Linear Heat Detection Installation Manual

July, 2007

NOTICE:
Installers of any SafeCable products or systems must be trained and hold a current and valid training certificate number. Do not install prior to successfully completing a SafeCable Training Program. Warranty will be void if installed by unauthorized personnel.

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NOTICE:
THESE INSTRUCTIONS DO NOT PURPORT TO COVER ALL DETAILS OR VARIATIONS IN EQUIPMENT, OR TO PROVIDE FOR EVERY POSSIBLE CONTIGENCY IN CONNECTION, INSTALLATION, OPERATION OR MAINTENANCE OF SAFECABLE LINEAR HEAT DETECTION SYSTEMS.

SHOULD FURTHER INFORMATION BE DESIRED OR SHOULD PARTICULAR PROBLEMS ARISE, WHICH ARE NOT COVERED SUFFICIENTLY FOR THE PURCHASERS PURPOSE, THE MATTER SHOULD BE REFERRED TO SAFE FIRE DETECTION, INC.

INSTALLATION, COMMISSIONING, SERVICE AND MAINTENANCE SHOULD ONLY BE PERFORMED BY SAFE FIRE DETECTION, INC. OR BY AN AUTHORIZED DISTRIBUTOR / REPRESENTATIVE FAMILIAR WITH ALL RELEVANT PROCEDURES AND HAZARDS. FOR INFORMATION REGARDING TRAINING SCHOOLS OR FACTORY APPROVED CERTIFICATION, PLEASE CONTACT SAFE FIRE DETECTION.

Disclaimer:
SAFE Fire Detection, Inc. reserves the right to change any information contained in this manual without notice.

Codes and Standards:
SAFE Fire Detection, Inc. strongly recommends that this manual be read in conjunction with the appropriate local codes and standards for fire detection systems and electrical connections.

Warranty Information

SAFE Fire Detection's new Linear Heat Detection (LHD) wire, SafeCable is a heat detector , not a system, and must interface with an approved fire alarm panel that meets all local and national codes to become a system.

All accessories pertaining to the detector for installation and mounting must be purchased from SAFE Fire Detection or the warranty may be void. If a system is desired, the fire alarm control/releasing panel can be purchased from SAFE Fire Detection to create a system, and if all it's components and accessories are purchased from SAFE Fire Detection Inc., SAFE Fire Detection Inc. will honor it's warranty as stated below. If non-approved mounting hardware is used and/or manufacturer's installation instructions are not complied with fully, the detector warranty may be void. The maximum length of SafeCable a fire alarm control/releasing panel can use is based on the maximum resistance allowed by the panel, as well as other electrical considerations for individual panels. Please SAFE Fire Detection for assistance or the detector warranty may be void.

Seller warrants that detectors and/or systems purchased from SAFE Fire Detection will, under normal use and service, be free from defects in material and workmanship for a period of one (1) year from the date of original sale. All parts and repairs under, the same conditions, as the systems above will be warranted for ninety (90) days. Seller agrees, upon written notice from Buyer given no later than thirty (30) days after the defect is discovered, to repair or replace at the Seller's option any part which, after examination by Seller, is disclosed to have been defective provided that such product is returned to Seller transportation prepaid during the warranty period. This warranty does not apply to any damage resulting from accident, improper installation, misuse or abuse. The full extents of Seller's warranty obligations are to repair or replace any defective part. Return Transportation is the responsibility of the buyer.

There are no other warranty obligations of seller, including any warranty of merchantability or fitness for a particular purpose, either expressed or implied.

Seller is not liable for any other costs, delays, labor charges, shipping or handling charges for warranty parts, or claims, nor for any consequential or incidental damages with respect to the product for its use.

Using Fire Alarm Control/Releasing Panels other than the PFC-4410 and PFC-4410A

SafeCable may be used with any Fire Alarm Control/Releasing Panel. The total number of feet per zone of SafeCable will vary according to the capabilities of the panel. To determine the maximum number of feet of linear heat detection wire permitted on a panel other than the PFC-4410and PFC-4410A, please contact SAFE Fire Detection, Inc. Be sure to review the Warranty Section above for details on system and detector warranties. SAFE Fire Detection, Inc. makes no warranty for any other panel or its operation.

Table of Contents

This guide is to be used as a general guideline for installing SafeCable linear heat detection (LHD) wire. Please be sure to check all local and state codes prior to designing and installing a system. It is advisable to contact the local AHJ in the planning stages of a project.

1. SAFE Introduction

SAFE Fire Detection, Inc. is committed to providing the best customer support in the industry. This provides our clients with the satisfaction of knowing that their valuable assets and business operation are our greatest concerns. This trust has been earned through 33 years of proven product reliability, dedication, and by providing unparalleled detection helping safeguard facilities around the world.

SAFE Fire Detection's products have been leading the Early Warning Fire Detection (EWFD) market since 1972, protecting loss from fire, smoke, heat and water. Our new product line, SafeCable, is revolutionizing linear heat detection by implementing advanced polymer and digital technologies into an already proved method of detection.

We have built our reputation not just on products, but customer focused solutions. We combine extensive industry knowledge with solid technical expertise to help our clients customers safeguard their valuable assets.

This manual will provide information regarding the proper installation of a SafeCable detection system (see warranty information), as well as a guide in planning for adequate coverage of the protected areas in accordance with accepted fire protection principles. The current NFPA 72 National Fire Alarm Code provides important information regarding the use of linear heat detectors, including spacing and location for adequate area protection. It is important to note that codes, standards and regulatory requirements do change over time and it is highly recommended that prior to planning and installation, the Authority Having Jurisdiction (AHJ) be consulted to ensure compliance.

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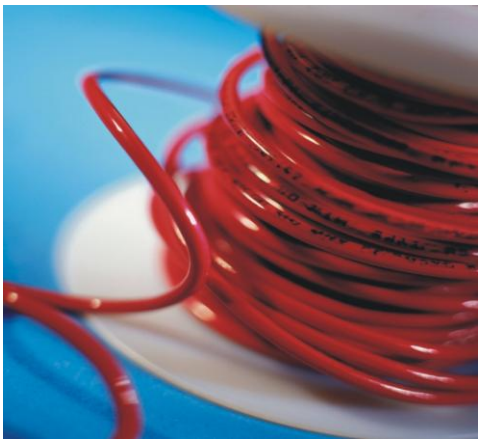
2. Digital Linear Heat Detection Wire Operation



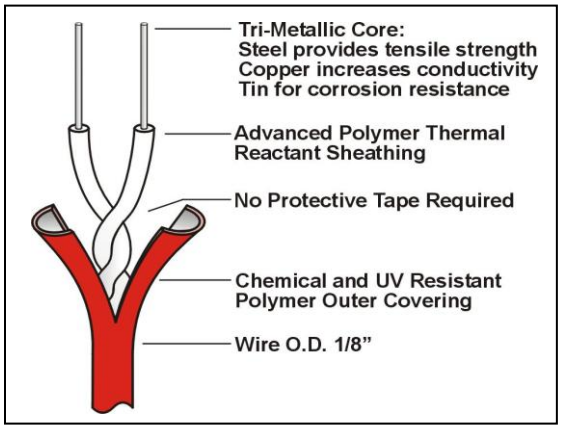


Figure 1

SafeCable digital linear heat detection wire is a combination of advanced polymer and digital technologies that can detect heat anywhere along its entire length.

SafeCable consists of a twisted pair of extremely low resistance (.05 ohm/ft. of twisted pair) tri-metallic conductors, sheathed in new advanced thermal polymers (Figure 1). These polymers are chemically engineered to breakdown at specific fixed temperatures allowing the twisted conductors to make contact and initiate an alarm at the control panel without any calibration for changes in ambient temperatures. The distance locating option allows the control panel to identify and display the exact location, in feet or meters from the control panel, where the heat source interacted with the detection wire.

2.1 SafeCable Specifications:

Diameter:	1/8" (3mm)
Weight:	Nominal 15lbs/1,000 ft. (23kg/1,000m)
Bend Radius:	3" (7.6cm)
Max. Voltage Rating:	30 VAC, 42 VDC
Resistance:	.05 ohms/ft. (.164 ohms/m)
Temperature Ratings:	155°F (68°C), 172°F (78°C), 190°F (88°C), 220°F (105°C)
Sheathing:	PVC – Corrosive and UV Resistant Nylon – Harsh Industrial Environments Polypropylene – Chemical Environments

Figure 2

2.2 Determining Alarm Temperature Rating

The most important factor in determining which detection temperature wire to use, is the maximum ambient temperature of the hazard area or equipment to be protected (Figure 3). The proper temperature SafeCable must be selected to provide the fastest alarm response to a potential fire condition without creating false alarm conditions. In the selection process it is critical to consider the hazard areas highest potential ambient temperature. For example, unvented attics, sheds and warehouse roofs can sustain temperatures well in excess of

120°F (49°C) as a result, 155°F (68°C) SafeCable (TC155) should not be used in these areas because it has a Maximum Ambient Install Temperature rating of 113°F (45°C).

Maximum Ambient Install Temperature	Alarm Temp.	Part Number
Up to 113°F (45°C)	155 (68°C)	TC155
Up to 122°F (50°C)	172 (78°C)	TC172
Up to 158°F (70°C)	190 (88°C)	TC190
Up to 158°F (70°C)	220 (105°C)	TC220

Figure 3

2.3 Multiple Temperatures on a Single Zone

Areas that utilize equipment such as boilers, heat ducts, and steam pipes, can require special design attention. SafeCable allows for multiple alarm temperature wire to be spliced together for greater or less sensitivity on the same initiating circuit. SafeCable can be installed near these types of heat generating equipment, but attention does need to be paid to the recommended spacing limitations. Be sure to use proper splicing techniques (section 6.3) for these types of connections.

2.4 Using SafeCable with a Pre-Action Sprinkler or Suppression System

SafeCable linear heat detection wire, may be used to initiate a double interlock pre-action sprinkler, deluge, or other suppression system by using any existing fire alarm control/releasing panel (FACRP).

Illustrated in Figure 4 is a typical system configuration for a SafeCable linear heat detection system connected to a typical conventional fire alarm control panel with indicating, action and releasing circuits.

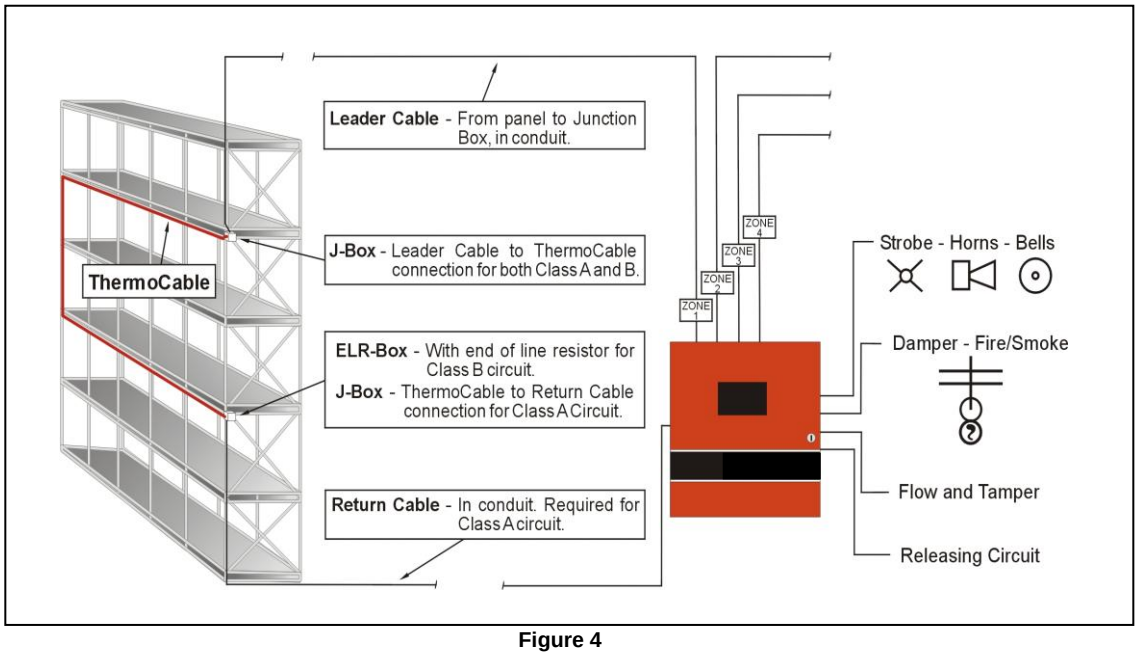


Figure 4

2.5 Typical Pre-Action Systems

The following diagrams illustrate different variations of Class “A” and Class “B” system configurations for Single Hazard, Pre-Action, and Cross Zoning Systems.

TYPICAL SINGLE HAZARD CLASS "A"

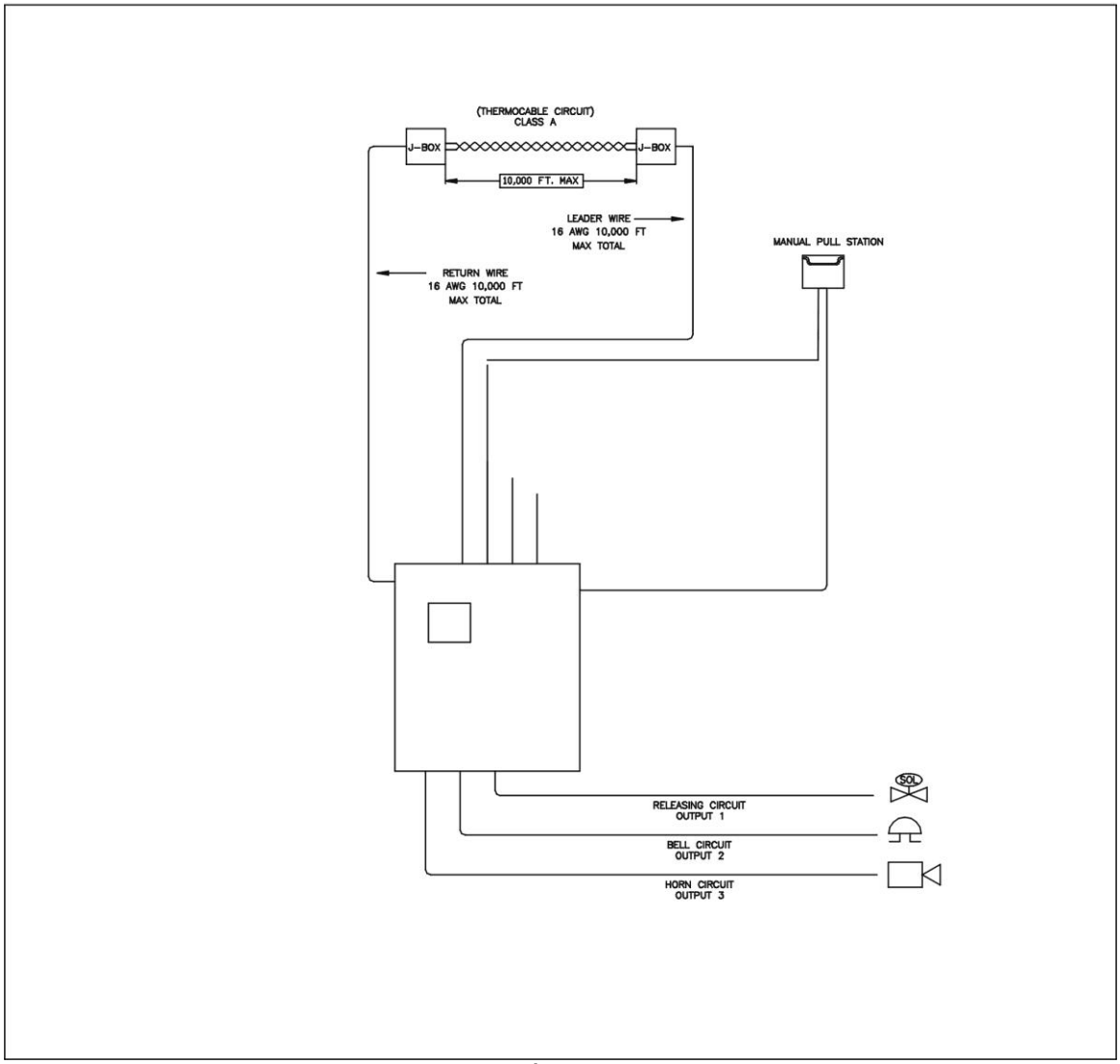


Figure 5

TYPICAL SINGLE HAZARD CLASS "A"

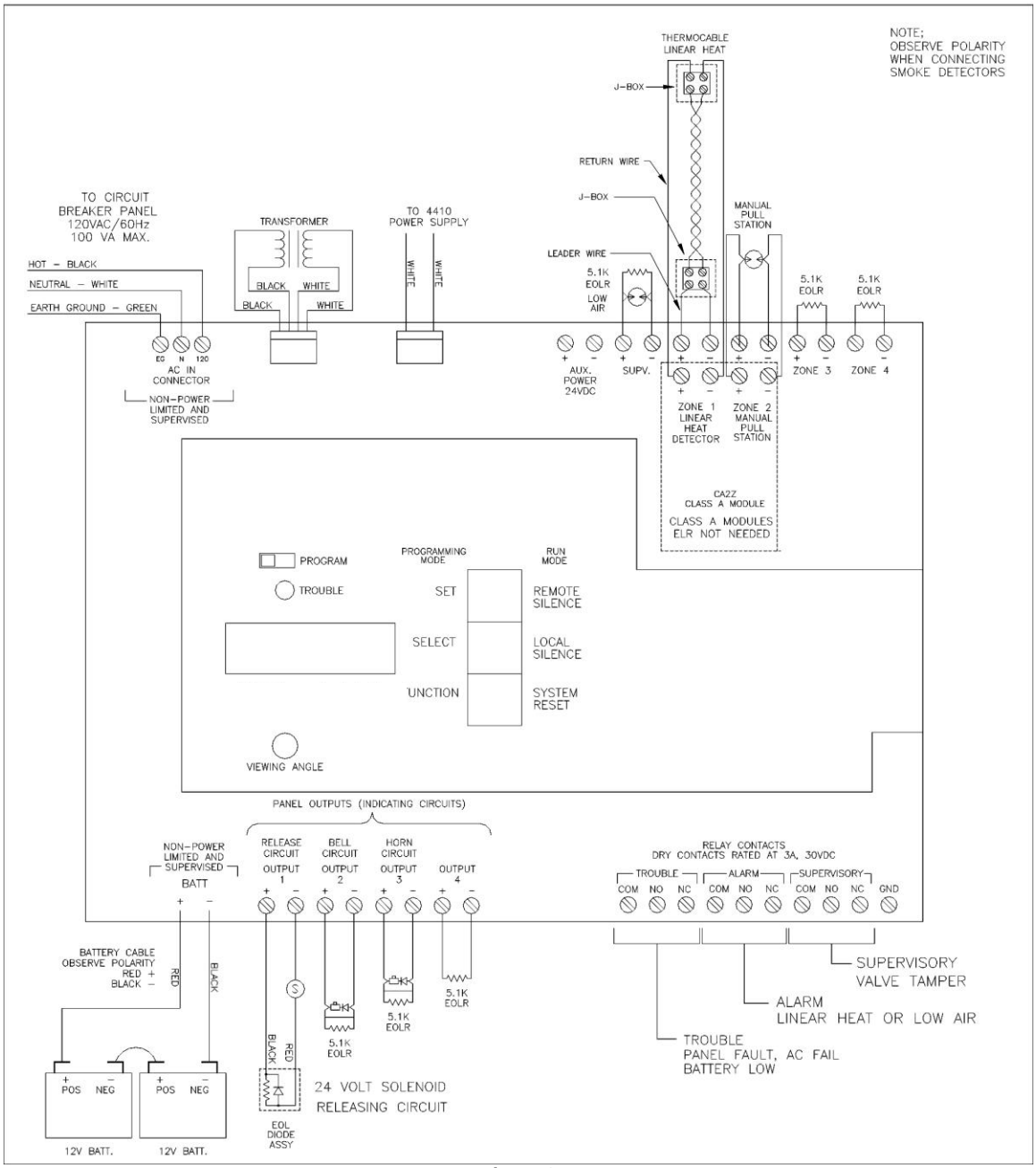


Figure 6

TYPICAL SINGLE HAZARD CLASS "B"

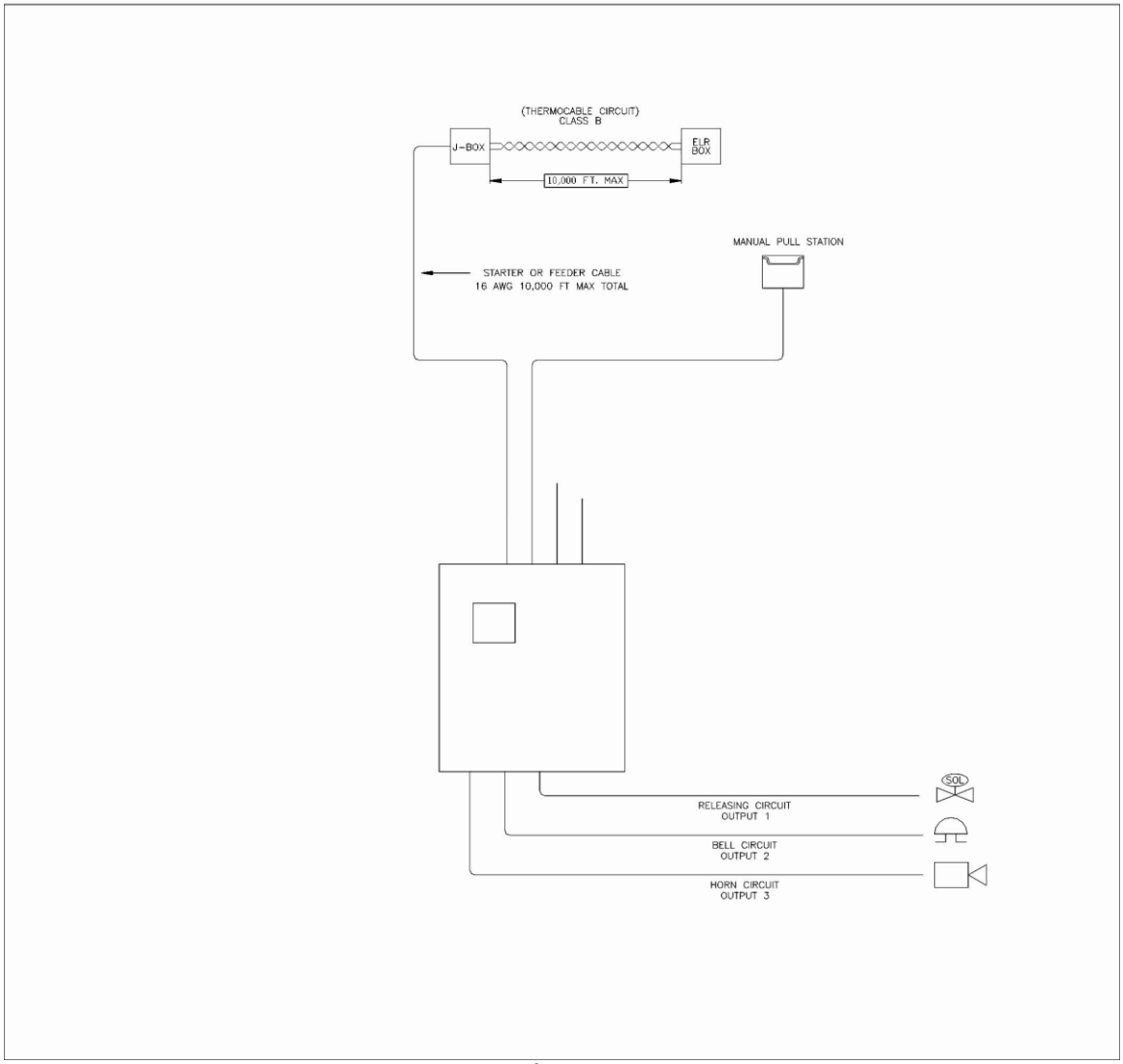


Figure 7

TYPICAL SINGLE HAZARD CLASS "B"

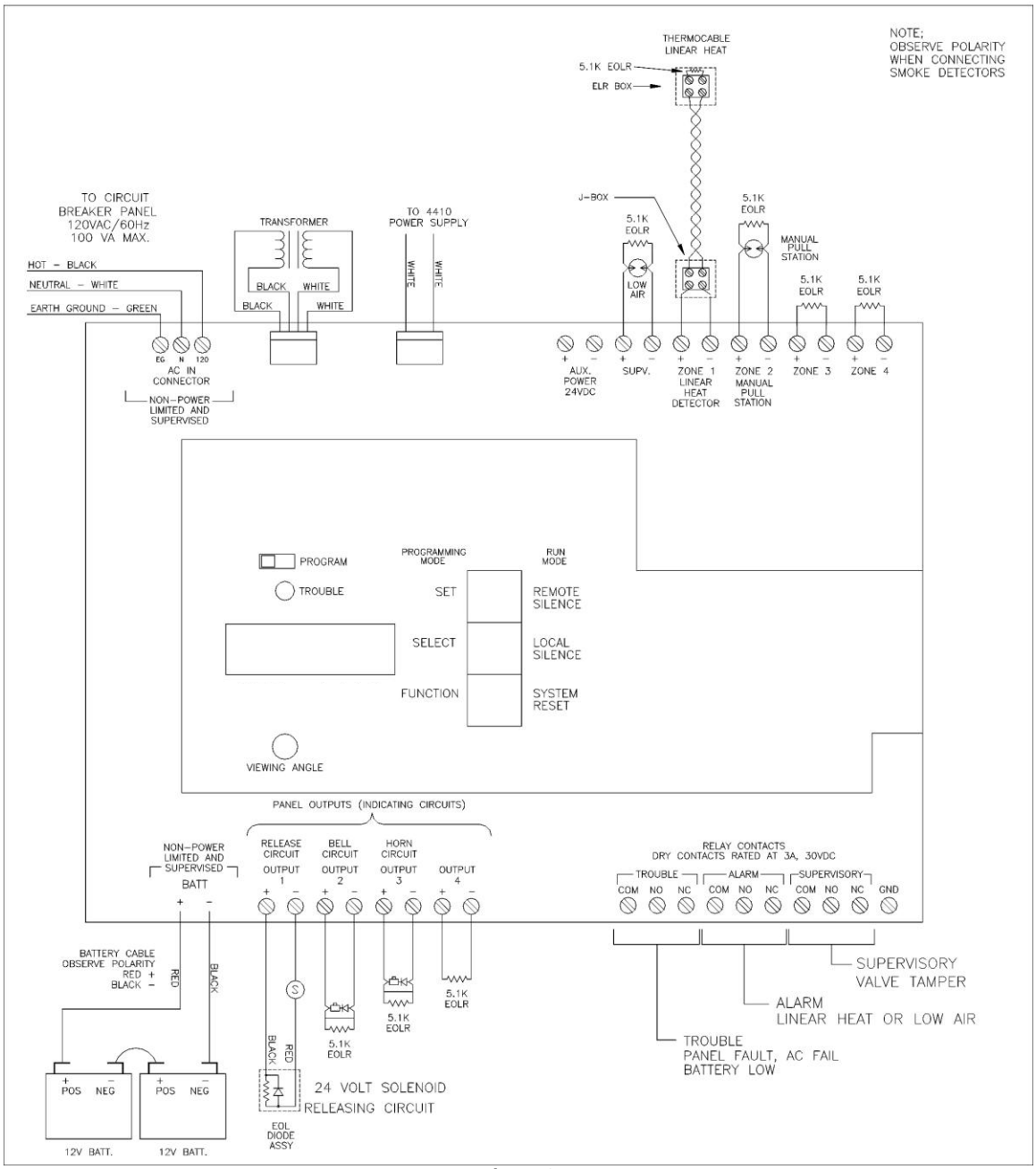


Figure 8

TYPICAL SINGLE HAZARD CLASS "A" PRE-ACTION SYSTEM

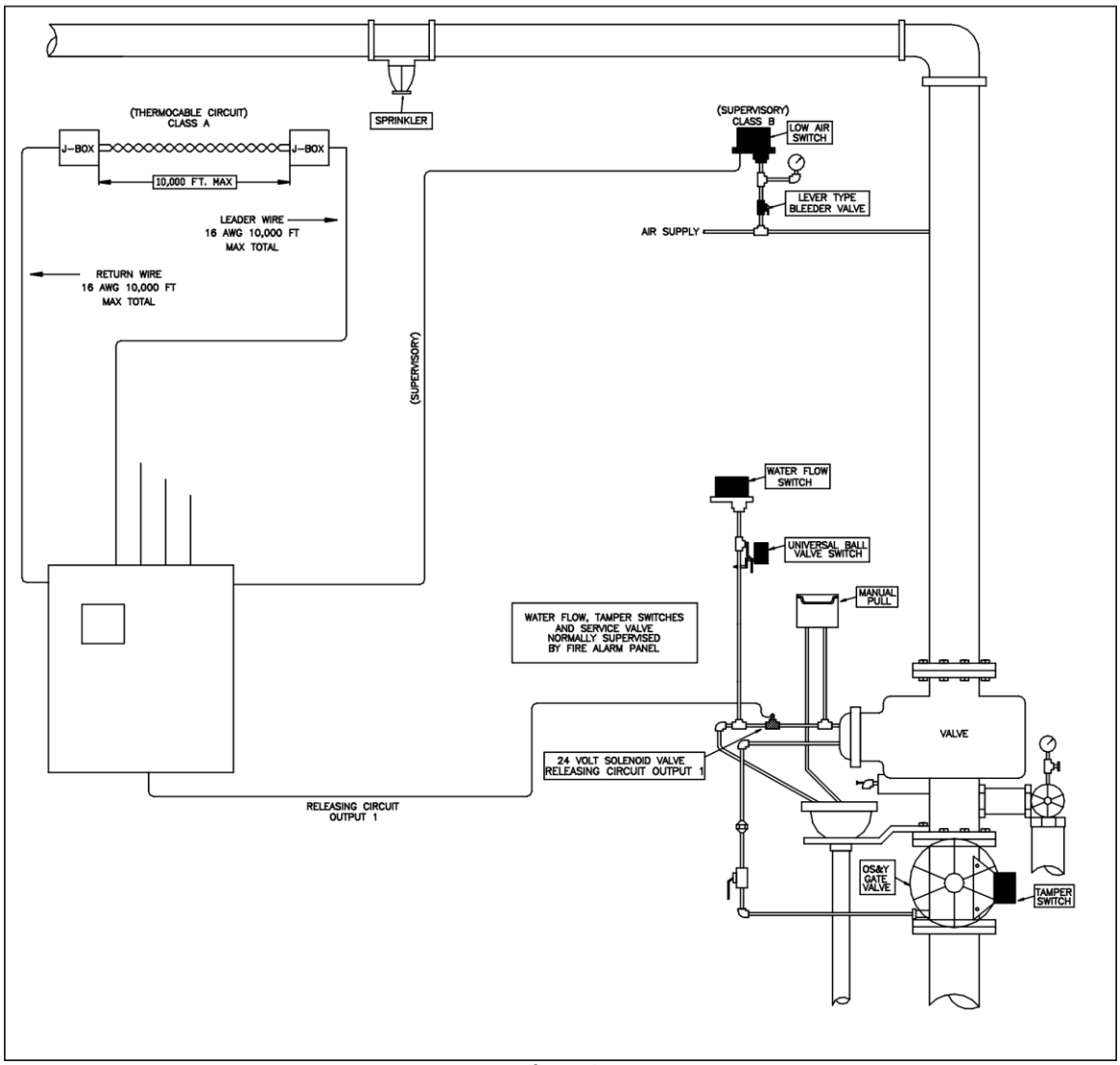


Figure 9

TYPICAL SINGLE HAZARD CLASS "A" PRE-ACTION SYSTEM

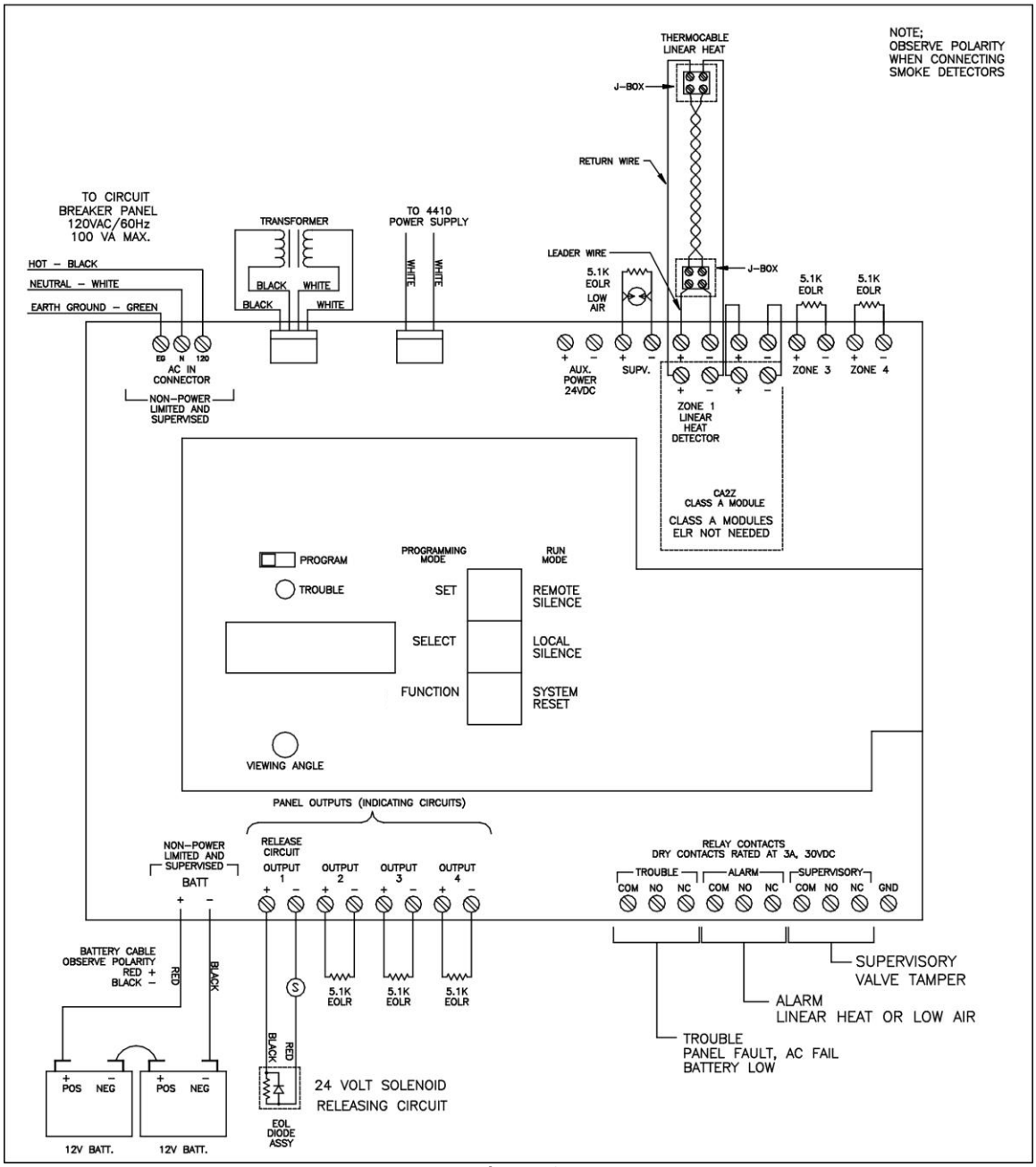


Figure 10

TYPICAL SINGLE HAZARD CLASS "B" PRE-ACTION SYSTEM

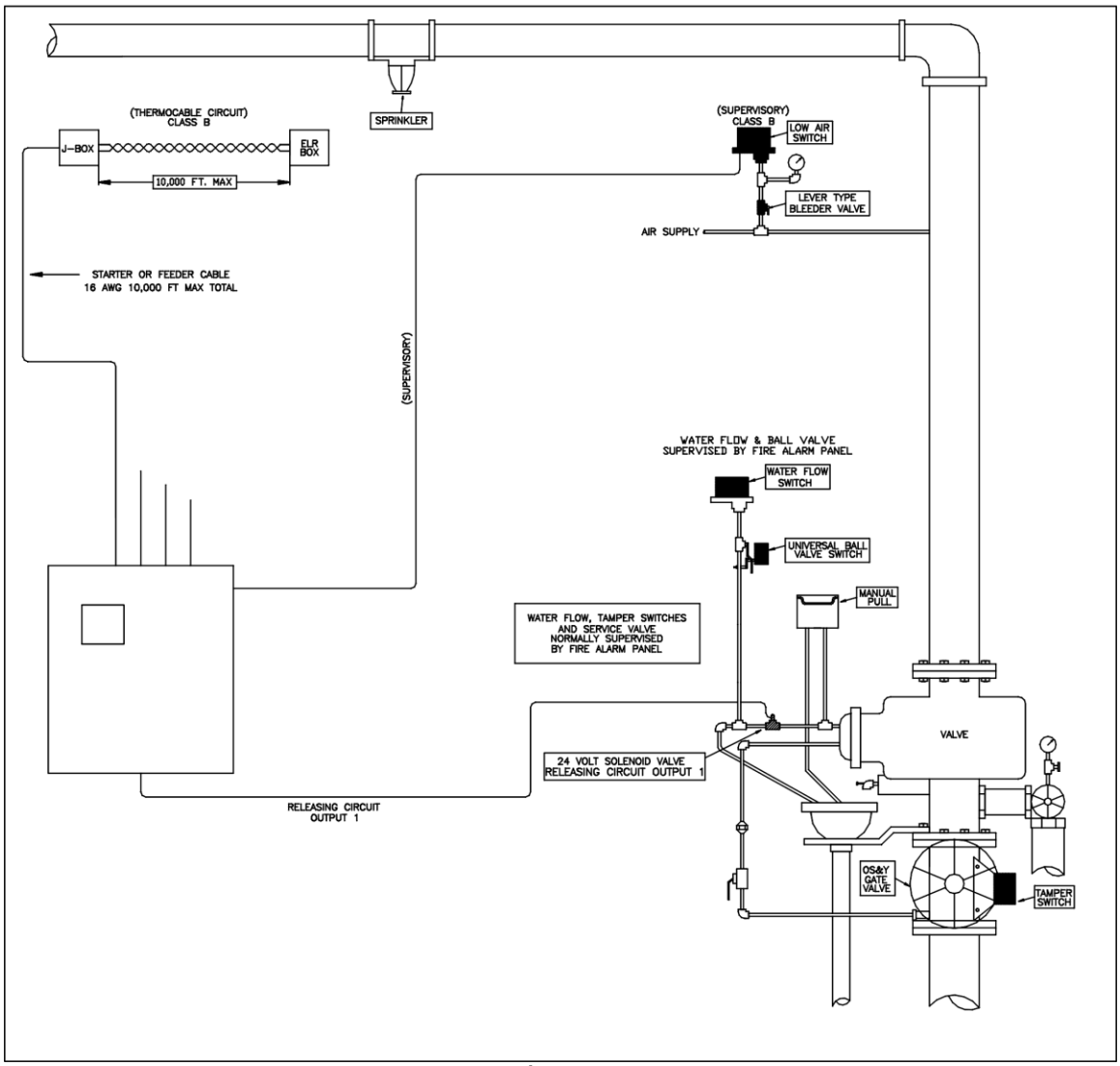


Figure 11

TYPICAL SINGLE HAZARD CLASS "B" PRE-ACTION SYSTEM

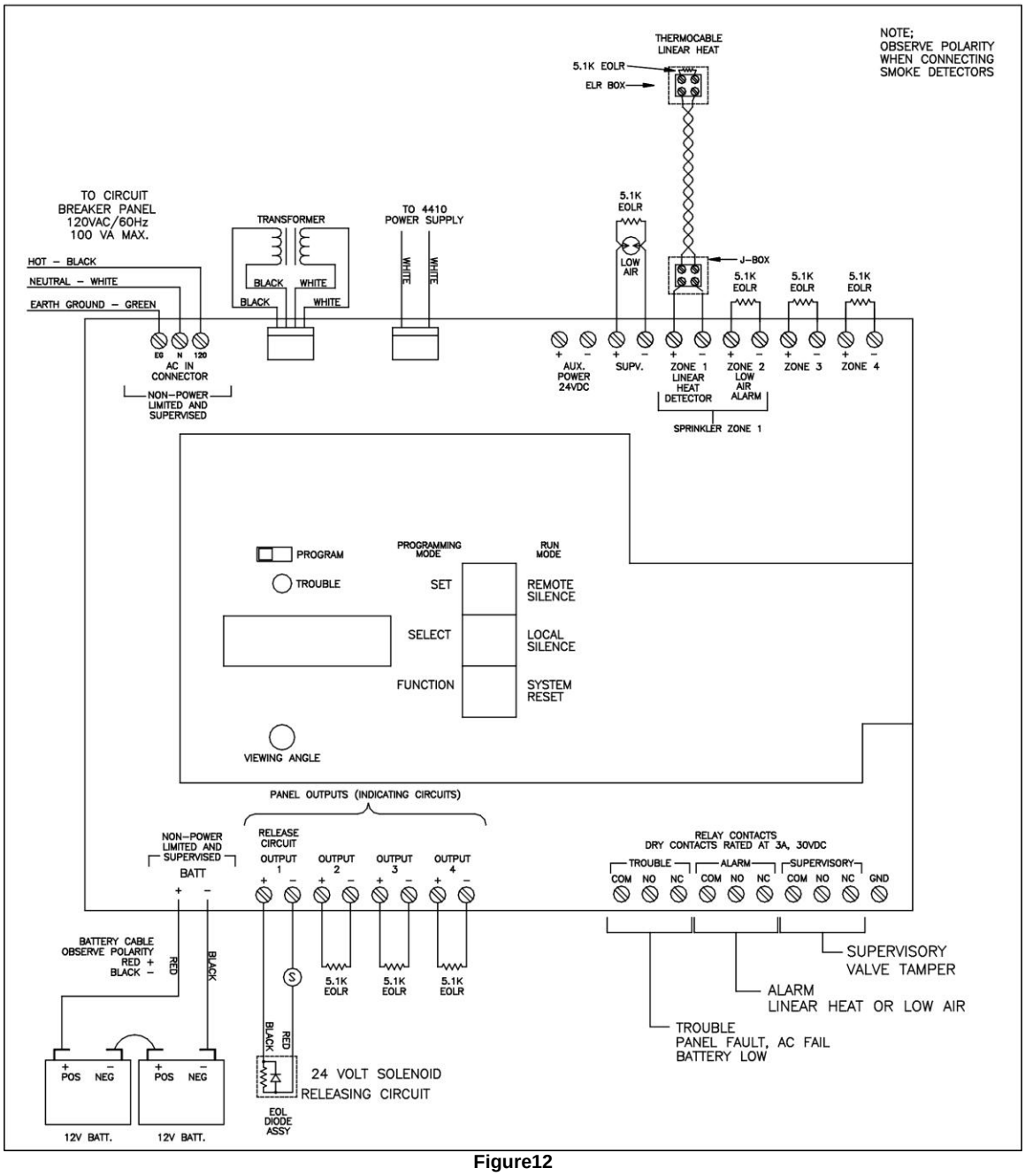


Figure12

TYPICAL SINGLE HAZARD CLASS "A" CROSS ZONED PRE-ACTION SYSTEMS (FM 8-29 REFRIGERATED STORAGE APPLICATIONS)

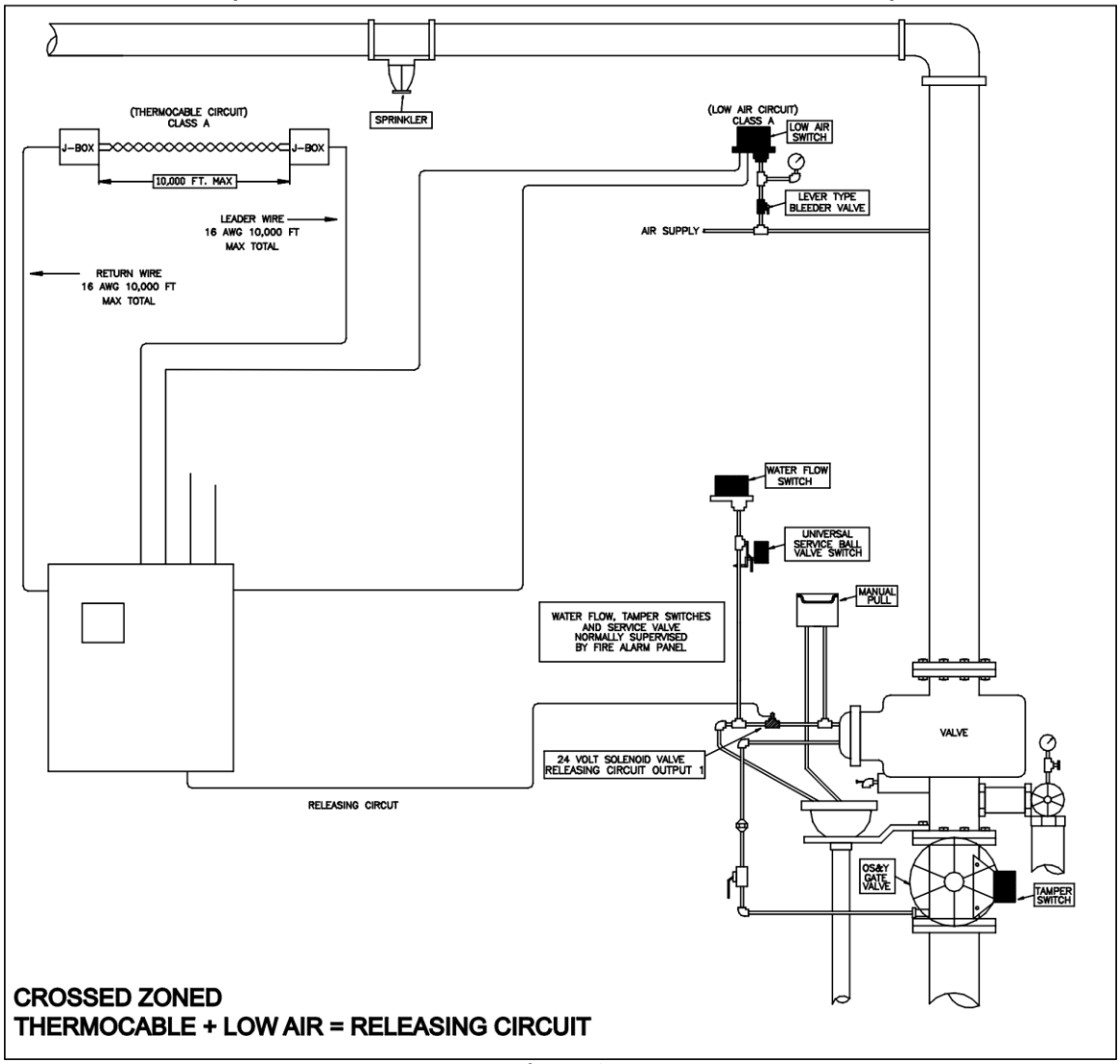


Figure 13

TYPICAL SINGLE HAZARD CLASS "A" CROSS ZONED PRE-ACTION SYSTEMS (FM 8-29 REFRIGERATED STORAGE APPLICATIONS)

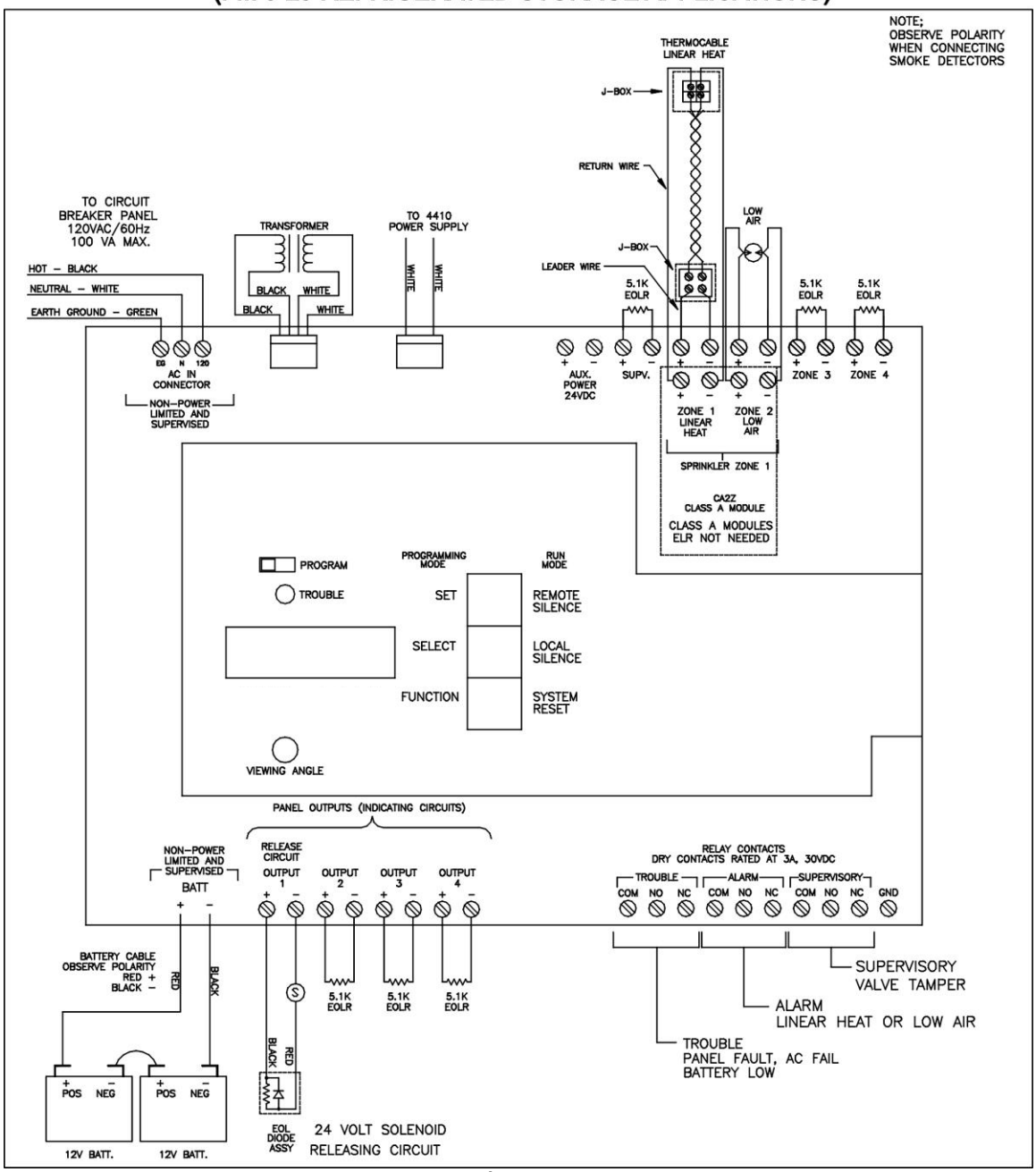


Figure 14

TYPICAL SINGLE HAZARD CLASS "B" CROSS ZONED PRE-ACTION SYSTEMS

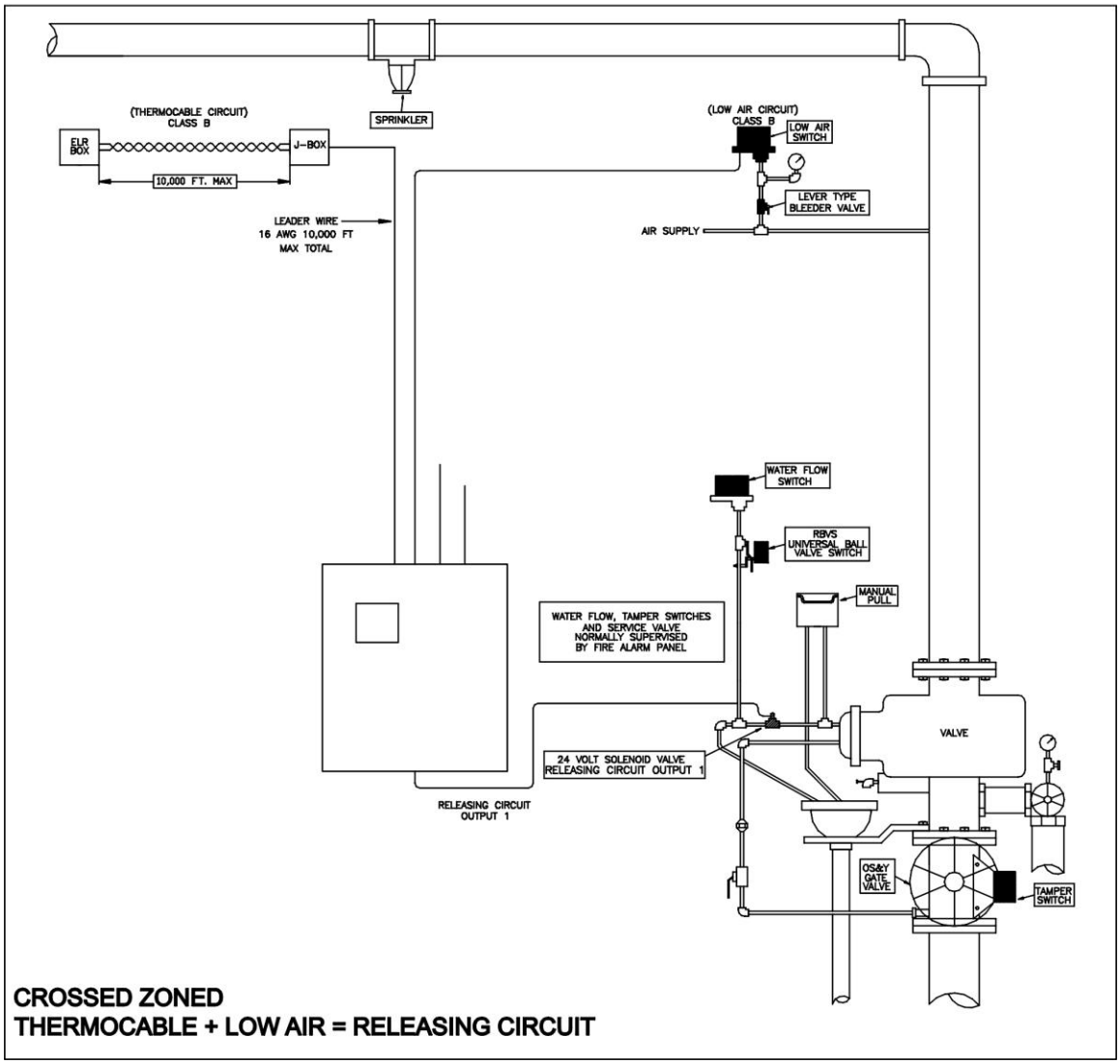


Figure 15

TYPICAL SINGLE HAZARD CLASS "B" CROSS ZONED PRE-ACTION SYSTEMS

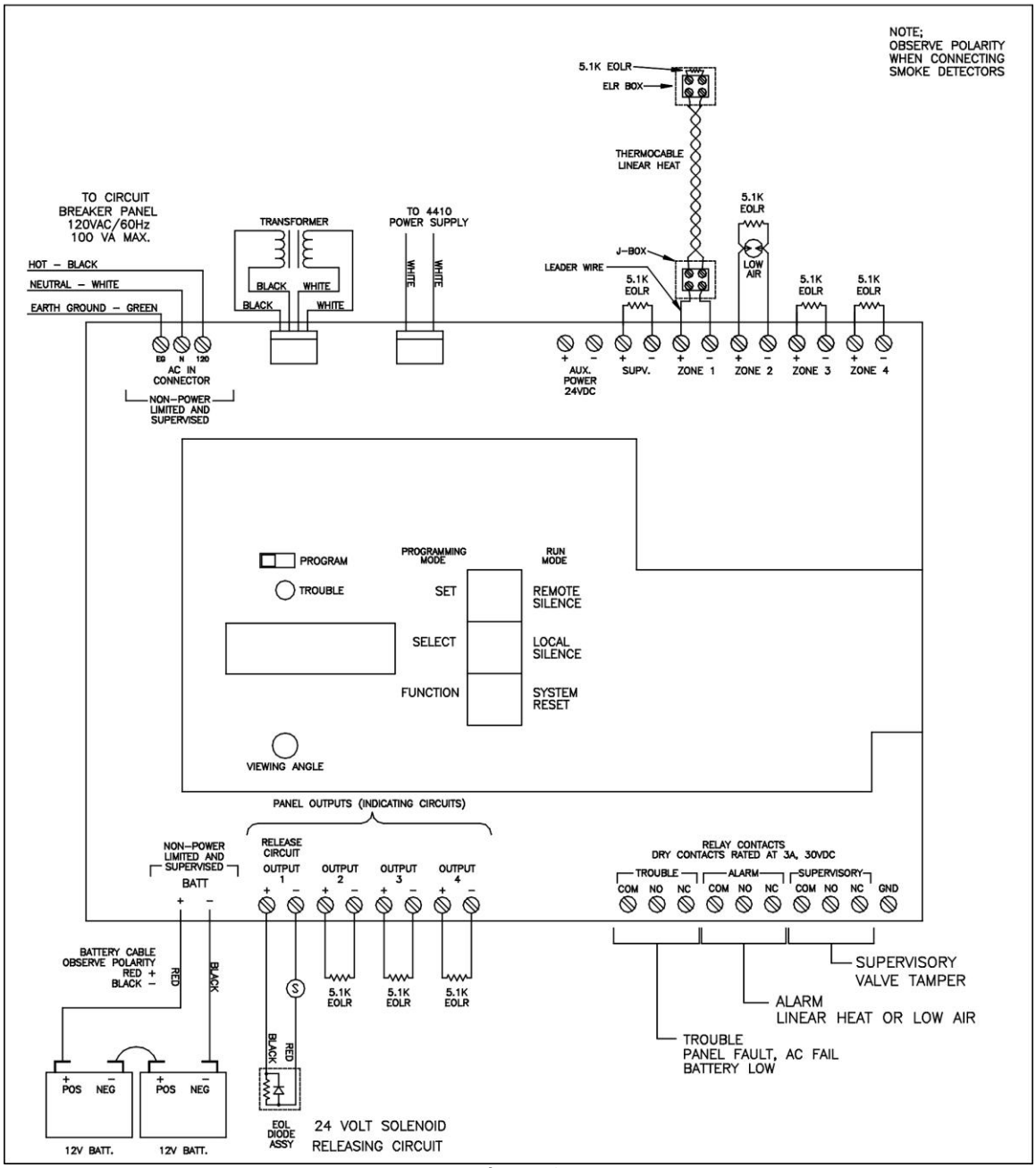


Figure 16

3. SafeCable System Configuration

The illustration in Figure 17 identifies all the components of a typical SafeCable installation. The Mounting Accessories will vary depending on the type of installation. Each of these components will be discussed in detail further in this section.

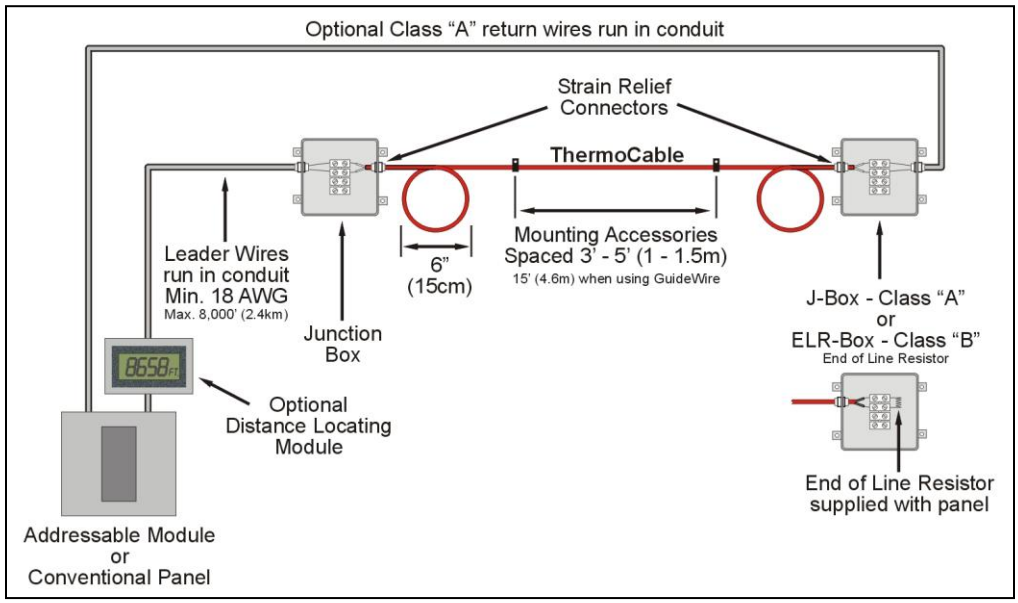


Figure 17

3.1 Leader Cable – Connection from Panel to Junction Box

A Leader Cable, an approved type of copper wire minimum 18 AWG or Limited Energy Cable (Fire Alarm Wire), is run from the control panel to a J-Box located in the protected area where it is connected to the beginning of the SafeCable portion of the circuit as shown (Figure 17). The leader cable from the fire alarm panel to the J-Box (described in section 3.2) may be run in conduit if needed or required by local code. Please consult with the AHJ to determine if local code mandates the use of conduit for low voltage wiring. This connection must be housed in a J-Box to ensure proper connection, operation, and to prevent moisture and dirt build up which can affect the detection system. The table below (Figure 18) is an estimating guide for the maximum length and gauge size of the copper leader cable used in each initiating circuit when using the PFC-4410 or PFC-4410A fire alarm control/releasing panel, see Section 7 of this manual for details. Actual leader cable length may vary depending on the length of SafeCable used on a particular circuit or zone and the allow resistance of the initiating circuit of the fire alarm control panel used. Check the manufacturer's specifications for the resistance of the type of copper wire used, and add to total resistance of the SafeCable on the circuit. Be sure not to exceed the manufacturer's maximum allowed resistance/impedance per circuit.

Maximum Leader Cable Length and Wire Gauge when Using 10,000 Feet of SafeCable on One Initiating Circuit.

Up to 8,000 ft. (2.4km) – 18 AWG
8,001 to 12,700 ft. (2.4km to 3.9km) – 16 AWG
12,701 to 20,200 ft. (3.9km to 6.1km) – 14 AWG
20,201 to 31,100 ft (6.2km to 9.5km) – 12 AWG

Figure 18

3.2 Junction and Termination Boxes

Standard J-Box (Junction Box) / ELR-Box (Termination Box)

Standard NEMA 4 enclosures (J-Box/ELR-Box, Part #: TC1000 - Figure 19) are used to house the connection of the leader cable to the SafeCable portion of the circuit, and at the end of each SafeCable wire run. At the end of a SafeCable run for a Class "B" circuit, the enclosure will house the connection of the SafeCable to the End of Line Resistor supplied by the panel manufacturer. For a Class "A" circuit, it will house the connection of the SafeCable to the Class "A" return wire, see sections 7.2 and 7.3 for wiring diagrams. Screw Terminal Connectors (Part #: TC1005X – Qty. 10/pack) must be used for these connections, wire nuts and/or tape are not acceptable. Strain Relief Connectors (Part #: TC100), described in section 4.1, must be used for all SafeCable penetrations through the J-Box/ELR-Box wall. A 7/8" (22mm) hole must be made into the enclosure for fitting the Strain Relief Connector. For best results use a hole saw, not a drill bit.

Standard
J-Box/ELR-Box
TC1000

Figure 19

Heavy Duty HDJ-Box (Junction Box) / HDELR-Box (Termination Box)

Heavy Duty NEMA 4 enclosures (HDJ-Box/HDELR-Box, Part #: TC1002 - Figure 20) are available for special applications, or when using the optional test switch at the end of a SafeCable run. For installations requiring a test switch, a Backplate (Part #: TC1003) and Test Switch (Part #: TC1004) must be mounted in the larger heavy duty box. Screw Terminal Connectors (Part #: TC1005X – Qty. 10/pack) must be used for these connections, wire nuts and/or tape are not acceptable. Strain Relief Connectors (Part #: TC100), described in section 4.1, must be used for all SafeCable penetrations through the HDJ-Box/HDELR-Box wall. A 7/8" (22mm) hole must be made into the enclosure for fitting the Strain Relief Connector. For best results use a hole saw, not a drill bit.

Heavy Duty
HDJ-Box/HDELR-Box
TC1002

Figure 20

Notes:

- All leader wires or Class "A" return wires must be run in conduit properly fastened to the junction boxes.
- All junction and termination boxes must be approved for use in the locations in which they are installed.
- For outdoor installations, IP66 rating connections must be made.

4. Installation Hardware

Please refer to the SafeCable price sheets for box quantity part numbers on installation hardware. Using non-approved fasteners may create false alarms and may void the SafeCable warranty.

4.1 Strain Relief Connectors

In order to hold the SafeCable securely in place, and provide a dust and moisture free environment in the junction and termination boxes, a Strain Relief Connector (Part #: TC100 - Figure 21) must be used whenever the detection wire enters or exits any junction or termination box. A 7/8" (22mm) hole is needed for fitting the strain relief connector through the enclosure wall. For best results, use a hole saw, not drill a bit, when cutting the opening for the Strain Relief Connector in a J-Box/ELR-Box or HDJ-Box/HDELR-Box.

Strain Relief Connector
TC100

Figure 21

4.2 Cable Fasteners

There are a number of SafeCable approved fasteners, each designed for a specific application. Approved fasteners are designed to allow for tension to be adjusted progressively and insure that the detection wire is clamped lightly and in a manner, which does not cause damage. The following are descriptions of the various available fasteners, and examples of their installation and application.

4.2.1 Cable Ties

The Double and Single Loop Cable Ties (Figure 22) made from nylon 6.6 are used to fasten detection wire to sprinkler pipes and may be used in temperatures from -40°F (-40°C) to 185°F (85°C). For sprinkler pipes larger than 3.5" (8.9cm), large single loop cable ties (Part #: TC1029L – Qty. 50/pack) are used with smaller single loop ties (Part #: TC1018C – Qty. 100/pack or TC1018M – Qty. 1,000/pack) to support the SafeCable as shown in Figure 23. Cable ties are mostly used in installations when following the sprinkler system piping. Be sure not to tighten cable ties excessively preventing it from freely moving within the cable tie. When used in sub-freezing conditions, caution should be given to keeping these straps warm during the installation process.

Double Loop Cable Ties

Pipe Diameter: ¾" – 2"
TC1027C – Qty. 100/pack
TC1027M – Qty. 1,000/pack

Pipe Diameter: 2½" – 3½"
TC1028M – Qty. 1,000/pack

Single Loop Cable Tie

Pipe Diameter: 4" – 6"
TC1029L – Qty. 50/pack

Use with Single Loop Ties
TC1018C – Qty. 100/pack
TC1018M – Qty. 1,000/pack

Single Loop Cable Tie

TC1018C – Qty. 100/pack
TC1018M – Qty. 1,000/pack

Use in conjunction with cable tie TC1029L or cable tie mount TC1017C

Figure 22

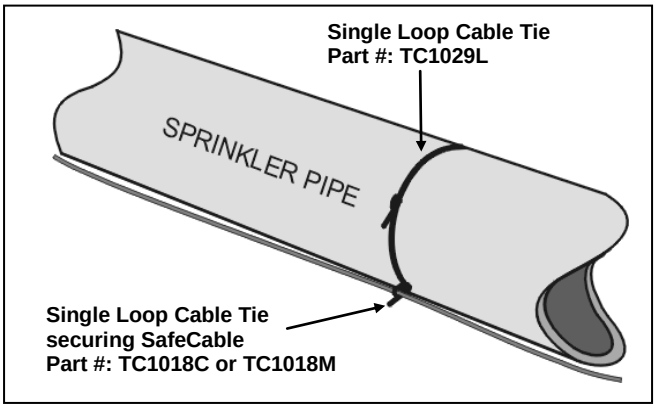


Figure 23

4.2.2 Cable Clips

Nylon 6.6

Cable Clips (Part #: TC1012C - Qty. 100/pack or TC1012M - Qty. 1,000/pack) are available in nylon 6.6 and are the most commonly used type of fastener (Figure 24). These nylon clips can be used in temperatures from -40°F (-40°C) to 185°F (85°C) and are ideal for virtually any application. The clip wraps around the detection wire and can be used in most applications using No. 6, 8 or 10 screws, bolts, or Push Pins (Part #: TC1034Q – Qty. 25/pack, Figure 30). When using cable clips in corners, do not exceed a 3" radius bend. For details on radius bends, see Section 6.1 Figure 58.

Figure 24

Cable Clip – Zinc Plated Steel

Zinc plated steel cable clips (Part #: TC1013L - Qty. 50/pack) are versatile and may be used for both indoor and outdoor applications (Figure 25). A ¼-inch (6mm) mounting hole is provided for mounting using screws, bolts, or Push Pins (Part #: TC1034Q –25/pack, Figure 30).

Figure 25

4.2.3 Beam Clamps

Beam clamps are available in two styles (Figure 26). The TC1014C (Qty. 100/box) is a spring steel clamp intended for general indoor applications, while the TC1015L (Qty. 50/box) is a heavy duty zinc plated clamp suitable for both indoor and outdoor applications. For fastening SafeCable to the Beam Clamp, Cable Clips (Part #: TC1012C - Qty. 100/box or TC1012M - Qty. 1,000/box) and Push Pins (Part #: TC1034Q – Qty. 25/pack, Figure 30) should be used.

Beam Clamps

Spring Steel
TC1014C – Qty: 100/box

Zinc Plated Steel
TC1015L - Qty: 50/box

Figure 26

Beam Clamps above are shown with
Cable Clip (Part #: TC1012C or TC1012M) and Push Pin (Part #: TC1034Q)

4.2.4 Cable Tray Clips

The Cable Tray Mounting Clip (Part #: TC1020C - Qty. 100/box) is a very versatile clip that can be used for a number of installation projects. It can accommodate a material thickness up to 3/16" (4.8 mm).

The TC1021C (Qty. 100/box) Cable Tray Mounting Clip is designed for material thickness from 1/16 to 5/32 inches (1.6 – 4.0 mm) while the TC1022C (Qty. 100/box) can accommodate materials from 5/32 to 1/4 inches (4.0 – 6.4 mm). These clips attach to the side rails of the cable tray and hold the SafeCable in the recommended sine wave pattern.

These clips can also be used in various types of installations for securing SafeCable to a structure.

Cable Tray Mounting Clips

TC1020C – Qty. 100/box
Material thickness up to 3/16"

TC1021C – Qty. 100/box
Material thickness from 1/16" to 5/32"

TC1022C – Qty. 100/box
Material thickness from 5/32" to 1/4"

Figure 27

Cable Tray Mounting Clips above are shown with
Cable Clip (Part #: TC1012C or TC1012M) and Push Pin (Part #: TC1034Q)

4.2.5 Universal Mounting Clips

Universal Mounting Clips are constructed of spring steel and available in two sizes for a variety of applications. TC1023C (Qty. 100/box) are used for material thicknesses from 1/8" – 1/4" and TC1024C (Qty. 100/box) are used for material thicknesses from 5/16" – 1/2". For fastening SafeCable, Cable Clips (Part #: TC1012C - Qty. 100/pack and TC1012M - Qty. 1,000/pack) and Push Pins (Part # TC1034Q – Qty. 25/pack, Figure 30)

Universal Mounting Clips
TC1023C – Qty. 100/box - 1/8" to 1/4"
TC1024C – Qty. 100/box - 5/16" to 1/2"

Figure 28

Universal Mounting Clips above are shown with
Cable Clip (Part #: TC1012C or TC1012M) and Push Pin (Part #: TC1034Q)

4.2.6 Mounting L Bracket

Steel L-Brackets are 6.7 inches (17 cm) long and contain 5 mounting holes which provide a great deal of flexibility in the mounting position of the detection wire. L-Brackets are normally used in floating rooftop applications but may also be used for suspending SafeCable in other applications. Push Pins (Part #: TC1034Q - Qty. 25/pack, Figure 30) or bolts are used with Cable Clips (Part #: TC1012C - Qty. 100/pack and TC1012M - Qty. 1,000/pack) to secure the SafeCable.

L-Bracket
TC1016

Figure 29

4.2.7 Push Pins

Push Pins (Part #: TC1034Q - Qty. 25/pack) are made of Nylon 6.6 and can be used in temperatures from -40°F (-40°C) to 185°F (85°C). They may be used fasten the Cable Clips to any of the Beam Clamps, Cable Tray and Universal Mounting Clips, and L-Brackets described above

Push Pin
TC1034Q – Qty. 25/pack

Figure 30

4.2.8 Adhesives and Cable Tie Mounts

There may be situations when the use of a screw or bolt mount fastener is not an option and an adhesive mounting system is the only viable solution, Figure 31. An adhesive mounting system consists of an approved industrial adhesive (TC1019) along with cable tie mounts (TC1017C – Qty. 100/pack) and cable ties (TC1018C – Qty. 100/pack or TC1018M – Qty. 1,000/pack). Constructed of weather resistant black nylon 6.6, the TC1017 Cable Mounts, and TC1018C and TC1018M Cable Ties are also suitable for outdoor use. Cable ties should not be excessively tightened preventing the SafeCable from expanding and contracting due to the varying temperatures in the hazard area. An adhesive mounting system should not be used in environments where continuous operating temperatures are in excess of 180°F (82°C) or lower than 0°F (-17.8°C). Also note that harsh chemical environments may have an adverse effect on an adhesive and cause premature failure.

Cable Tie Mount Adhesive
TC1019

Cable Tie Mount
TC1017C – Qty. 100/pack

Single Loop Cable Tie
TC1018C – Qty. 100/pack
TC1018M – Qty. 1,000/pack

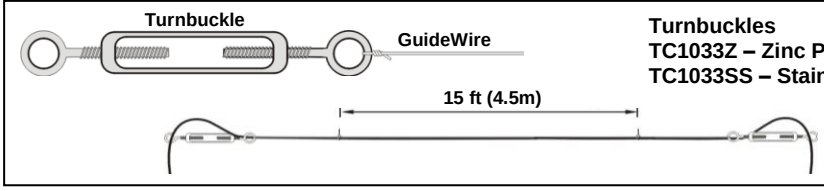
Figure 31

4.2.9 Staples

Never use staples to install SafeCable.

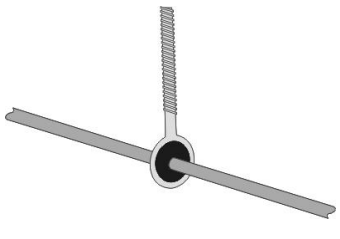
4.2.10 Guide Wire Installations – Turnbuckles and Eyebolts

When spanning distances where supporting the detection wire at the recommended intervals is not practical, SafeCable with guide wire may be used. The guide wire is fastened using turnbuckles (Part #: TC1033Z – Zinc Plated, or TC1033SS – Stainless Steel) at each end of the span with additional supports spaced at 15 foot (4.5m) intervals as shown in Figure 32. Eyebolts with Insulating Grommets (Part #: TC1032) as shown in Figure 33 are used for supporting the SafeCable at these intervals to help reduce sag in the detection and guide wires. Distances up to 250 feet (76m) may be supported when using SafeCable with guide wire.



Turnbuckles
TC1033Z – Zinc Plated
TC1033SS – Stainless Steel

Figure 32



Eyebolt – Includes One Nut
TC1030ZX – Zinc Plated – Qty. 10/box
TC1030SS – Stainless Steel – Qty. each

Additional Nuts
TC1031ZC – Zinc Plated – Qty. 100/box
TC1031SSC – Qty. 100/box

Insulating Grommets
TC1032C – Qty. 100/pack

Figure 33

5. SafeCable Linear Heat Detection Design

As discussed previously, the SafeCable installation must be in compliance with the NFPA 70 National Electrical Code, NFPA 72 National Fire Alarm Code or as indicated by the local authority having jurisdiction. This portion of the manual will provide examples of installation designs for specific SafeCable applications such as refrigerated storage areas, cable trays, tunnels, etc.

SafeCable Linear Heat Detector wire can be installed in a manner similar to that of spot type heat detectors at the ceiling level, which provides for broad or wide area detection. Applications may also involve installations that are close to the potential hazard, this allows for quick heat transfer and alarm notification. This is known as special application or proximity detection.

Underwriters Laboratories (UL) and Factory Mutual Research Corporation (FM) have both tested and approved SafeCable and have assigned listed spacing requirements. These requirements are discussed in detail in the following sections. When designing detection coverage it is important to keep in mind that there are a number of factors that can affect the final design layout and may result in less than maximum spacing for proper coverage. These factors may include air movement, type of construction, ceiling heights and obstructions. The authority having jurisdiction may require spacing other than the recommended and should be consulted prior to installation.

5.1 Area Detection

For broad or wide area detection, SafeCable should be installed on the ceiling, or sidewalls within 20 inches (51cm) of the ceiling. Installations involving beam or joist construction will be addressed in the following sections. Figure 34 lists spacing for the appropriate listing agency.

Temperature Rating (SafeCable)	UL/ULC	FM
155°F (68°C)	35' (10.7 m)	30' (9.1 m)
172°F (78°C)	35' (10.7 m)	30' (9.1 m)
190°F (88°C)	35' (10.7 m)	30' (9.1 m)
220°F (105°C)	35' (10.7 m)	25' (7.6 m)

Figure 34

5.1.1 Smooth Ceiling Spacing

The maximum spacing for smooth ceiling installations shall not be greater than the listed spacing between parallel detection wire runs and within half the listed spacing of any walls or partitions which rise to within 18 inches (46cm) of the ceiling. Figure 35 is an example of a smooth ceiling design using 35 foot (10.7m) spacing.

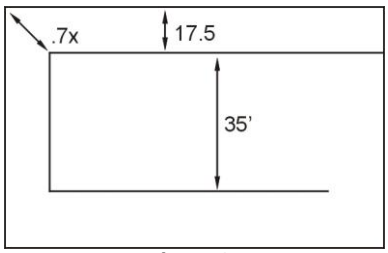


Figure 35

5.1.2 Beam Construction

Spacing design for beam construction is based on two factors, the depth of the beam and beam spacing. Be sure to follow the guidelines listed below to ensure a properly installed system or refer to NFPA 72 for more details.

Beams 4 Inches (10cm) or Less in Depth

- Layout same as smooth ceiling.
- Maximum parallel run spacing is 35 feet (10.7m) between detection wire runs.
- Maximum of 17' 6" (5.3m) off any walls or partitions which rise to within 18 inches (46cm) of the ceiling.

Beams Greater than 4 Inches (10cm) in Depth

- Maximum wire run spacing is 2/3 of the smooth ceiling spacing between detection wire runs that are perpendicular to the beams.
- Maximum of 17' 6" (5.3m) off any walls or partitions that rise to within 18 inches (46cm) of the ceiling. These wire runs are at a right angle to the beams as indicated in Figure 36.
- Detection wire running parallel to the beams may remain at the standard spacing.
- If beams have a depth greater than 18 inches (46cm) with spacing of more than 8 feet (2.4m), each area created by the beams (beam pocket) shall be considered as separate areas and will require coverage.

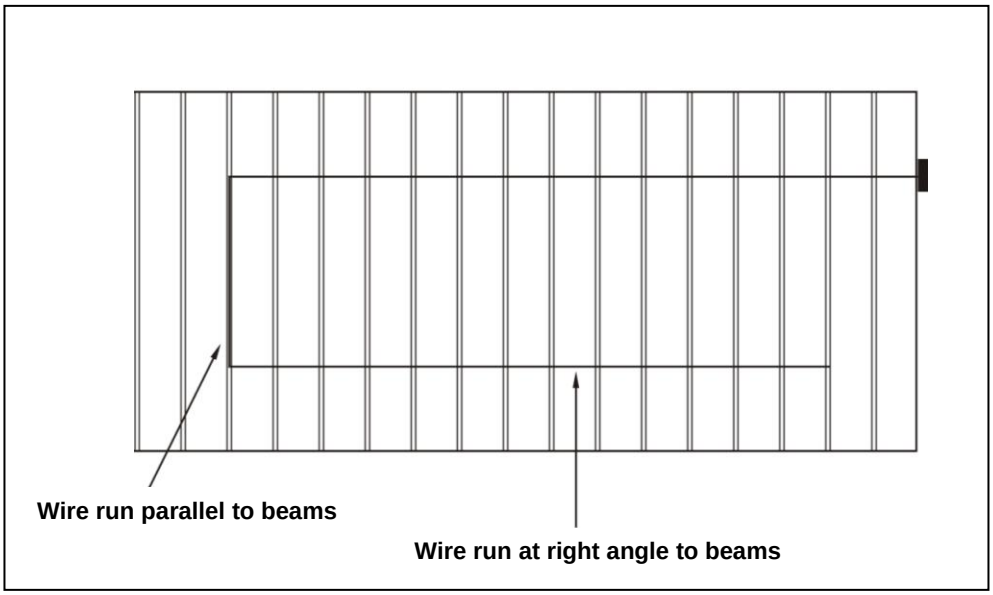


Figure 36

5.1.3 Solid Joist Construction

With solid joist construction, SafeCable shall be mounted on the bottom of the joists. Where the detector wire runs parallel to the joists, the maximum allowable spacing is one-half of that for a smooth ceiling. Figure 37 illustrates a typical design for ceiling coverage on solid joist construction.

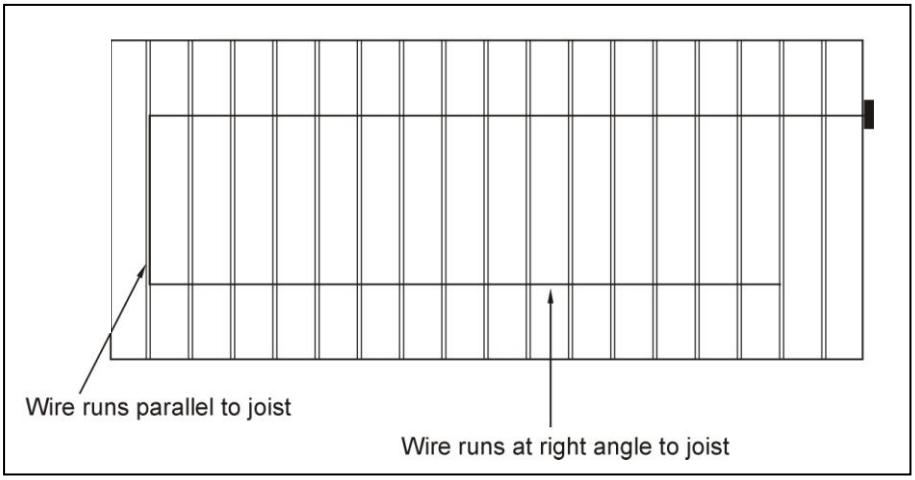


Figure 37

5.1.4 Sloped Ceilings

Figure 38 illustrates the installation of SafeCable on a sloped or peaked ceiling. There must be at least one run within 3 feet (.9m), measured horizontal from the ceiling peak. Any additional wire runs required, should be designed based on the horizontal distance projected down from the ceiling and based upon the type of construction used in the ceiling. Be sure to reduce spacing for installations above 30 feet (9.1m) as described in Section 5.1.5.

Refer to NFPA 72 Section 5.6.5.4 for more details concerning sloped ceilings.

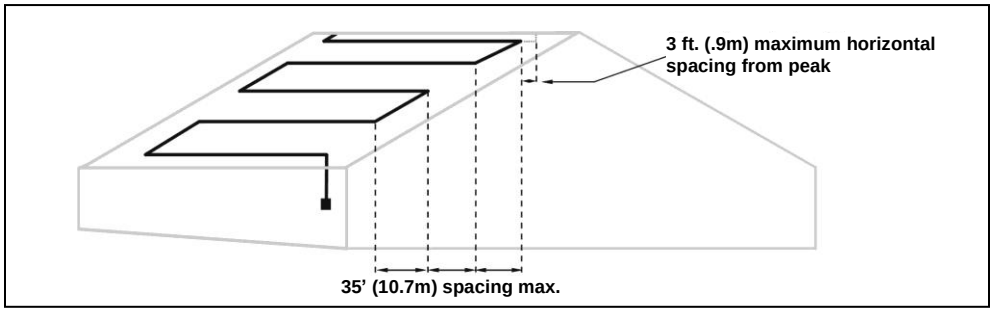


Figure 38

Note: Sloped Ceilings that are Considered Flat

Per code, some sloped ceilings may be considered flat if they meet certain criteria. To determine if a ceiling is considered flat, take the difference in inches between the lowest wall and the highest wall, and divide that number by the width of the wall in feet. If the resulting number is less than 1.5, it is considered a flat ceiling.

5.1.5 High Ceiling Spacing

For ceiling heights up to 30 feet (9.1m), SafeCable may be spaced on 35 foot (10.7m) centers. For installations higher than 30 feet (9.1m), the spacing is reduced to half the listed spacing, 17' 6" (5.3m) as shown in Figure 39.

Ceiling Heights		Multiply
Min.	Max.	Listed Spacing by
0	30' (9.1m)	1.00
30'+ (9.1m+)		.5

Figure 39

5.1.6 Dead Air Space

SafeCable should not be installed in a corner within 4 inches (10cm) of a sidewall or the ceiling. As the Figure 40 illustrates, a dead air space is created where the ceiling and sidewall join together. As hot gases rise from a fire source, they spread out, cool and begin to fall, which creates the dead air space and can affect the ability of the detection wire to function properly.

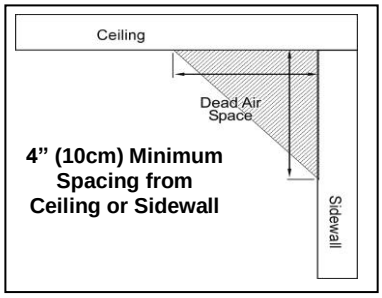


Figure 40

5.2 Proximity Detection

For proximity or special application protection, SafeCable should be installed on or immediately above the hazard in a way that allows for it to be exposed to a rise in temperature caused by a fire condition.

5.2.1 Motors, Generators, Pumps, Valves

SafeCable can be mounted directly on the surface of virtually any type of mechanical and electrical equipment as shown in Figure 41. This type of installation allows for quick response to overheating equipment, which can provide warning earlier than using area detection alone. Typically, the SafeCable used to protect equipment directly is of a higher activation temperature. The higher temperature detection wire can be spliced into the same detection wire used for the area detection where both are considered part of the same zone. When mounting directly to motor housings, generators, etc., the SafeCable selection should be governed by the ambient operating temperature of the surface it is mounted to.

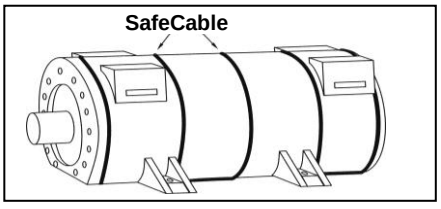


Figure 41

5.2.2 In-Cabinet Detection

SafeCable can be weaved through electrical panels, switchgear and other electrical cabinets in a manner to bring it near electrical components in the cabinet as shown in Figure 42. Detection cable should be fastened using non-conductive nylon TC1012C or TC1012M nylon cable clips. In this type of application, special care needs to be given to ensure that the proper temperature of SafeCable is selected based on the ambient temperature of the protected area and the surface where the detection wire is mounted.

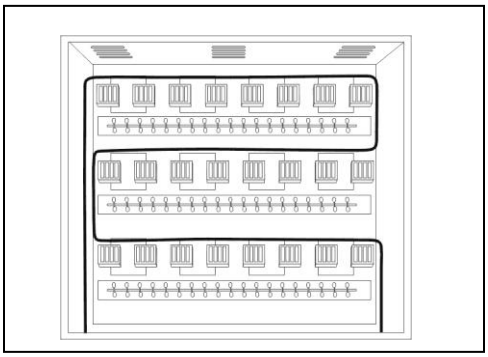


Figure 42

5.3 Pre-Action and Deluge Sprinkler Systems

When using SafeCable as an initiating device for pre-action sprinkler systems, attention should be paid to the spacing and location guidelines provided by Factory Mutual (FM).

Generally, FM acceptance requires that linear heat detection wire be installed at spacing not greater than that allowable for a ceiling sprinkler system. The detection wire should be run parallel to each sprinkler branch line to the end of the line, then run at a right angle to the next sprinkler line coming back in the opposite direction and continued until the end of the detection zone. Insure that any right angle bend in the detector wire maintains at least a 3” (7.6cm) radius. A SafeCable wire run (zone) can utilize up to 10,000 feet (3,048 meters) of detection cable. If the sprinkler zone requires more than 10,000 feet of detection wire, an additional detection zone will be required.

5.3.1 Zone Definitions

It is important to note that a detection zone allocation for SafeCable should not be confused with a zone allocation for a sprinkler system. If a sprinkler zone extends beyond the capabilities of a signal detection zone then an additional detection zone must be added. In this case, either detection zone will operate the same solenoid valve for the sprinkler zone. Detection zone coverage should not extend beyond the coverage of the sprinkler zone.

5.4 Rack Storage

The following sections detail using SafeCable in a variety of rack storage systems including open rack with and without sprinkler protection and refrigerated storage. When installing SafeCable in a rack system with or without a sprinkler system, FM guidelines must be followed along with the manufactures recommendations.

5.4.1 Open Rack Storage without Sprinklers

When installing the SafeCable in open rack system without a sprinkler system, the number of detection wire runs is based on the height of the rack. As a general rule, there should be one detection wire run for every 10 feet (3m) of rack height. The detection wire should be attached to the load beam and run in the transverse flue space.

- For example, an 18' (5.5m) rack should be given two wire runs while a 40' (12m) rack system should have four wire runs.

For more details, please refer to NFPA 72 regarding these, and similar types of installations.

5.4.2 Open Rack Storage with Sprinkler Protection

In the case of signal or double row racks, one run of SafeCable is needed for each sprinkler level as shown in Figure 43. The detection wire should be attached to the load beam at the sprinkler level and run in the transverse flue space. For multiple row racks, each sprinkler line would require a corresponding run of detection wire.

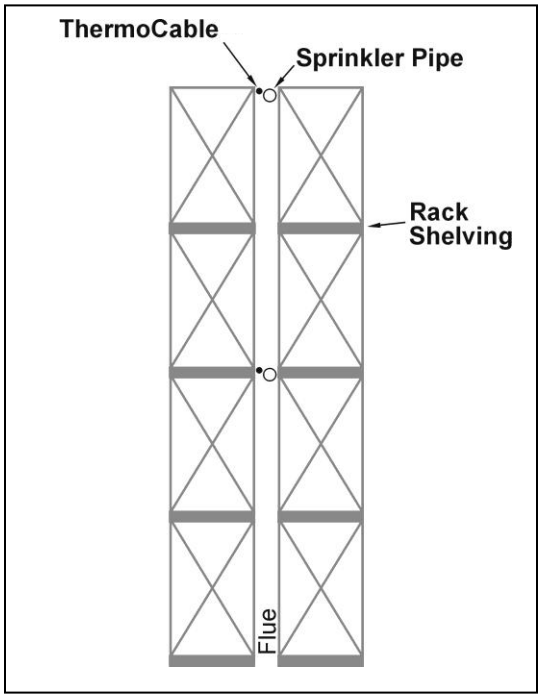


Figure 43

5.4.3 Refrigerated Storage Areas

When using SafeCable as an initiating device for pre-action sprinkler systems in refrigerated storage areas, attention should be paid to the guidelines provided by Factory Mutual (FM). Guidelines can be found in FM Loss Prevention Data Sheets like 8-29. Generally, FM acceptance requires linear heat detection wire be installed at spacing not greater than that allowed for a ceiling sprinkler system. For this reason, when ceiling detection is required in a refrigerated storage application, the ceiling detection wire may be fastened to the sprinkler piping. Be sure to check with the AHJ when planning this type of installation.

When installing SafeCable in conjunction with a sprinkler system in a rack system, FM guidelines must be followed along with manufactures recommendations. In the case of signal or double row racks, one line of SafeCable is needed for each sprinkler level. The detection wire should be attached to the load beam at the sprinkler level and run in the transverse or longitudinal flue space. For multiple row racks, each sprinkler line would require a corresponding run of detection wire.

Installation:

The leader cable is run from the fire alarm control/releasing panel to a J-Box mounted to the rack for a particular zone. The SafeCable is then run from the J-Box through the racks as indicated in Figures 44 and 45, which may then cross the isle to a second rack system. When mounting the detection wire on the horizontal load beam, utilize the angle iron or open channels of the rack structure to help protect the detection wire from accidental breakage from forklifts and product. The wire may be fastened to these structures by using TC1012C or TC1012M cable clips made from nylon 6.6 to withstand the continuous cold or subzero temperatures. When crossing isles, be sure to elevate the SafeCable enough to stay clear of any possible damage that may be caused by forklifts, cranes or product. Detection wire may be run one section above the sprinkler level to prevent damage to both the sprinkler pipe and detection cable simultaneously which may alarm and begin to flow water.

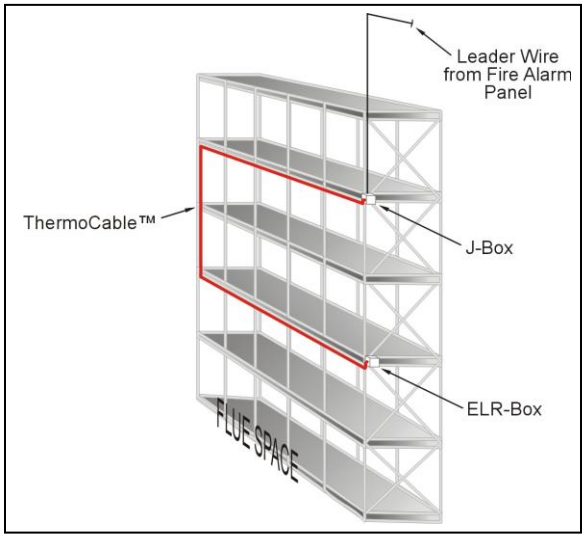


Figure 44

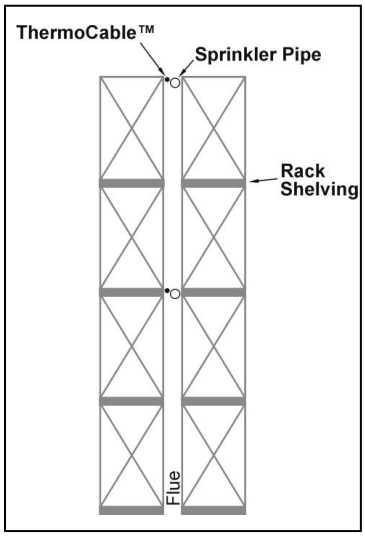


Figure 45

A refrigerated storage warehouse may require a Class “A” detection circuit rather than Class “B”. For this type of installation, a copper wire is run from a J-Box at the end of the detection wire zone back to the panel to complete the circuit, see Section 7.2 for wiring diagrams.

SafeCable will contract as temperature drops when a refrigerated storage warehouse is brought down to operating temperature. Installations in refrigerated storage areas, prior to cool down, require a certain amount of sag to be maintained during installation to accommodate for contraction. Figure 46 is a chart to assist in determining the amount of sag which should be maintained between mounting fasteners.

Sag Chart

Temperature	Sag	Wire Mount Spacing
20°F (-7°C)	3/4" (19mm)	3 - 5’ (1 - 1.5m)
0°F (-18°C)	7/8” (22mm)	3 - 5’ (1 - 1.5m)
-20°F (-29C)	1” (25mm)	3 - 5’ (1 - 1.5m)
-40°F (-40°C)	1 1/8” (29mm)	3 - 5’ (1 - 1.5m)

Figure 46

5.5 Cable Trays

A sine wave pattern, as shown below in Figures 47 and 48, should be used when installing SafeCable in a cable tray application. The maximum distance between each peak, or valley, should not exceed 6 feet (1.8m). The detection wire is secured in place at the sides of the cable tray using the most appropriate mounting clip based on the tray construction. See Section 4.2.4 of this manual for cable tray mounting hardware and descriptions. This mounting hardware will ensures proper installation and contact with the cables in the cable tray.

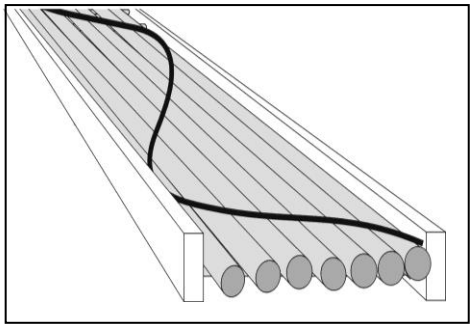


Figure 47

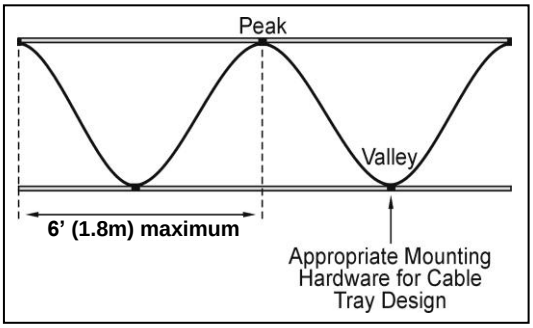


Figure 48

NOTE: It is important that the detection wire be placed on top of all cables in the tray, and that any additional cables runs must be threaded below the SafeCable to provide proper cable tray protection.

5.5.1 Estimating SafeCable Length for Cable Trays

Recommended installation requires that the SafeCable be run in a sine wave pattern, it may be difficult to estimate the total length of SafeCable needed for a particular run. The following calculation will help determine the approximate amount of SafeCable needed for a cable tray installation (Figure 49).

To determine the number of mounting point along the cable tray, divide the length of the cable tray by 3 and add 1.

Cable Tray Length divided by Width Coefficient = Total Length of SafeCable

Cable Tray Width	Width Coefficient
1'6" (.5m)	.87
2' (.6m)	.78
3' (.9m)	.65
4' (1.2m)	.57

Figure 49

5.6 Conveyors

There are several common areas to protect on conveyor systems. Rollers that overheat due to friction from loss of lubrication, and overheating roller bearings can ignite the belt and/or product on the belt. Material on the conveyor may also ignite from friction or sparks. Failing and overworking may also cause drive motors to overheat and ignite. These are all common areas to protect on a conveyor system.

Details for conveyor applications are outlined and illustrated in Figures 50 and 51. At times it may be necessary to support SafeCable by using a guide wire (Section 4.2.10). For these installations, the wire must be supported every 15 ft. (4.5m). This will help prevent wire sag, which may interfere with the operation of the conveyor or be damaged by the material being transported by the conveyor. Be sure to check with plant operators to determine the height of the material transported and how it is loaded on the conveyor. For example, if a conveyor is loaded from the right side, the height of material will most likely be greater on the left side of the conveyor. Therefore, greater care must be taken when determining where the detection cable is to be located. Keeping this in mind will prevent unnecessary damage to the detection cable.

Primary Areas for Conveyor Belt Detection

1. Above the conveyor belt protects the product on the belt.
2. Between the upper and lower belts if the conveyor is located on a grated floor.
3. Below the lower return belt if the conveyor is located on a solid floor.

See Figure 51 for installation details.

Figure 50

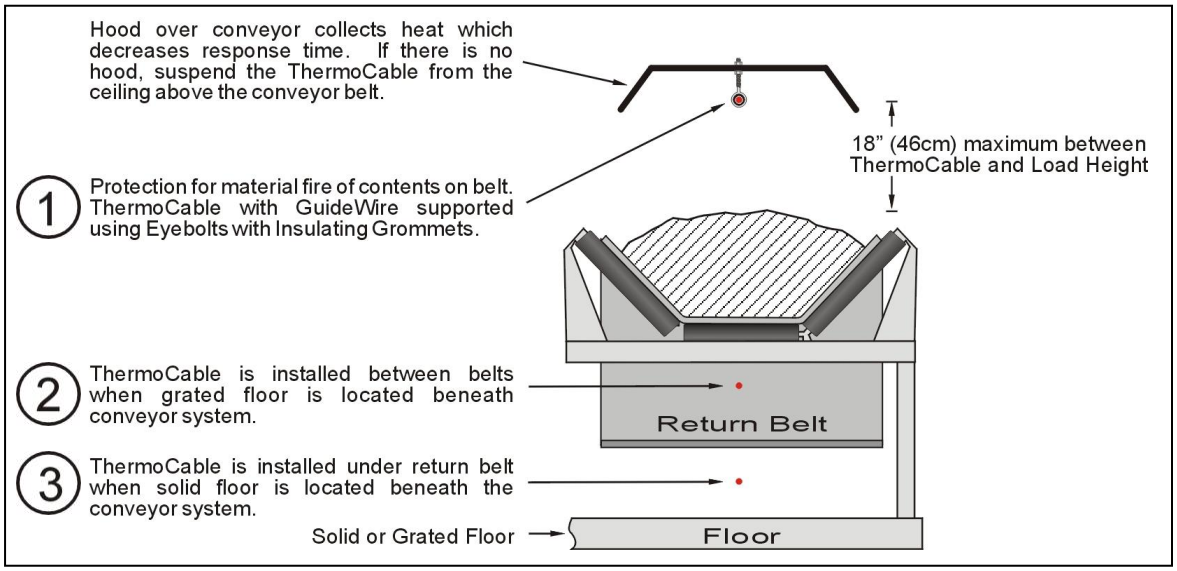


Figure 51

5.7 Baghouses - Dust Collectors

The shape and design of baghouses and dust collectors vary. The outer perimeter of the unit must be protected as illustrated in Figure 52. Depending on the design of the unit, SafeCable may also be run on an inner perimeter as illustrated in Figure 53. If required, detection cable may also be run in conduit to a higher level inside the unit.

Either guide wire or L-Brackets may be used to secure the detection wire approximately 3 ft. (.9m) above the base of the unit. When using L-Brackets, be sure to support the detection cable a maximum of every 3 ft. (.9m).

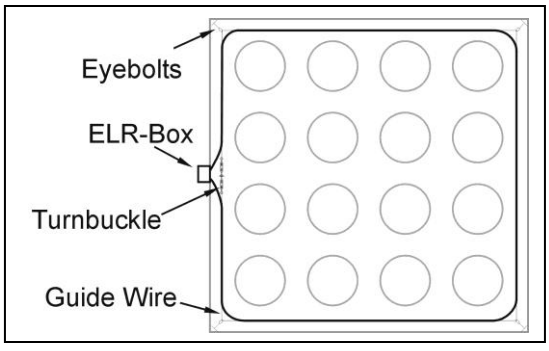


Figure 52

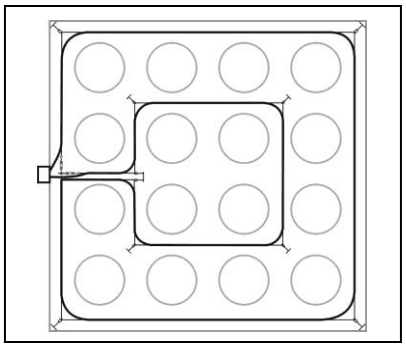


Figure 53

NOTE: Proximity detection as described in Section 5.2 may be used to protect blower motors and electrical equipment in the event of an overheating condition.

5.8 Tunnel Applications

When creating a SafeCable design for tunnels, keep in mind that a single zone of SafeCable can extend up to 10,000 feet (3,048m). As seen in the diagram below, in most cases, the detection wire is installed on the ceilings over the traffic areas. A complete design would include coverage of not just the traffic areas but also equipment and mechanical rooms, tray runs and tunnel ventilating systems. Figure 54 illustrates a simple tunnel application. With a maximum of 10,000 feet (3,048m) of SafeCable per zone, a wide number of variations are possible for different installation configurations. Standard spacing discussed in section 5 may be used for tunnel applications.

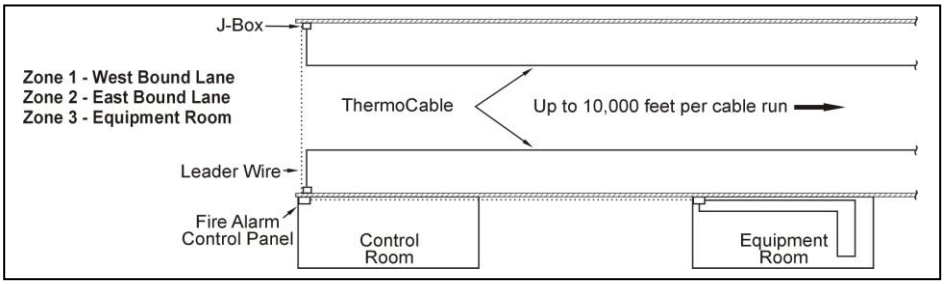


Figure 54

5.9 Floating Roof Storage Tanks

Design for a floating roof storage tank calls for SafeCable to be installed around the inside perimeter of the tank. L-Brackets (TC1016) with zinc plated cable clips (TC1013L) are used to secure the detection wire in the area between the primary seal and the secondary weather seal, or attached to the foam dam directly over the secondary weather seal. A description of these mounting accessories is found in Section 4 of this manual.

A leader cable is run from the Fire Alarm Control/Releasing Panel to a J-Box mounted inside a leader cable coil receptacle located on the floating rooftop. This receptacle will collect the leader cable as the floating rooftop raises and lowers. The SafeCable is then run from the junction box around the perimeter of the tank to the ELR-Box with end of line resistor for a Class “B” detection circuit.

If a Class “A” detection circuit is required, the SafeCable will terminate in a second J-Box where it is connected to a copper wire returning to the fire alarm panel to complete the circuit.

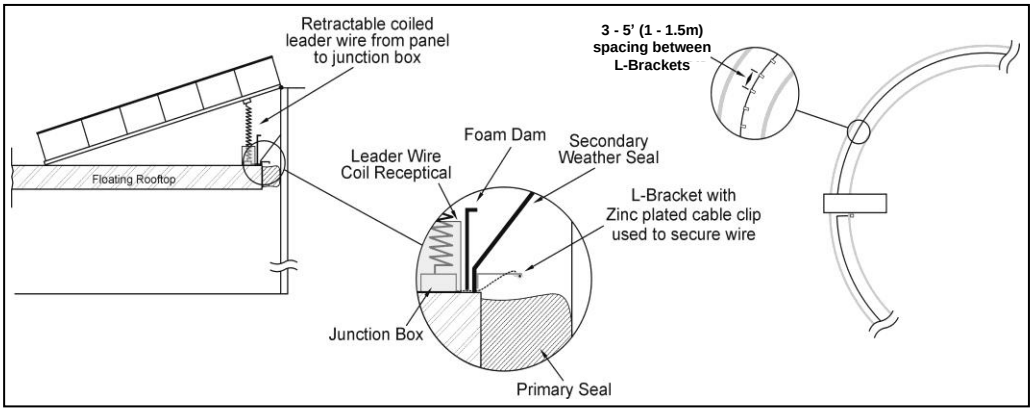


Figure 55

5.10 Outside Applications

When designing a detection system for outside use, some important factors must be kept in mind. The effect of solar heat, particularly when the detection wire is installed in direct sunlight, can cause the ambient temperatures to exceed the maximum limit. Consideration should be given to installing a protective shield over the detection wire to help in reducing the effects of sunlight and thereby lowering the temperature. Shielding can also extend the useful life of SafeCable by protecting it from the effects of extensive UV radiation. Although standard SafeCable is approved for outdoor use, nylon coated SafeCable may be used for added resistance to UV radiation.

When using SafeCable installed inside conduit for outside applications such as bridges, take precaution in selecting the appropriate temperature rating. Sunlight on the conduit may increase the internal temperature enough to active the detection wire.

All outdoor splices and connections must be made in a NEMA 4 rated junction box. The J/ELR-Box and HDJ/HDELR-Box are NEMA 4 enclosures approved for use in outdoor applications.

6. SafeCable Installation

To prevent damage to SafeCable during installation and ensure proper functioning, only mounting accessories provided by SAFE Fire Detection should be used. Mounting hardware not supplied by SAFE Fire Detection may void the warranty of the SafeCable.

- SafeCable Linear Heat Detection is approved as a heat actuated device for use on a supervised fire alarm control/releasing panel. SafeCable is available in multiple temperatures, and ratings are the same as heat detectors and sprinklers. Refer to our temperature rating chart (Figure 3) for assistance in choosing the best wire for your environment. SafeCable can be installed for both area protection and local applications (close to the hazard or potential heat source) for a faster response.

- SafeCable installations must be in compliance with the NFPA 70 National Electrical Code, NFPA 72 National Fire Alarm Code or as indicated by the local authority having jurisdiction. Its use is intended to be in conjunction with an approved fire alarm control/releasing panel and installed in continuous runs without T-Taps or branch lines.

- SafeCable should always be enclosed in conduit for the following: when installed 6 feet (1.8m) or less from the floor, all runs through the floor, or entry into a manual pull station.

6.1 Installing SafeCable

During installation, it is important to handle SafeCable with a degree of care. The polymer outer covering is very durable, but the inner core wires and thermal reactive sheathing can be damaged if not handled properly. The following are some installation guidelines to assist you in avoiding damage to the SafeCable, and to help ensure a successful and trouble free installation.

Note: To avoid recoiling, keep a small amount of tension on cable at all times while dispensing.

- **ALWAYS** support the detection cable at 3 to 5 foot (1 - 1.5m) intervals using appropriate fasteners.
- **ALWAYS** test wire before installation with a multimeter to be sure there are no shorts in the detection cable. SafeCable integrity is also tested prior to shipping for quality assurance.
- **ALWAYS** keep tension on the detection cable during installation to prevent recoiling of the wire.
- **ALWAYS** allow the proper amount of sag when installing the detection wire. Refer to the sag chart below (Figure 56) for detailed information.

Sag Chart

Temperature	Sag	Wire Mount Spacing
20°F (-7°C)	3/4" (19mm)	3 - 5' (1 - 1.5m)
0°F (-18°C)	7/8" (22mm)	3 - 5' (1 - 1.5m)
-20°F (-29C)	1" (25mm)	3 - 5' (1 - 1.5m)
-40°F (-40°C)	1 1/8" (29mm)	3 - 5' (1 - 1.5m)

Figure 56

- **ALWAYS** be sure to install SafeCable to meet local, state and federal codes and installation guidelines.
- **ALWAYS** use mounting hardware and accessories provided by SAFE Fire Detection Inc. to help prevent damage to the detection cable, ensure a properly functioning installation, and prevent voiding the warranty.
- **ALWAYS** take care during SafeCable installations not to excessively pull or drag the detection cable across sharp objects or corners. Although durable, the outer coating of the detection wire may become damaged if a certain level of care is not taken during installation.
- **ALWAYS** loop SafeCable once before entering a J-Box / ELR-Box, (Figure 57). This will help prevent excessive tension from expansion and contraction, or accidental dislodging from the terminal strip.

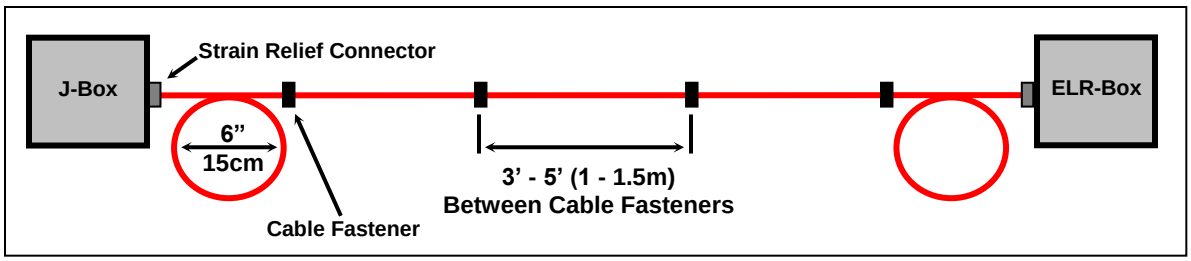


Figure 57

- **ALWAYS** be sure to tighten Strain Relief Connector adequately to ensure the detection cable is secure and a moisture proof seal is formed.

- **NEVER** install SafeCable in such a manner that the detection cable from one zone extends into another zone.

- **NEVER** install SafeCable on top of things that may act as a heat sink such as pipes, beams, or metal racks. This may result in delayed activation time.

- **NEVER** tighten mounting clips to the point where the detection wire is pinched, stretched, or to the point where it cannot move freely within the mounting device.

- **NEVER** bend the detection wire to a 90° angle. All bends or turns should be rounded with a minimum 3 inch (7.6 cm) radius, as shown below in Figure 58, and fastened six inches from the right angle as shown.

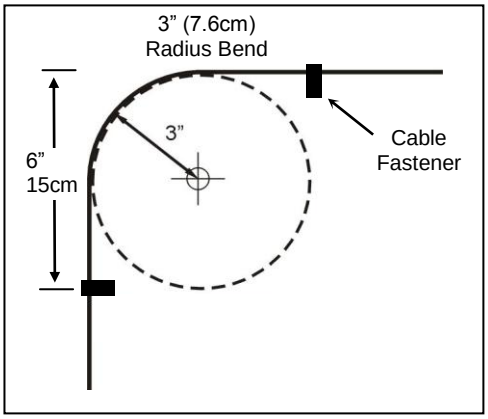


Figure 58

- **NEVER** paint the detection wire, per UL and FM requirements.

- **NEVER** use wire nuts or similar devices as all connections should be made with approved splicing techniques using Screw Terminals as described in Section 6.3.

- **NEVER** stretch the detection wire, always allow some slack in the runs especially in refrigerated storage applications.

- **NEVER** place the detection wire where it can be damaged by foot, equipment, or truck traffic.

- **NEVER** store detection wire in areas where the ambient temperature is near, or exceeds the ambient installation temperature of the wire.

- **NEVER** install SafeCable using non-approved fasteners, this may damage the wire, cause false alarms, and void the warranty.

6.2 Screw Terminal Connectors and Splicing Accessories

When splicing SafeCable, it is necessary to use a Screw Terminal Connector (Part #: TC1005X - 10 pack) to ensure a durable and proper connection. Splicing tape is also used to wrap the point of the splice to prevent moisture and build up of contamination. If needed, sealant tape for weatherproof splices is available. Figure 59 shows the available connecting and splicing accessories.

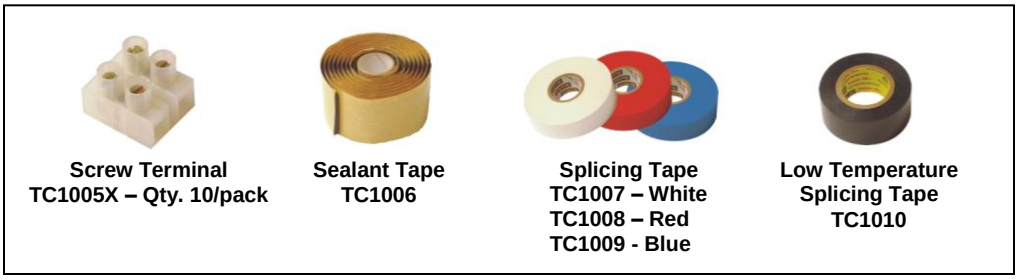


Figure 59

6.3 Splicing

There are two methods for splicing SafeCable together, standard and J-Box splices. J-Box splices are preferred over standard splices due to their greater durability and are required for all outdoor splices. Both methods are detailed below.

6.3.1 Standard Splicing – Option 1

When splicing SafeCable, be sure to securely fasten all connections using a Screw Terminal (Part #: TC1005X – Qty. 10/pack) to prevent accidental dislodging. To prevent humidity and dust from entering the splicing connection, thoroughly wrap the splice with Sealant Tape (Part #: TC1006) by overlapping the layers approximately half the width of the tape. To secure the Sealant Tape, wrap the splice again using Splicing Tape (Part #s: TC1007 – White, TC1008 – Red, or TC1009 – Blue). Be sure to use enough Splicing Tape and Sealant Tape to thoroughly seal the connection. If splicing in low temperatures, below 32° (0°C), be sure to use Low Temperature Splicing Tape (Part #: TC1010).

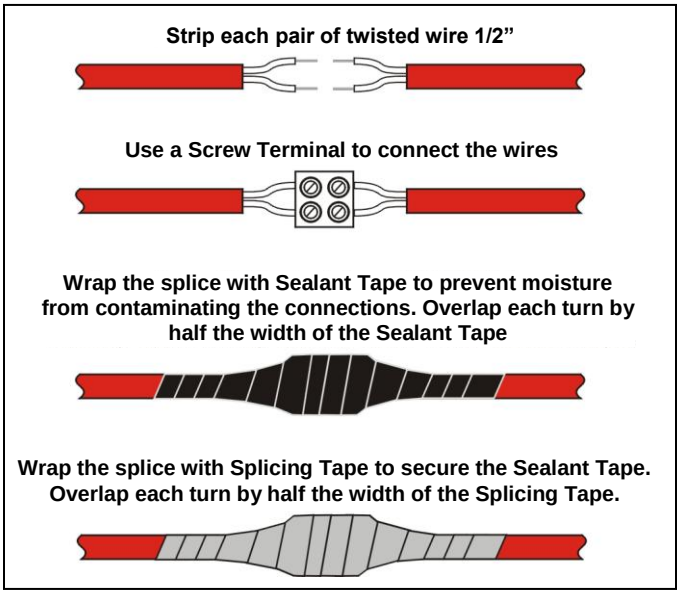


Figure 60

6.3.2 J-Box Splicing – Option 2

For durable a splice that offers the greatest protection from humidity, dirt, and accidental dislodging, a J-Box splice should be used as shown in Figure 61. In addition, all outdoor splices must also be made in a J-Box. For these splices, the SafeCable is run into a J-Box (Part #: TC1000) or HDJ-Box (Part #: TC1002) through a Strain Relief Connector (Part #: TC100). The Strain Releif Connector is fastened through a 7/8" hole made in the enclosure. For best results, use a hole saw, not a drill bit to make the penetration. The SafeCable connections are made inside the J-Box using a Screw Terminal (Part #: TC1005X). Be sure to securely tighten the screws on the Screw Terminal to prevent accidental dislodging.

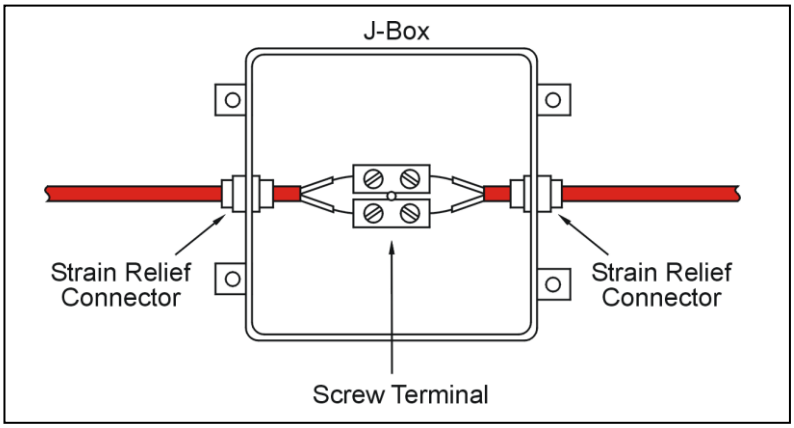


Figure 61

7. Fire Alarm Control Panel Installation and Wiring

SafeCable may be used with any Fire Alarm Control/Releasing Panel. The total length of SafeCable per zone will vary according to panel capabilities. To determine the maximum number of feet for a specific panel, please contact SAFE Fire.

7.1 Panel Installation – PFC-4410 and PFC-4410A

- The fire alarm control/releasing panel is normally mounted at a level that will provide easy access to the unit for configuration, programming and maintenance.
- All signal wires must be screened and of a suitable type. The specific type of wire used may depend upon local fire regulations. Please consult with the AHJ during planning.
- The unit must not be placed in areas where either the temperature or humidity is outside the specified operating range.
- The unit should not be placed in close proximity to any equipment expected to generate high radio frequency levels (such as radio alarms) or units generating high levels of electrical energy (such as large electric motors or generators).
- Do not drill into the top of the panel as this may cause metal shavings to damage the electrical components in the panel.

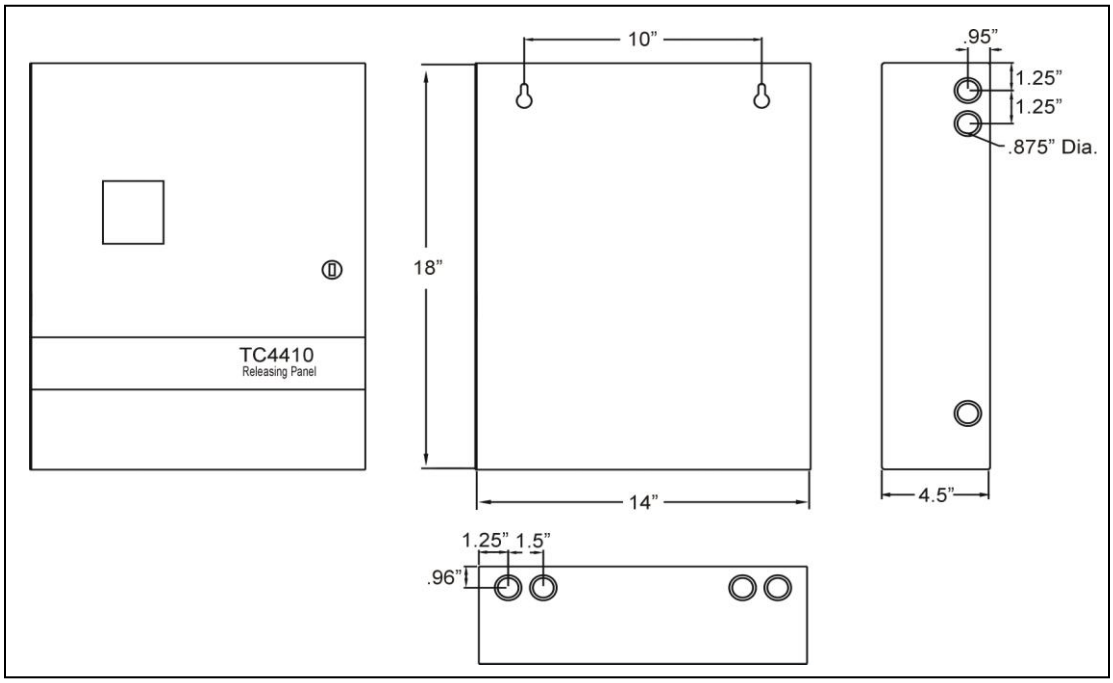


Figure 62 – PFC-4410 / PFC-4410A Panel dimensions

7.2 Wiring Diagram for Class "A" Circuits

Figure 63 is a Class "A" wiring example where the leader cable from the panel connects to the SafeCable inside a J-Box. The end of the SafeCable run terminates in a second J-Box where it connects to an approved copper wire, of the appropriate gauge, and is run back to the control panel to compete the Class "A" circuit. The end of line resistor is incorporated into the fire alarm control panel, or Class "A" Module if using the PFC-4410 or PFC-4410A. Class "A" Module installation and wiring for the PFC-4410 or PFC-4410A is discussed in sections 7.4.1 and 7.4.2.

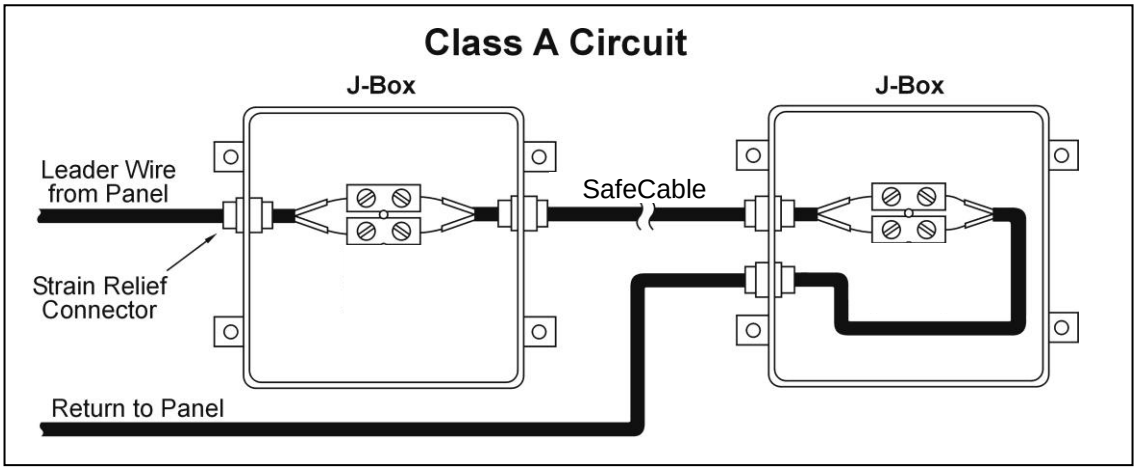


Figure 63

7.3 Wiring Diagram for Class "B" Circuits

Figure 64 is a Class "B" wiring example where the leader cable from the panel connects to the SafeCable inside a J-Box. The end of the SafeCable run terminates in an ELR-Box, which houses the end of line resistor making it a class "B" circuit.

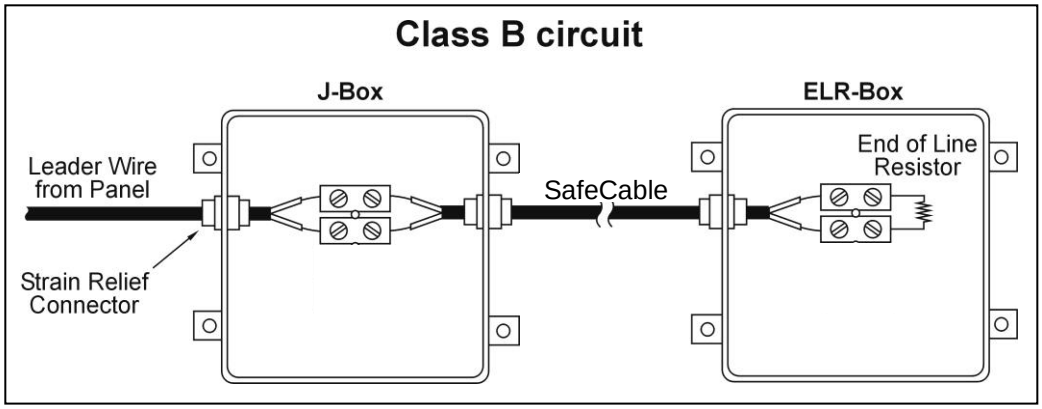


Figure 64

7.4 Using the PFC-4410 and PFC-4410A Fire Alarm Control/Releasing Panel

The PFC-4410 and PFC-4410A Fire Alarm Control/Releasing Panels from SAFE Fire Detection, Inc. can monitor up to 10,000 linear feet (3,048m) of SafeCable per zone. This four zone panel offers four Class "B" initiating circuits (optional Class "A"), four Class "B" indicating circuits (optional Class "A"), and one Class "B" supervisory circuit.

7.4.1 Connecting SafeCable to the PFC-4410 and PFC-4410A

SafeCable is a normally open contact device, it closes (shorts) upon activation. As a result, it must be used only on initiating circuits that can detect a closure or short as an alarm. For installation requiring four Class "A" initiating circuits, a Class "A" Initiating Device Module (Part #: TC4402, Figure 65) must be used to convert two Class "B" initiating device circuits into two Class "A" circuits.

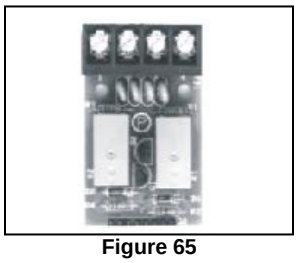


Figure 65

7.4.2 Class "A" and "B" Wiring for Initiating Circuits on the PFC-4410

The initiating device circuit may be either Class "A" or Class "B" based the application and codes, please consult the AHJ to be sure the proper type of circuit is designed. Class "A" circuits have the ability to continue to transmit trouble signals and alarms during a single circuit fault. Illustrated in Figure 66 is a typical SafeCable wiring diagram for a Class "A" detection circuit using the TC4402 Class "A" Initiating Device Module. For a Class "A" configuration, the end of line resistor is located on the TC4402 module. Additional wiring details can be found in Section 7.2.

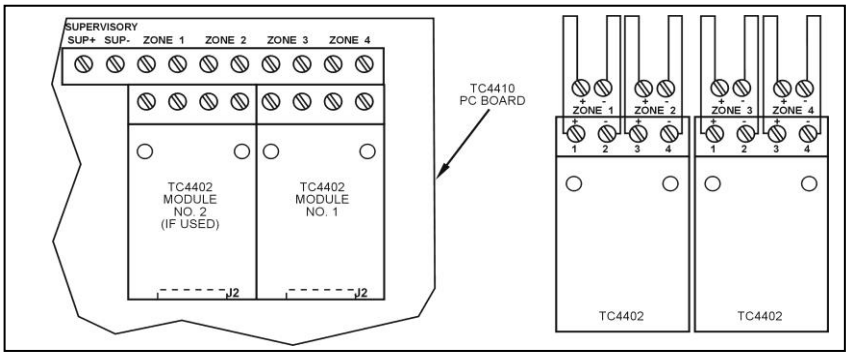


Figure 66

Figure 67 illustrates the TC4410 wiring diagram for a typical SafeCable Class "B" circuit with a 5.1K end of line resistor. Additional wiring details can be found in Section 7.3.

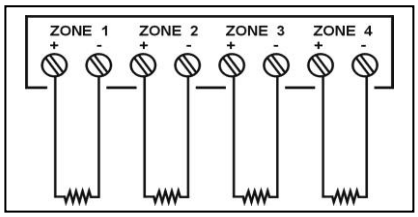


Figure 67

7.4.3 Class "A" Option for Indicating Circuits when Using the PFC-4410 and PFC-4410A

When a Class "A" indicating circuit is required, the Class "A" Indicating Appliance Circuit Module (Part #: TC4401, Figure 68) must be used to convert a single Class "B" indicating appliance circuit to a Class "A" circuit. One module is required or each indicating appliance circuit. Figure 69 illustrates the mounting and wiring for the TC4401.

Figure 68

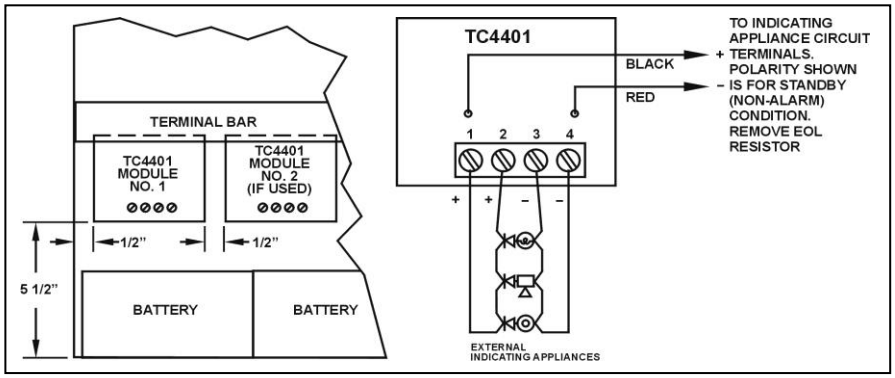


Figure 69

8. Distance Locating Module

Distance locating for a SafeCable Linear Heat Detection System is available by using the SafeCable Distance Locating Module (Part #::APDL-Z1). These single zone modules may be used with both addressable and conventional system designs. Shown below in Figure 70 is a typical conventional system wiring diagram of a SafeCable APDL-Z1 Distance Locating Module. For details regarding other system configurations, please refer to the SafeCable Distance Locating Module Installation and Instruction Manual for wiring and installation details.

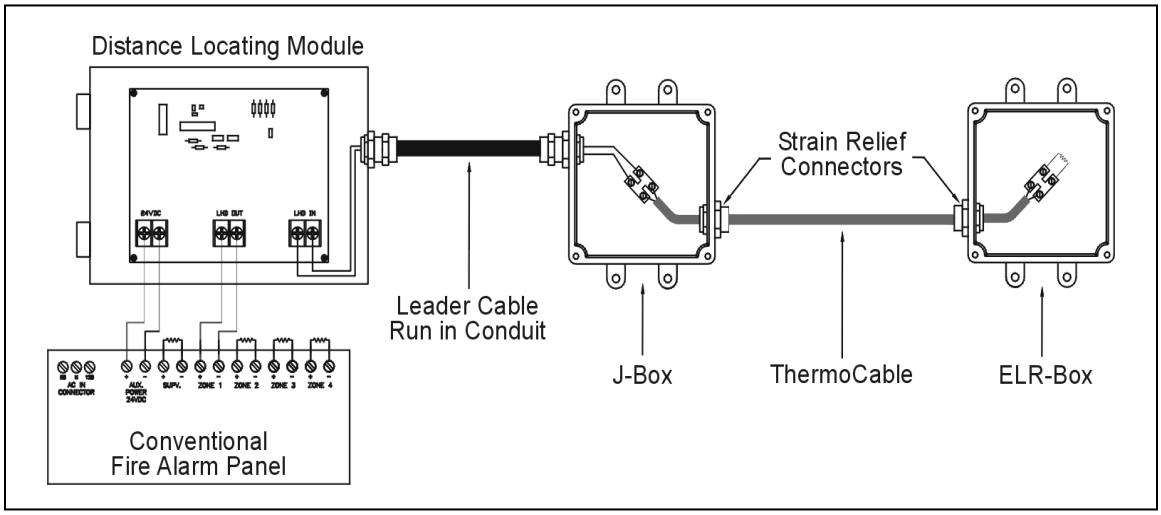


Figure 70

9. Intrinsic Safety Barriers (ISB)

Intrinsic Safety Barriers are used in hazardous installations to prevent accidental ignition of flammable materials. These barriers are energy limiting and utilize shunt-diodes which direct voltage spikes to ground. Connected in series with wiring entering any hazardous area, these barriers prevent explosions in all normally occurring explosive environments including mixtures of air with flammable gasses, vapors, dust and fibers if a fault occurs in the safe area. Grounding wires are run in conduit or raceways separate from any non-intrinsically safe wiring. Figure 71 is a typical wiring detail when using an Intrinsic Safety Barrier.

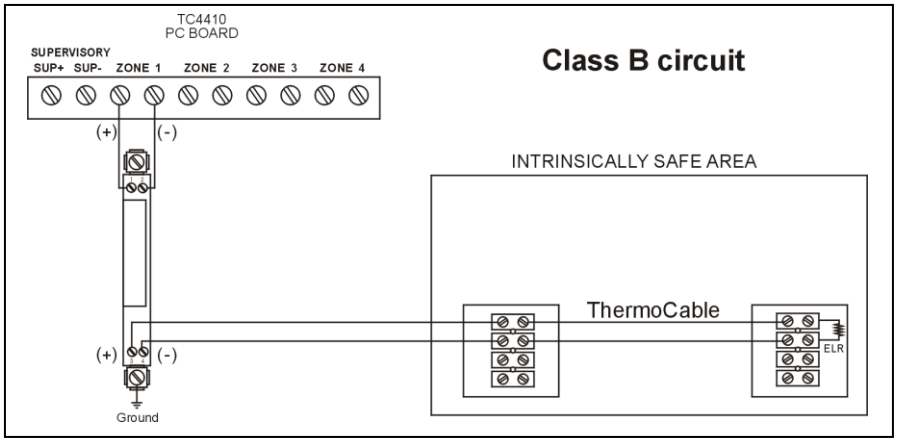


Figure 71

10. SafeCable Testing and Commissioning

The following recommendations for visual inspection and testing of SafeCable are based on the guidelines set forth in NFPA 72 for non-restorable line type heat detectors.

10.1 Visual Inspections

A visual inspection of the SafeCable system should be performed on a semiannual basis unless the authority having jurisdiction requires it to be performed more frequently. The inspections should be made to insure that there have been no changes made, such as building modifications, occupancy hazards or environmental effects, which would inhibit the performance of the detection system. Based on approval from the authority having jurisdiction, areas that are inaccessible for safety considerations, such as continuous process operations, energized electrical equipment, etc. should be inspected during scheduled shutdowns but not exceeding 18 months.

10.2 Testing Procedures

A complete test of a SafeCable Linear Heat Detector system should be performed after initial installation and, unless required more frequently by the local authority having jurisdiction, on an annual basis. Testing the detection wire should be included as part of a complete inspection and test program designed for the facilities entire fire detection and suppression system. Experienced and qualified personnel should conduct all inspections, testing and maintenance of these systems.

Prior to the start and after completion of the test, notification should be given to all personnel and facilities that receive alarm or trouble signals. All suppression systems should be disabled in whatever fashion necessary to insure that the test does not cause activation. Insure that all suppression systems are re-activated after the tests are completed.

The method of testing SafeCable, being a fixed temperature, non-restorable line type heat detector is discussed in NFPA 72, which states, “Do not heat test. Test mechanically and electrically for function. Measure and record loop resistance. Investigate changes from acceptance test.” To test mechanically, use a jumper wire to short each zone at the most distant point.

10.3 Methods and Procedures for Testing of Class “A” and Class “B” Initiating Circuits

10.3.1 Class “A”

To test a Class “A” initiating circuit, remove the positive and negative return leads of the circuit on the control panel terminals. This will cause a trouble signal. To throw the circuit into an alarm condition, place a jumper across the disconnected return leads. This will cause an alarm condition and activate the circuit.

10.3.2 Class “B”

To test a Class “B” initiating circuit, push the test button located in the HDELR-Box. If the HDELR-Box does not have a test button, simply use a jumper to create a short across the end of line resistor, which will create an alarm if working properly. Do not use an ELR-Box with test button in conjunction with systems controlling a suppression system.

10.4 NFPA Required Resistance Test

NFPA 72 requires that loop resistance be measured and recorded during each test. This is done when each circuit is in an alarm condition by disconnecting the detection circuit's leader cables from the terminal in the control panel and placing an ohmmeter across both leader cables. Record the resistances indicated on the ohmmeter and compare the values with previous tests. Any changes in resistance levels should be investigated. Changes in resistance levels may be caused by accidental damage to the SafeCable polymer outer covering, in-line splices or at wire termination points.

10.5 Heat Test - If Required

If the local authority having jurisdiction requires a heat test rather than the NFPA 72 recommended electrical test procedure, the following method should be used. At the extreme location in the detection loop, install a small length of SafeCable to be used for testing, utilizing approved splicing methods or zone box connections. The heat test may be applied to the test area in the required fashion to satisfy the test requirements. Be sure that the SafeCable used for the test has the same activation temperature as the installed SafeCable. After the test is completed, the heat actuated portion of the SafeCable should be replaced and the system placed back on line.

11. Locating Ground Faults

If care is not taken during the installation, the detection wire may be damaged by the surrounding conditions, i.e. sharp edges on load beams, conduit, equipment, etc. In these situations, it is possible to damage the outer coating of the detection wire. Damaged and bare detection wire making contact with metal may produce a ground fault. There are two methods to locate a ground fault.

For more details regarding the procedure to locate ground faults, please refer to the SafeCable Training Module CD.

11.1 Cut and Splice Technique

The cut and splice technique is a very time consuming and labor intensive way to isolate a ground fault. It is simply cutting into the detection cable at the halfway point to see if the fault is in the section of wire between the cut and panel or the cut and the end of the zone. Once you have determined which half the short is in, you then half it again and again until you locate the ground fault. The damaged portion is then removed and a new section of SafeCable spliced in using the approved splicing techniques as described in section 6.3.

11.2 Ground Fault Locating Devices

Ground faults can also be isolated using a ground fault locator. These commercially available locating devices are very helpful in determining the location of the fault and are available from an electrical supply house.

12. Maintenance

SafeCable LHD Wire

SafeCable linear heat detection systems require very little maintenance. When performing yearly testing, unless mandated more frequently by the AHJ, compare resistance levels with the previous year. Changes in resistance levels may be caused by accidental damage to the SafeCable polymer outer covering, in-line splices or at wire termination points. Please refer to Section 10.2 for more information on testing procedures.

Fire Alarm Control/Releasing Panel

Be sure to replace the backup power supply batteries every four (4) years to ensure proper operating conditions (90 hour backup) in the event of power loss.

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