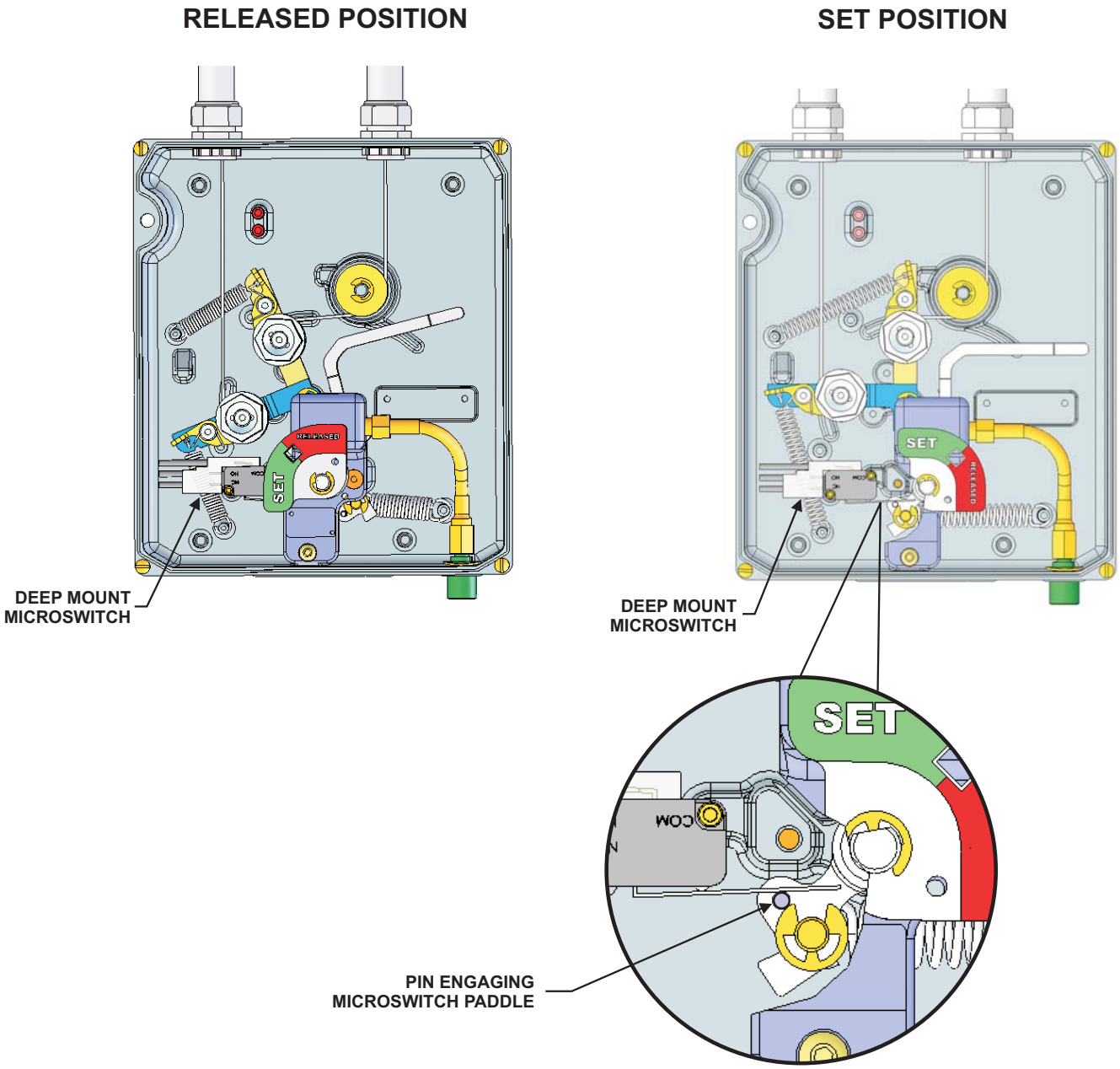


Figure 4-25. Deep Mount Microswitch, 'Released' and ‘Set’ Positions

4-4.1.6 WIRING MICROSWITCHES

These are used when it is necessary to open or close electrical circuits. The following are examples, but not limited to:

- Electric appliance shutdown
- Make up air shutdown
- Electric gas valve shutdown
- Shuntbreaker/relay

Note: Not for alarm initiation.

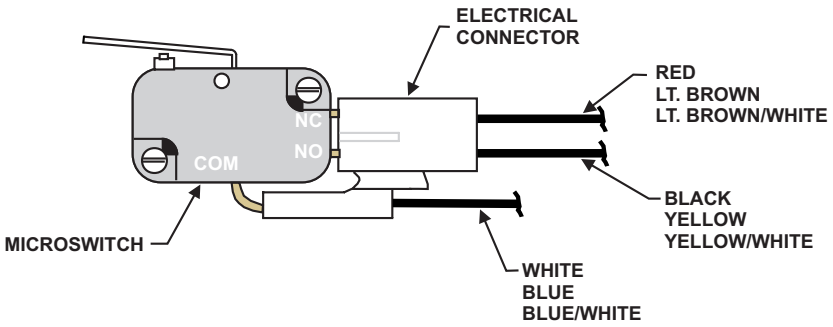


Figure 4-26. Microswitch Kit, P/N 87-120039-001, 87-120039-501

Table 4-5. Electrical Ratings for Microswitch Kit, P/N 87-120039-001 and 87-120039-501

125/250 Vac	20-1/2 Amps
250 Vac	1-1/2 HP
125 Vac	1/2 HP

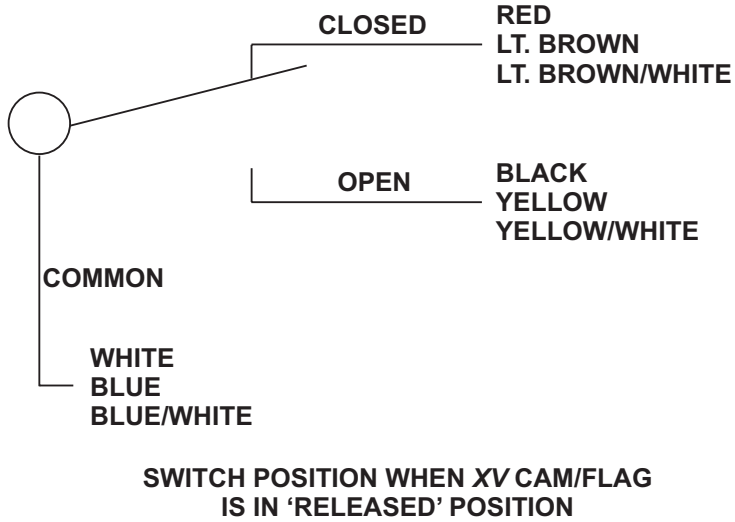


Figure 4-27. Microswitch on Released Position

Microswitch to be used for:

- Alarm initiation
- Solenoid release

Not to be used for:

- Electric appliance shutdown
- Make up air shutdown
- Electric gas valve shutdown
- Shuntbreaker/relay

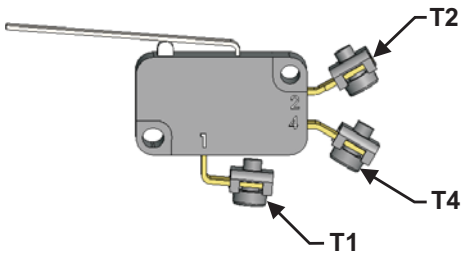


Figure 4-28. Microswitch in Released Position, P/N 87-120047-001

Table 4-6. Electrical Ratings for Microswitch P/N 87-120047-001

250 Vac	15 Amps
250 Vac	1/2 HP
125 Vac	1/2 HP

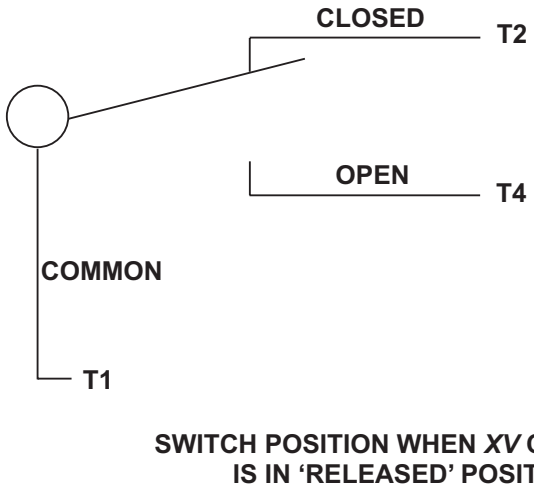


Figure 4-29. Microswitch (Terminal Type) Position in Released Position

4-4.1.7 MOUNTING THE SOLENOID, P/N 83-100034-001

The Solenoid can be used in conjunction with mechanical detection or if mechanical detection or a Remote Manual Release is not needed. Red lockout screws are mounted in the control system.

The Solenoid includes an attached mounting bracket. Included in the hardware kit are two Allen screws.

WARNING

The Solenoid operates on 24 Vdc only. Connection to a higher voltage can result in non-operation, or burning out of the coil.

Work on the Solenoid should never take place while the system is in the 'Set' and ready position. The Solenoid operates directly on the latch. Ensure that the System Nitrogen Cartridge is removed and the Cam/Flag assembly is released or locked out with the Keeper Pin (P/N 60-9197108-000).

1. Using a 3/32-inch Allen key, position the Solenoid behind the High-Pressure Nitrogen Tubing, aligning the mounting bracket with the mounting screw holes on the actuator mounting pad (see Figure 4-30).
2. Secure the Solenoid and bracket assembly to the *XV* Control System enclosure with the enclosed 3/32-inch Allen screws.
3. Dress the wires from the Solenoid up above the internal nitrogen hose, along the bottom of the *XV* and in front of the high mount microswitch mounting pad.
4. Using a cable tie, secure the Solenoid wires to the internal nitrogen hose.

Note: Wiring of the Solenoid must be done according to NFPA 72, National Fire Alarm Code and NFPA 70, National Electrical Code. Wiring the Solenoid through a Microswitch is required. The solenoid coil is 24 Vdc at 1.5 Amp and at 70°F (21°C).

5. Wire the Solenoid to the microswitch:
   - Wire one lead from the Solenoid to terminal T1 of the microswitch.
   - Wire the second lead from the Solenoid through Knockout 1 or Knockout 2 through the conduit and into an approved control panel.
   - Finish the releasing loop by attaching a wire to T4 of the microswitch, through the conduit and into an approved control panel. See Figure 4-30.

Releasing the *XV* Control System opens the contact and stops the releasing current.

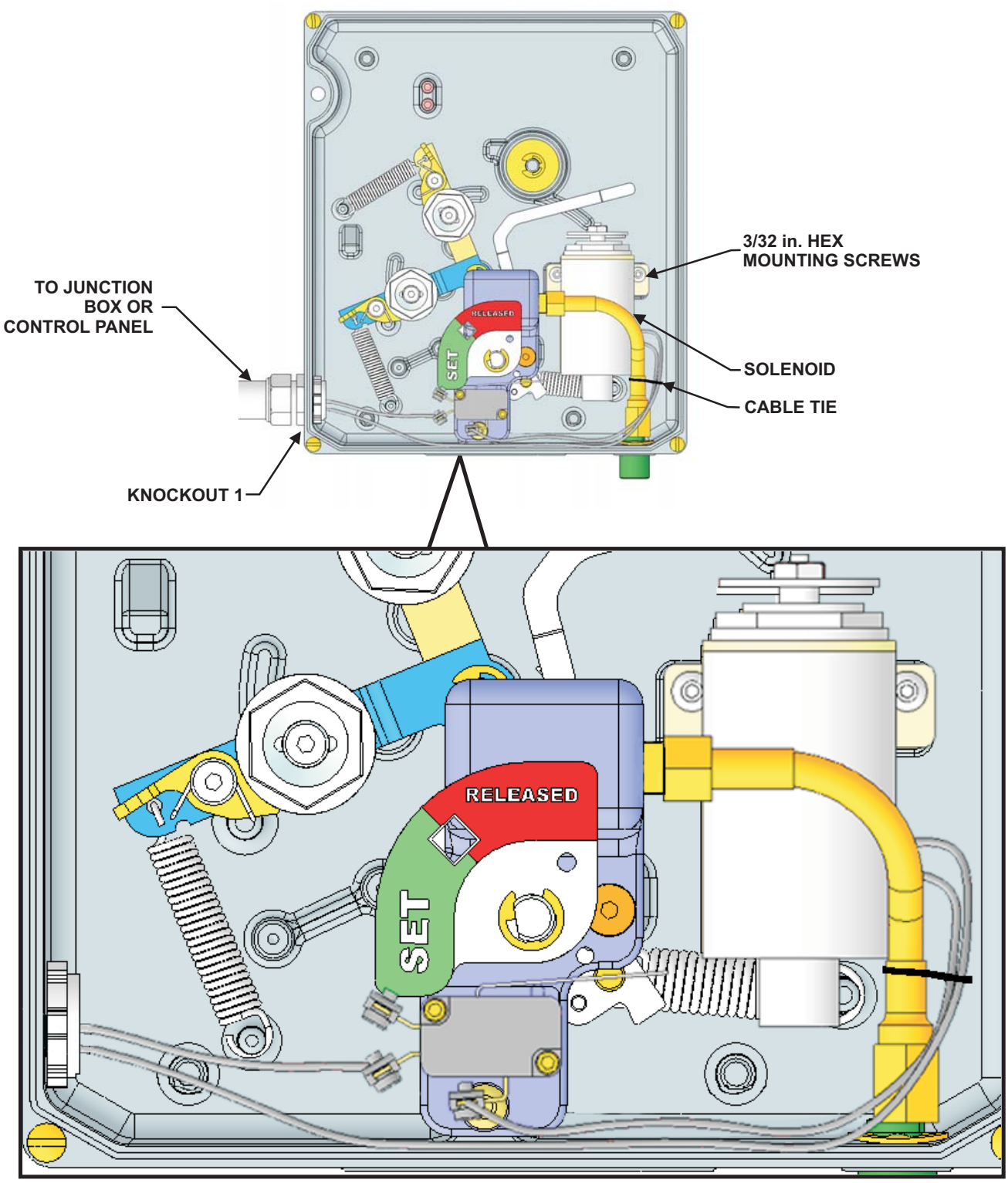
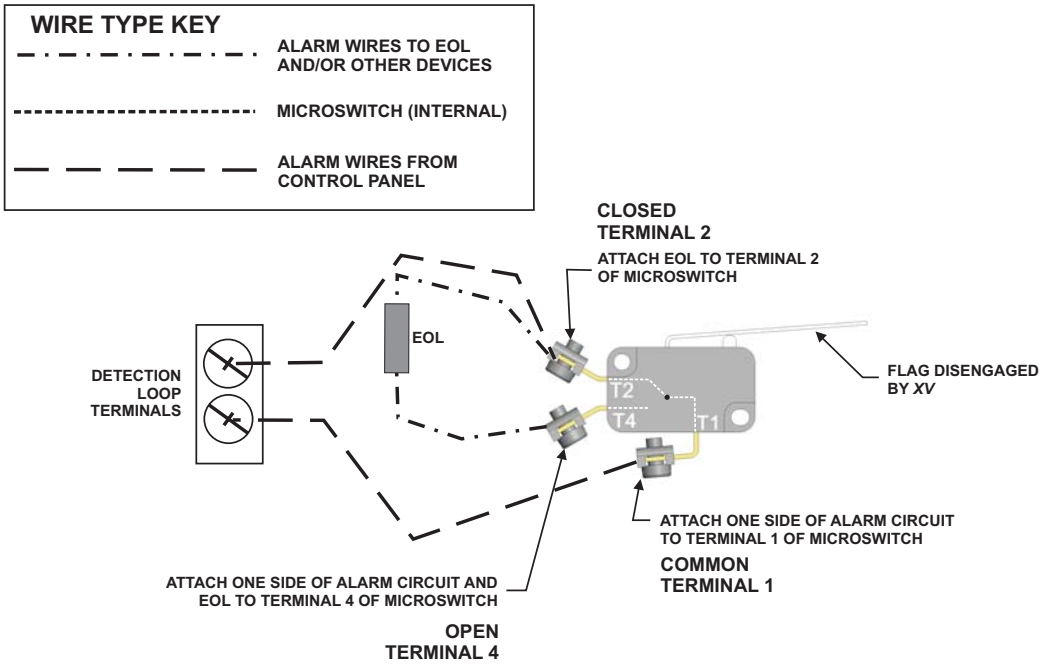


Figure 4-30. Solenoid Mounted and Wired in the *XV* Control System

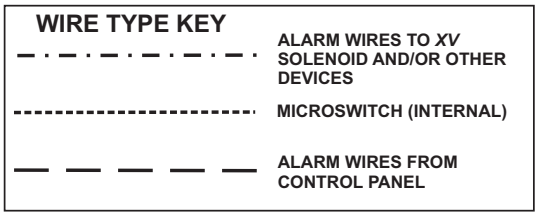
Note: Dress the wires from the Solenoid down along in front of the high mount microswitch mounting pad and out through Knockout 1 or Knockout 2.

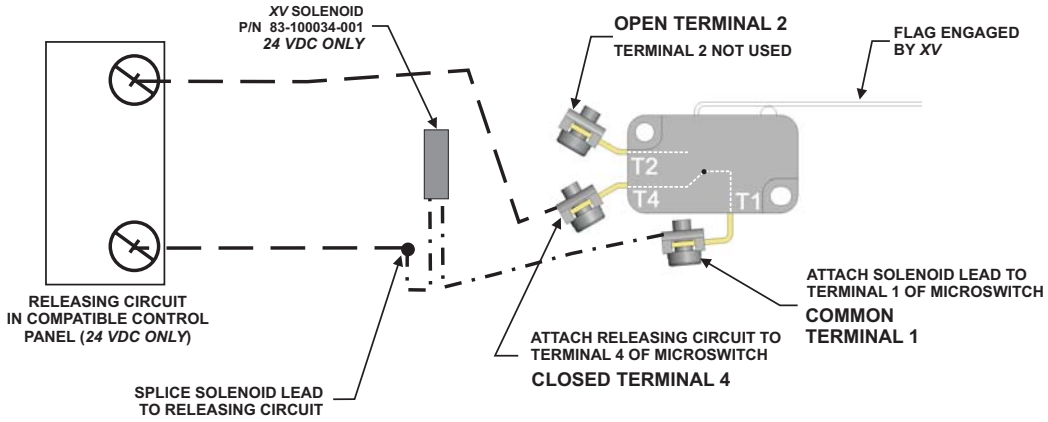
Refer to Figure 4-31 and Figure 4-32 for initiation and releasing wiring diagrams.



SWITCH POSITION WHEN *XV* FLAG/CAM IS IN RELEASED POSITION

Figure 4-31. Alarm Wiring with Terminal Type Microswitch





SWITCH POSITION WHEN *XV* FLAG/CAM IS IN SET POSITION

Figure 4-32. Release Wiring with Terminal Type Microswitch

4-4.1.7.1 Locking Out Detection Lines 1 and 2

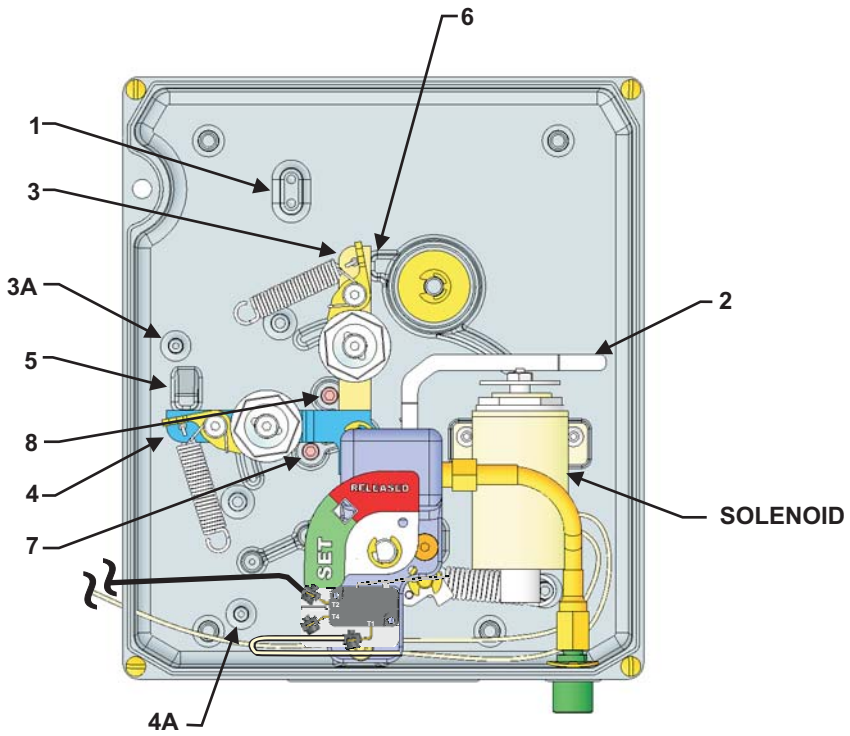


Figure 4-33. Locking Out Detection Lines 1 and 2 with Solenoid Mounted in *XV*

Table 4-7. Locking Out Detection Lines 1 and 2

Item	Description
1	Lockout screw pad (shown with red lockout screws removed)
2	Actuation Latch
3	Spring and beam for Detection Line 2 (locked out)
3A	Spring Post for Detection Line 2 (spring removed)
4	Spring and beam for Detection Line 1 (locked out)
4A	Spring Post for Detection Line 1 (spring removed)
5	Beam Stop for Detection Line 1
6	Beam Stop for Detection Line 2
7	Lockout pad for Detection Line 1 (red lockout screw inserted)
8	Lockout pad for Detection Line 2 (red lockout screw inserted)

1. Ensure that nothing is armed or set in the *XV*.
2. With the *XV* completely disarmed, remove the spring from its respective posts (item 3A, Detection Line 2, and item 4A, Detection Line 1). It is permissible to remove the spring from the detection beam.
3. Push the detection beam (item 4) against its respective beam stop (item 5).
4. Push the detection beam (item 3) against its respective beam stop (item 6).
5. Using a 9/64-inch allen key (hex) remove red lockout screws from storage pad (item 1) and carefully thread into lockout pads (items 7 and 8).

CAUTION **Never lock out a detection line that is being used in a fire protection system.**

CAUTION **Refer to the appropriate DIOMs for instructions on disabling the system for service, repair, and maintenance.**

4-4.2 Optional Equipment Installation

4-4.2.1 INSTALLING REMOTE MANUAL RELEASE, P/N 875572

The Remote Manual Release is equipped with a safety pin and seal wire which must be removed to permit installation of the control cable from the *XV* Control System.

Note: The Remote Manual Release is optional if the *XV* Control System (local manual release) is in a clearly visible, easily accessible, unobstructed location. If it is not, a Remote Manual Release must be used for mechanical systems.

Install the Remote Manual Release as outlined in Steps 1 through 9 (see Figure 4-34).

1. Mount the Remote Manual Release at a means of egress, on a clear, unobstructed exit location between 42 — 48 inches (1067 — 1219 mm) above the floor. Refer to NFPA 17A and NFPA 96, latest editions.The cable can enter the handle from the side hole in the snap-out cover or from the rear of the handle. If the cable is to enter from the rear, perform alternate Steps 1-a and 1-b, otherwise, proceed to Step 2.
    a. Drill a hole in the wall opposite the position of the Remote Manual Release handle plug (when mounted).
    a. Attach a 1/2-inch EMT adapter to the hole in the wall.
2. Mount the back plate to the wall using bolts or No. 10 self-tapping wood screws of required length.
3. Remove the Corner Pulley covers to aid in installing the 1/16-inch steel cable through the system.
4. Feed the 1/16-inch steel cable through the Remote Manual Release through 1/2-inch conduit or EMT to the *XV* Control System. Use Corner Pulleys (P/N 844648) for all changes in direction. Leave at least 12-inches of 1/16-inch steel cable coming out of the Remote Manual Release.

Note: The Remote Manual Release cable attaches to the latch of the *XV* Control System. The Remote Manual Release uses Port 5 of the *XV* Control System.

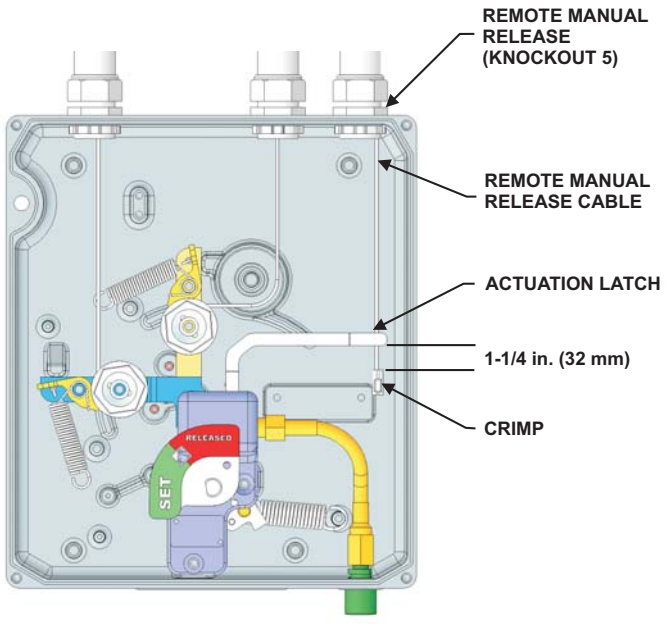


Figure 4-34. Remote Manual Release with Detection Lines 1 and 2 Locked Out

5. There is a through hole in the end of the actuation latch. Carefully feed the control cable through the hole in the actuation latch.

Note: It is important that the control cable slips easily through the hole in the end of the actuation latch. The actuation latch must be able to operate without interference from the control cable. Later, the movement of the actuation latch assembly will be tested before completing the setting of the *XV* Control System. Approximately 1-1/4 inches (32 mm) of control cable (with crimp end not included) should be left under the actuation latch, when in the 'Released' position.

6. Slip a Crimp Sleeve (P/N 214951) over the end of the control cable.
7. Making a loop, slip the end back through the Crimp Sleeve.
8. Use the Crimping Tool (P/N 253538) to fasten the Crimp Sleeve to the control cable.
9. Cut the loop off of the crimped cable assembly. Cut any loose ends off as close to the Crimp Sleeve as possible.
10. If a second Remote Manual Release is required, use the Tee Pulley assembly (P/N 843791).

4-4.2.1.1 Attaching Remote Manual Release

Note: You can use two Remote Manual Releases with a Tee Pulley (P/N 843791) going to the *XV* Control System.

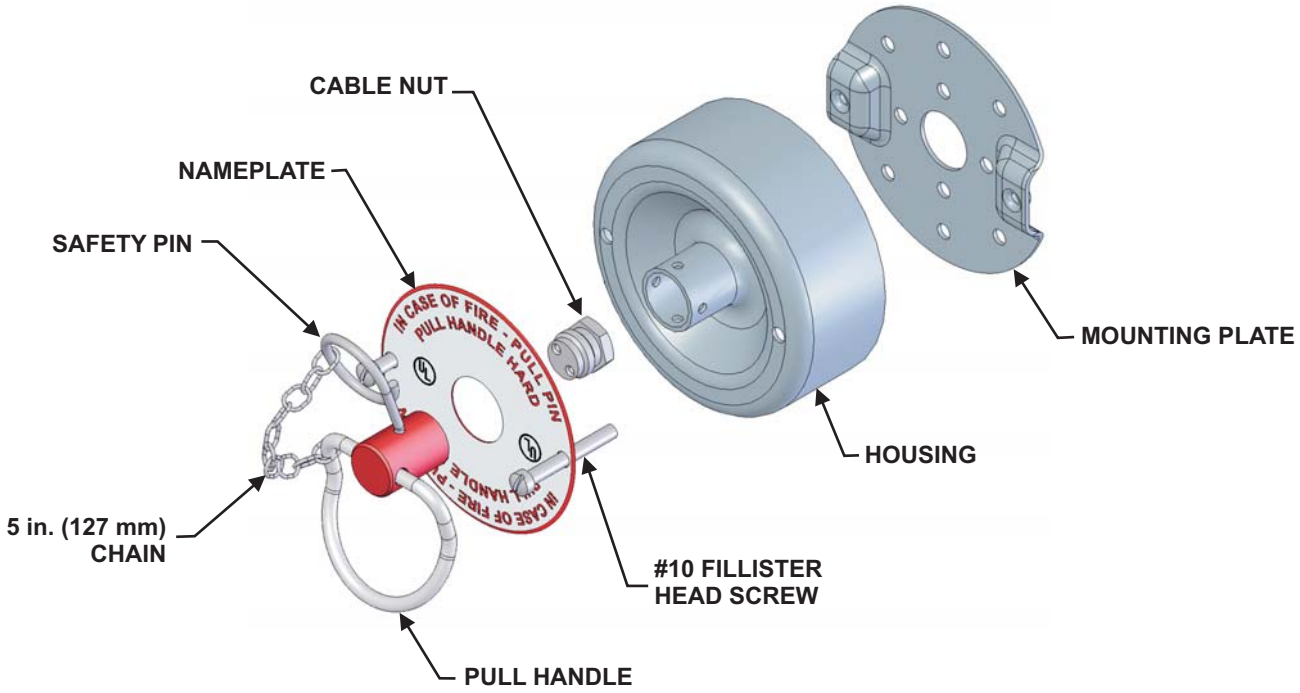


Figure 4-35. Exploded View of the Remote Manual Release

1. Attach a length of 1/16-inch steel cable to the Remote Manual Release handle, as follows (refer to Figure 4-36):
   a. Unscrew the cable nut from the Remote Manual Release plug.
   b. Thread the cable through the cable nut hex-head end at least 3-4 inches from the entry of the Remote Manual Release box. Return the cable through the other hole of the cable nut hex-head.
   c. Screw the cable nut into the Remote Manual Release handle plug until tight. Insert the Remote Manual Release handle plug in the hole in the Remote Manual Release handle assembly.
   d. Cut excess slack where it emerges from the second hole in the hex-head end of the cable nut.
   e. Line up the holes in the Remote Manual Release handle and the Remote Manual Release handle plug and insert the safety pin to hold the plug in place. Loosely wrap the seal wire around the release handle to lock.

2. Attach the cover with nameplate to the mounting plate using the 2 screws provided.
3. Reattach Corner Pulley covers.

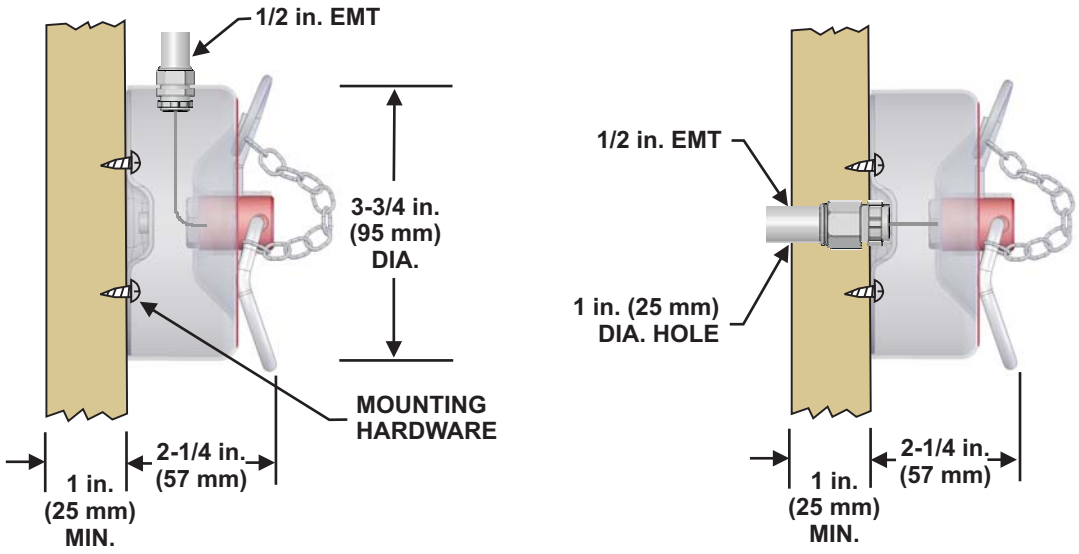


Figure 4-36. Installing the Remote Manual Release, P/N 875572

4-4.2.1.2 Attaching Remote Manual Release Pull Station, P/N 87-120110-001 (Pull-to-Trip)

Note: You can use two Remote Manual Releases with a Tee Pulley (P/N 843791) going to the *XV* Control System.

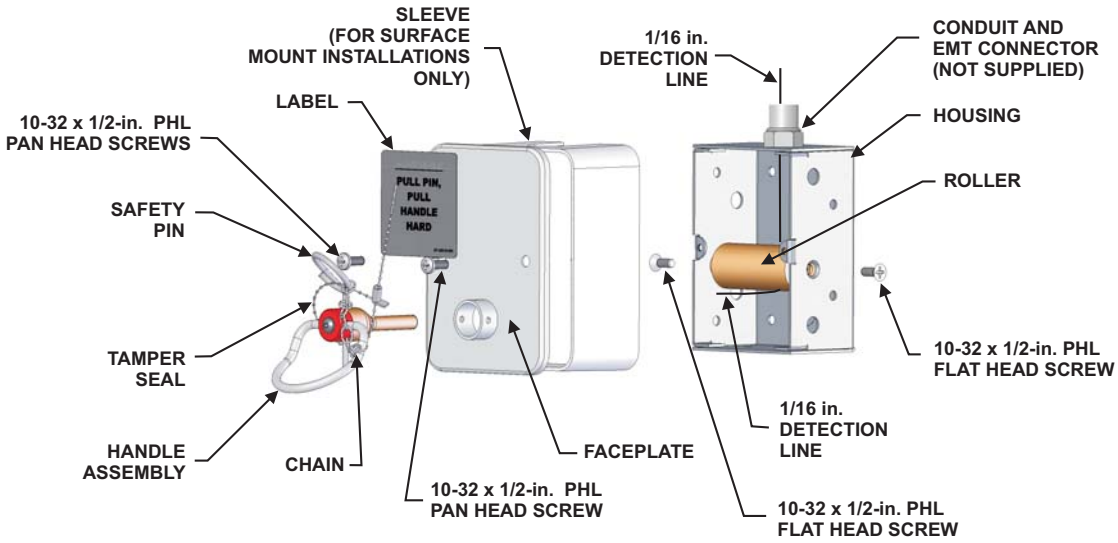


Figure 4-37. Remote Manual Release Pull Station, Pull-to-Trip (EMT/Conduit at Top)

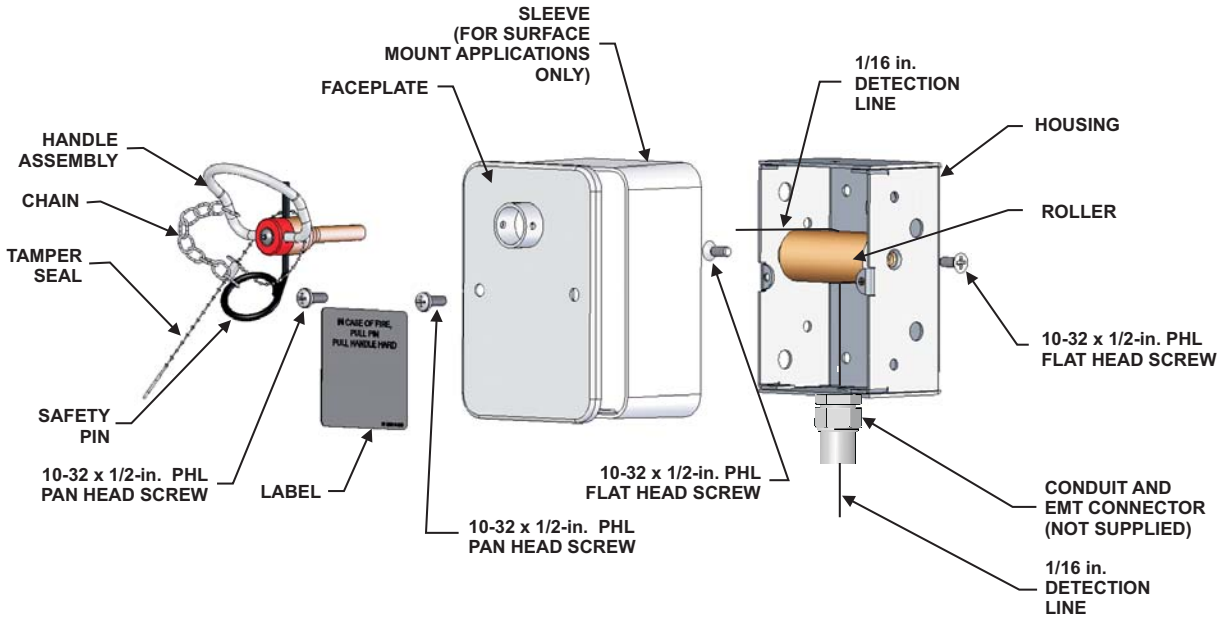


Figure 4-38. Remote Manual Release Pull Station, Pull-to-Trip (EMT/Conduit at Bottom)

When installing the Remote Manual Release Pull Station, it may be surface mounted or recess mounted. The Remote Manual Release Pull Station is designed to mount in the same manner for the Pull-to-Trip mode and the Release-to-Trip mode.

Note: The supplied plastic sleeve is to be used on surface mount installations only.

1. Mount the Remote Manual Release Pull Station at a means of egress, on a clear, unobstructed exit location between 42 — 48 inches (1067 — 1219 mm) above the floor. Refer to NFPA 17A and NFPA 96, latest editions.

   The 1/16-inch (2 mm) diameter stainless steel detection line cable can enter the Pull Handle from the top, bottom, or rear knockout in the housing. If the cable is to enter from the rear of the housing, perform Step 1a., otherwise, proceed to Step 2.

   a. Drill a hole in the wall opposite the position of the Remote Manual Release Pull Station (when mounted). The hole must be large enough for a 1/2-inch EMT adapter to fit through.

2. Mount the housing to the wall or stud using mounting hardware of required length (Mounting hardware not supplied). If recess mount, attach the housing to a wall stud so that the front surface extends out from the wall stud 1/8-inch to 3/16-inch.
3. Feed the 1/16-inch steel cable through the Remote Manual Release Pull Station into the 1/2-inch conduit or EMT to the *XV* Control System. Leave at least 12-inches of cable coming out of the Remote Manual Release Pull Station.

Note: The Remote Manual Release cable attaches to the actuation latch of the *XV* Control System. The Remote Manual Release in Pull-to-Trip mode uses Port 5 of the *XV* Control System.

4. Install the roller to the housing using the #10-32 x 1/2-inch flat head screws provided. If the EMT/Conduit is at the top, refer to Figure 4-37. Route 1/16-inch (2 mm) diameter stainless steel detection line cable as shown. If the EMT/Conduit is at the bottom, refer to Figure 4-38. Route 1/16-inch (2 mm) diameter stainless steel detection line cable as shown.

WARNING **Verify that the 1/16-inch steel cable is behind the roller. Improper cable location will not allow for proper use!**

5. Install the sleeve over the housing (surface mount installations only).
6. Slide the detection line cable through the opening in the faceplate, and attach the faceplate to the housing, using the #10-32 pan head screws provided.
7. Thread the detection line cable through the hole closest to the Handle Assembly. Loop the cable around and through the other open hole. See Figure 4-39.
8. Tighten the setscrew on the end of the Handle Assembly. Pull the cable tight against the handle, and cut off any remaining loose cable close to the Handle Assembly as possible.

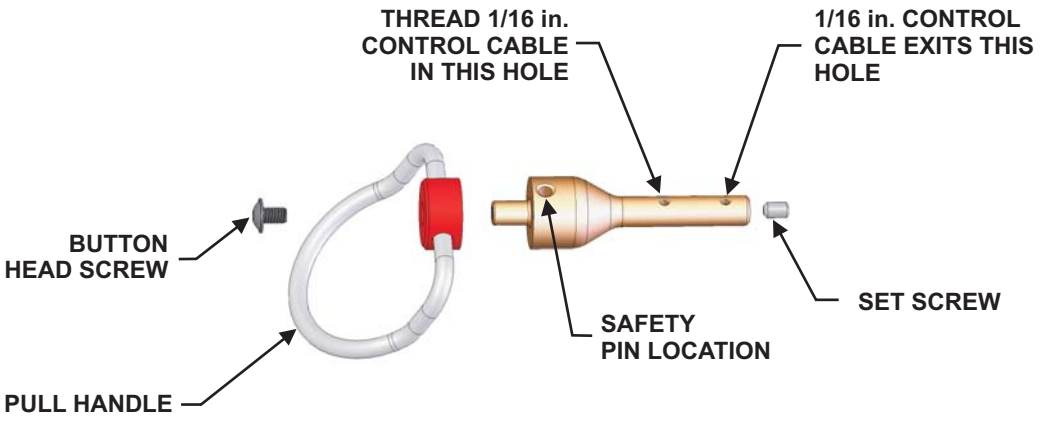


Figure 4-39. Remote Manual Release Pull Station Handle Assembly

9. Insert the Handle Assembly into the faceplate, line up the holes on the faceplate collar and the hole on the Handle Assembly, and install the safety pin.

Note: Use the #8-32 screw on the handle assembly to rotate the handle to get the hole in the pin and the faceplate collar to line up.

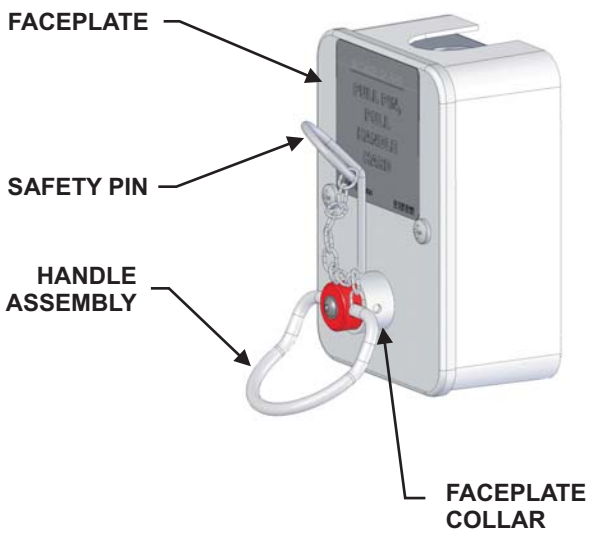


Figure 4-40. Securing the Remote Manual Release Pull Station

10. Tightly wrap the tamper seal around the faceplate collar, through the safety pin and behind the handle to lock.

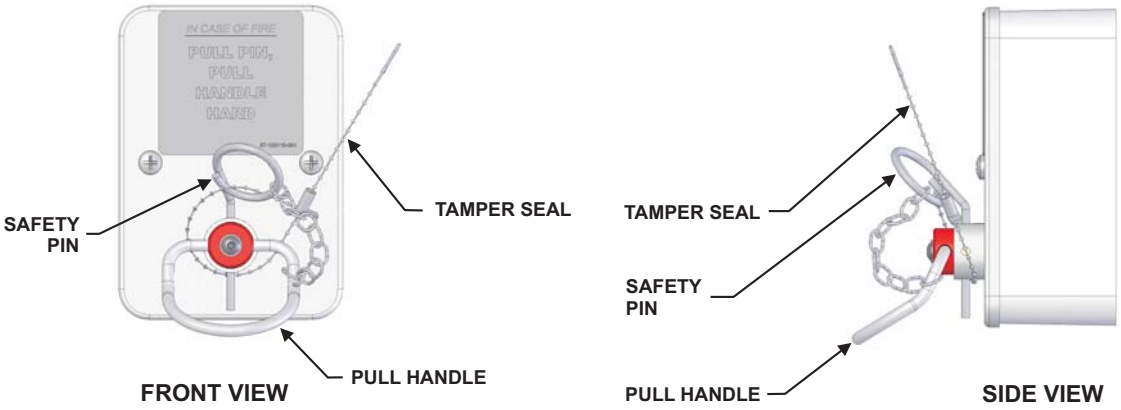


Figure 4-41. Wrap Tamper Seal Around Pull Handle

Note: If a second Remote Manual Release is required, use the Tee Pulley assembly (P/N 843791).

4-4.2.1.3 Attaching Remote Manual Release Pull Station, P/N 87-120110-001 (Release-to-Trip)

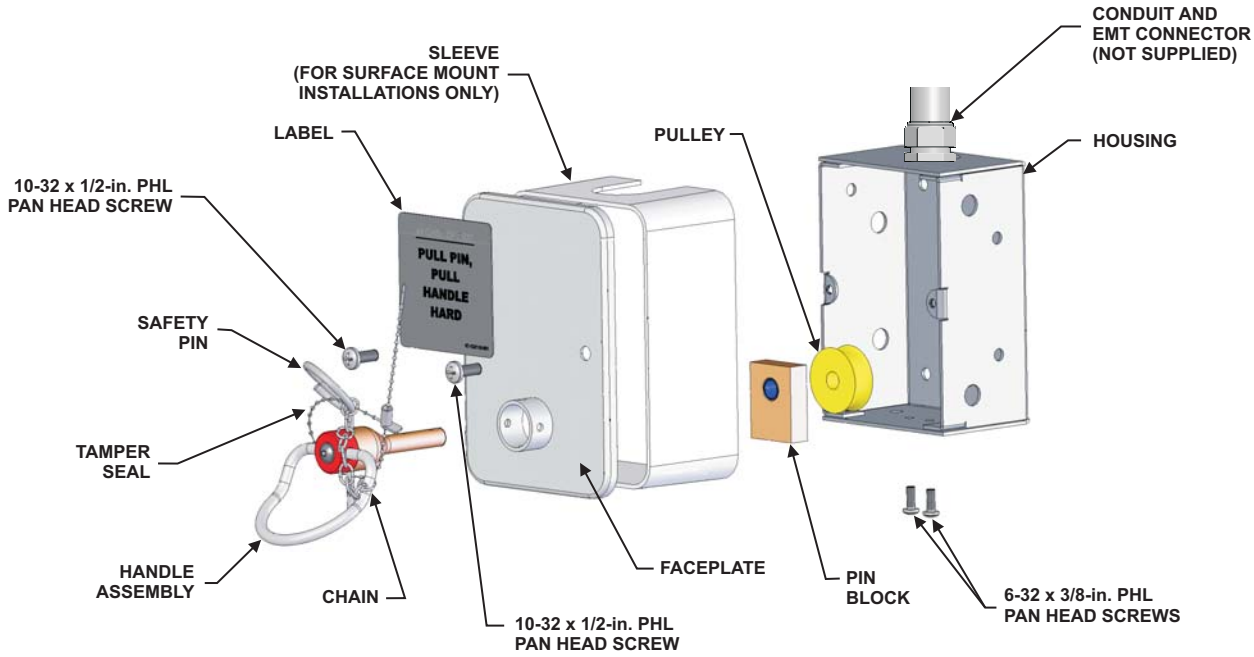


Figure 4-42. Exploded View of the Remote Manual Release Pull Station, Release-to-Trip

When installing the Remote Manual Release Pull Station, it may be surface mounted or recess mounted. The Remote Manual Release Pull Station is designed to mount in the same manner for the Pull-to-Trip mode and the Release-to-Trip mode.

Note: The supplied plastic sleeve is to be used on surface mount installations only.

1. Mount the Remote Manual Release Pull Station at a means of egress, on a clear, unobstructed exit location between 42 — 48 inches (1067 — 1219 mm) above the floor. Refer to NFPA 17A and NFPA 96, latest editions.

   The 1/16-inch (2 mm) diameter stainless steel detection line cable can enter the Pull Handle from the top of the housing.
2. Mount the housing to the wall or stud using mounting hardware of required length (mounting hardware not supplied). If recess mount, attach the housing to a wall stud so that the front surface extends out from the wall stud 1/8-inch to 3/16-inch.
3. Install a 3-Way Pulley (P/N 60-9197602-000) inline with the EMT connector.

WARNING **The rear knockout may NOT be used in this setup**.

Note: A 3-Way Pulley (P/N 60-9197602-000) cannot be used to operate dual gas valves. Only one (1) 3-Way Pulley can be used in a given detection system and must be counted as two (2) Corner Pulleys.

4. Feed the 1/16-inch steel detection line cable through the 1/2-inch conduit or EMT into the Remote Manual Release Pull Station. There should be a loop of detection line cable protruding into the Housing and back through the 3-Way Pulley.

Note: The Remote Manual Release detection line cable attaches to the actuation latch of the *XV* Control System. The Remote Manual Release in Release-to-Trip mode uses Port 3 or 4 of the *XV* Control System.

CAUTION

No Corner Pulleys can be used between the 3-Way Pulley and the Remote Manual Release Pull Station.

5. Loosely install the Pin Block inside the housing using the #6-32 x 3/8-inch pan head screws provided.
6. Install the faceplate using the #10-32 x 1/2-inch screws provided.
7. Insert the Handle Pin so that it protrudes through the Pin Block.
8. Tighten the #6-32 x 3/8-inch pan head screws to secure the Pin Block.
9. Remove the faceplate and Handle Assembly. This step properly aligns the Pin Block with the faceplate.
10. Bring the detection line cable loop down inside the housing while placing it around the provided Pulley. Line up the Pulley with the hole in the Pin Block.
11. Place the Handle Pin through the Pin Block and then through the Pulley.

Note: Do not tighten detection line(s) at the *XV* Control System until Remote Manual Release Pull Station is completely assembled.

12. Install the sleeve over the housing (surface mount installations only).
13. Attach the faceplate using the #10-32 x 1/2-inch screws provided.
14. Place the Safety Pin through the Handle Pin and the faceplate collar.

Note: Use the #8-32 screw on the handle assembly to rotate the handle to get the hole in the pin and the collar to line up.

15. Attach the handle using the #8-32 flange button head screw.

Note: You can now tighten the detection line(s) at the *XV* Control System at this time.

If using as an End-of-Line device, use a clamp block instead of the Pulley.

16. Tightly wrap the tamper seal around the faceplate collar, through the safety pin and behind the handle to lock.

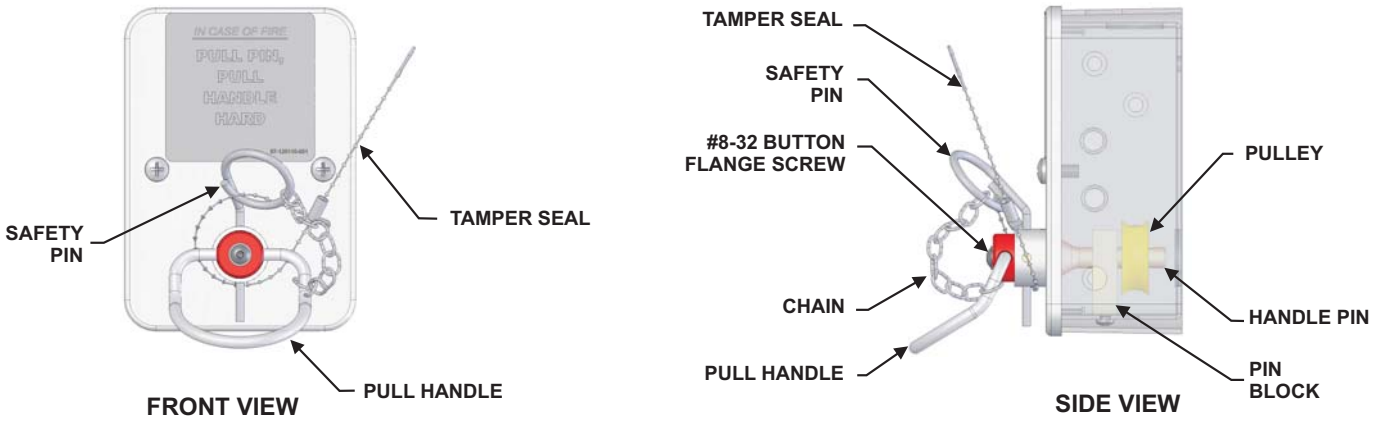


Figure 4-43. Remote Manual Release Pull Station, Release-to-Trip (Side View)

4-4.2.2 CABLING MECHANICAL GAS VALVE IN THE *XV* CONTROL SYSTEM

Note: The following instructions assume that the cabling will begin from the end of the line (gas valve).

The gas valve cable is easier to attach while the Cam/Flag is in the 'Released' position. Final gas valve cable adjustment must take place when the Cam/Flag is in the 'Set' position. The gas valve should be set only after setting the Cam/Flag.

1. Bringing the control cable in from the valve, carefully insert the end of the cable into the hole in the end of the trigger.
2. Pull enough cable through so that there is slack on the outlet side of the trigger. Slip a Cable Crimp (P/N 214951) over the end of the cable.
3. Making a loop, slip the end back through the Cable Crimp. Use the Crimping Tool (P/N 253538) to fasten the Cable Crimp to the cable. Cut the loop off of the crimped cable assembly. Cut any loose ends off as close to the Crimp Sleeve as possible.
4. Pull the cable back through so the crimp rests at the trigger (see Figure 4-44).

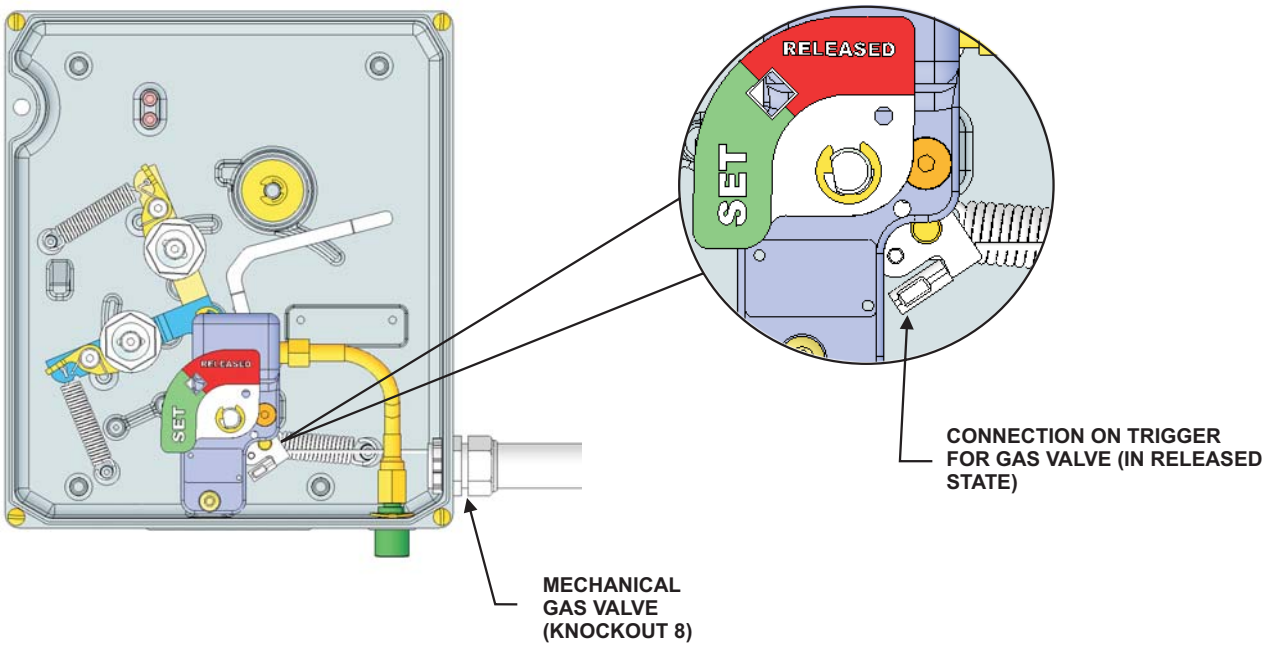


Figure 4-44. Cabling Gas Valve (Cam/Flag 'in Released' State)

To set the gas valve, use the Keeper Pin (P/N 60-9197108-000) to set Cam/Flag and lock it into the 'Set' position. The gas valve can now be set and adjusted.

To set the gas valve later, the system must be completely set up, with all detection lines in the 'Set' position. The Cam/Flag can then be set and the gas valve can be properly adjusted.

CAUTION **Only Tee Pulleys (P/N 843791) can be used to operate Dual Gas Valves.**

4-4.2.2.1 CABLING MECHANICAL GAS VALVE

1. To set the gas valve, use the Keeper Pin (P/N 60-9197108-000) to set Cam/Flag and lock it into the 'Set' position.

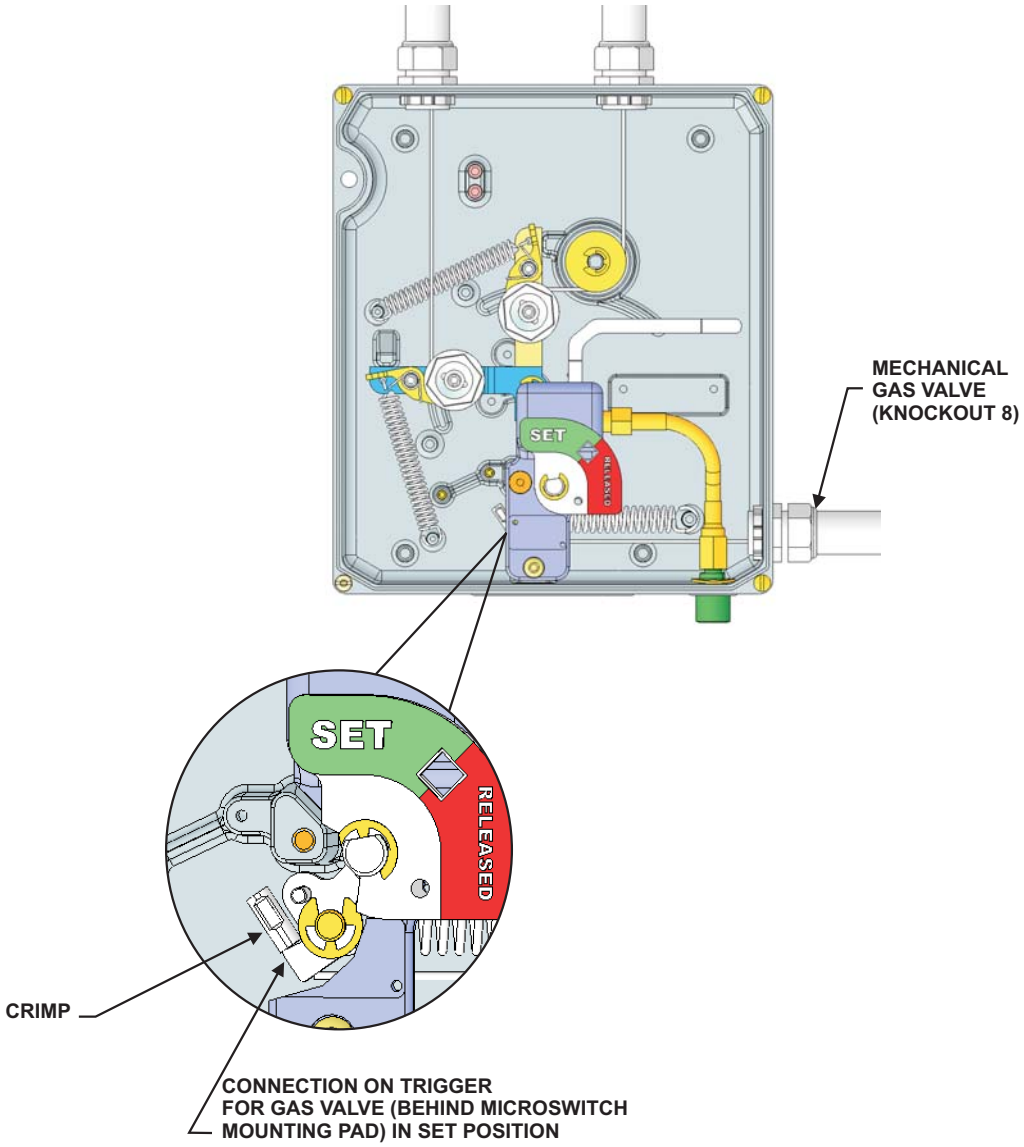


Figure 4-45. Cabling Gas Valve (Cam/Flag in 'Set' State)

2. Remove top and bottom knockouts from the 2x2 electrical box. Install 1/2-inch (13 mm) EMT to top hole of the electrical box (see Figure 4-46).
3. Mount the electrical box to the wall using appropriate hardware.
4. Run conduit and install Corner Pulleys (where appropriate) from the *XV* to the electrical box.
5. Install the gas valve to the electrical box using the washer and nut provided with the gas valve.
6. Slip a Cable Crimp (P/N 214951) over the end of the cable.
7. Insert the cable through the gas valve stem.
8. Making a loop, slip the end back through the Cable Crimp.
9. Pull on the cable to lift the gas valve to the open position.

CAUTION **When pulling on the cable to lift the gas valve, do not over adjust the gas valve.**

10. Use the Crimping Tool (P/N 253538) to fasten the Cable Crimp to the cable. Cut the loop off of the crimped cable.

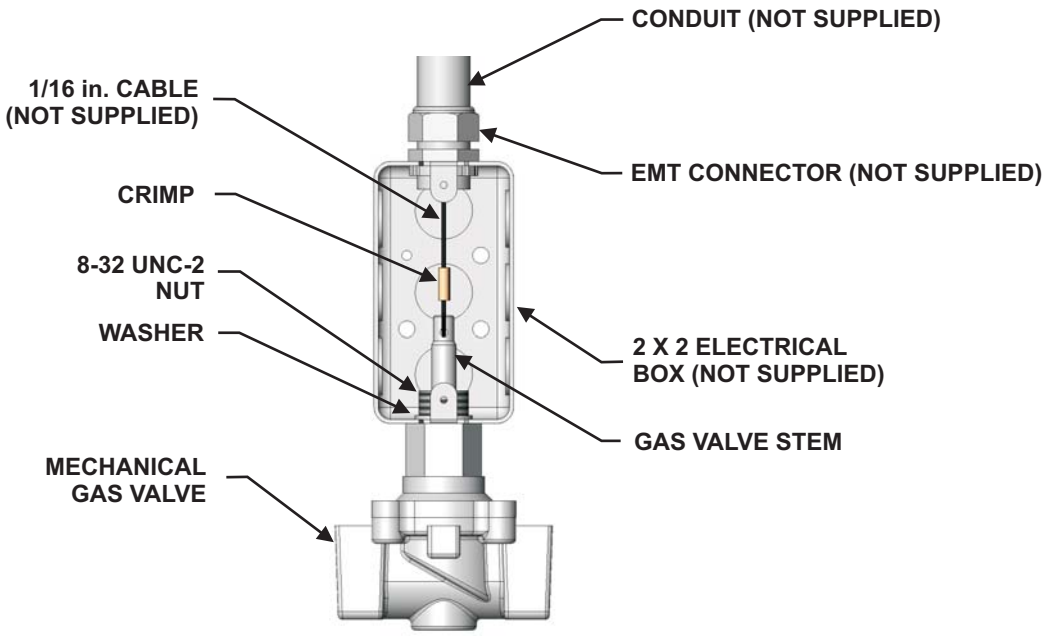


Figure 4-46. Installing Mechanical Gas Valve

4-4.2.3 INSTALLING PRESSURE OPERATED RELEASE, P/N 874290

Install the Pressure Operated Release as follows.

1. Locate the Pressure Operated Release in a suitable position on a wall so that the release is no more than 10 ft. (3 m) from the Kidde IND Dry Chemical Cylinder(s), and installed on a 12 inches (305 mm) vertical length of 1/2-inch (13 mm) pipe (riser).

   The vertical riser is fastened to a tee which may be located within 10 ft. (3 m) in the discharge pipe. The purpose of the riser is to provide an air cushion during discharge to prevent the entrance of Dry Chemical into the Pressure Switch.
2. Mount to wall using suitable hardware.
3. Connect the release input port to the cylinder discharge piping using an appropriate standard weight tee with a 1/2-inch side outlet.
4. Install conduit and Corner Pulleys from the window, door, or other ventilating device being closed to the safety pin on the Pressure Operated Release in such a manner that the cable pull on the safety pin will be in a straight line and perpendicular to the stem.
5. Route the 1/16-inch control cable through conduit and Corner Pulleys. Connect cable ends to plunger and mechanical release at device.

Note: The maximum allowable load to be attached to the plunger is 100 pounds.

4-5 POST-INSTALLATION CHECKOUT

Note: Kidde recommends that all system installations be recorded by the use of photos for future reference.

The Kidde IND Dry Chemical System must be checked for proper installation and operation before it can be put into service. The goal of the initial inspection is to verify that the system design is adequate for the application and that the installation conforms to the instructions described in NFPA 17 and NFPA 33 and this manual. The inspection must cover the following parts of the system:

- Extinguishing System
- Piping System
- Detection System
- Control System
- Mechanical System

At this point, the Kidde IND Dry Chemical System should be configured as follows:

- Cylinder mountings are secure.
- Discharge Adapter Kits are secure.
- Valve Protection Plates are attached to the top of the cylinder valves (other than the first most cylinder).
- Nozzles are secure.
- For Mechanical Actuation:
  - Detectors are secure and properly placed.
  - Remote Manual Releases are secure and in the ready mode.
  - All conduit and Corner Pulleys are secure, and all Corner Pulleys capped.
- For Electrical Actuation:
  - Ensure that the Solenoid is secure.
  - Check the fire control panel. Ensure that it is operational and in standby mode.
- SVAs are secured to the copper tubing and are not connected to the cylinder valves.
- The High-Pressure Nitrogen Tubing from the *XV* Control System is ***not*** connected to the *XV* Control System outlet.
- The *XV* Control System contains no cartridges, neither the System Test Cartridge, nor the System Nitrogen Cartridge.
- The detection lines are in the 'Released' position.
- The Cam/Flag is in the 'Released' position.

4-5.1 Extinguishing System Visual Inspection

The purpose of this inspection is to ensure that the system is designed according to all applicable standards. The inspection must address the following issues.

1. Is the type and quantity of dry chemical used adequate to extinguish the type of fire presented during risk assessment and review of application?
2. Are the Mounting Brackets securely fastened to a wall or other structural member?
3. Are all Cylinder and Valve Assemblies ready for installation?
   a. Are all pressure gauges in the operating (“green”) range?
   b. Are all cylinders in good condition, without evidence of corrosion or damage?
   c. Are all nameplates in place?

4. Has the agent distribution piping been cleaned and inspected (internally) to remove oil or particulate matter that could affect agent discharge? Refer to agent distribution piping checkout procedures.
5. Does the agent distribution piping comply with the design parameters in this manual?
    a. Are all pipe lengths and equivalent pipe lengths within specified limits?
    b. Are the specified piping material and fittings installed?
6. Are piping joints, discharge nozzles and pipe supports securely fastened to prevent dry chemical leakage or hazardous movement during discharge?
7. Are all discharge nozzles applicable to the type of coverage required?
    a. Are all nozzles properly aimed and secured?
    b. Are all nozzles spaced within parameters listed in this manual?
    c. Are all nozzles clean, equipped with the proper blow off cap?

4-5.2 Agent Distribution Piping Checkout

WARNING

Do not use water or oxygen to blow out piping. Moisture will cause blockage. The use of oxygen is very dangerous as the possible presence of even a minute quantity of oil may cause an explosion, thereby causing death, serious personal injury and/or property damage.

The agent distribution piping must be blown clear with dry air or nitrogen to clean out the system and to check for any leaks or obstructions. One possible method is as follows:

1. Pressurize an empty test cylinders with nitrogen to approximately 100 PSIG (6.89 bar).
2. Be sure that blow-off caps or other suitable discharge indicators are attached to all nozzles.
3. Remove Dry Chemical Cylinder and Valve Assemblies from the Discharge Adapters and brackets.
4. Attach the test cylinders to the Discharge Adapters and discharge its contents into the piping system.
5. Verify that all nozzle caps blow off.
6. Remove all nozzles from the system and clean out any debris.
7. Re-install all nozzles and replace all nozzle blow-off caps.
8. Re-install the Chemical Cylinder and Valve Assemblies and the Discharge Adapters.

4-5.3 Detection System Inspection

The purpose of the detection system inspection is to ensure that the system is properly installed and designed.

1. Have temperature changes created by process start-up conditions been measured and accounted for?
2. Has a temperature survey been conducted to determine the maximum ambient temperature in the protected area?
3. Have the detectors been installed in a neat, professional manner, and in accordance with the technical data in this manual?
    a. Are all detection system signal lines (cable, wiring, or tubing) properly installed in conduit or EMT?
    b. Has a point-to-point check for signal line continuity been conducted?
4. Is the Remote Manual Release(s) located in a path of exit or egress and is it clearly identified?

4-5.4 Control System Inspection

The purpose of the control system inspection is to ensure that the detection system has been properly interfaced to the extinguishing system, and that all required auxiliary functions such as ventilation shutdown and alarm notification have been achieved. In general, the inspection must address the following points:

1. Will each installed detector activate the extinguishing system?
2. Are all Cylinder and Valve Assemblies simultaneously activated upon receipt of a single detector signal?
3. Are all auxiliary functions accomplished?

The detailed control system inspection will depend upon the operating characteristics (mechanical or electrical) of the installed fire suppression system.

4-5.5 Mechanical Systems Inspection

The *XV* Control System must be checked for proper connection to external components. It must also be properly set prior to the final system checkout. Before setting the *XV* Control System, check that:

1. All stainless steel cable to detectors and Remote Manual Release(s) is protected with conduit or EMT. Conduit runs must be clean and secure.
2. All cable runs to external components enter the proper *XV* Control System input/output ports and are installed in accordance with the instructions in Chapter 4.
3. There is no branching in the cabling to the detectors.
4. Stainless steel control cable lengths, and Corner Pulley and Tee Pulley counts are within listed limits.
5. Inspect copper tubing and fittings.
6. Ensure nitrogen actuation lines are within listed parameters.

4-6 COMMISSIONING THE SYSTEM

Perform the“Post-Installation Checkout” on page 4-46.

4-6.1 Arming the System

Set the detection beams by turning the ratchet spools counterclockwise (see Figure 4-47).

Tighten the line until the beam reaches the Stop. **Do not overtighten**.

Note: In long cable lines (over 125 ft. [38 m]) there will be stretch in the control cable and in the loops for the detectors. It is important to ensure the control cable is tight without over tightening.

CAUTION **The actuation latch must be in the horizontal position. If it is in any position other than horizontal, the system could malfunction.**

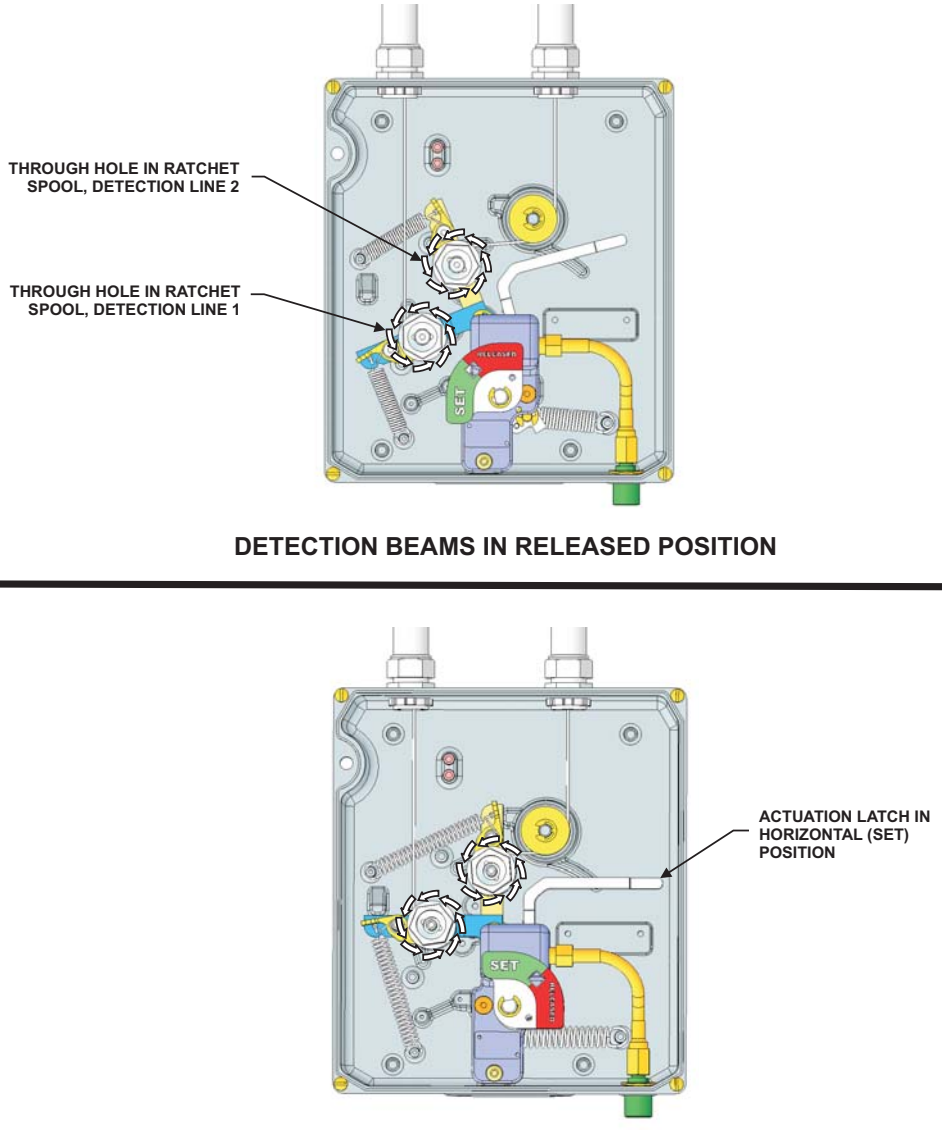


Figure 4-47. Setting the Detection Beams

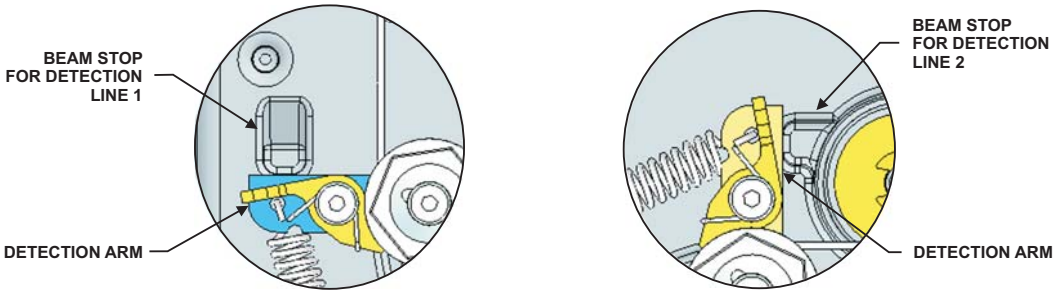


Figure 4-48. Detection Beam Stops

CAUTION

If the Remote Manual Release control cable is interfering with the free movement of the actuation latch, it might require re-cabling. If there is something else interfering with the free movement of the actuation latch, take appropriate corrective action. If it is determined that the interference is due to a mechanical fault of the *XV* Control System, it must be replaced and returned to the factory.

Be careful not to allow the control cable to become entangled with any other parts in the system. If it does, perform the following steps.

1. Using a 7/8-inch socket (or equivalent), slightly turn the ratchet spool. Do not turn so far that it will click into the next step. Using the thumb release on the pawl, release the ratchet and allow it to turn backwards. The beam will move back to the 'Released' position.

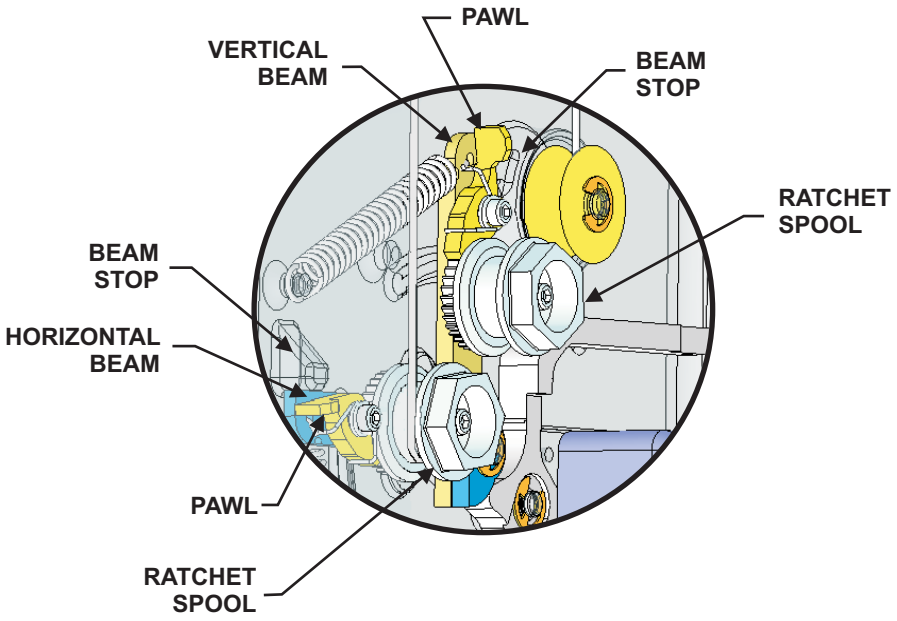


Figure 4-49. View of Ratchet Spool and Pawl

2. Untangle the control cable and guide it onto the spool while ratcheting. Once there is tension, there should be no more entanglement.

3. Using a 7/8-inch socket (or equivalent), carefully ratchet up the slack in the control cable lines (see Figure 4-51). Tighten the line until the beam reached the stop. **Do not overtighten**.

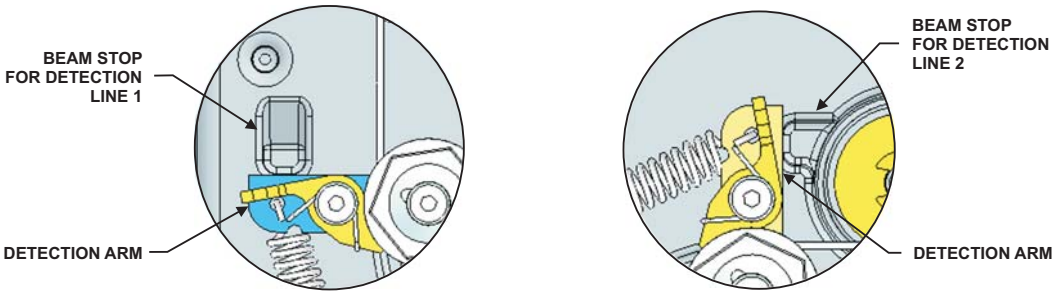


Figure 4-50. Detection Beam Stops

Note: The actuation latch should now be in the horizontal position. If it is not, check to ensure the Remote Manual Release control cable is not interfering with the actuation latch and that the actuation latch swings freely.

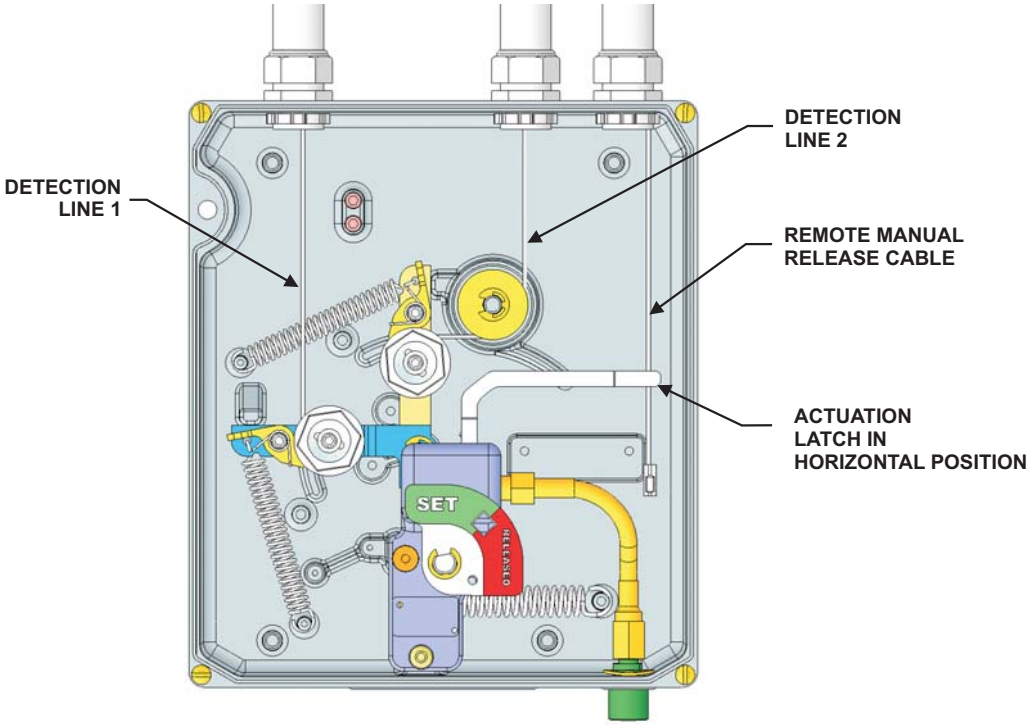


Figure 4-51. Positions of Detection Beams in 'Set' Position

When the two tensioned lines are set, the actuation latch will automatically fall into a horizontal position. It is possible to set the Cam/Flag, if it is not already locked in place.

Twist the Cam/Flag 90° clockwise until it clicks into place. The actuation latch will move up, then reset into the horizontal position (see Figure 4-52). Install Keeper Pin in the Cam/Flag.

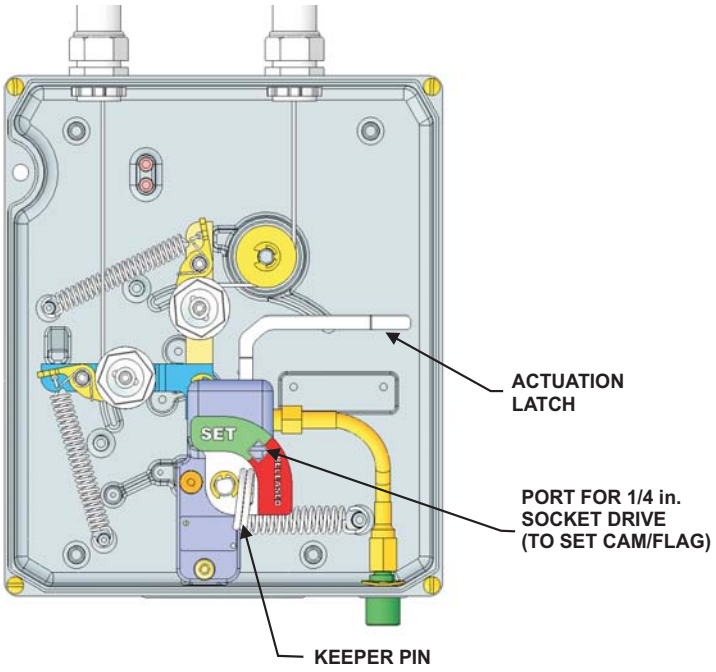


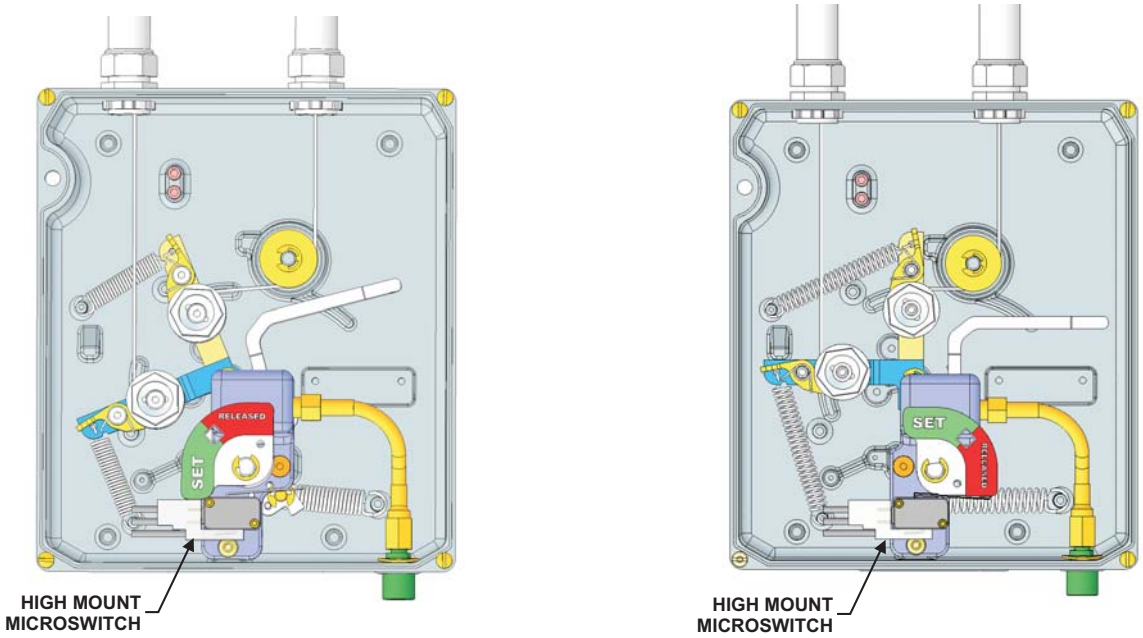
Figure 4-52. Latch Shown in 'Set' Position

4-6.1.1 CHECKING MICROSWITCHES, P/N 87-120039-001

Check to ensure that the microswitches are set. The Cam/Flag should hold down the High Mount Microswitch paddles. The trigger pin should hold up the Deep Mounted Microswitches. Gently push the microswitch paddles toward the body of the microswitches. If there is a “click,” the microswitch is not adjusted properly in the *XV* Control System. Make appropriate adjustments.

CAUTION

The trigger pin on the Deep Mounted Microswitches must be underneath the paddle(s) of the microswitch. If the paddle is under the trigger pin, the microswitch will not change position upon actuation of the *XV* Control System and the paddle(s) might be bent or broken upon such actuation.



RELEASED POSITION **SET POSITION**

Figure 4-53. High Mount Microswitch, 'Released' and ‘Set’ Positions

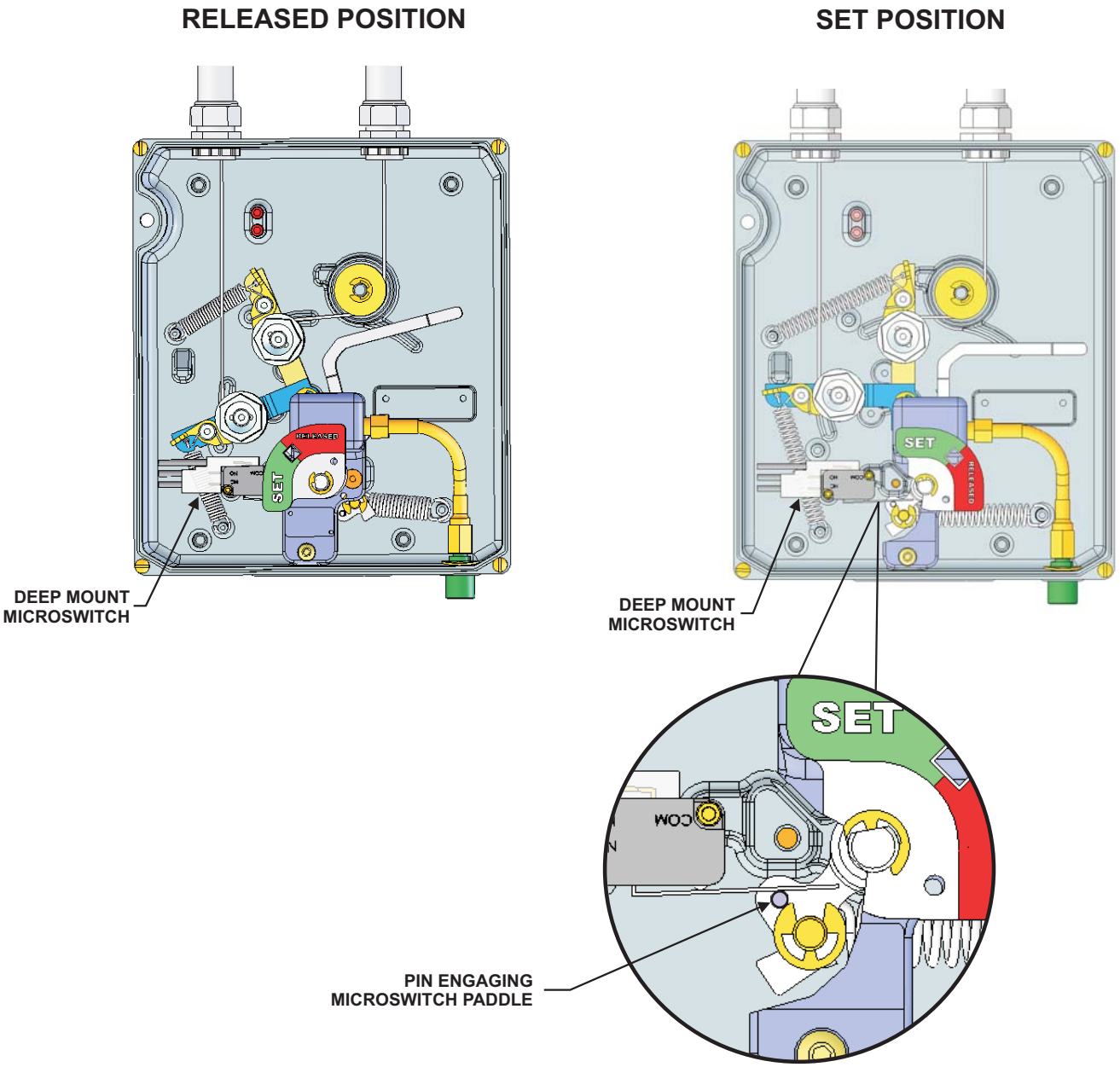


Figure 4-54. Deep Mount Microswitch, 'Released' and ‘Set’ Positions

4-6.1.2 CHECKING SOLENOID, P/N 83-100034-001

If applicable, ensure that the Solenoid (if installed) is in the de-energized state and the actuation latch is horizontal.

Manually test the Solenoid by pushing the Solenoid piston to engage the actuation latch. This allows the Cam/Flag to rotate to the ‘Release’ position.

WARNING **While performing the manual test of the Solenoid, the rotation of the cam / flag could cause personal injury.**

4-6.2 Functional Testing of the *XV* Control System

Perform the"Post-Installation Checkout" on page 4-46.

4-6.2.1 TEST MECHANICAL LINK LINES FOR THE *XV* CONTROL SYSTEM

To test the mechanical detector lines, perform the following steps.

CAUTION

The mechanical detector lines are under tension. Wearing safety glasses and gloves is required during this process.

Before cutting a detector, ensure the System Nitrogen Cartridge is not installed in the *XV* Control System and the Keeper Pin is in place in the Cam/Flag.

1. Remove the Keeper Pin from the Cam/Flag.
2. Go to the far end of the detection line. Cut the detector.
3. Check to ensure the rotation of detection spool and beam assembly as intended.
4. Check to ensure the Cam/Flag has rotated to the 'Release' position.
5. Check the microswitches to ensure that they have changed phase as intended.
6. Check the gas valve line to ensure that it has moved freely and that the gas valve has closed. Verify that all gas fired appliances have shut down, including the pilot lights.
7. Check each detector and bracket to ensure the travel distance of the cable. Make sure the line has operated without interference at any place in the system.
8. Replace detector that was cut.
9. Reset detector line.
10. Check and ensure the actuation latch is reset back to the horizontal position. Reset the Cam/Flag.
11. Insert Keeper Pin into Cam/Flag.
12. Reset all electrical shut-offs.

Repeat steps 1 through 12 for second detection line, if applicable.

4-6.2.2 TEST REMOTE MANUAL RELEASE, P/N 875572 (IF APPLICABLE)

CAUTION

Before testing the Remote Manual Release, ensure the System Nitrogen Cartridge is not installed in the *XV* Control System and remove the Keeper Pin from the Cam/Flag.

1. Operate the Remote Manual Release by pulling the safety pin located on the release handle and then pulling on the handle.
2. Observe the length of control cable that comes out of the Remote Manual Release. It should be between 3 and 4 inches (76 and 102 mm).
3. Insert the release handle back into the Remote Manual Release.

CAUTION

It is important that the control cable slips easily through the hole in the end of the actuation latch. The actuation latch must be able to operate without interference from the control cable. Be sure to test the movement of the actuation latch assembly before completing the setting of the *XV* Control System. 1-1/4 inch (32 mm) to 1-1/2 inch (38 mm) of control cable (with crimp end not included) should be left under the actuation latch, when in the 'Released' position.

4. Go to the *XV* Control System and check to ensure the Crimp Sleeve is against the bottom of the actuation latch and the actuation latch is pulled up at approximately two o'clock position.
5. Pull slack control cable back into the *XV* Control System.

4-6.2.3 TEST REMOTE MANUAL RELEASE, P/N 87-120110-001 (IF APPLICABLE)

CAUTION

Before testing the Remote Manual Release, ensure the System Nitrogen Cartridge is not installed in the *XV* Control System and remove the Keeper Pin from the Cam/Flag.

1. Operate the Remote Manual Release by pulling the safety pin located on the release handle and then pulling on the handle.
2. Observe the length of control cable that comes out of the Remote Manual Release. It should be between 3 and 4 inches (76 and 102 mm).
3. Insert the release handle back into the Remote Manual Release.

CAUTION

It is important that the control cable slips easily through the hole in the end of the actuation latch. The actuation latch must be able to operate without interference from the control cable. Be sure to test the movement of the actuation latch assembly before completing the setting of the *XV* Control System. 1-1/4 inch (32 mm) to 1-1/2 inch (38 mm) of control cable (with crimp end not included) should be left under the actuation latch, when in the 'Released' position.

4. Go to the *XV* Control System and check to ensure the Crimp Sleeve is against the bottom of the actuation latch and the actuation latch is pulled up at approximately two o'clock position.
5. Pull slack control cable back into the *XV* Control System.
6. Install tamper seal (if not installed previously).

4-6.2.4 TEST SOLENOID, P/N 83-100034-001 (IF APPLICABLE)

CAUTION

Before testing the Solenoid, ensure the System Nitrogen Cartridge is not installed in the *XV* Control System and that the Keeper Pin is in place in the Cam/Flag.

Note: If there is no Solenoid installed in the system, proceed to Paragraph 4-6.2.5.

The instructions for testing electrical releasing of the system will be found in the Design, Installation and Maintenance (DIOM) Manual for the fire control unit being used. A complete functional test shall be accomplished according to that manual and NFPA 72.

1. Remove Keeper Pin.
2. Following the instructions in the DIOM manual of the fire control unit, test the electrical operation of the *XV* Control System. It will be important to observe all time delays, alarm and releasing features.
3. Verify actuation of the *XV* Control System.
4. Check the microswitches to ensure that they have changed phase as intended.
5. Check the gas valve line to ensure that it has moved freely and that the gas valve has closed. Verify that all gas fired appliances have shut down, including the pilot lights.

6. Ensure that the fire control panel has been reset according to the DIOM Manual for the fire control unit being used. The Solenoid should be de-energized.
7. Check and ensure the actuation latch is reset back to the horizontal position. Reset the Cam/Flag.
8. Insert Keeper Pin into port on Cam/Flag.
9. Reset all electrical shut-offs.

4-6.2.5 INSPECT HIGH-PRESSURE NITROGEN TUBING

To perform an inspection of the High-Pressure Nitrogen Tubing, use the following steps.

1. Ensure Keeper Pin (P/N 60-9197108-000) is in the Cam/Flag.
2. Ensure that all fittings are tightly attached.

CAUTION

It is important to verify that the *XV* Control System is in the 'Set' position. The detection beams must be against their respective stops. The actuation latch must be in the horizontal position and the Cam/Flag in the 'Set' position. The Keeper Pin must be in place in the Cam/Flag.

3. Check all of the SVA pistons to ensure that they are in the set position.

   The bottom surface of the piston must be in the body of the SVA. If it is in the released position, push the piston into the body of the SVA (see Figure 4-55).

Recommendation: Kidde recommends that the actuation testing take place before the full test.

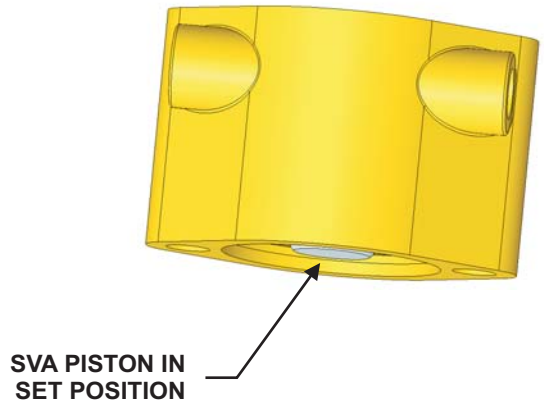


Figure 4-55. SVA in ‘Set’ Position

4-6.3 Actuation Test for the *XV* Control System

1. After ensuring that the system is in the 'Set' position and the Keeper Pin is in place, locate the Test Cartridge (P/N 87-120044-001). Carefully install the cartridge into the valve assembly of the *XV* Control System. Tighten until cartridge is snug (see Figure 4-56). It is permissible to perform this test with the System Cartridge.

CAUTION

Do not attempt to push the piercing pin down. Pushing the piercing pin too far can cause the O-ring to move to the valve bore. This could cause the O-ring to chip or break upon actuation of the system. Inserting the System Nitrogen Cartridge will push the piercing pin down to the proper location in the valve bore.

Note: Do not use a wrench or other tool to tighten the cartridge. Hand tightening is sufficient. If leakage is observed, check the condition of the flat gasket in the valve bore.

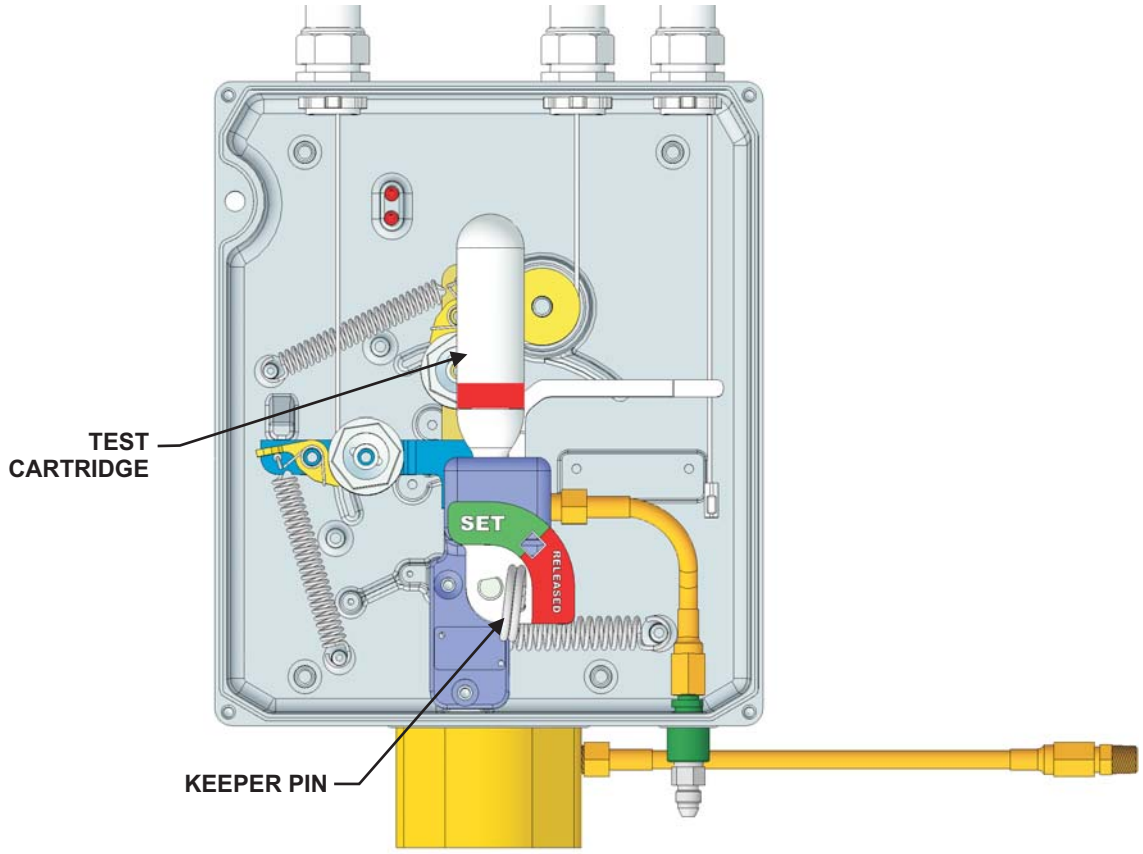


Figure 4-56. *XV* Control System, Test Cartridge Placement

2. Locate the cover of the *XV* Control System. Ensure that the local manual handle is set and that the Safety Pin is inserted (see Figure 4-57). The handle should be locked in the set position. If the handle can turn, adjust until the pin can be inserted all the way through the handle into the body of the cover.

Note: Installation of a tamper wire seal can prevent the pin from slipping out.

3. Remove the Keeper Pin from the *XV* Control System Cam/Flag. Carefully install the cover onto the *XV* Control System enclosure. The cover has a tongue that fits into the groove of the *XV* Control System enclosure. Center the cover over the *XV* Control System enclosure and fit the tongue and groove together.

CAUTION

While the cover is resting on the enclosure, moving it upward could engage the local manual release with the latch, causing the *XV* Control System to release. Keep the cover as centered as possible while performing this step.

4. Fasten the cover to the enclosure with the captive screws. Turn the captive screws until snug.

Note: The Valve Protection Plates should remain on the top of the Cylinder and Valve Assemblies until directed to remove it.

5. Attach the High Pressure Nitrogen Tubing.

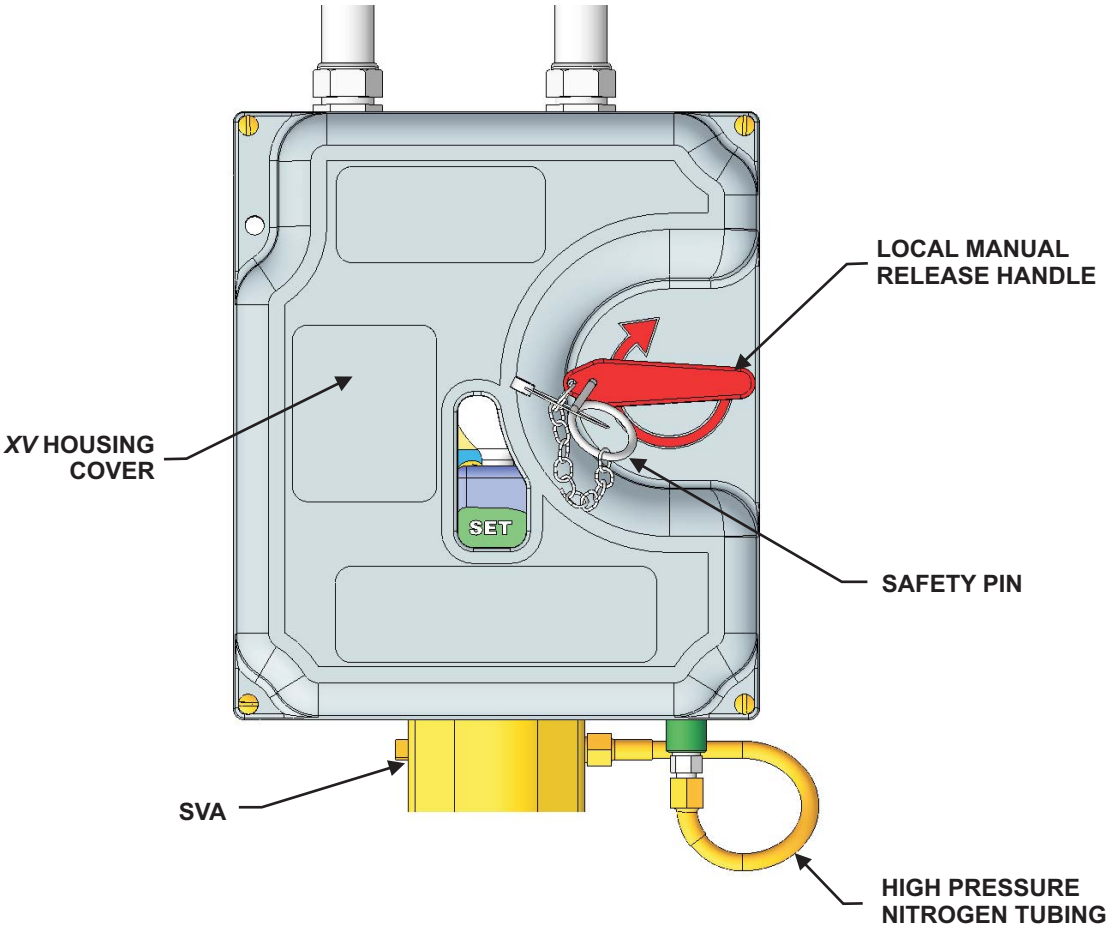


Figure 4-57. *XV* Control System, Cover Attached

6. Pull the safety pin and turn the handle in the direction of the arrow about 1/8-turn. The system will fire, pressurizing the actuating lines.

Note: Do not loosen any of the fittings on the actuating lines at this time.

7. Inspect the actuating lines and SVAs for leakage. Each SVA piston must be in the released position (down) and locked. Check each piston to ensure that it is fully extended.

Note: If any leakage is observed, appropriate steps must be taken to implement corrective action. However, pressure should be bled off before any action is implemented on the actuating lines.

WARNING

The system uses high pressure. Safety goggles or glasses must be worn.

All pressure must be released from the actuation lines before resetting the Cam/Flag. Failure to do so will cause the head of the piercing pin to protrude through the port, exposing the O-ring. This could result in the O-ring being damaged, thereby causing malfunction or non-function of the system, as designed. Always ensure that the pressure has been released before resetting the Cam/Flag.

8. After ensuring there is no leakage, loosen the swivel fitting located at the bottom right side of the *XV* Control System (see Figure 4-58). Allow the pressure to vent slowly. When the pressure is completely vented, disconnect the fitting and remove the cover.

CAUTION

To avoid accidental discharge later in the service sequence, it is important to completely disconnect the fitting outside the *XV* Control System.

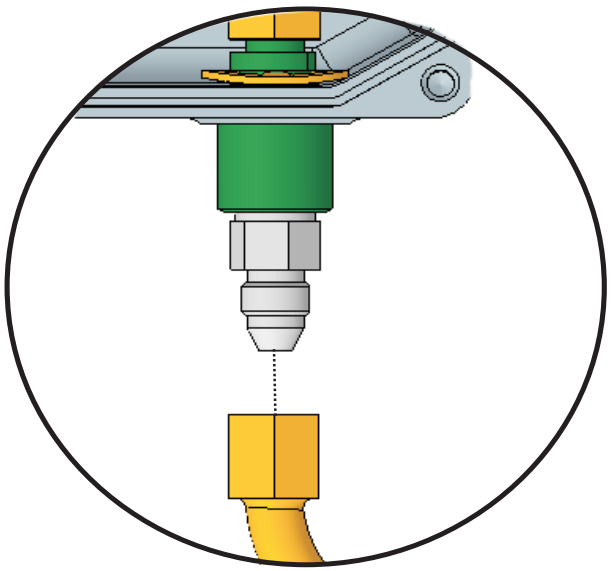


Figure 4-58. Fitting on Outside of *XV* Control System

9. Remove the spent cartridge used for the functional test.
10. Discard the spent cartridge in an appropriate manner. Check to ensure the detection lines are set. Refer to
11. Reset the Cam/Flag and reinstall the Keeper Pin into the Cam/Flag.

Note: Ensure the microswitches are setting properly. Check the Deep Mount Microswitches to ensure the trigger pin is under the paddles of the microswitches and is pushing them up. Check the High Mount Microswitches to ensure the Cam/Flag is pushing down on the paddles.

12. Install the Safety Pin into the local manual release handle of the cover assembly. Install a tamper indicator through the safety pin and around the handle.
13. Reset all of the SVAs. Push the piston into the body of each SVA.

14. Carefully remove the Valve Protection Plate from the cylinder valves and install the SVA to each cylinder. Secure with the bolts included. Ensure that each SVA is securely tightened.

CAUTION

A System Nitrogen Cartridge is required for final system set up. Using any other cartridge could cause malfunction or non-function of the system.

Note: Check the condition of the flat gasket in the valve bore. Do not use a wrench or other tool to tighten the cartridge. Hand tightening is sufficient.

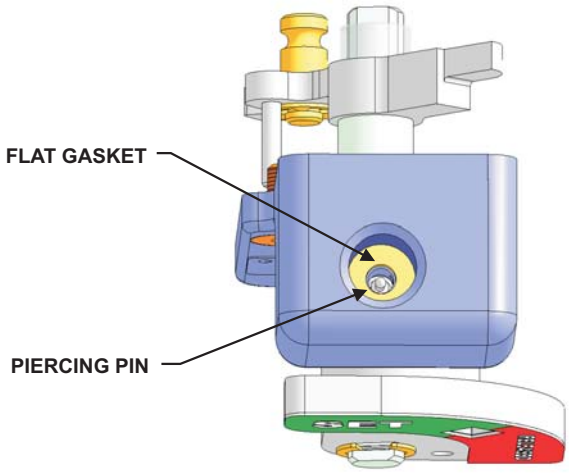


Figure 4-59. Valve Body with Flat Gasket

15. When all SVAs are secured, locate the System Nitrogen Cartridge (P/N 87-120043-001). In the area provided, write the date of installation of the cartridge. Carefully install the System Nitrogen Cartridge into the valve assembly of the *XV* Control System. Hand-tighten in until it is snug.
16. Locate the cover of the assembly. Ensure the tamper seal remains intact in the safety pin.
17. Remove the Keeper Pin from the Cam/Flag.
18. Carefully install the cover onto the enclosure. The cover has a tongue that fits into the groove of the enclosure. Center the cover over the enclosure and fit the tongue and groove together.

CAUTION

While the cover is resting on the enclosure, moving it upward could engage the local manual release with the actuation latch, causing the *XV* Control System to release. Keep the cover as centered as possible while performing this step.

19. Fasten the cover to the enclosure with the captive screws. Turn the captive screws until snug.

CAUTION

Securing the High Pressure Nitrogen Tubing onto the *XV* Control System will complete the setup of the Kidde System. System discharge could occur if the system has not been properly set.

20. Secure the High Pressure Nitrogen Tubing back onto the bottom of the *XV* Control System. Ensure that the fit is properly snug to prevent leakage. Refer to Figure 4-58.

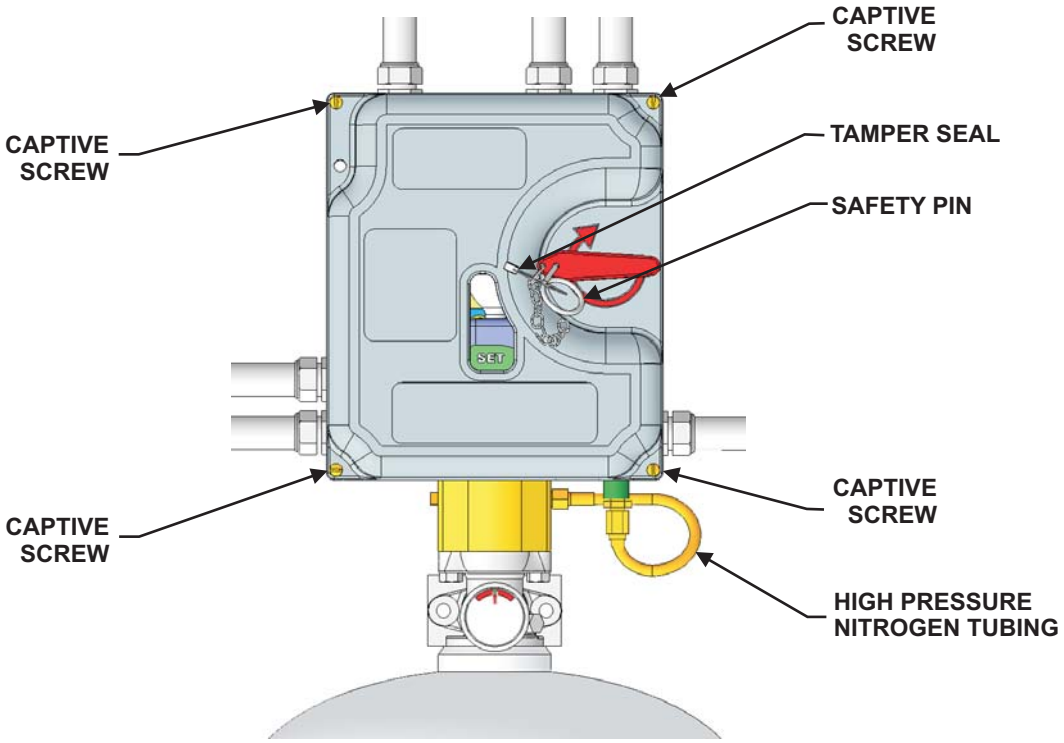


Figure 4-60. Cylinder Mounted *XV* Control System

21. Apply labels to the cover of the *XV* Control System.

4-6.3.1 DISPOSAL OF CARTRIDGE

Following are the recommended instructions for disposal of spent cartridges.

WARNING

Never dispose of a pressurized cartridge. Cartridges must be discharged before discarding. Filled gas cartridges may be dangerous if not handled properly. Do not heat cartridges above 120°F (49°C). Pressurized cartridges that become overheated can explode, and thereby cause property damage, severe personal injury, and possibly death.

Determine if gas is present in the cartridge. All puncturable type disposable cartridges are presumed to be fully charged unless the small puncturable end (opposite of the rounded bottom) is **clearly punctured**. If the puncture is not clear, the cartridge may be weighed using a scale capable of reading in grams accurate to 0.1 g. **The weight of the cartridge shall be less than the indicated weight imprinted on the side of the cartridge by the amount of the indicated charge.**

After using one of the methods described to determine that no gas is present in the cartridge, the cartridge may be placed with normal refuse, or may be placed with steel recycling materials. All of the steel cartridges are produced from a low carbon (14) steel product. Once empty, no residue remains. Cross cutting or sectioning is not required.

CHAPTER 5
MAINTENANCE

5-1 INTRODUCTION

Note: It is the responsibility of the system installer to review system operation and owner obligations, and to provide the owner's manual to the owner at the time of system installation.

This chapter contains the service and maintenance instructions for the Kidde® IND™ Dry Chemical System. These procedures must be preformed regularly, and in accordance with all applicable regulations. If problems arise, corrective action must be taken.

5-2 INSPECTION AND MAINTENANCE PROCEDURES

Use Table 5-1 to identify preventative maintenance schedule of the Kidde Dry Chemical System.

Table 5-1. Preventative Maintenance Schedule

Schedule	Requirement	Paragraph
Monthly	Owner's Inspection	Paragraph 5-2.1
Semi-Annual	System Inspection by an Authorized Kidde Distributor	Paragraph 5-2.2
Every Six Years	System Inspection by an Authorized Kidde Distributor	Paragraph 5-2.4
Every 12 Years	Detailed System Inspection by an Authorized Kidde Distributor	Paragraph 5-2.7

5-2.1 Monthly Inspection Procedure (by Owner)

Refer to the cylinder nameplate for the proper maintenance instructions. In accordance with NFPA 17 and NFPA 33, make frequent inspections to ascertain that the system is operable. Also, be sure that nothing has occurred which would compromise the effectiveness of the system.

The following procedure is to be performed by the Owner of the system.

Table 5-2. Owner's Monthly Inspection

Checkbox	Procedure
☐	Inspect all system components, agent distribution pipe, and conduit runs for physical damage and/or displacement.
☐	Inspect all nozzles to see if protective caps (if applicable) are in place. Check for possible obstructions to the discharge of the dry chemical.
☐	Inspect all detectors (Fusible-links and Thermo-bulbs) for contamination. If contamination is found, contact an authorized Kidde Pre-Engineered Distributor for service.
☐	Inspect each Cylinder and Valve Assembly. The pointer on the pressure gauge should be in the "green" range. The cylinder should not show evidence of corrosion or damage.
☐	Inspect manual pull stations are unobstructed and in clear view and labeled for intended use.
☐	Inspect all tamper seals are intact and the system is in a ready condition.
☐	Verify the inspection tag or certificate is in place and current.
☐	A record of the monthly inspection is to be kept reflecting the date inspected, initials of the person performing the inspection, and any corrections required.
☐	If wall mounted, the *XV* Control System must be tightly bolted to the wall. If cylinder mounted, the *XV* Control System must be tightly bolted to the SVA. The Cam/Flag on the *XV* Control System indicator should point to the 'Set' position. The safety pin and seal wire on the local manual release handle should be in place. Refer to Figure 5-1. If no Remote Manual Release (P/N 875572) is installed, the path to the local manual release on the cylinder should be clear and unobstructed and within reach.
☐	If any discrepancies are noted while making this inspection, DO NOT CONTINUE OPERATING HAZARDOUS PROCESSES OR TURN ON PROTECTED EQUIPMENT. Immediately contact an authorized Kidde Distributor for service and/or repair.

CAUTION

No other action shall be taken by the system owner other than visual. If further maintenance is determined necessary as a result of owner inspection, contact an authorized Kidde Distributor.

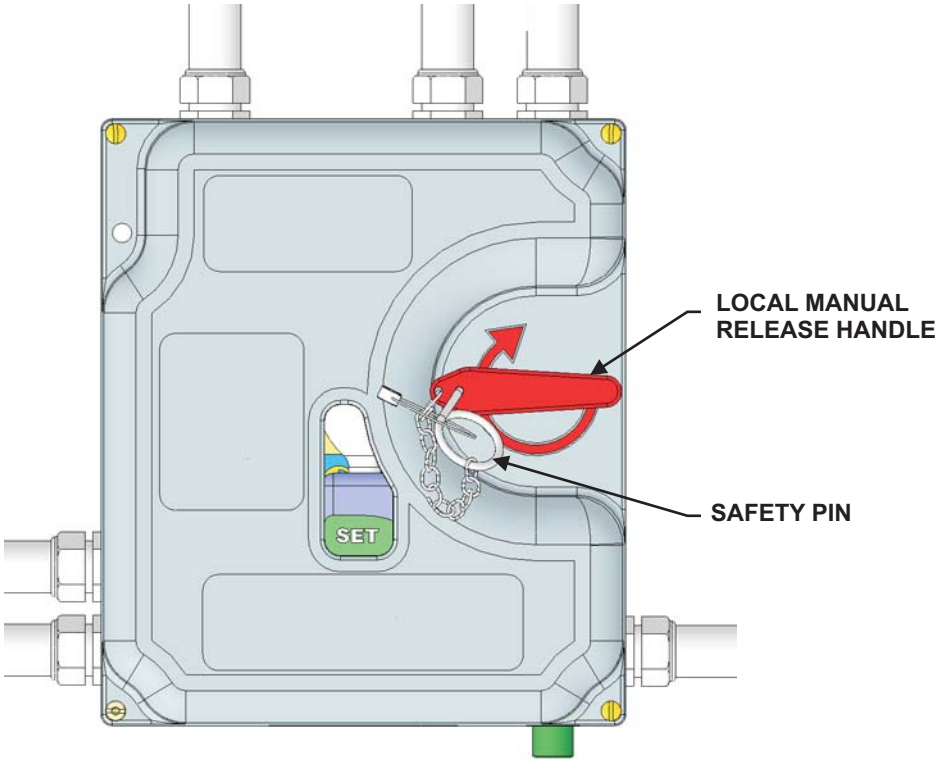


Figure 5-1. *XV* Control System, Outside View

WARNING

Do not operate hazardous processes or turn on protected equipment until the required system alterations are complete.

Any unauthorized alterations to the protected area or equipment, or to the dry chemical system, can render the fire suppression system ineffective or non-operational. Contact an authorized distributor of Kidde Pre-Engineered dry chemical systems if any modifications are contemplated. Failure to follow these instructions could result in death or serious personal injury and/or property damage.

5-2.2 Semi-Annual Service Procedure (By Authorized Kidde Distributor Only)

All systems shall be inspected and serviced semi-annually by an authorized Kidde distributor.

Table 5-3. Semi-Annual Service Procedure

Checkbox	Procedure
☐	Preparation for Servicing and Testing
☐	Functional Testing of the System
☐	Clean Out Agent Distribution Piping
☐	Test Mechanical Detector Lines
☐	Test Remote Manual Release (if applicable)
☐	Test Solenoid (if applicable)
☐	Inspection of High-Pressure Nitrogen Tubing
☐	Perform Actuation Tests
☐	Disposal of Cartridge

5-2.2.1 PREPARATION FOR SERVICING AND TESTING

1. Disconnect the high-pressure nitrogen tubing from the *XV* Control System (see Figure 5-2).

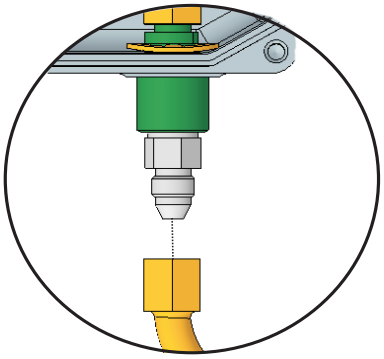


Figure 5-2. High-Pressure Nitrogen Tubing Location, Close Up

2. Verify that the system design and installation are adequate to protect the hazard area and that the installation conforms to the instructions in this manual. Some of the items to verify are:
   a. All equipment requiring fire protection within the hazard area is protected.
   b. There have been no unauthorized alterations to the protected area or equipment, or to the dry chemical system, that render the fire suppression system ineffective or non-operational.
   c. All Cylinder Mounting Brackets are securely fastened to a wall or other structural member.

d. All nozzles are properly aimed, secured and located within the proper distance from the protected equipment. Each nozzle should be clean and equipped with the proper nozzle blow-off cap (if applicable).

e. The agent distribution piping is properly sized for the number and type of nozzles required.

f. All piping joints and pipe supports are securely fastened to prevent dry chemical leakage and hazardous movement during discharge.

g. The pipe lengths, sizes, fittings and material are as specified in this Manual.

h. The number, type, and placement of detectors are suitable for all hazards within the hazard area.

i. The Remote Manual Release, if used, is located in a path of exit or egress and is clearly identified.

j. Stainless steel control cable lengths and Corner Pulley (P/N 844648) counts are within listed limits. Conduit runs should be clean and secure.

k. All wiring is in compliance with local codes.

l. All field wiring is free of ground fault or short-circuit conditions.

m. No branch circuits exist in the wiring to the detectors or to the Solenoid (P/N 83-100034-001).

n. All auxiliary components such as Pressure Operated Releases (P/N 874290) are secure and show no evidence of physical damage.

o. All system components and installation material are as specified in this manual.

3. Remove the cover from the *XV* Control System. Install Keeper Pin (P/N 60-9197108-000). See Figure 5-3 for Keeper Pin location.

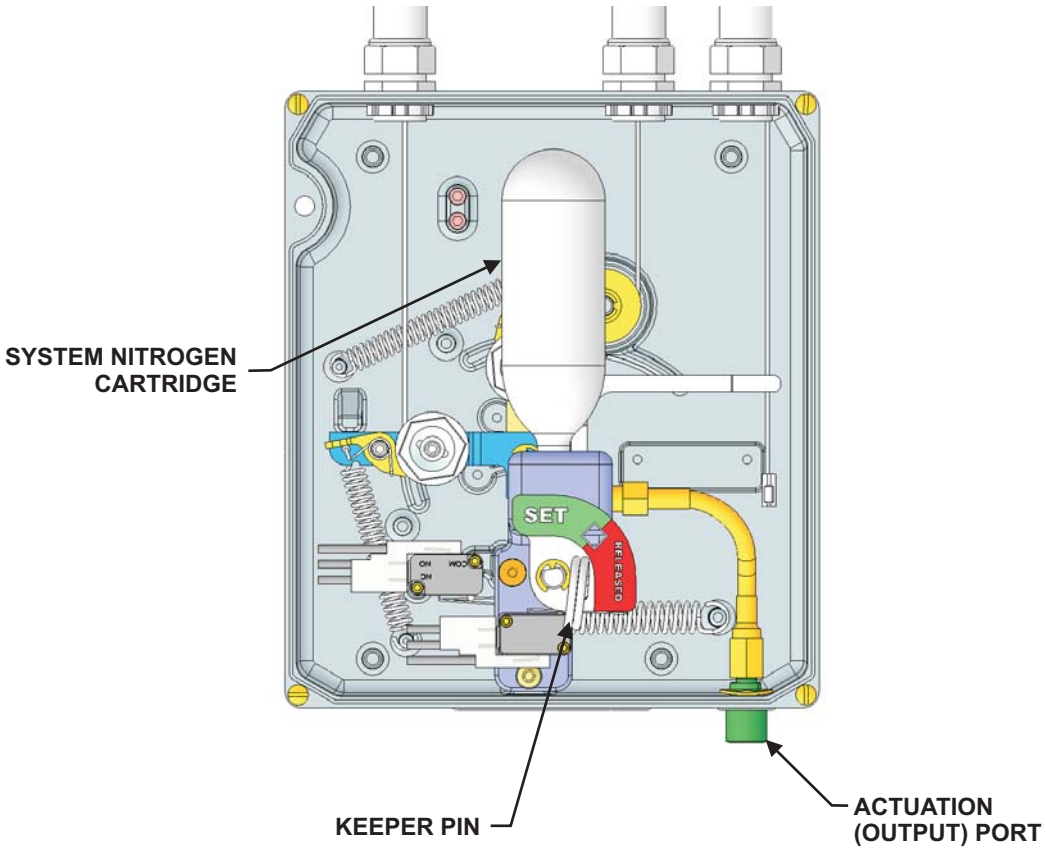


Figure 5-3. *XV* Control System, Internal View

4. Remove the System Nitrogen Cartridge (P/N 87-120043-001). Refer to Figure 5-3 for location in *XV* Control System.
5. Check flat gasket inside valve body. If damaged, replace (see Figure 5-4).

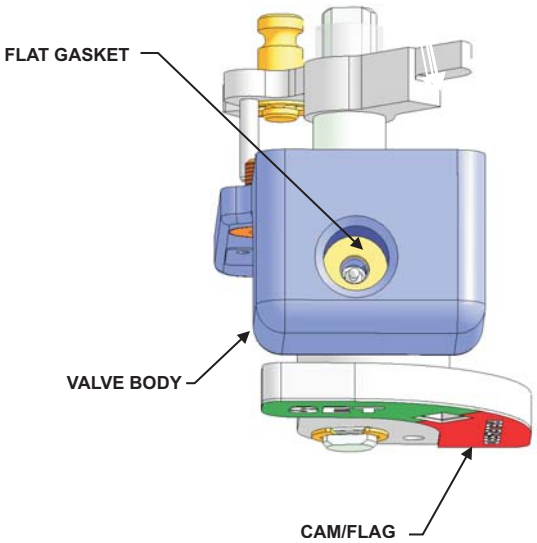


Figure 5-4. Valve Body and Flat Gasket Location

6. Verify installation of the lockout screws for appropriate usage (refer to Figure 5-3).
7. Remove the System Valve Actuators (SVAs, P/N 87-120042-001) from all cylinders. See Figure 5-5 for location.

Note: If the *XV* is cylinder mounted and mcroswitches are installed in the *XV*, remove the electrical connectors to proceed. Reconnect the electrical connectors when done.

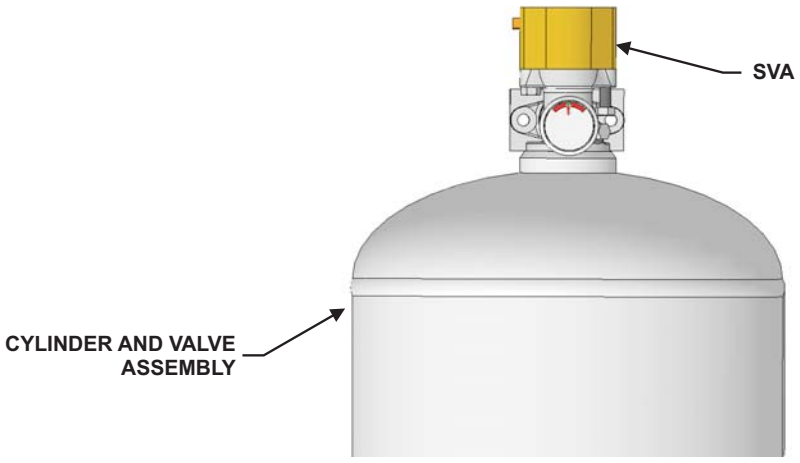


Figure 5-5. System Valve Actuators

8. Install cylinder valve protection plates.

9. Disconnect Discharge Adapter Kit (agent piping) from all cylinders (see Figure 5-6).

Note: Disconnecting the Discharge Adapter Kit typically involves removing cylinders.

10. Install the Anti-Recoil Plate.

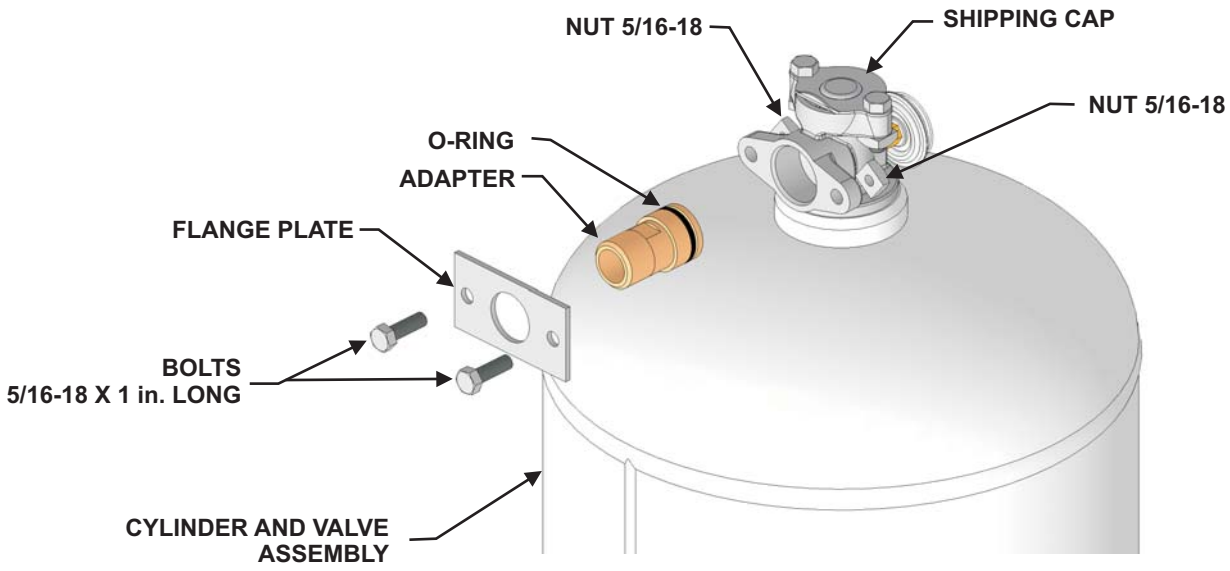


Figure 5-6. Removing Discharge Adapter Kit

5-2.3 Functional Testing of the System

Note: These tests are meant as a complete mechanical functional test. They are not meant as an agent discharge or air/nitrogen test.

WARNING

Ensure that all System Nitrogen Cartridges have been removed from the *XV* Control System before proceeding.

Improper usage of the lockout screws will cause a malfunction or non-function of the system. Failure to follow these instructions could result in death or serious personal injury and/or property damage.

5-2.3.1 AGENT DISTRIBUTION PIPING

WARNING

Do not use water or oxygen to blow out agent distribution piping. Moisture will cause blockage. The use of oxygen is very dangerous as the possible presence of even a minute quantity of oil may cause an explosion, thereby causing death, serious personal injury and/or property damage.

The agent distribution piping must be blown clear with dry air or nitrogen to clean out the system and to check for any leaks or obstructions.

5-2.3.2 MECHANICAL DETECTOR LINES

To test the mechanical detector lines, perform the following steps:

CAUTION

The mechanical detector lines are under tension. Wearing safety glasses and gloves is required during this process.

Before cutting a detector, ensure the System Nitrogen Cartridge is not installed in the *XV* Control System and that the Keeper Pin is in place in the Cam/Flag.

1. Go to the far end of the line. Cut the detector.
2. Check to ensure the rotation of detection spool and beam assembly is as intended.
3. Check each detector and bracket to ensure the travel distance of the cable. Make sure the line has operated without interference at any place in the system.
4. Verify the crimp is at least 1-1/2 inches from the detector bracket conduit tubing.
5. Replace all of the detectors in the detection line.
6. Set the detection beams by turning the ratchet wheels in the direction of the arrows (see Figure 5-7).
7. Tighten the line until the beam reaches the Stop. **Do not overtighten**.

Note: In long cable lines (over 125 feet) there will be stretch in the cable and in the loops for the detectors. It is important to ensure the cable is tight without over tightening.

8. If more than one detection line is being used, repeat Steps 1 through 5.

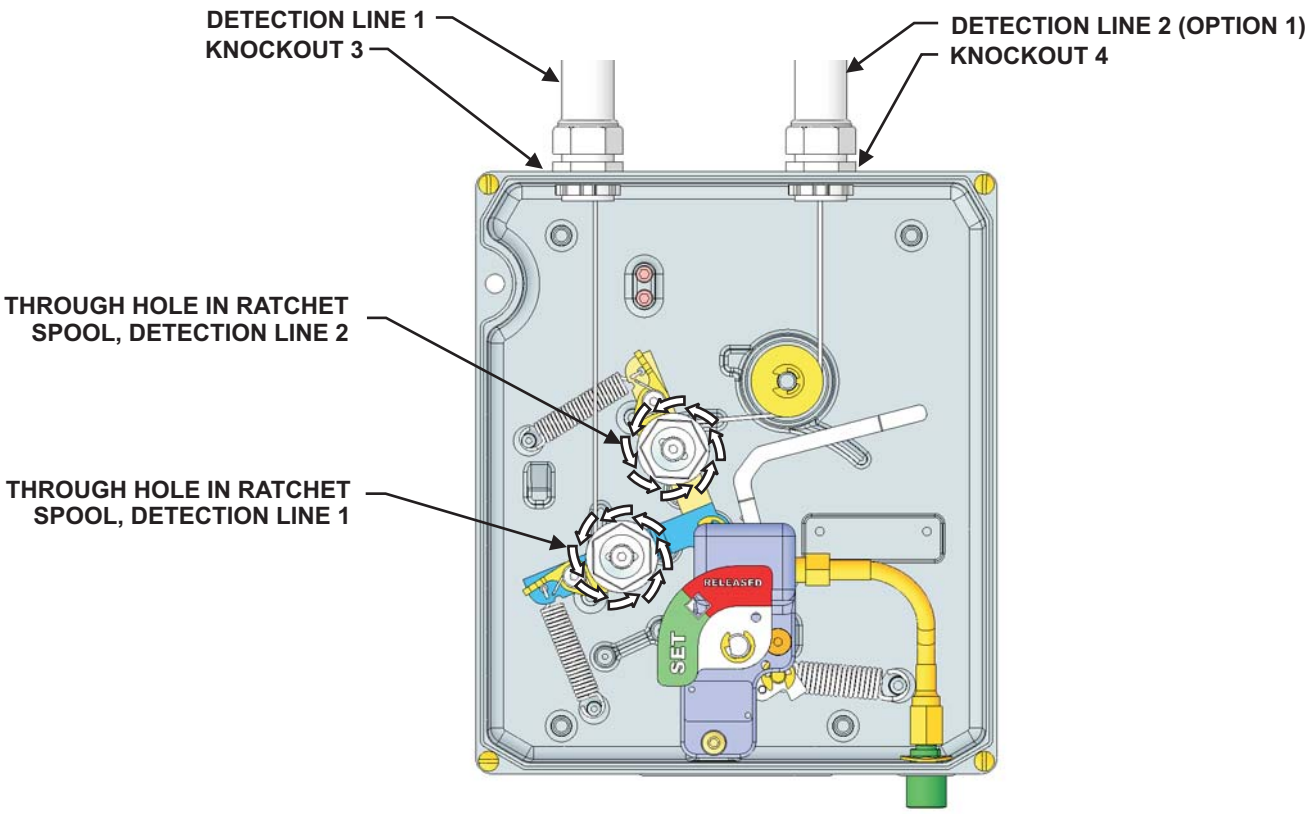


Figure 5-7. Setting the Detection Lines

CAUTION

If the Remote Manual Release control cable is interfering with the free movement of the actuation latch, it might require re-cabling. If there is something else interfering with the free movement of the actuation latch, take appropriate corrective action. If it is determined that the interference is due to a mechanical fault of the *XV* Control System, it must be replaced and returned to the factory.

9. Be careful not to allow the control cable to become entangled with any other parts in the *XV* Control System. If it does, perform the following steps:
   a. Using a 7/8-inch socket (or equivalent) slightly turn the ratchet. Do not turn so far that it will click into the next step. Using the thumb release on the pawl, release the ratchet and allow it to turn backwards. The beam will move back to the 'Released' position.
   b. Untangle the control cable and guide it onto the spool while ratcheting. Once there is tension, there should be no more entanglement.
   c. Using a 7/8-inch socket (or equivalent), carefully ratchet up the slack in the control cable lines (see Figure 5-8). Tighten the line until the beam reached the stop. **Do not overtighten**.

Note: The actuation latch should now be in the horizontal position. If it is not, check to ensure the Remote Manual Release control cable is not interfering with the actuation latch and that the actuation latch swings freely.

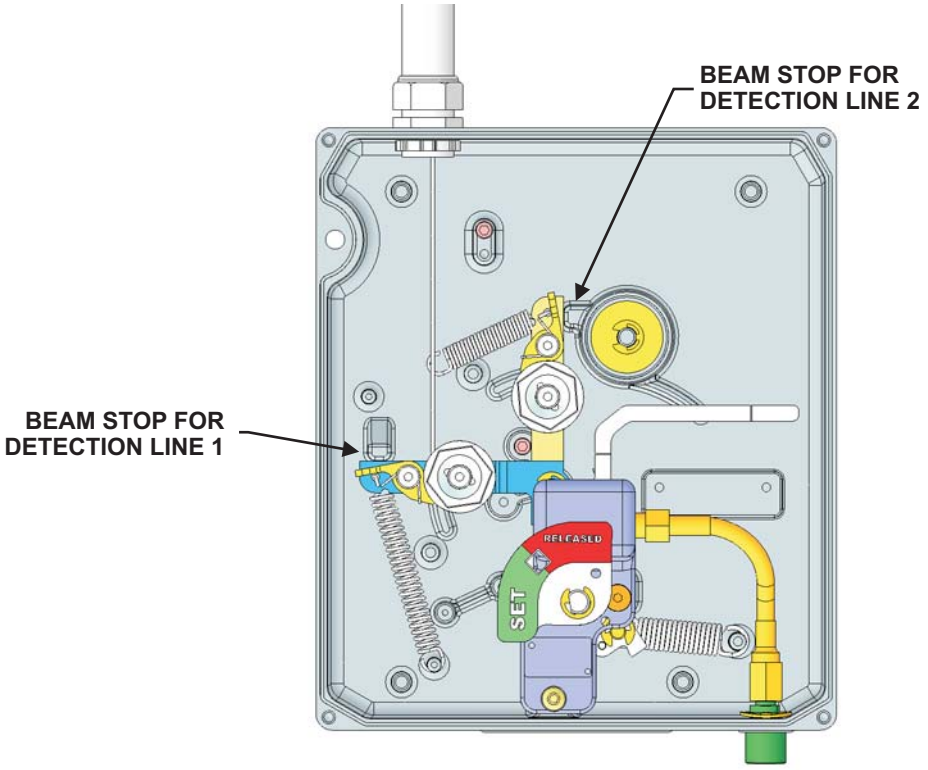


Figure 5-8. Positions of Ratchet Stops in 'Set' Position

CAUTION

The actuation latch must be in the horizontal position. If it is in any position other than horizontal, the system could malfunction.

d. When the two detection lines are set, the actuation latch will automatically fall into a horizontal position. It is possible to set the Cam/Flag, if it is not already locked in place. Rotate the Cam/Flag 90° clockwise until it clicks into place. The actuation latch will move up, then reset into the horizontal position (see Figure 5-9).

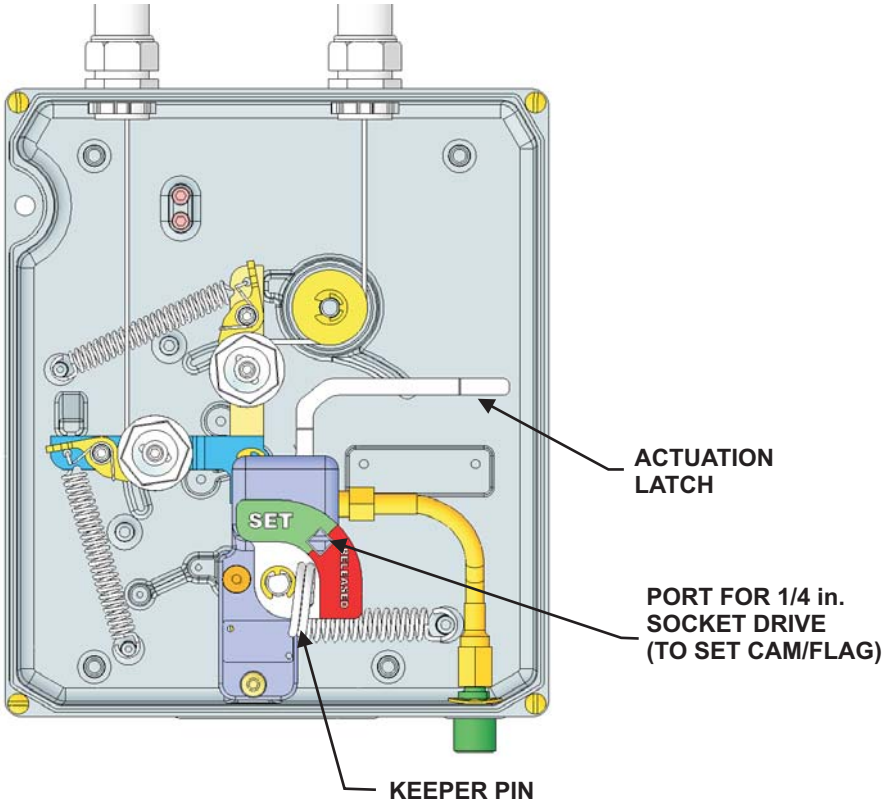


Figure 5-9. Actuation Latch Shown in 'Set' Position

10. Repeat steps 1 through 7 for second detection line, if applicable.

Note: The Keeper Pin should be in place; therefore, the Cam/Flag will not require resetting (refer to Figure 5-3).

5-2.3.3 REMOTE MANUAL RELEASE, P/N 875572 (IF APPLICABLE)

WARNING

Before proceeding, ensure the System Nitrogen Cartridge is not installed in the *XV* Control System and that the Keeper Pin is in place in the Cam/Flag. Failure to follow these instructions could result in death or serious personal injury and/or property damage.

1. Remove Keeper Pin from the Cam/Flag.
2. Operate the Remote Manual Release by pulling the safety pin located on the Remote Manual Release, and then pulling on the release handle (refer to Figure 5-1).
3. Observe the length of control cable that comes out of the Remote Manual Release. It should be between 3 and 4 inches (76 and 102 mm).

CAUTION

It is important that the control cable slips easily through the hole in the end of the actuation latch. The actuation latch must be able to operate without interference from the control cable. Be sure to test the movement of the actuation latch assembly before completing the setting of the *XV* Control System. 1-1/4-inch to 1-1/2-inch of control cable (with crimp end not included) should be left under the actuation latch, when in the 'Released' position.

4. Insert the release handle back into the Remote Manual Release.
5. Go to the *XV* Control System and check to ensure the Crimp Sleeve (P/N 214951) is against the bottom of the actuation latch and the actuation latch is pulled up at approximately 2 o'clock position (see Figure 5-10).

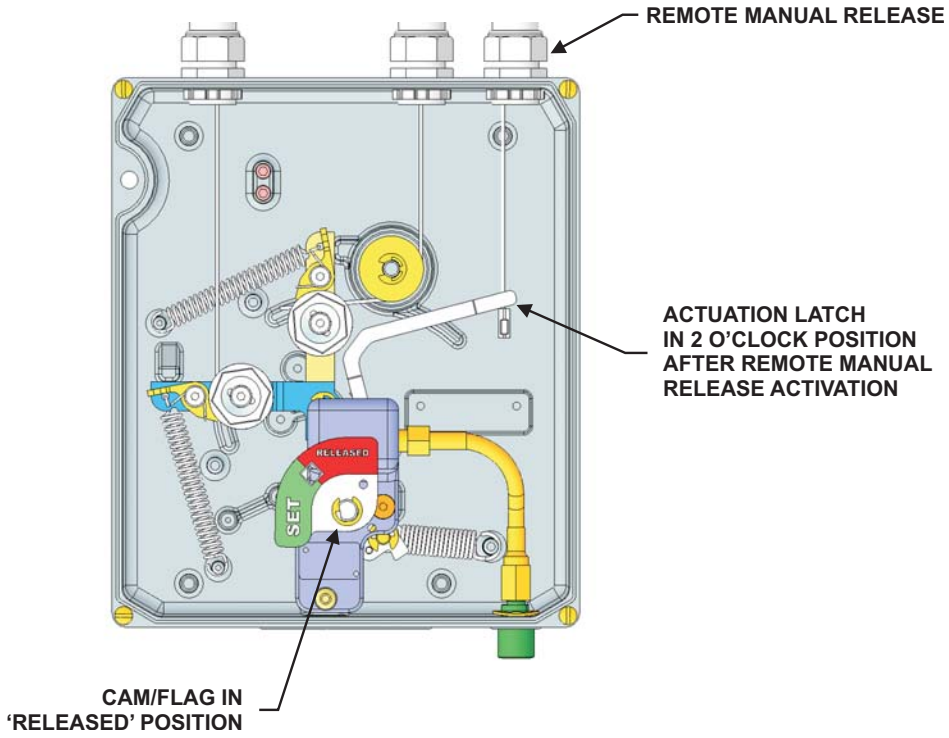


Figure 5-10. Actuation Latch in Release Position

6. Pull the slack out of the control cable back into the *XV* Control System.
7. Insert Keeper Pin back into the port on the Cam/Flag.

5-2.3.4 SOLENOID, P/N 83-100034-001 (IF APPLICABLE)

If there is no Solenoid installed in the *XV* Control System, proceed to Paragraph 5-2.3.5.

WARNING

Before proceeding, ensure the System Nitrogen Cartridge is not installed in the *XV* Control System and that the Keeper Pin is in place in the Cam/Flag. Failure to follow these instructions could result in death or serious personal injury and/or property damage.

The instructions for testing electrical releasing of the system will be found in the Design, Installation and Maintenance Manual for the fire control panel being used. A complete functional test shall be accomplished according to that manual and NFPA 72.

1. Remove the Keeper Pin from the Cam/Flag.
2. Following the instructions of the fire control panel's manual, test the electrical operation of the *XV* Control System. It will be important to observe all alarm and releasing features.
3. Verify actuation of the *XV* Control System.
4. Check the Microswitches (P/N 87-120039-001) to ensure that they have changed state as intended.
5. Check the gas valve line (if applicable) to ensure that it has moved freely and that the gas valve has closed. Verify that all gas fired appliances have shut down, including the pilot lights.
6. Ensure that the fire control panel has been reset according to the applicable manual for the fire control panel being used. The Solenoid should be de-energized.
7. Ensure the actuation latch is reset back to the horizontal position. Reset the Cam/Flag.
8. Insert Keeper Pin into port on Cam/Flag.
9. Reset all electrical shut-offs.

WARNING

It is important to light all gas pilots. Failure to do so could cause a dangerous build up of gas, thereby causing death or serious personal injury and/or property damage.

10. Relight all gas pilots.

5-2.3.5 HIGH-PRESSURE NITROGEN TUBING, P/N 87-120045-001

To perform an inspection of the High-Pressure Nitrogen Tubing, use the following steps:

1. Insert the Keeper Pin into the Cam/Flag of the *XV* Control System.
2. Ensure that all fittings are tightly attached.

CAUTION

It is important to verify that the system is in the 'Set' position. The detection beams must be against their respective stops. The actuation latch must be in the horizontal position and the Cam/Flag in the 'Set' position. The Keeper Pin must be in place in the Cam/Flag.

3. Check all of the SVA pistons to ensure that they are in the set position.
4. The bottom surface of the piston must be in the body of the SVA. If it is in the released position, push the spring loaded plunger in while pushing the piston into the body of the SVA (see Figure 5-11).

Note: If the Authority Having Jurisdiction (AHJ) requires a full discharge test or an air/nitrogen test, Kidde recommends that the actuation testing take place before the full test.

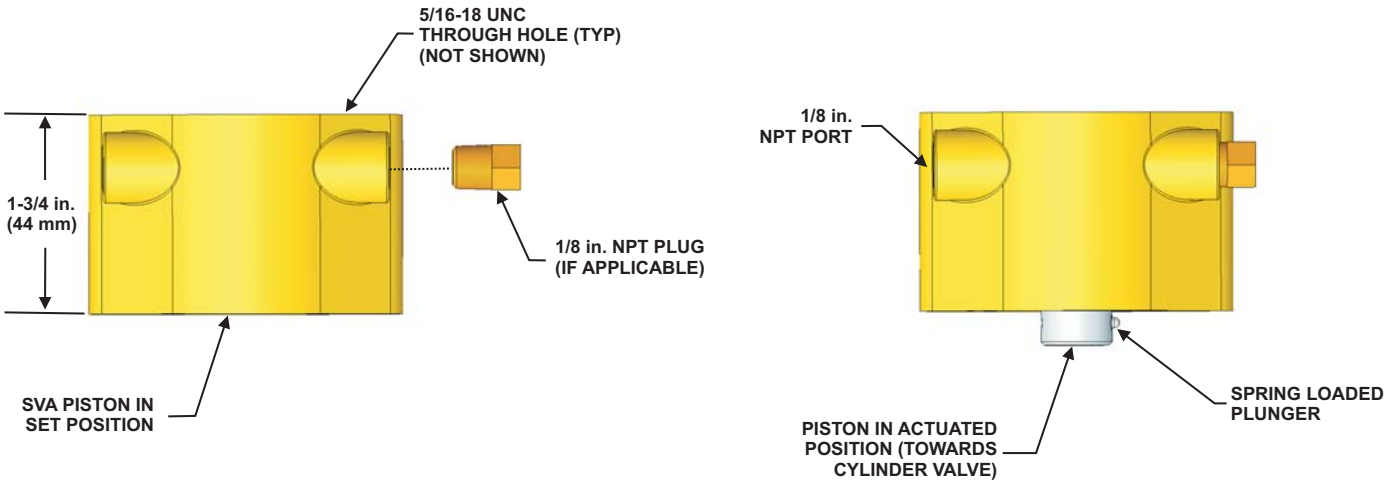


Figure 5-11. System Valve Actuator (SVA)

5. Proceed to the Actuation Test, Paragraph 5-2.3.6.

5-2.3.6 ACTUATION TEST

CAUTION

Do not attempt to push the piercing pin down. Pushing the piercing pin too far can cause the O-ring to move to the valve bore. This could cause the O-ring to chip or break upon actuation of the system, and thereby possibly cause the system to malfunction. Inserting the System Nitrogen Cartridge will push the piercing pin down to the proper location in the valve bore.

1. Ensure that the system is in the 'Set' position and the Keeper Pin is in place. Carefully install the Test Cartridge (P/N 87-120043-001) into the valve assembly of the *XV* Control System. Tighten until cartridge is snug (see Figure 5-12).

Note: Do not use a wrench or other tool to tighten the cartridge. Hand tightening is sufficient. If leakage is observed, check the condition of the flat gasket in the valve body.

2. Install High-Pressure Nitrogen Tubing to the SVA.

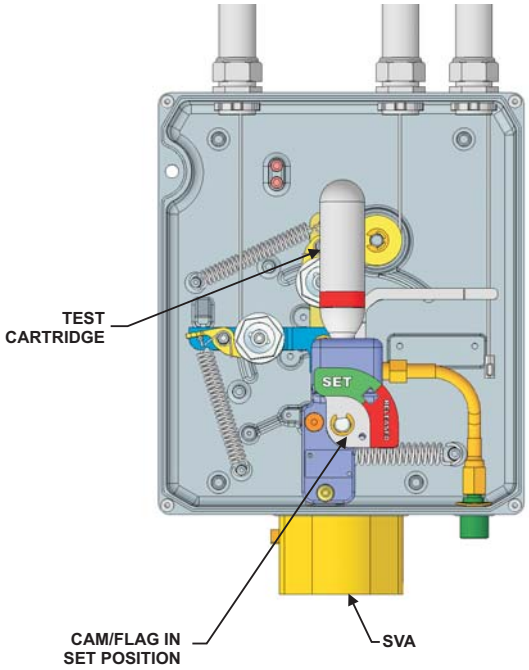


Figure 5-12. *XV* Control System, Test Cartridge

CAUTION

While the cover is resting on the *XV* Control System enclosure, moving it upward could engage the local manual release with the latch, causing the *XV* Control System to release. Keep the cover as centered as possible while performing this step.

3. Ensure that the local manual remote handle on the *XV* cover is set and that the safety pin is inserted (refer to Figure 5-1). The handle should be locked in the set position. If the handle can turn, adjust until the pin can be inserted all the way through the handle into the body of the cover.

Note: Installation of a tamper wire seal can prevent the pin from slipping out.

4. Remove the Keeper Pin from the *XV* Control System Cam/Flag. Carefully install the cover onto the *XV* Control System enclosure. The cover has a tongue that fits into the groove of the *XV* Control System enclosure. Center the cover over the *XV* Control System enclosure and fit the tongue and groove together.
5. Fasten the cover to the *XV* Control System enclosure with the captive screws until snug.

Note: The Valve Protection Plate should remain on the top of the cylinder until directed to remove it.

6. Pull the safety pin and turn the handle in the direction of the arrow about 1/8-turn. The system will fire, pressurizing the actuating lines.

Note: Do not loosen any of the fittings on the actuating lines at this time.

7. Inspect the actuating lines and SVAs for leakage. Each SVA piston must be in the released position (down) and locked. Check each piston to ensure that it is fully extended and the spring-loaded plunger is extended.

Note: If any leakage is observed, appropriate steps must be taken to implement corrective action. However, pressure should be bled off before any action is implemented on the actuating lines.

WARNING

The system uses high pressure. Safety goggles or glasses must be worn. Failure to follow these instructions could result in death or serious personal injury and/or property damage.

CAUTION

All pressure must be released from the actuation lines before resetting the Cam/Flag. Failure to do so will cause the head of the piercing pin to protrude through the port, exposing the O-ring. This could result in the O-ring being damaged, thereby causing malfunction or non-function of the system, as designed. Always ensure that the pressure has been released before resetting the Cam/Flag.

8. After ensuring there is no leakage, loosen the High Pressure Nitrogen Tubing located at the bottom right side of the *XV* Control System. Allow the pressure to vent slowly. When the pressure is completely vented, disconnect the High-Pressure Nitrogen Tubing and remove the *XV* cover.

Note: It is important to completely disconnect the High Pressure Nitrogen Tubing (see Figure 5-13).

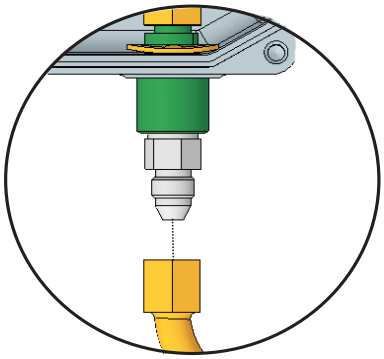


Figure 5-13. High-Pressure Nitrogen Tubing

9. Remove the spent cartridge used for the functional test.
10. Discard the spent cartridge in an appropriate manner (see Paragraph 5-2.3.6.1). Check to ensure the detection lines are set. Reset the Cam/Flag and reinstall the Keeper Pin into the Cam/Flag.

Note: Ensure microswitches are setting properly. Check the deep mount microswitches to ensure the trigger pin is under the paddles of the microswitches and is pushing them up. Check the high mount microswitches to ensure the Cam/Flag is pushing down on the paddles.

11. Install the Safety Pin into the local manual release handle of the *XV* Control System cover assembly. Install a tamper indicator through the pin and around the handle.
12. Reset all of the SVAs. Push the spring-loaded plunger in while pushing the piston into the body of each SVA.
13. Carefully remove the Valve Protection Plate from the cylinder valves and install the SVA to each cylinder. Secure with the bolts included. Ensure that each SVA is securely tightened.
14. If the *XV* Control System is cylinder mounted, secure the *XV* to the SVA with bolts removed earlier.

Note: You may need to remove the electrical connectors from the microswitches. Reinstall electrical connectors when completed.

15. Remove the Anti-Recoil plate from the cylinder.
16. Install the Discharge Adapter Kit.
17. Reinstall cylinder and securely fasten cylinder to mounting bracket.

CAUTION

A System Nitrogen Cartridge is required for final system setup. Using any other cartridge could cause malfunction or non-function of the system.

18. Write the date of installation in the area provided on the System Nitrogen Cartridge. Carefully install the System Nitrogen Cartridge into the valve assembly of the *XV* Control System. Hand-tighten until it is snug.

Note: Do not use a wrench or other tool to tighten the cartridge. Hand tightening is sufficient. If leakage is observed, check the condition of the flat gasket in the valve body.

19. Remove the Keeper Pin from the Cam/Flag.

CAUTION

While the cover is resting on the *XV* Control System enclosure, moving it upward could engage the local manual release with the actuation latch, causing the *XV* Control System to release. Keep the cover as centered as possible while performing Step 20.

20. Carefully install the cover onto the *XV* Control System enclosure. Ensure the tamper seal remains intact in the safety pin. The cover has a tongue that fits into the groove of the *XV* Control System enclosure. Center the cover over the *XV* Control System enclosure and fit the tongue and groove together.
21. Fasten the cover to the *XV* Control System enclosure with the captive screws until snug.
22. Secure the High-Pressure Nitrogen Tubing back onto the bottom of the *XV* Control System. Ensure that the swivel is properly snug to prevent leakage.

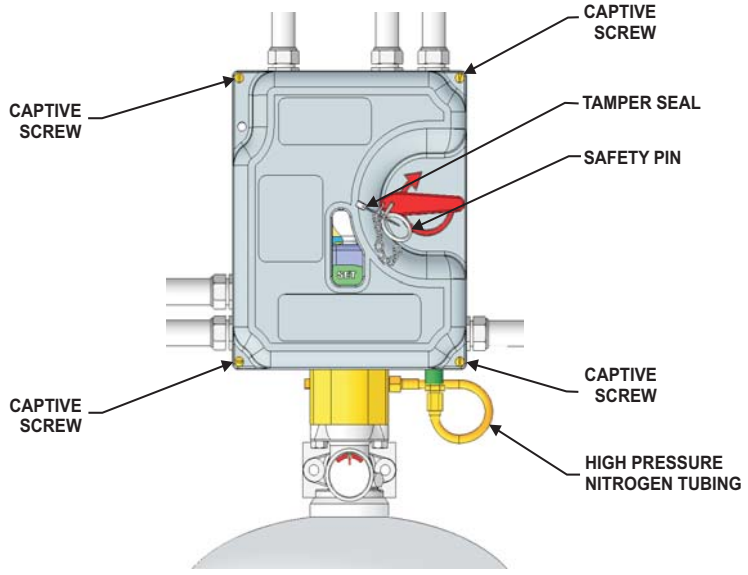


Figure 5-14. Cylinder Mounted *XV* Control System in Set Position

This completes the Semi-Annual Service of the Kidde IND Dry Chemical System. See Figure 5-15 for a diagram of the complete, armed, *XV* Control System.

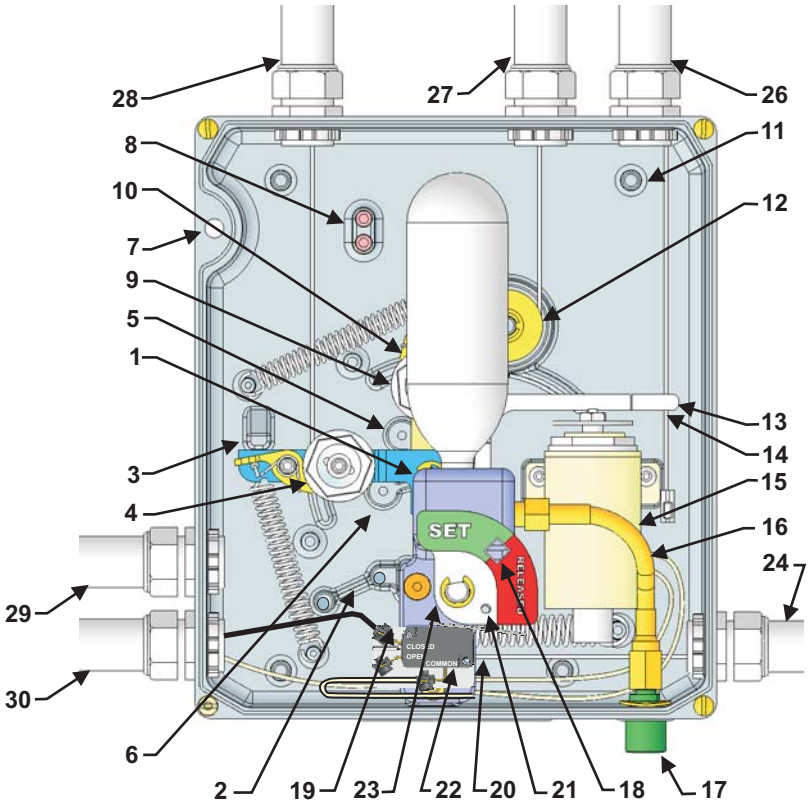


Figure 5-15. *XV* Control System, Set Position

Table 5-4. References to Figure 5-15

Item	Knockout Number	Description
1		Valve Assembly
2	2	Mounting Pad for Deep-Mounted Microswitch
3	3	Beam Stop for Detection Line 1
4	3	Spool and Ratchet for Detection Line 1 ('Set' position)
5	3	Lockout Pad for Detection Line 1 (hidden when tripped)
6	4 or 6	Lockout Pad for Detection Line 2 (hidden when tripped)
7		Port for lock or seal
8		Storage pad for lockout screws
9	4 or 6	Spool and Ratchet for Detection Line 2 ('Set' position, shown partially behind cartridge)
10	4 or 6	Beam Stop for Detection Line 2 (behind cartridge, not shown)
11		Mounting hole for Wall Mounting (1 of 4 in back of box)
12	4	Pulley Wheel for Detection Line 2 (shown partially behind cartridge)
13	5	Actuation Latch and lever for Remote Manual Release and Solenoid ('Set' position)
14		Through hole for Remote Manual Release cable
15	7	Solenoid
16		Internal High-Pressure Nitrogen Tubing **DO NOT REMOVE***
17		High-Pressure Nitrogen Tubing outlet (1/8-inch NPT) **DO NOT REMOVE***
18		Port for 1/4-inch socket drive (to set Cam/Flag)
19	8	Connection on trigger for gas valve ('Set' position)
20	8	Connection on trigger for gas valve ('Released' position)
21		Port for Keeper Pin (60-9197108-000)
22	1	High-Mount Microswitch
23		Status/setting for Cam/Flag ('Set' position)
24	8	Mechanical Gas Valve
25	6	Detection Line 2 (Option 2) — Not Shown
26	5	Remote Manual Release
27	4	Detection Line 2 (Option 1)
28	3	Detection Line 1
29	2	Switch Lead for Deep Mounted Microswitch
30	1	Switch Lead for High Mounted Microswitch
*Note: The Internal High-Pressure Nitrogen Tubing and Outlet Fitting are intregal to the *XV* Control System, and are included in the factory quality inspection and tests. Removal of these parts could the harm the integrity of the system.		

5-2.3.6.1 Disposal of Cartridge

Following are the recommended instructions for disposal of spent cartridges.

WARNING

Never dispose of a pressurized cartridge. Cartridges must be discharged before discarding. Filled gas cartridges may be dangerous if not handled properly. Do not heat cartridges above 120°F (49°C). Pressurized cartridges that become overheated can explode, and thereby cause death or serious personal injury and/or property damage.

Determine if gas is present in the cartridge. All puncturable type disposable cartridges are presumed to be fully charged unless the small puncturable end (opposite of the rounded bottom) is **clearly punctured**. If the puncture is not clear, the cartridge may be weighed using a scale capable of reading in grams accurate to 0.1 g. **The weight of the cartridge shall be less than the indicated weight imprinted on the side of the cartridge by the amount of the indicated charge.**

After using one of the methods described to determine that no gas is present in the cartridge, the cartridge may be placed with normal refuse, or may be placed with steel recycling materials. All of the steel cartridges are produced from a low carbon (14) steel product. Once empty, no residue remains. Cross cutting or sectioning is not required.

5-2.4 Six-Year Maintenance

The six-year maintenance is typically done in conjunction with the semi-annual maintenance. These procedures shall be performed **in addition** to the tests conducted at Semi-Annual intervals (Paragraph 5-2.2), and the monthly inspections (Paragraph 5-2.1).

Refer to NFPA 17 for all six-year maintenance and hydrostatic testing.

5-2.4.1 DRY CHEMICAL CYLINDERS

The Kidde IND Dry Chemical System must be examined at least every six years. Kidde recommends that a complete internal inspection be done in accordance with this schedule.

Table 5-5. Dry Chemical Cylinder Inspection

Checkbox	Procedure
☐	Determine date of cylinder manufacture. See CGA pamphlet C-1 for hydrostatic test requirements.
☐	Depressurize the Cylinder and Valve Assembly.
☐	Remove the valve and siphon tube.
☐	Remove and discard the dry chemical from the cylinder.
☐	Visually inspect the entire inside surface of the cylinder, per CGA pamphlet C-6.
☐	Hydrostatically test the cylinder if appropriate. See Paragraph 5-2.4.2 on page 5-21.
☐	Rebuild valve with new stem/O-ring and new valve/cylinder O-ring. See Paragraph 5-2.5.4 on page 5-22.
☐	Recharge the cylinder as described in See Paragraph 5-2.6 on page 5-24.

5-2.4.2 HYDROSTATIC TESTING

Refer to Title 49 of the Code of Federal Regulations Paragraph 180, and CGA pamphlets C-1 and C-6.

Hydrostatic testing is to be performed on the Kidde cylinder in compliance with the appropriate DOT requirements.

The dry chemical is to be discarded when performing the hydrostatic test.

Note: Do not reuse the dry chemical per NFPA-17.

To protect the hazard during this testing period, a substitute cylinder is to be used, one of equal to the unit under test. An alternate protection method may be used so long as it is acceptable to the Authority Having Jurisdiction (AHJ).

This is only an example; failure to properly identify and test the cylinder to appropriate DOT requirements may result in damage to cylinder.

CAUTION

No leakage, rupture, or expansion greater than 10% shall be allowed. Internal or external corrosion, denting, bulging, or evidence of rough usage that would be likely to weaken the cylinder should cause the cylinder to be condemned and replaced.

Cylinders are to be either hydrostatically tested or volumetric-expansion tested to **TWO TIMES** the standard rating. A cylinder's standard rating is stamped on the crown or footing of the cylinder. For example:

MARKINGS:	DOT 4BW-360
RATING:	360 PSI
TEST PRESSURE:	720 PSI

When cylinders have been hydrostatically tested, recharge according to Paragraph 5-2.6.

5-2.5 Recharge Instructions

5-2.5.1 GENERAL INFORMATION

The monammonium-phosphate base dry chemical used in extinguishing a fire is not harmful. However, it is best to clean the area immediately after fire extinguishment. Prolonged exposure of equipment to dry chemical can result in localized corrosion due to moisture in the air.

The Pressure Operated Release must be disassembled and cleaned of dry chemical. The Pressure Operated Release's stem and piston preformed packing must be lubricated with silicone grease. In addition, the two-way check tee (if used) is to be blown clean with nitrogen to remove all dry chemical.

5-2.5.2 DEPRESSURIZE CYLINDER AND VALVE ASSEMBLY

Note: Before beginning, refer to Paragraph 5-2.6 for preparation before recharging.

Protective eyewear must always be worn when working with pressurized cylinders. Never service a Cylinder and Valve Assembly unless the Anti-Recoil Plate (P/N 255681) and Protection Cap (P/N 255096) are installed. Failure to follow these instructions could result in death or serious personal injury and/or property damage.

WARNING

WARNING

Do not use water or oxygen to blow out agent distribution piping. Moisture will cause blockage. The use of oxygen is very dangerous as the possible presence of even a minute quantity of oil may cause an explosion, thereby causing death or serious injury and/or property damage.

1. Ensure all pressure is vented by slowly loosening the High-Pressure Nitrogen Tubing at the bottom of the *XV* Control System.
2. Check each pressure gauge to ensure that all cylinders are empty.
3. Unbolt the Discharge Adapters and the SVAs from all discharged cylinders.
4. Loosen the Mounting Bracket retaining strap(s) and install the Anti-Recoil plate(s) and the Protection Cap(s).
5. Remove all discharged cylinder(s).

Note: All cylinders shall be recharged as described Paragraph 5-2.6.

5-2.5.3 DISASSEMBLE THE CYLINDER VALVE

1. Remove the valve and siphon tube assembly from the discharged cylinder.
2. Invert the cylinder and tap the threaded neck end on a wooden block to remove any residual dry chemical.
3. Blow any dry chemical residual from the valve, siphon tube and cylinder threads.
4. Visually inspect the entire inside and outside surface of the cylinder per CGA Pamphlet C-6.

5-2.5.4 REBUILDING CYLINDER VALVE

When rebuilding the cylinder valve, use the Valve Rebuild Kit, P/N 87-120067-001. This kit includes:

- Valve stem,
- Valve spring,
- Spring retainer,
- Cylinder O-ring,
- Retaining ring, and
- Valve stem O-ring.

Use the following procedures to rebuild the cylinder valve.

1. Remove siphon tube from the cylinder valve.
2. Secure valve body. Place valve body over a short piece of 3/4-inch pipe (or equivalent) to prevent the valve stem from falling out.
3. Remove the following from the valve body:
   - Retaining ring
   - Spring retainer
   - Valve spring
   - Valve stem
   - Cylinder valve O-ring

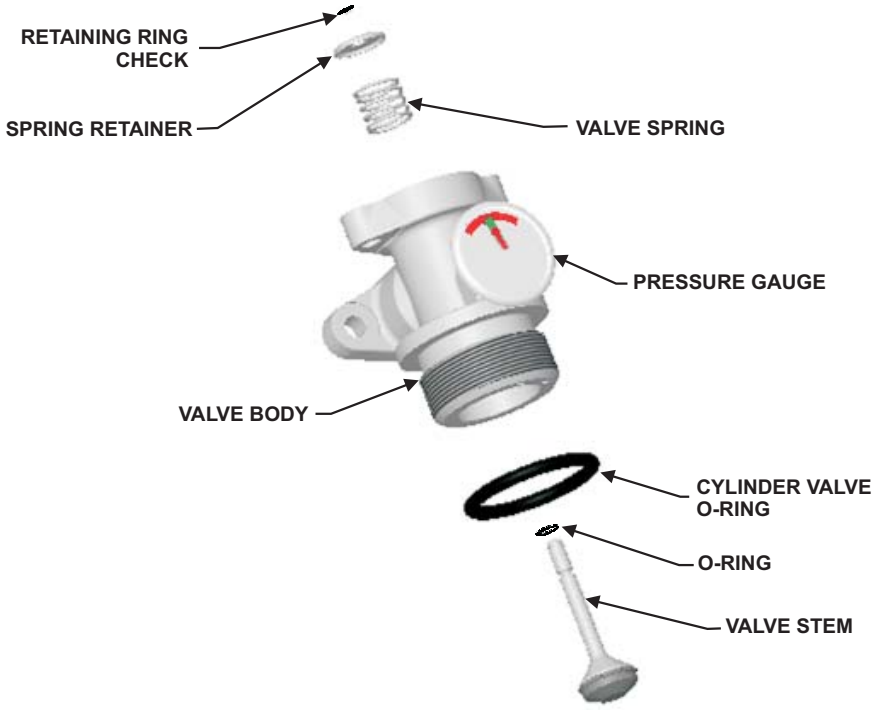


Figure 5-16. Valve Assembly, Exploded View

4. Put a light coating of lubricant (supplied in the Valve Rebuild Kit) on the valve stem O-ring. Do not grease the bonded seal on valve check (see Figure 5-16).
5. Install the valve stem.
6. Install valve spring.
7. Install spring retainer.
8. Push down on the valve spring and spring retainer. Install the retaining ring.
9. When installing the retaining ring, it is recommended that you use a box wrench to push the valve spring down and to maintain pressure while encompassing the retaining ring in place.
10. Put a light coating of lubricant (supplied in the Valve Rebuild Kit) on the cylinder valve O-ring.
11. Install valve to cylinder O-ring.
12. Reinstall siphon tube to cylinder valve.

5-2.6 Recharging Cylinders

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. Refer to the Safety Summary for more information regarding pressurized cylinders. Failure to follow these instructions could result in death or serious injury and/or property damage.

CAUTION

Do not attempt to recharge any cylinder without 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 five (5) 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.

1. Fill the cylinder with the appropriate weight of the ABC agent or BC agent as indicated on the cylinder nameplate. Use Kidde P/N 806411 for ABC dry chemical, or Kidde P/N 804904 for BC dry chemical.
2. Reinstall the siphon tube and valve and ensure it is tight.
3. Unbolt the Anti-Recoil Plate and bolt the charging adapter to the outlet port of the valve. Securely clamp the cylinder to a rigid structure.
4. Use nitrogen to pressurize the cylinder to 360 PSI (24.82 bar) at 70°F (21°C). Use a calibrated gauge.

Note: Do not rely on the pressure regulator or the cylinder pressure gauge to determine the container pressure (see Figure 5-17 for a suggested recharging arrangement).

5. Remove the charging adapter and check for leakage using a soap solution.
6. Bolt the Anti-Recoil Plate to the valve outlet. Leave the protection plates in place until the cylinder is ready to be reinstalled.

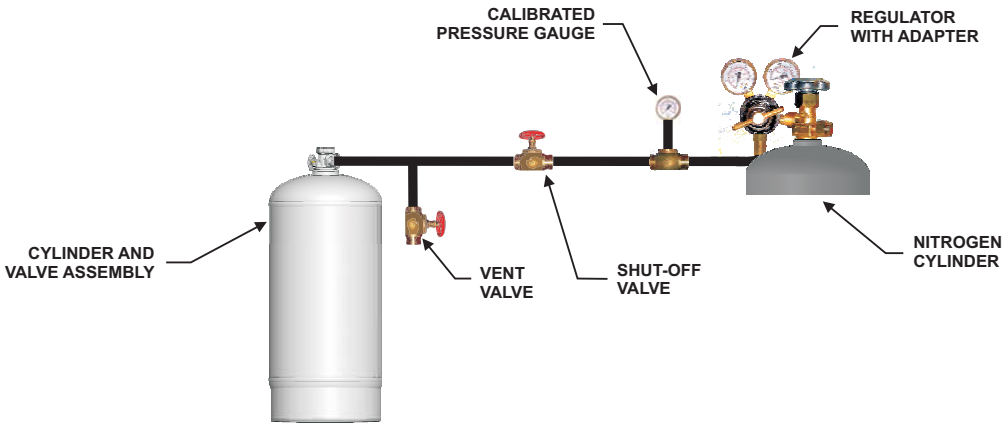


Figure 5-17. Recharge Hookup

After the inspections and procedures described previously in this section, and after having recharged all dry chemical cylinders, the fire suppression system is ready to be fully checked out before installation of the recharged dry chemical cylinders. Perform the steps outlined in Paragraph 5-2.3, Functional Testing of the System.

5-2.6.1 CYLINDER LEAK TEST

1. Remove the spare discharge adapter and check for leakage using a soap solution.
2. 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.

5-2.7 Twelve-Year Maintenance

The twelve-year maintenance ties in with the:

- Six-year maintenance,
- Semi-annual maintenance, and
- Monthly Inspections

All maintenance procedures and inspections listed above have to be performed at this time. Refer to Paragraph 5-2.1 to start this process.

In addition, the following inspections are required to comply with NFPA-17 and DOT requirements.

Table 5-6. Twelve-Year Service Procedure

Checkbox	Procedure
☐	*XV* Control System: - Replace the *XV* System Nitrogen Cartridge - Rebuild the *XV* Control System Valve
☐	Hydrostatically Test the Dry Chemical Cylinders
☐	Recharge Cylinders
☐	Installing Valve Rebuild Kit

5-2.7.1 *XV* CONTROL SYSTEM

The System Nitrogen Cartridge (P/N 87-120043-001) requires replacement at intervals of twelve years. Check the date that was written on the cartridge at the time of installation.

At the time of replacement, the old System Nitrogen Cartridge may be used for the functional tests.

5-2.7.1.1 Rebuild the *XV* Control System Valve

The *XV* Pin/Gasket Rebuild Kit (P/N 87-120046-001) includes the following:

- Valve Gasket
- Piercing Pin
- O-ring
- Retaining Ring
- Pin/Gasket Service Label

Refer to Figure 5-18 when performing the service operation.

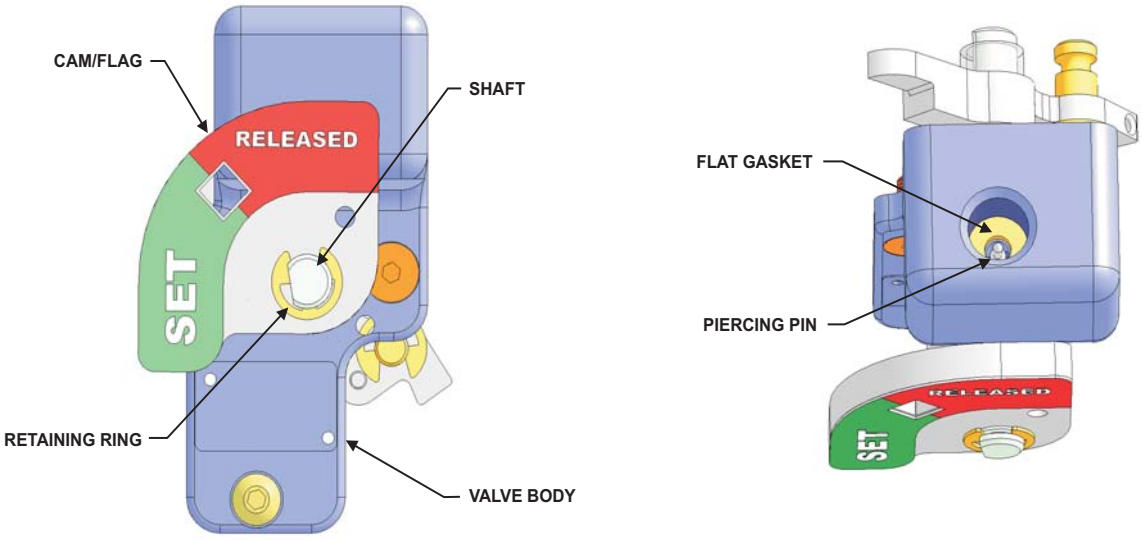


Figure 5-18. Valve Body with Piercing Pin Shown

1. Ensure that the Cam/Flag is in the Released position.
2. Remove the System Nitrogen Cartridge.
3. Carefully remove the retaining ring and set in a safe place. Refer to Figure 5-18 for location.
4. Slide the Cam/Flag off the shaft.

CAUTION

The point on the piercing pin is extremely sharp. Handle with care. It is important to discard the piercing pin that is removed from the *XV* Control System at the 12-year cycle. It must never be used again.

5. Using a small screwdriver or other tool, push the Piercing Pin (P/N 60-9197212-000) out of the port, in the direction of the shaft. Discard the Piercing Pin.
6. Remove and discard the Flat Gasket (P/N 06-236204-001) located inside the gas cartridge inlet.

CAUTION

Use care not to damage the threads in the gas cartridge inlet.

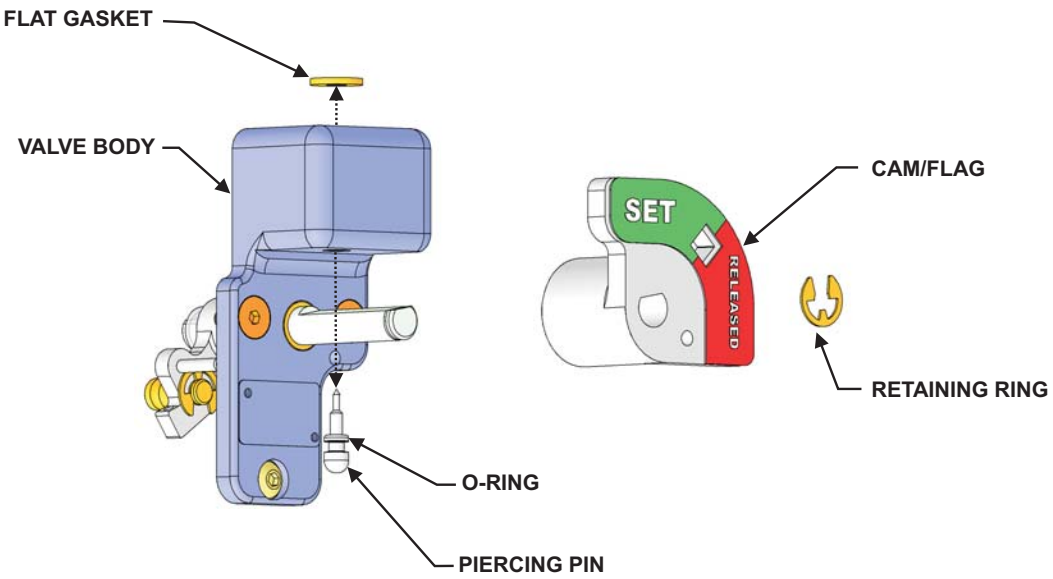


Figure 5-19. Removal of Piercing Pin and Flat Gasket

7. Insert a new Flat Gasket (Use only P/N 06-236204-001). Ensure that the gasket is seated firmly inside the gas cartridge inlet.
8. With the sharp end of the Piercing Pin pointed into the port, push the Piercing Pin into the port until the O-ring is inside the valve body.
9. Reinstall Cam/Flag.

Note: Ensure there is no interference with the Piercing Pin. If there is interference, push the pin further into the body. While sliding the Cam/Flag over the shaft, ensure that the paddles for the microswitches also do not interfere.

10. Install the retaining ring into the groove on the top of the shaft.

Note: The Cam/Flag may seem slightly loose on the shaft. It will turn slightly This is acceptable. There will be further tests to ensure the fit is proper.

11. Turn the Cam/Flag to check engagement with the microswitch paddles.
12. Write the date on the Pin/Gasket Service Date label in the space provided. Attach the Pin/Gasket Service Date label.

Note: Do not install the label onto the local manual release handle. Attach it to another part of the system where is will not interfere with system operation.

CAUTION

Only System Nitrogen Cartridge shall be used for final system set up. Using any other cartridge could cause malfunction or non-function of the system in an emergency situation.

13. Once these steps have been performed, proceed with all Functional and Actuation Tests according to Paragraph 5-2.3.6. At the completion of the Actuation Test, install a **new** System Nitrogen Cartridge. In the space provided, write in the date the cartridge is being installed. Carefully install the System Nitrogen Cartridge into the valve assembly of the *XV* Control System. Hand tighten until it is snug.

Note: Do not use a wrench or other tool to tighten the cartridge. Hand tightening is sufficient. If leakage is observed, check the condition of the cam and flat gasket/piercing pin in the valve bore.

14. Verify that the system Owner's Manual is in place.

15. Review system operation with the owner or other responsible persons.
16. Dispose of cartridge according to the instructions in Paragraph 5-2.3.6.1.

5-3 POST-DISCHARGE MAINTENANCE

5-3.1 General Information

The sodium bicarbonate-base or monammonium-phosphate base dry chemical used in extinguishing a fire is not harmful. However, it is best to clean the area immediately after fire extinguishment. Prolonged exposure of equipment to dry chemical can result in localized corrosion due to moisture in the air.

The pressure-operated trip must be disassembled and cleaned of dry chemical. The pressure-operated trip's stem and piston preformed packing must be lubricated with silicone grease. In addition, the two-way check tee (if used) is to be blown clean with nitrogen to remove all dry chemical.

5-3.2 Cylinder and Valve Assembly

Check each pressure gauge to ensure that all cylinders are empty. Unbolt the discharge adapters and SVA(s) from all discharged cylinders. Loosen the mounting bracket retaining straps and install the anti-recoil plates and the shipping caps. Remove all discharged cylinders. Bolt a test fixture to each SVA.

All cylinders shall be recharged as described in Section 5-2.6, Recharging Cylinders

5-3.2.1 VALVE DISASSEMBLY - See Section 5-2.5.3, Disassemble the Cylinder Valve

WARNING

Protective eyewear must always be worn when working with pressurized cylinders. Never service a Cylinder and Valve Assembly unless the Anti-Recoil Plate (P/N 255681) and Shipping Cap (P/N 255096) are installed. Failure to follow these instuctions could result in death or serious personal injury and/or property damage.

5-3.3 Resetting the Mechanical System

1. Replace all detectors with new detectors having the same temperature and load rating as the original detectors.

Note: Any detectors exposed to heat will no longer provide reliable protection and must be replaced.

2. After replacing the detectors, remove the front cover from each *XV* Control System. Reset each *XV* Control System as described in Chapter 4.

5-3.4 Resetting the Electrical System

1. Inspect and test all thermostats. Replace any thermostats that have obviously been damaged by exposure to excessive heat. Check the actuation set point of the remaining thermostats by heating the thermostats and recording the actuation temperature. If the actuation temperature of any thermostat is more than 10° F higher than its original setting, the thermostat should be replaced. Hot oil and a high-temperature thermometer can be used to check the temperature. Heating should be done slowly.
2. After replacing any damaged thermostats, remove the front cover from each *XV* Control System. Reset each *XV* Control System as described in Chapter 4.

5-3.5 Clean Distribution System and Nozzles

1. Remove all nozzles from the system and inspect each nozzle for debris. Remove any debris. Re-install the nozzles on the distribution pipe and replace all nozzle blow-off caps. Reapply silicone grease where applicable.
2. Inspect the system piping and fittings and replace any pipe or fittings subjected to direct flame or excessive heating.
3. Blow out the distribution pipe with dry air or nitrogen. One possible procedure for accomplishing this is to use a test cylinder-and-valve assembly, without any dry chemical, pressurized with nitrogen to 100 psig. Verify that all nozzle caps (where applicable) do indeed blow off, or that other suitable discharge indicators show proper flow through all nozzles. Remove all nozzles from the system and inspect for debris. Remove any debris. Re-install the nozzles on the distribution pipe and replace all nozzle blow-off caps. Reapply silicone grease where applicable.

WARNING

Do not use water or oxygen to blow out piping. Moisture will cause blockage. The use of oxygen is very dangerous as the possible presence of even a minute quantity of oil may cause an explosion, and therefore could result in death or serious personal injury and/or property damage.

5-3.6 Recharge Cylinders - See Section 5-2.6, Recharging Cylinders

CAUTION

Do not attempt to recharge any cylinder without 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 five (5) 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.

5-3.7 Valve Reassembly

1. Replace the Valve-to-Cylinder O-Ring, P/N 5661-0327.
2. Fill the cylinder with the appropriate weight of the ABC agent or BC agent as indicated on the cylinder nameplate. Use Kidde P/N 806411 for ABC dry chemical, or Kidde P/N 804904 for BC dry chemical.
3. Reinstall the siphon tube and valve and ensure it is tight.
4. Install O-Ring (P/N 1080-1900) on a spare discharge adapter (P/N 844908).
5. 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.

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.

6. Use nitrogen to pressurize the cylinder to 360 PSI (24.82 bar) at 70°F (21°C). Use a calibrated gauge.

Note: Do not rely on the pressure regulator or the cylinder pressure gauge to determine the container pressure. Refer to Figure 5-17 for a suggested recharging arrangement.

5-3.8 Cylinder Leak Test

1. Remove the spare discharge adapter and check for leakage using a soap solution.
2. 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.

5-3.9 Rechecking the System

After the inspections and procedures described previously in this section, and after having recharged all dry chemical cylinders, the fire-suppression system is ready to be fully checked out before installation of the recharged dry chemical cylinders.

1. Follow the system checkout and test procedures outlined in Chapter 4. Follow the procedures for *XV* Control System mechanical and/or electrical devices as appropriate.
2. Be sure to check the system for all three modes of operation (automatic, local-manual, and remote-manual actuation).
3. After the system has been satisfactorily checked out, follow the-steps under Paragraph 4-6 “Commissioning the System.”
4. After completing the “Commissioning the System” procedure, the system will be online and ready to protect the process, equipment, or combustibles. As with any equipment, periodic maintenance must be performed as indicated in Table 5-1.

CHAPTER 6
PARTS LIST

Table 6-1. Parts List

DRY CHEMICAL CYLINDER AND VALVE ASSEMBLIES	
IND-21/25 ABC Cylinder and Valve Assembly	486573
IND-45/50 ABC Cylinder and Valve Assembly	486574
IND-70/75 ABC Cylinder and Valve Assembly	83-100018-001
Discharge Adapter Kit Note: One required for each cylinder.	844908
Gauge Shield	83-131024-001
CYLINDER MOUNTING EQUIPMENT	
IND-21/25 Shelf Type Mounting Bracket	486487
IND-45/50 Shelf Type Mounting Bracket	486488
IND-70/75 Shelf Type Mounting Bracket	87-100009-001
Floor Mounting Kit for IND-70 Note: Requires P/N 87-100009-001.	87-100010-001
KIDDE *XV* CONTROL SYSTEM	
XV Control System	87-120099-001
High Pressure Nitrogen Tubing	87-120045-001
System Valve Actuator (SVA)	87-120042-001
Solenoid, 24 Vdc for P/N 87-120099-001	83-100034-001
Microswitch Kit for P/N 87-120099-001	87-120039-001
Vent Check	877810
EMT Connector and O-Ring Kit, 3 sets	87-120058-001
Actuation Delay Assembly	83-100035-001
IND SYSTEM DISCHARGE NOZZLES	
Nozzle, Total-Flooding (TF)	83-100005-001
Nozzle, Duct/Plenum (D/P)	83-100006-001
Nozzle, 3-Way	83-100037-001
Nozzle Cap for Total-Flooding Nozzle	06-250099-067
Nozzle Cap for Duct/Plenum Nozzle	264742
Nozzle Cap for 3-Way Nozzle	06-250099-067
3/4-inch Flow Restrictor	83-100050-001
1-inch Flow Restrictor	83-100051-001
MECHANICAL ACTUATION COMPONENTS	
Universal Link Housing Kit Note: Includes Bracket, Crimp Sleeve and "S" Hook	87-120064-001

Table 6-1. Parts List (Continued)

KGS-165 Standard Response Link, 165°F (57°C), Red	87-120091-165
KGS-212 Standard Response Link, 212°F (100°C), Green	87-120091-212
KGS-286 Standard Response Link, 286°F (141°C), Blue	87-120091-286
KGS-360 Standard Response Link, 360°F (182°C), Mauve	87-120091-360
KGS-450 Standard Response Link, 450°F (232°C), Black	87-120091-450
KGS-500 Standard Response Link, 500°F (260°C), Black	87-120091-500
KGR-165 Rapid Response Link, 165°F (57°C), Red	87-120096-165
KGR-212 Rapid Response Link, 212°F (100°C), Green	87-120096-212
KGR-286 Rapid Response Link, 286°F (141°C), Blue	87-120096-286
KGR-360 Rapid Response Link, 360°F (182°C), Mauve	87-120096-360
KGR-450 Rapid Response Link, 450°F (232°C), Black	87-120096-450
KGR-500 Rapid Response Link, 500°F (260°C), Black	87-120096-500
Remote Manual Release	875572
Corner Pulley	844648
Tee Pulley	843791
Cable, 1/16-inch x 500 ft. long	219649
Crimp Sleeve, Minimum 50 Pieces	214951
S Hook, Minimum 50 pieces	87-9189413-000
Pressure Operated Release	874290
Pressure Operated Switch, 3 Pole	486536
KML-165 Link 165°F (57°C) "ML" Yellow	282661
KML-212 Link 212°F (100°C) "ML" White	282662
KML-360 Link 360°F (182°C) "ML" Unpainted	282664
KML-500 Link 500°F (260°C) "ML" Orange	282666
Fusible-Link Housing Kit	804548
MECHANICAL CABLE OPERATED GAS SHUTOFF VALVES	
3/4-inch NPT	87-100001-001
1-inch NPT	87-100001-002
1-1/4-inch NPT	87-100001-003
1-1/2-inch NPT	87-100001-004
2-inch NPT	87-100001-005
2-1/2-inch NPT	87-100001-006
3-inch NPT	87-100001-007

Table 6-1. Parts List (Continued)

ELECTRIC ACTUATOR GAS SHUTOFF VALVES, 120 Vac	
1/2-inch NPT Electric Actuator Gas Shutoff Valve	60-9197017-000
3/4-inch NPT Electric Actuator Gas Shutoff Valve	60-9197018-000
1-inch NPT Electric Actuator Gas Shutoff Valve	60-9197019-000
1-1/4-inch NPT Electric Actuator Gas Shutoff Valve	60-9197020-000
1-1/2-inch NPT Electric Actuator Gas Shutoff Valve	60-9197021-000
2-inch NPT Electric Actuator Gas Shutoff Valve	60-9197022-000
21/2-inch NPT Electric Actuator Gas Shutoff Valve	60-9197444-000
3-inch NPT Electric Actuator Gas Shutoff Valve	60-9197445-000
Manual Reset Relay	60-9101735-000
QUIK-SEALT AND COMPRESSION SEAL ADAPTERS	
Compression Seal Adapter, 3/8-inch Tubing	26504601
Compression Seal Adapter, 1/2-inch Tubing/1/4-inch Pipe	26504602
Compression Seal Adapter, 5/8-inch Tubing/3/8-inch Pipe	26504603
Compression Seal Adapter, 3/4-inch Tubing/1/2-inch Pipe	26504605
Compression Seal Adapter, 1/2-inch EMT	26504604
Quik-Seal Adapter, 3/8-inch NPT Female	26499301
Quik-Seal Adapter, 1/2-inch NPT Female	26499302
Quik-Seal Adapter, 3/4-inch NPT Female	26499303
Quik-Seal Adapter, 1-inch NPT Female	26499304
Quik-PatchT (for Hole Patching up to 1-1/8-inch Diameter)	26499305
VALVE SPARE PARTS	
Complete Valve Assembly, IND Dry Chemical	878767
Replacement Gauge	283951
Valve Stem	877343
Valve Spring	217768
Spring Retainer	253299
Retaining Ring Check	18490004
Fusible Plug	257754
O-Ring, Valve to Cylinder	56610327
O-Ring, Valve Stem	64350006
Protection Plate for Top Valve	255096
Valve Outlet Anti-Recoil Plate	255681
Siphon Tube for P/N 486573 or P/N 486570	265018
Siphon Tube for P/N 486574 or P/N 486471	265019
Siphon Tube for P/N 83-100019-001 or P/N 83-100018-001	WK-264992-000

Table 6-1. Parts List (Continued)

SYSTEM SPARE PARTS	
Seal Wire	15262
Fan Caution Decal	282726
Decal (for P/N 875572, Remote Manual Release)	261154
Backplate (for P/N 875572 Manual Release)	277088
Replacement Strap (for 486487 and 486488 Cylinder Brackets)	255700
Replacement Strap for 87-100009-001 (70/75) Cylinder Bracket	06-117989-001
INSTALLATION TOOLS AND RECHARGE EQUIPMENT	
Nitrogen Cartridge for Kidde *XV* Control System	87-120043-001
Test Cartridge for *XV* Control System	87-120044-001
Keeper Pin for *XV* Control System	60-9197108-000
Actuation Delay Rebuild Kit	87-120066-001
Valve Rebuild Kit for *XV* Control System	87-120046-001
O-Ring for Discharge Adapter Kit	10801900
Cylinder Nameplate for P/N 486573, Non UL	283977
Cylinder Nameplate for P/N 486574, Non UL	283978
Cylinder Nameplate for P/N 83-100018-001, Non UL	06-231866-021
Positive Action Crimp Tool	253538
Recharge Adapter	279262
Hydrostatic Test Adapter	878453
BC Dry Chemical, 50 lb. Pail	804904
ABC Dry Chemical, 50 lb. Pail	806411
MANUALS	
Kidde IND Dry Chemical System for Enclosed Spray Booths	83-100036-001
IND System Owner's Manual	83-INDOMA-001

APPENDIX A
ELECTRICAL DETECTION INSTALLATION (DETECT-A-FIRE®)

A-1 INTRODUCTION

DETECT-A-FIRE® thermal detectors are UL Listed, UL of Canada available upon request, and FM Approved detection and release devices used with fire detection systems to activate alarms and actuate extinguishing systems. This Rate Compensated device combines the best features of both fixed temperature and rate-of-rise detectors.

Table A-1. Electrical Rating

Model Number	Contact Operation on Temperature Rise	Electrical Rating[1] (Resistive Only)
27120	Opens (450° F Max.)	5.0 Amps 125 Vac 0.5 Amps 125 Vdc
28020		
27121	Closes	5.0 Amps 125 Vac 0.5 Amps 125 Vdc 2.0 Amps 24 Vdc 1.0 Amps 48 Vdc
28021		

[1] Although incandescent lamps are considered resistive, their inrush current is 10 - 15 times their steady current. Do not exceed ratings.

A-2 LOCATION

DETECT-A-FIRE® Units are precision temperature sensors. They must be mounted in an area (normally a ceiling) so that:

1. The detector spacing complies with both system requirements and requirements of the local Agency Having Jurisdiction.
2. The thermal air path to the shell is not obstructed.

Spacing per UL, FM, and UL of Canada is shown in Table A-2. Distances given are for between units on smooth ceilings. Distances from partitions or walls are half that shown. To assure that all spacing requirements are met, consult the local Authority Having Jurisdiction.

A-3 MOUNTING

Detect-A-Fire units are not position sensitive. Horizontal and vertical detectors refer to the most common mounting configuration for that unit. However, each type can be mounted either horizontally or vertically depending on the application and installation requirements.

Table A-2. Detect-A-Fire Spacing

Setting	Tolerance	SPACINGS (in feet)			Color Coding
		UL	ULC	FM	
140°F	±7/-8°F	50	50	25	Black
160°F	±7/-8°F	25	25	25	Black
190°F	±7/-8°F	50	50	25	White
210°F	±7/-8°F	25	50	25	White
225°F	±7/-8°F	25	50	25	White
275°F	±10°F	25	50	25	Blue
325°F	±10°F	50	50	25	Red
360°F	±10°F	25	50	25	Red
450°F	±15°F	25	50	25	Green
500°F	±15°F	50	50	25	Orange
600°F	±20°F	N/A	50	25	Orange
725°F	±25°F	N/A	50	25	Orange

Note: For clean agents and CO_2 suppression systems, ceiling spacing 20 ft. (6.1 m) apart unless otherwise specified.

Not all units are suitable for all hazard location applications. Refer to Table A-3 and markings on the detector for hazardous location suitability.

Table A-3. Hazardous Location Applications

Hazardous Location	Model Number	Fittings Required for UL, ULC Listings and FM Approval
Class I[2], Groups A, B, C, and D; Class II[2], Groups, E, F, and G	27120-22 27121-20 28020-3 28020-5	Mount detector to a suitably-listed fitting in accordance with National Electric Code and/or Local Authority having Jurisdiction.
Class I[2], Groups B, C, and D; Class II[2], Groups, E, F, and G	27120-0 27121-0 28021-0	

[2] Division 1 and 2.

A-4 INSTALLATION

Heat detectors are to be installed in an anticipated path of convective heat flow from the fire, and spaced at a maximum on-center distance of 20 ft. (6.1 m) for ceiling heights up to 10 ft. (3.7 m) (refer to Chapter 3).

The electrical wire from the *XV* Control System to the Control Panel must be protected by 1/2-inch EMT (minimum).

WARNING

It is likely that industrial applications involving flammable or combustible liquids will be enclosed within or surrounded by areas that will be classified as Class-I or Class-II, Division-1 or Division-2 locations (Zone 1 or Zone 2). Dry Chemical system electrical components, such as heat detectors, located within these areas shall be rated for use in classified areas, and all wiring to these components shall conform to the provisions of NFPA 70, National Electrical Code, for Class-I or Class-II, Division-1 or Division-2 locations (Zone 1 or Zone 2). Failure to follow these instructions could result in death or serious personal injury and/or property damage.

When the Heat Detector locations have been selected, mount the units as specified in the following sections.

A-4.1 Ceiling Locations

1. It is recommended that standard 4-inch octagonal outlet boxes be used to mount detectors. Use explosion-proof conduit boxes, if necessary.
2. Attach detector to the 4-inch. round outlet box cover through the 7/8-inch diameter hole using 1/2-14 NPT retainer nut. The heat detector maximum torque values are:
   - 20 foot-pounds
   - 27.1 Newton-meters
3. Connect system wiring to detector, observing spacing requirements and applicable electrical codes.
4. Apply RTV sealing compound around the end of the heat detector to which the wires are attached.
5. If moisture is present, you must use a moisture proof box. Mount detector and box cover to box using #8-32 screws.

Series 28000 units are similar to Series 27100 units except they have two 1/2-14 NPT threads for mounting.

The unit may be mounted as described above or may be threaded into a 1/2-14 NPT tapped hole in the vessel wall or threaded into a coupling brazed or welded to the vessel wall.

Note: Wire the Heat Detectors to the listed fire control panel as indicated in an approved wiring diagram.

A-4.1.1 ORDINARY LOCATIONS

The DETECT-A-FIRE Units are to be installed in grounded metallic junction boxes only. They are to be secured to the boxes using two lock nuts, one on either side of the mounting plate. DETECT-A-FIRE Units are not to be installed in non-metallic junction boxes.

A-4.1.2 HAZARDOUS LOCATIONS

For Class I, Division 1 and 2 locations, install the DETECT-A-FIRE Unit in a listed explosion-proof enclosure with a minimum thread engagement of five full turns. No non-conductive material is to be placed on the threaded joint of the DETECT-A-FIRE Unit or in the listed explosion-proof enclosure. For Division 2 locations, assure that a protective ground terminal is provided in the listed explosion-proof enclosure when flexible metal conduit is used.

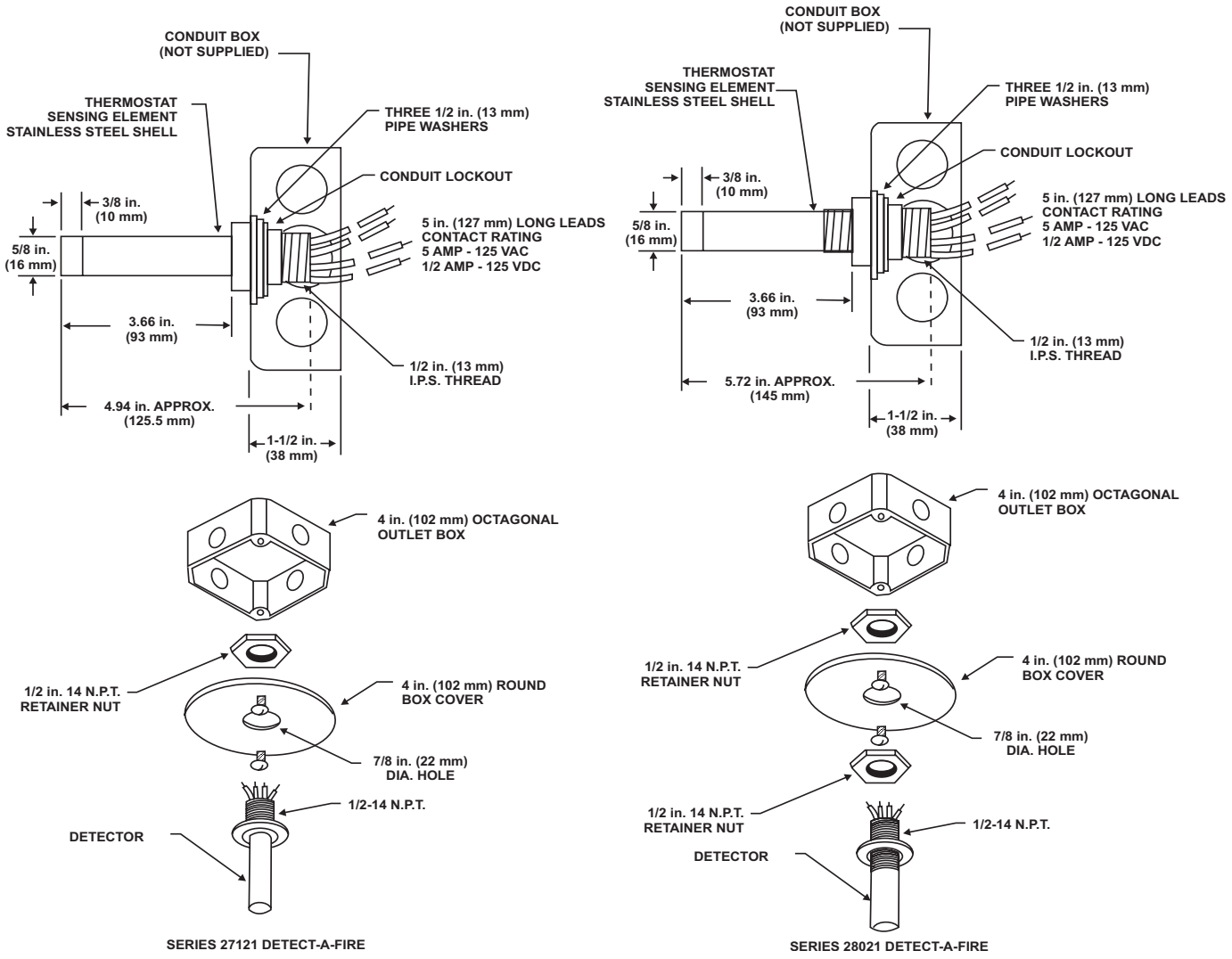


Figure A-1. Mounting a Detect-A-Fire

A-4.1.3 NON-HAZARDOUS OUTDOOR LOCATIONS

Mount the DETECT-A-FIRE in a listed NEMA Type 3 outlet box, cover and conduit, with 1/2-14 NPT threads and a minimum thread engagement of five full turns. Use of pipe plugs with RTV silicon rubber sealant, a rubber gasket, and self-sealing screws to attach the cover, and PTFE thread seal tape on the DETECT-A-FIRE threads should be appropriate for outdoor applications and in accordance with the National Electric Code and/or Authority Having Jurisdiction.

Table A-4. Non-Hazardous Outdoor Locations

Model Number	°F Temperature Settings	Fittings Required for UL Listings and FM Approval
27120-0 27120-22 27121-0 27121-20	140, 160, 190, 225	Mount detector to a fitting suitable for outside use (NEMA Type 3), in accordance with National Electric Code and/or Authority Having Jurisdiction.

A-4.2 Duct Applications

1. Drill a 1-1/4-inch (32 mm) hole at each selected location.
2. It is recommended that standard 4-inch octagonal outlet boxes be used to mount detectors. Use explosion-proof conduit boxes, if necessary. Mount the conduit box securely to the outside of the duct so that the heat detector tube extends into the duct.
3. Attach the detector to the 4-inch round outlet box cover through the 7/8-inch diameter hole using 1/2-14 NPT retainer nut.
4. Connect the system wiring to the detector, observing spacing requirements and applicable electrical codes.
5. If moisture is present, you must use a moisture proof box. Apply RTV sealing compound around the end of the heat detector to which the wires are attached.
6. Mount the detector and box cover to the box using #8-32 screws.
7. Wire the Heat Detectors to the Listed fire control panel as indicated in an approved wiring diagram.

Note: All electric fittings inside of the protected area (work area, plenum/pit/tunnel and exhaust duct) shall be Class I or II, Division I or II (Zone 1 or 2) rated electrical boxes, pipe and fittings.

A-4.3 Field Wiring Requirement

Field wiring must be capable of withstanding the maximum anticipated ambient temperature in the application.

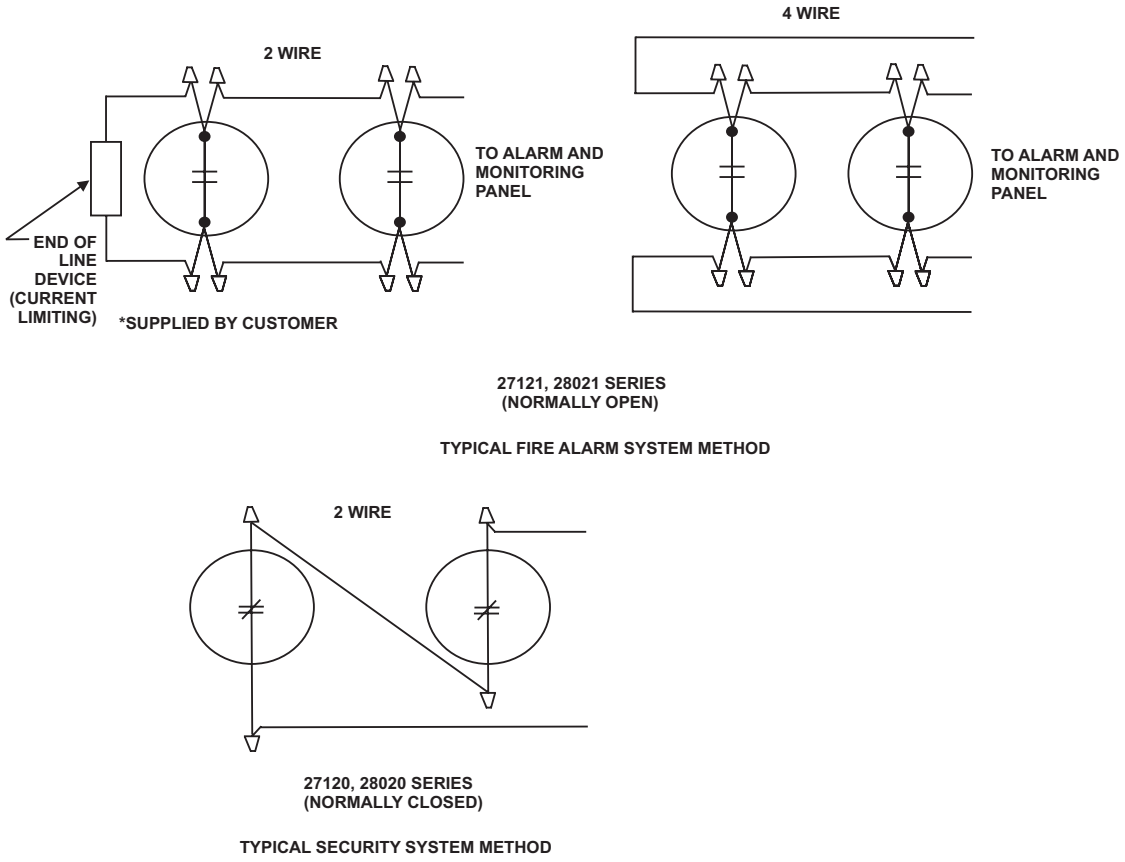


Figure A-2. System Wiring

A-5 FUNCTIONAL TEST

When used with automatic fire extinguishing systems first disconnect the initiator/solenoid leads from the panel and connect a 24 Vdc bulb to initiator terminals in the control unit. Heat the DETECT-A-FIRE units with a heat lamp or other convenient source. When the bulb in the control unit changes state, remove heat source and allow DETECT-A-FIRE unit to cool. Reset control unit. Test lamp must change state and stay changed after system is reset. Do not reconnect initiator/solenoid leads until all DETECT-A-FIRE units have cooled below set point as indicated by test lamp. When DETECT-A-FIRE units are used in other types of systems, disconnect them from the system, connect a 24 Vdc lamp and power source in series with the DETECT-A-FIRE units and test with heat source as above. Make sure that contacts have reset to normal condition before reconnecting to system circuit.

CAUTION

1. In order to function properly, the sensing shell of the unit must remain free from paint, grease, oil, etc. Should such a build up occur, do not, under any circumstances, attempt to remove it. Replace the unit.

2. Detectors mounted in an area subject to physical abuse or damage, other than above, must be suitably protected without obstructing the thermal air path to the unit.

3. Do not install the unit where the shell would be physically damaged by sand, grain, rocks, etc.

4. Do not overtorque the unit when installing.

5. Any detector that has been abused or damaged must be replaced.

6. Consult the factory for special precautions necessary for outdoor use or moist environments.

It is possible for a unit to have been abused or damaged and not display any outward indication of the damage. all units should be tested periodically in accordance with National Fire Protection Association requirements (72) or the local Agency Having Jurisdiction.

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