



P **POTTER**
The Symbol of Protection

Fire Sprinkler Monitoring
& Releasing Systems
Training Manual

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Foreword

The purpose of this manual is to provide general information to persons responsible for the design, installation and operation of sprinkler system monitoring.

The manual covers terminology, basic theory of operation, basic system design, and installation information. As with any installation, the manufacturers instructions should be followed.

It does not contain information regarding when or how a particular type of system should be installed in a specific location. That should be performed by a qualified engineer or designer using information from the NFPA codes and standards, any local or national building codes and the authority having jurisdiction.

Information in this manual was obtained from:

Potter Electric

National Fire Protection Association [NFPA]

National Electrical Manufacturers Association [NEMA]

Introduction

When properly installed, supervised, and maintained, automatic fire sprinkler systems are the most effective method of controlling damage and providing life safety in the event of a fire. In most cases they will detect and control a fire before hazardous flames and toxic gasses destroy a building or cause loss of life. Although a sprinkler system may extinguish a fire, it's primary purpose is to contain the spread of the fire until the fire department arrives.

In an untended fully sprinklered building, if one or more sprinkler heads activate to extinguish a fire, water will continue to flow until the system is shut down. Unless the head is one of the "on-off" types that reset when the temperature returns to normal. Also, if the heat source should fail in the winter, sprinkler pipes containing water could freeze and rupture. Water discharging through an open sprinkler head or broken pipe for several hours can cause considerable damage. Monitoring for water flow and building temperature will alert the proper personnel to those property damaging situations.

Sprinkler systems may sit idle for years or even decades, however, when needed they must work to perfection. Even though they have an excellent performance record, the occasional failure can be catastrophic. Most of these failures are the result of the sprinkler system not being fully operational at the time of the fire. Monitoring for water flow, valve position, low building temperature, etc. along with regular testing according to NFPA standards will help to ensure proper operation.

Glossary/Definitions

Addressable Device - A fire alarm system component with discreet identification that can have its status individually identified, or that is used to individually control other functions.

Air Sampling-Type Detector - A detector that consists of a piping or tubing distribution network from the detector to the areas being protected. A fan in the detector housing draws air from the protected area back to the detector. The air is analyzed for products of combustion.

Alarm Signal - A signal indicating an condition that requires immediate response, such as a signal indicative of a fire.

Alarm Verification - A feature of some automatic fire detection and alarm systems to reduce unwanted alarms. Smoke detectors must report alarm conditions for a minimum period of time, or confirm alarm conditions within a given time period after being reset, to be accepted as a valid alarm initiating signal.

Analog Initiating Device - An initiating device that transmits a signal indicating varying degrees of condition, such as smoke obscuration levels. As contrasted with a conventional initiating device which can only indicate an “on/off” condition.

Annunciator - A unit containing two or more indicator lamps, alpha-numeric displays, or other equivalent means in which each indication provides status information about a circuit, condition, or location.

Approved - Acceptable to the “authority having jurisdiction”. *Note:* The National Fire Protection Association does not approve, inspect or certify any installations, procedures, equipment, or materials, nor does it approve or evaluate testing laboratories.

Authority Having Jurisdiction (AHJ) - An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

Automatic Extinguishing System Operation Detector - A device that detects the operation of an extinguishing system by means appropriate to the system employed. Including but not limited to water flow devices.

Automatic Extinguishing System Supervision - Devices that respond to abnormal conditions that could affect the proper operation of an automatic sprinkler system or other fire extinguishing system. Including but not limited to control valves, pressure levels, room temperature, etc.

Automatic Fire Detectors - A device designed to detect the presence of fire or the products of combustion. Including but not limited to heat detectors, flame detectors, smoke detectors.

Auxiliary Fire Alarm System - A system connected to a municipal fire alarm system for transmitting an alarm of fire to the public fire service communication center. Fire alarms from an auxiliary system are received at the public fire service communication center on the same equipment and by the same methods as alarms transmitted manually from municipal fire alarm boxes located on streets.

Branch Line - A piping system, generally in a horizontal plane, connecting not more than one hose connection with a standpipe.

Breakglass Fire Alarm Box - A fire alarm box in which it is necessary to break a special element in order to operate the box.

Ceiling - The upper surface of a space, regardless of height. Areas with a suspended ceiling would have two ceilings, one visible from the floor and one above the suspended ceiling.

Ceiling Height - The height from the continuous floor of a room to the continuous ceiling of a room or space.

Ceiling Surfaces - Ceiling surfaces referred to in conjunction with the locations of initiating devices are as follows:

A) *Beam Construction* - Ceilings having solid nonstructural members projecting down from the ceiling surface more than 4 in. and spaced more than 3 ft., center to center.

B) *Girders* - Girders support beams or joists and run at right angles to the beams or joists. When the top of girders are within 4 in. of the ceiling, they are a factor in determining the number of detectors and are to be considered as beams. When the top of the girder is more than 4 in. from the ceiling, it is not a factor in detector location. **Check Valve** - A self-operating valve that is used to prevent reverse flow through any portion of the system.

Central Station - A supervising station that is listed for central station service.

Central Station Fire Alarm System - A system or group of systems in which the operations of circuits and devices are transmitted automatically to, recorded in, maintained by, and supervised from a listed central station.

Class A Circuit - Class A refers to an arrangement of monitored initiating device, signaling line, or notification appliance circuits, which would permit a single open or ground on the installation wiring of these circuits from causing loss of the systems intended function.

Class B Circuit - Class B refers to an arrangement of monitored initiating device, signaling line, or notification appliance circuits, which would permit a single open or ground on the installation wiring of these circuits to cause loss of the systems intended function.

Combination Detector - A device that either responds to more than one fire phenomenon or employs more than one operating principle to sense one of these phenomenon. Typical examples are combination smoke/heat detectors or a combination rate of rise and fixed temperature heat detector.

Compatibility Listed - A specific listing process that applies only to two wire devices [such as smoke detectors] designed to operate with certain control equipment.

Control Valve - A valve controlling flow to water-based fire protection systems. Control valves do not include hose valves, inspector's test valves, drain valves, trim valves for dry pipe, pre-action and deluge valves, check valves, or relief valves.

Digital Alarm Communicator Receiver [DACR] - A system component that will accept and display signals from digital alarm communicator transmitters [DACT] sent over public switched telephone network.

Digital Alarm Communicator System [DACS] - A system in which signals are transmitted from a digital alarm communicator transmitter [DACT] located at the protected premises through the public switched telephone network to a DACR.

Digital Alarm Communicator Transmitter [DACT] - A system component at the protected premises to which initiating devices are connected. The DACT will seize the connected telephone line, dial a pre-selected telephone number to connect to a DACR, and transmit signals indicating a status change of the initiating device.

Display - The visual representation of output data other than printed copy.

Dry Pipe Sprinkler System - A sprinkler system employing automatic sprinklers that are attached to a piping system containing air or nitrogen under pressure, the release of which (as from the opening of a sprinkler) permits the water pressure to open a valve known as a dry pipe valve, and the water then flows into the piping system and out the opened sprinklers.

End Of Line Device - A device such as a resistor or diode placed at the end of a class B circuit to maintain supervision

End Of Line Relay - A device used to supervise power [usually for 4-wire smoke detectors] and installed within or near the last device on an initiating circuit.

Evacuation - The withdrawal of occupants from a building. *Note:* Evacuation does not include relocation of occupants within a building.

Evacuation Signal - Distinctive signal intended to be recognized by the occupants as requiring evacuation of the building.

Exit Plan - Plan for the emergency evacuation of the premises.

Fire Alarm Control Unit [Panel] - A system component that receives inputs from automatic and manual fire alarm devices and may supply power to detection devices and transponders or off-premises transmitters. The control unit may also provide transfer of power to the notification appliances and transfer condition of relays or devices connected to the control unit. The fire alarm control unit can be a local unit or a master control unit.

Fire Rating - The classification indicating in time [hours] the ability of a structure or component to withstand fire conditions.

Fire Safety Functions - Building and fire control functions that are intended to increase the level of life safety for occupants or to control the spread of harmful effects of fire.

Flame Detector - A device that detects the infrared, ultraviolet, or visible radiation caused by fire.

Four Wire Smoke Detector - A smoke detector which initiates an alarm condition on two separate wires [initiating circuit] separate from the two power leads.

Heat Detector - A device that detects abnormally high temperature or rate of temperature rise.

Initiating Device - A system component that originates transmission of a change of state condition, such as a smoke detector, water flow switch, etc.

Initiating Device Circuit - A circuit to which automatic or manual initiating devices are connected.

Ionization Smoke Detector - A smoke detector that has a small amount of radioactive material which ionizes the air in the sensing chamber, thus rendering it conductive and permitting a current to flow between two charged electrodes. This gives the sensing chamber an effective electrical conductance. When smoke particles enter the sensing chamber they decrease the conductance of the air by attaching themselves to the ions, causing a reduction in mobility. When conductance is reduced to less than a predetermined level, the detector responds.

Level Ceilings - Those ceilings that are actually level or have a slope of less than 1½ in. per foot.

Light Scattering - The action of light being reflected and/or refracted off particles of combustion for detection by a photoelectric smoke detector.

Line Type Detector - A device in which detection is continuous along a path. Examples include projected beam smoke detectors and heat sensitive cable.

Listed - Equipment or materials included in a list published by an organization acceptable to the “authority having jurisdiction” and concerned with product evaluation, that maintains periodic inspection of production of listed equipment or materials and whose listing states either that the equipment or material meets appropriate standards or has been tested and found suitable for use in a specific manner. *Note:* The means for identifying listed equipment may vary for each organization concerned with product evaluation, some of which do not recognize as listed unless it is also labeled. The “authority having jurisdiction” should utilize the system employed by the listing organization to identify a listed product.

Local Fire Alarm System - A local system sounding an alarm at the protected premises as the result of the operation of automatic or manual initiating devices.

Manual Station [pull station] - A manually operated device used to initiate an alarm signal.

National Electrical Manufacturers Association [NEMA] - is a U.S. trade organization representing manufacturers of products used in the generation, transmission, distribution, control, and end-use of electricity. Many of NEMA's standards have been approved as American National Standards or adopted by the federal government.

National Fire Protection Association [NFPA] - Administers the development of and publishes codes, standards, and other materials concerning all phases of fire safety.

Non Restorable Initiating Device - A device whose sensing element is designed to be destroyed in the process of operation.

Notification Appliance - A fire alarm system component such as a bell, horn, speaker, strobe, etc., that provides an audible or visible output or both.

Notification Appliance Circuit - A circuit directly connected to a notification appliance.

Obscuration - A reduction in the atmospheric transparency caused by smoke. Usually expressed in percent per foot.

Particles of Combustion - Substances resulting from the chemical process of a fire.

Photoelectric Smoke Detector - A smoke detector utilizing a light source and a photosensitive sensor so arranged that the rays from the light do not normally shine on the photosensitive sensor. When smoke enters the light path, some of the light reflects off the smoke onto the sensor, causing the detector to respond.

Proprietary Fire Alarm System - An installation of fire alarm systems that serve contiguous and noncontiguous properties under one ownership from a proprietary supervising station located at the protected property.

Rate Of Rise Heat Detector - A device which will respond when the temperature rises at a rate exceeding a predetermined amount [usually about 15 degrees per minute].

Remote Station Fire Alarm System - A system installed in accordance with NFPA 72 to transmit alarm, trouble and supervisory from one or more protected premises to a remote location at which appropriate action is taken.

Residual Pressure - Potential pressure remaining in the system while the system is flowing.

Restorable Initiating Device - A device whose sensing element is not ordinarily destroyed in the process of operation. Restoration may be manual or automatic.

Riser - The vertical supply pipe in a sprinkler system.

Shall - In NFPA literature indicates a mandatory requirement.

Should - In NFPA literature indicates a recommendation or that which is requested but not required.

Sloping Ceiling - Ceilings having a slope of more than 1½ in. per foot.

A) *Sloping - Peaked Type*, Ceilings in which the slope is in two directions from the highest point. Curved or domed ceilings may be considered peaked.

B) *Sloping - Shed Type*, Ceilings in which the high point is at one side with the slope extending toward the opposite side.

Smooth Ceiling - A surface uninterrupted by continuous projections such as solid joists, beams or ducts, extending more than 4 in. below the ceiling surface.

Solid Joist Construction - Ceilings having solid structural or nonstructural members projecting down from the ceiling surface a distance of more than 4 in. and spaced at intervals 3 ft. or less, center to center.

Spot Type Detector - A device whose detecting element is concentrated at a particular location. Examples include, certain smoke and heat detectors.

Static Pressure - Pressure acting on a point in the system with no flow from the system.

Story - The portion of a building included between the upper surface of a floor and the upper surface of a floor or roof next above.

Stratification - An effect that occurs when air containing smoke particles or products of combustion is heated by burning material, rises until it reaches a level where there is no longer a temperature difference between it and the surrounding air.

Supervision - A visual and audible alarm signal given at the central safety station to indicate when the system is in operation or when a condition that would impair the satisfactory operation of the system exists. Supervisory alarms shall give a distinct indication for each individual system component that is monitored.













Supervisory Signal - A signal indicating an "off normal" condition on the fire suppression system. Examples include, tamper indication, low air pressure and low building temperature.









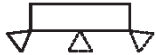


Thermal Lag - The difference between the operating temperature of a thermal detector and the actual air temperature.

Two Wire Smoke Detector - A smoke detector which initiates an alarm condition on the same pair of wires that supply power to the detector.










Wet Pipe Sprinkler System - A sprinkler system employing automatic sprinklers attached to a piping system containing water and connected to a water supply so that water discharges immediately from sprinklers opened by heat from a fire.

Fire Alarm and Emergency Communication Symbols

Signal Initiating Devices		
Referent (Synonym)	Symbol	Comments
manual stations (call point)		general
manual alarm box (pull station and pull box)		
telephone station (telephone call point)		
automatic detection and supervisory devices		general
heat detector* (thermal detector)		includes fixed temperture, rate compensation, and rate-of-rise detectors
smoke detector		includes photoelectric and ionization type detectors
duct detector		
gas detector		
flame detector* (flicker detector)		includes ultraviolet, infrared, and visible radiation type detectors
flow detector/switch		
pressure detector/switch		alternate term: pressure switch air, water, etc.
level detector/switch*		
tamper detector/switch		alternate term: tamper switch
valve with tamper detector/switch		

Audible Type Alerting Devices (Sounder)/Visual Type/ Emergency Illumination/Control and Supervisory		
Referent (Synonym)	Symbol	Comments
speaker/horn (electric horn)		
bell (gong)		
water motor alarm (water motor gong)		shield optional
horn with light as separate assembly (horn with strobe)		
horn with light as one assembly (horn with strobe)		
light (lamp, signal light, indicator lamp, strobe)		
illuminated exit sign		
illuminated exit sign with direction arrow		
emergency light, battery powered		number of lamps on unit need to be indicated
control panel		
door holder		

Water Supply and Distribution Symbols

Mains/Pipe/Valves		
Referent (Synonym)	Symbol	Comments
water main under building		indicate pipe size
suction main		indicate pipe size
post indicator and valve		indicate valve size
key operated valve		indicate valve size
os & y valve (outside screw and yoke, rising system)		
indicating butterfly valve		indicate valve size
non-indicating valve (non-rising stem valve)		
valve in pit		indicate valve size
check valve		indicate valve size

Organizations, Codes and Standards

Codes and Standards

The following NFPA codes and standards may be obtained from:

National Fire Protection Association

1 Batterymarch Park

Quincy, MA 02269-7471

Ph: 617-770-3000

Fx: 617-770-0700

www.nfpa.org

NFPA 13 Installation of Sprinkler Systems

NFPA 15 Water Spray Fixed Systems

NFPA 16 Deluge Foam-Water, Foam-Water Spray Systems

NFPA 70 National Electrical Code

NFPA 72 National Fire Alarm Code

NFPA 101 Life Safety Code

Building Codes & Fire Codes

International Code Council

500 New Jersey Avenue, N.W., Sixth Floor

Washington, D.C. 20001

1-888-ICC-SAFE (422-7233), ext. 6235

www.iccsafe.org

Listings and Approvals

U.L. (Underwriters Laboratories)

F.M. (Factory Mutual)

NYBSA or MEA (City of NY.)

CSFM (California State Fire Marshall)

The Difference Between Codes and Standards

Code

Codes specify circumstances under which a given type of protection is required. Codes are minimum requirements.

Examples of Codes:

NFPA 101 Life Safety Code

NFPA 70 National Electrical Code

International Fire Code

Standard

Standards detail how the protection required by the code is to be achieved.

Examples of Standards:

NFPA 13 Standard for the installation of sprinkler systems

NFPA 72 National Fire Alarm Code (This is actually a standard even though it is called a code)

The terms “Shall” and “Should” are often used. Shall indicates a mandatory requirement, Should indicates a recommendation.

Determine Fire Alarm Requirements

NFPA 101 Life Safety Code determines the fire alarm requirements based on the occupancy classification of the building.

Within each occupancy chapter, section 3.4 will specify the fire alarm requirements for that occupancy class. NFPA 101 Section 3.4 is “Detection, Alarms & Communication”. Section 3.5 is “Extinguishing Requirements”.

Section 3.4 Detection, Alarms and Communication

The *General* Provision

Specifies the conditions under which a fire alarm is required in that particular occupancy.

The *Initiation* Provision

Specifies how the fire alarm will be activated, other than as relates to automatic fire detection. It is typical in many occupancy chapters that the Initiation provision call for “Manual activation in accordance with 9.6.2.1”. When referred to chapter 9, only the applicable portions of chapter 9 apply for that occupancy.

The *Notification* Provision

Specifies “On Premises” signaling requirements. It may require voice evacuation, and may permit or prohibit the use of “Pre-Signal” features.

The *Detection* Provision

Specifies requirements for automatic detection. This section should always be reviewed, even if the building is not required to have a fire alarm system under the general statement for that occupancy class.

The *Emergency Forces Notification* Provision

Includes any requirement for “Off Premises” signaling (monitoring).

Section 3.5 Extinguishing Requirements

Specifies requirements for automatic sprinkler systems. Refers to chapter 9 section 9-7 “Automatic Sprinklers and other Extinguishing Equipment”

The code may require either an, approved automatic sprinkler or an approved supervised automatic sprinkler. Where a supervised automatic sprinkler is required, NFPA 101 2015, 9.7.2.1 and 9.7.2.2 are applicable.

International Building Code IBC and International Fire Code IFC

Chapter 9 of the IBC and IFC determine the fire alarm and sprinkler requirements based on building classification. The IFC then references the applicable NFPA standard for installation. Detection and notification requirements are stated in the IBC and IFC as well.

Sprinkler System Supervision Includes:

Water flow

Water Supply Control Valves

Fire Pump Status

Water Tank, Levels and Pressures

Air Pressure on Dry Pipe Systems

Building Temperature

Water supply control valves shall be supervised to obtain a distinctive signal when in an off normal position, within 2 revolutions of the handwheel, or when the valve has moved one fifth from its normal position.

The switch shall not restore to a normal condition throughout the entire travel of the valve, until it is restored to a fully open position.

A Supervisory signal must be visually or audibly distinctive from both Alarm and Trouble signals.

Water flow and supervisory devices cannot be connected on the same initiating circuit so that the closing of a valve is annunciated as a “trouble” condition.

Fire Alarm Signals

A. Alarm: A signal indicating a fire emergency.

1. Automatic water flow device
2. Manual fire alarm station (pull station)
3. Automatic fire detectors (smoke or heat detectors)

B. Supervisory: A signal indicating an “off-normal” condition exists on the extinguishing system.

1. Control valve switch
2. High/low air pressure switch
3. Water tank level and temperature switches
4. Low water pressure for public water supplies
5. Low building temperature switch
6. Water Column Switch

C. Trouble: A signal indicating a problem with the fire control panel or associated wiring which may render the system inoperable.

1. Loss of primary power (120VAC)
2. Loss of secondary power (battery)
3. A defect in the supervised wiring to an initiating device, indicating appliance or extinguishing agent release device.
4. Disabled circuit or function
5. Failure to communicate with central station
6. Fault

Types Of Sprinkler Systems

Wet Pipe Sprinkler System

Wet systems are the most common and reliable sprinkler systems since no equipment other than the sprinkler heads are required to operate. Wet systems use automatic sprinkler heads attached to piping containing water and connected to a water supply so that water will be discharged immediately from an open sprinkler. Water will only be discharged through heads that have opened due to fire.

Dry Pipe Sprinkler System

Dry pipe systems use automatic sprinklers attached to a piping system pressurized with air. These systems use a dry pipe valve and air pressure to hold back the water supply. When the air pressure in the system bleeds off due to an open sprinkler, the water pressure will open the valve and fill the system. The water will only be discharged through the heads that have opened due to fire. Dry systems are usually installed in unheated buildings or where there is the possibility of sprinkler pipes freezing.

Basic Sprinkler Systems and Water Flow Alarm Devices

Wet Pipe Sprinkler Systems

There are three basic types of wet systems

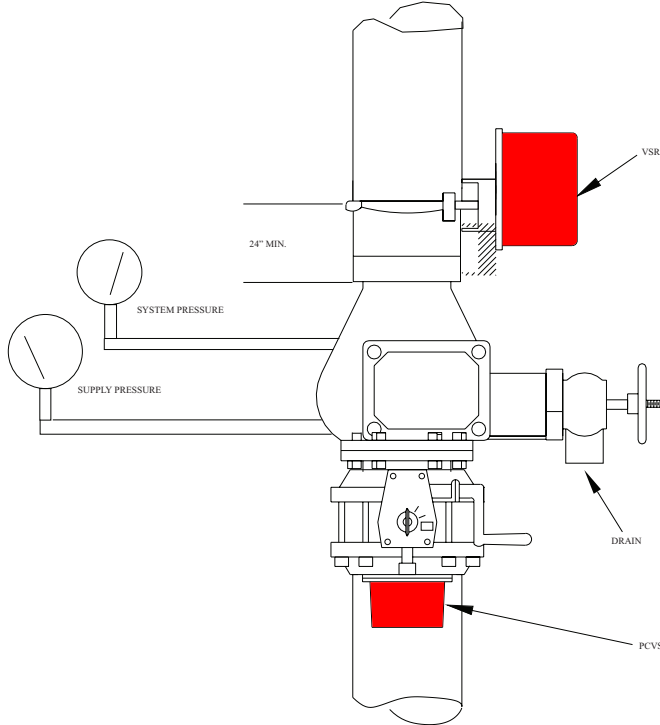
#1. Straight Pipe Riser:

This type of system does not have an alarm valve. There is either a riser check valve or backflow preventer which isolates the sprinkler water from the supply water. The main riser is fed directly from the water supply and branches out throughout the protected premises. These systems must use a vane (paddle) type flow switch. Due to constant fluctuations in water pressure, the waterflow switch should have a time delay or retard to prevent false alarms. The retard time is used to overcome water surges.

As the main riser extends upward, there may be branch lines going out to various floors or other areas of the protected structure. Depending on local or national requirements, there may be a water control valve and waterflow switch on the branch line. The valve would allow that branch to be shut down for maintenance or other reasons while leaving the rest of the system functional. The purpose of the waterflow switch would be to add another zone to the system to better locate the open sprinkler.

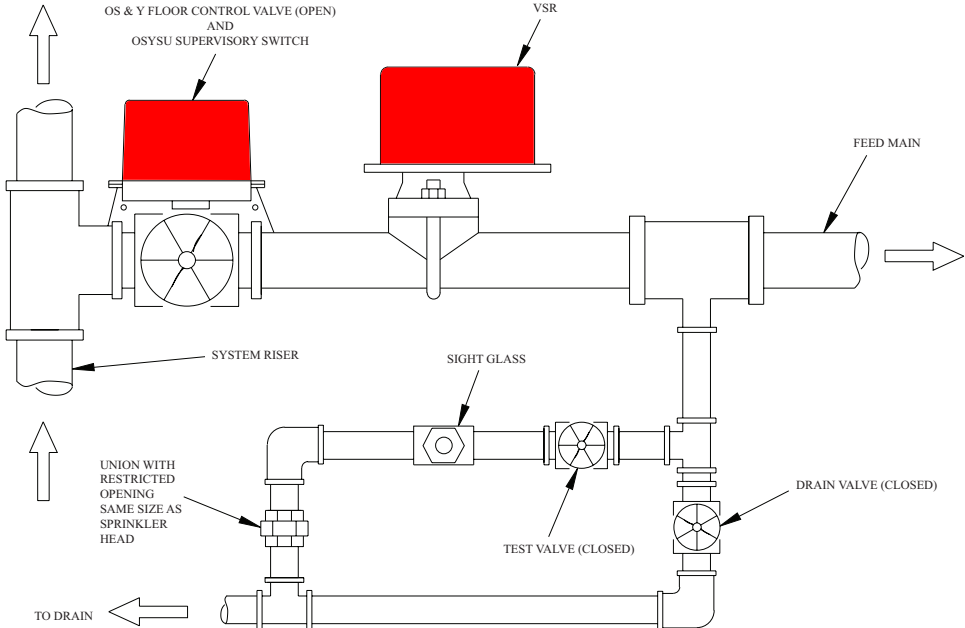
Straight Pipe Riser Waterflow And Supervisory Switch Installation (Main Riser Flow Switch)

Fig. 1



Branch Line Flow Switch

Fig. 2



Note: All water control valves shall be supervised per NFPA13 2016 8.16.1.1.2.1.

#2. Wet System With An Alarm Check Valve:

This type of system has an alarm check valve, the valve is basically a check valve with an alarm port. The main purpose of the alarm check valve is to ring a mechanical bell called a water motor gong. The valve should, (if properly maintained), help hold the system pressure steady and reduce the possibility of false alarms. Under normal circumstances, the clapper of the valve is closed, blocking the alarm port, maintaining the system pressure, and preventing the sprinkler system water from leaking back into the city supply. When a sprinkler opens due to fire, or there is a large surge in the city pressure, the clapper of the valve opens. The alarm port is now exposed to the incoming water supply. When the pressure at the switch reaches 6 psi, the pressure switch trips, or the retard time starts on the pressure switch with built in retard. This alarm port may be piped to the outside of the building through a water motor gong.

These systems can use a vane type flow switch with a retard or they can use a pressure type flow switch. The pressure type flow switch would be installed on the alarm port, in line with a water motor gong if one is being used. The pressure switch must either be installed on top of a retard chamber, (see Fig. 3), or a pressure switch with a built in retard, (see Fig. 4), must be used to prevent false alarms due to water surges. There must be an automatic drain on this line to allow the water to drain and the pressure to drop back to zero so the pressure switch can reset after a surge or activation of the alarm valve.

Pressure type flow switches can be installed without disabling the sprinkler system. Since they are installed on the alarm port, there is no pressure or water present under normal circumstances. The sprinkler system does not have to be drained, they can be installed without shutting off the water supply. Therefore the sprinkler system is never out of service.

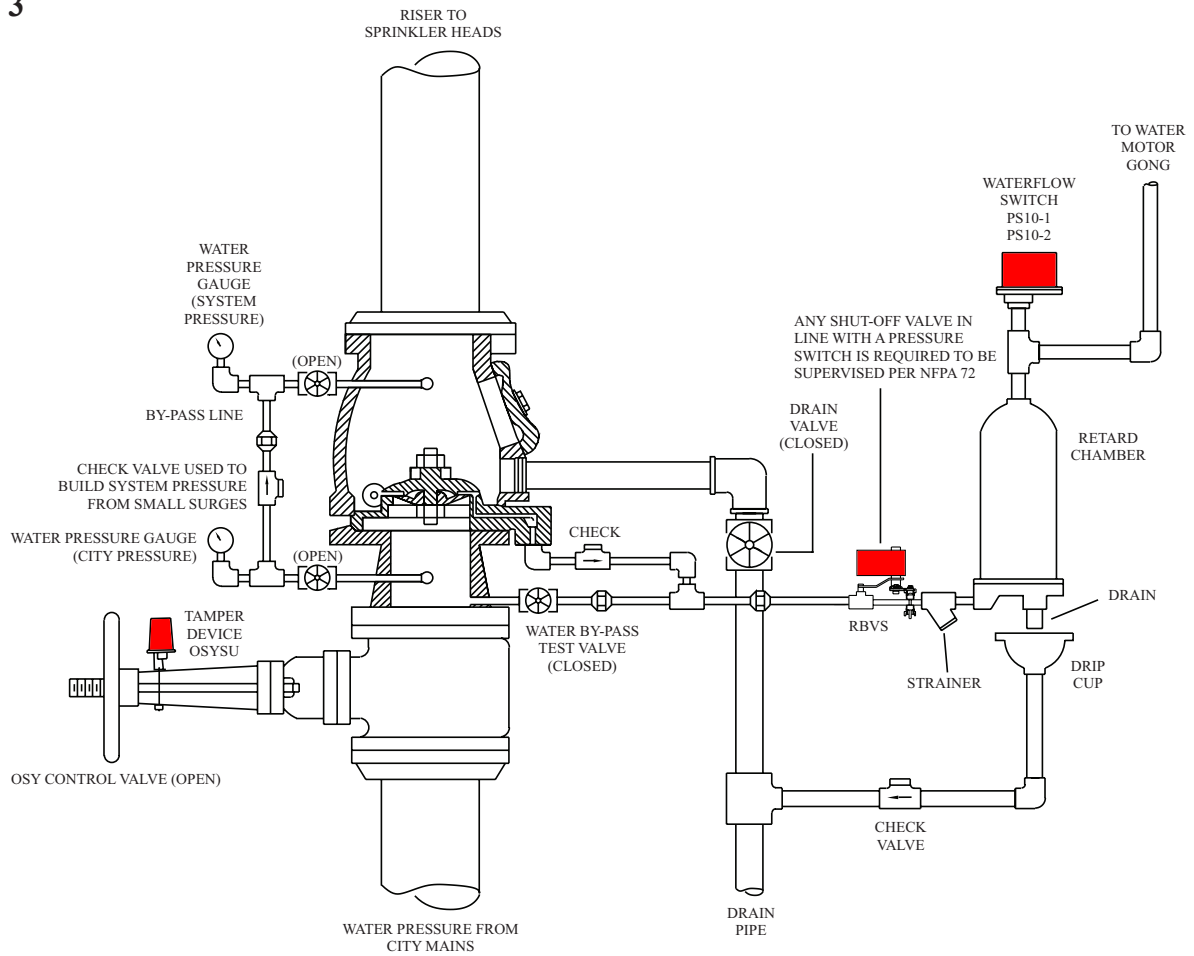
Retard chambers are metal containers that fill with water when there is a surge in city pressure. They absorb the pressure increase thereby allowing the pressure switch to only operate in an actual alarm condition. There is an automatic drain at the bottom of the chamber to allow the surge to drain out. Retard chambers require maintenance to make sure that the drain stays clear and doesn't get clogged with rust or corrosion. If a surge does not drain from the retard chamber before another surge happens, the retard chamber may fill causing the pressure switch to send a false alarm.

A pressure switch with a built in retard allows the system to remain operational at all times, and eliminates the maintenance required on the retard chamber. An automatic drain is still required to relieve the pressure on the line.

Note: All water control valves shall be supervised per NFPA13 2016 8.16.1.1.2.1 and IFC 903.4. Pressure type flow switches must be installed before any shut-off valve, or such valve must be electronically supervised.

Pressure Type Flow Switch Installed On Top Of Retard Chamber

Fig. 3



Note:

Unless excess pressure is pumped into system, the waterflow device should have a retard per NFPA 72 2016 17.12. There shall be no shut-off valve in line to a pressure type waterflow switch, unless the shut-off is electrically supervised. The Potter Model RBVS is designed to electrically supervise ball valves.

This is the same type of system except this one uses a pressure switch with a built-in retard instead of installing the pressure switch on top of the retard chamber. In this case, the retard chamber is only being used to delay the water motor gong. If there is no water motor gong, the retard chamber can be eliminated.

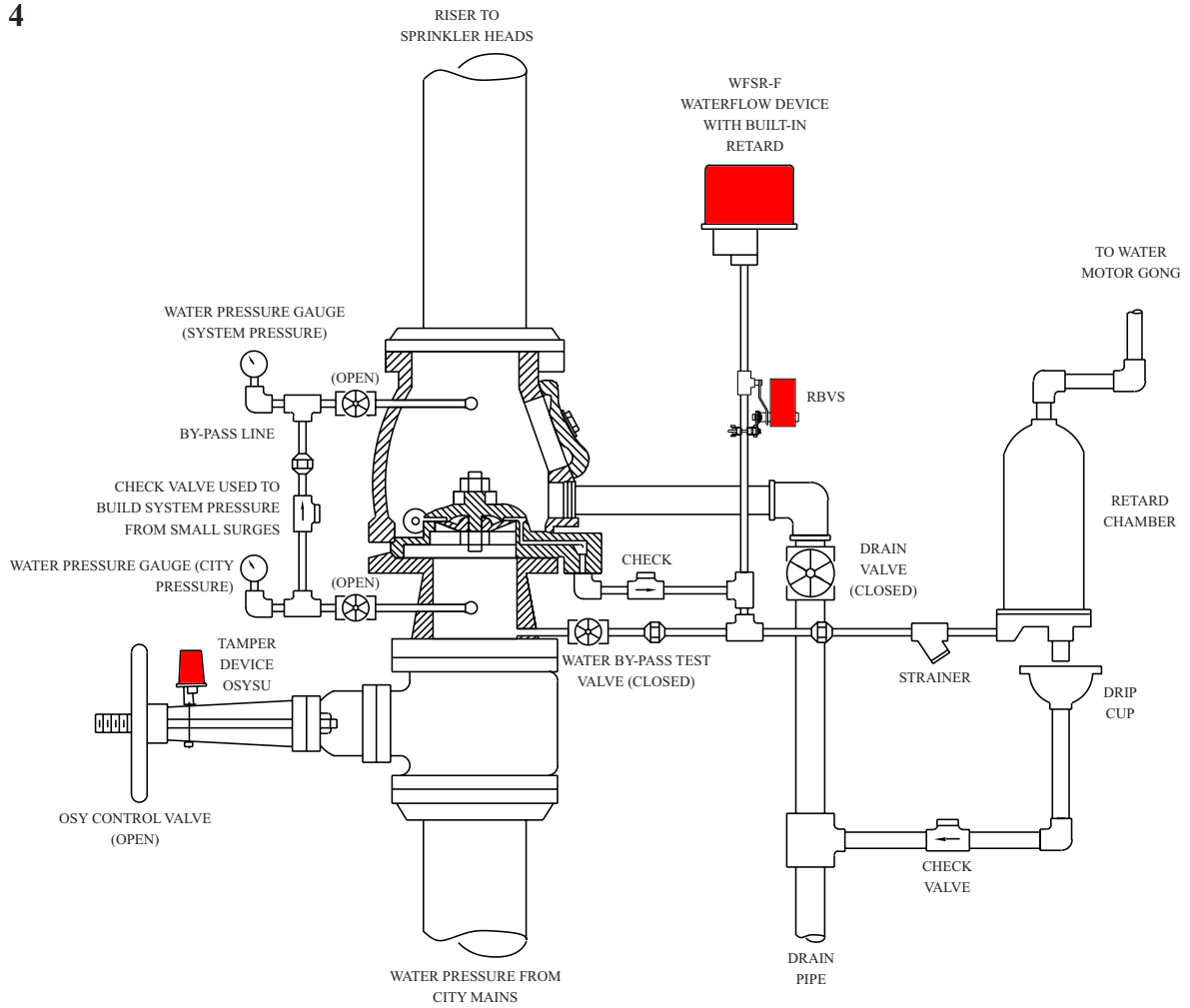
The retard time will start when the pressure at the WFSR-F reaches 6 psi. The pressure must remain there for the length of time the retard is set in order for the device to trip.

Pressure type flow switches can be installed without disabling the sprinkler system. Since they are installed on the alarm port, there is no pressure or water present under normal conditions. The sprinkler system does not have to be drained, they can be installed without shutting off the water supply. Therefore, the sprinkler system is never out of service.

A pressure switch with a built-in retard allows the system to remain operational at all times, and eliminates the maintenance required on the retard chamber. An automatic drain is still required to relieve the pressure on the line.

Pressure Type Flow Switch With Built-in Retard

Fig. 4



Note:

Unless excess pressure is pumped into system, the waterflow device should have a retard per NFPA 72 2016 17.12. There shall be no shut-off valve in line to a pressure type waterflow switch, unless the shut-off is electrically supervised. The Potter Model RBVS is designed to electrically supervise ball valves.

#3. Wet System With Maintained Excess Pressure

This type of system has a jockey or excess pressure pump that is maintaining a higher pressure on the system side of the check valve than the supply pressure can be expected to reach. This excess pressure holds the clapper of the valve down even when the city pressure fluctuates. This eliminates false alarms caused by water surges.

Two different methods utilizing two different waterflow devices can be used to monitor these types of systems. Excess pressure systems do not require retards on the flow switches.

On both systems the excess pressure pump should be monitored with a supervisory pressure switch. This switch should be set to trip when the pressure drops 10 psi below normal, this will prevent false alarms due to a drop in pressure from a pump failure. A typical excess pressure system may maintain a system pressure of 120 psi. The low pressure supervisory switch would be set to trip at 110 psi. High pressure should be monitored to prevent damage to sprinkler system and long delay of a waterflow alarm.

A. Straight Riser With Maintained Excess Pressure

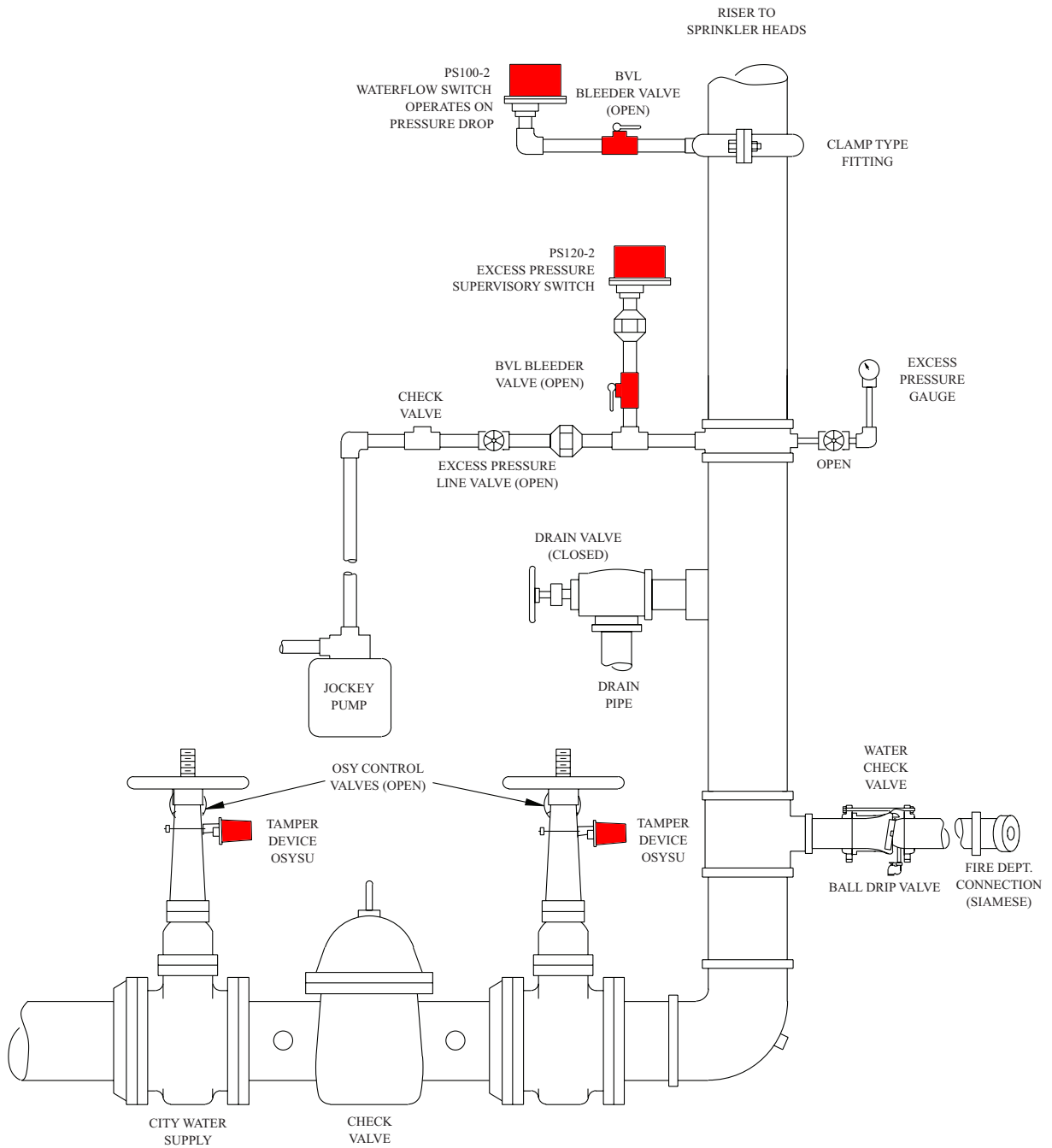
A pressure drop type waterflow device is connected to the system side of the check valve. Activation of a sprinkler head in the system results in a loss of excess pressure, the pressure will drop down to whatever the supply pressure is. The waterflow switch detects this drop in pressure and sends an alarm signal.

The low pressure supervisory switch is set to trip approximately 10 psi below the normal excess pressure. The waterflow switch would be set to trip 10 psi below the supervisory switch. The trip point of the waterflow switch must be higher than the water supply pressure can be expected to reach.

Note: All water control valves should be supervised per NFPA 13 2016, 8.16.1.1.2.1.

Wet System With Excess Pressure (Pressure Drop) Waterflow Alarm Installation

Fig. 5



B. Wet System With Alarm Check Valve And Maintained Excess Pressure

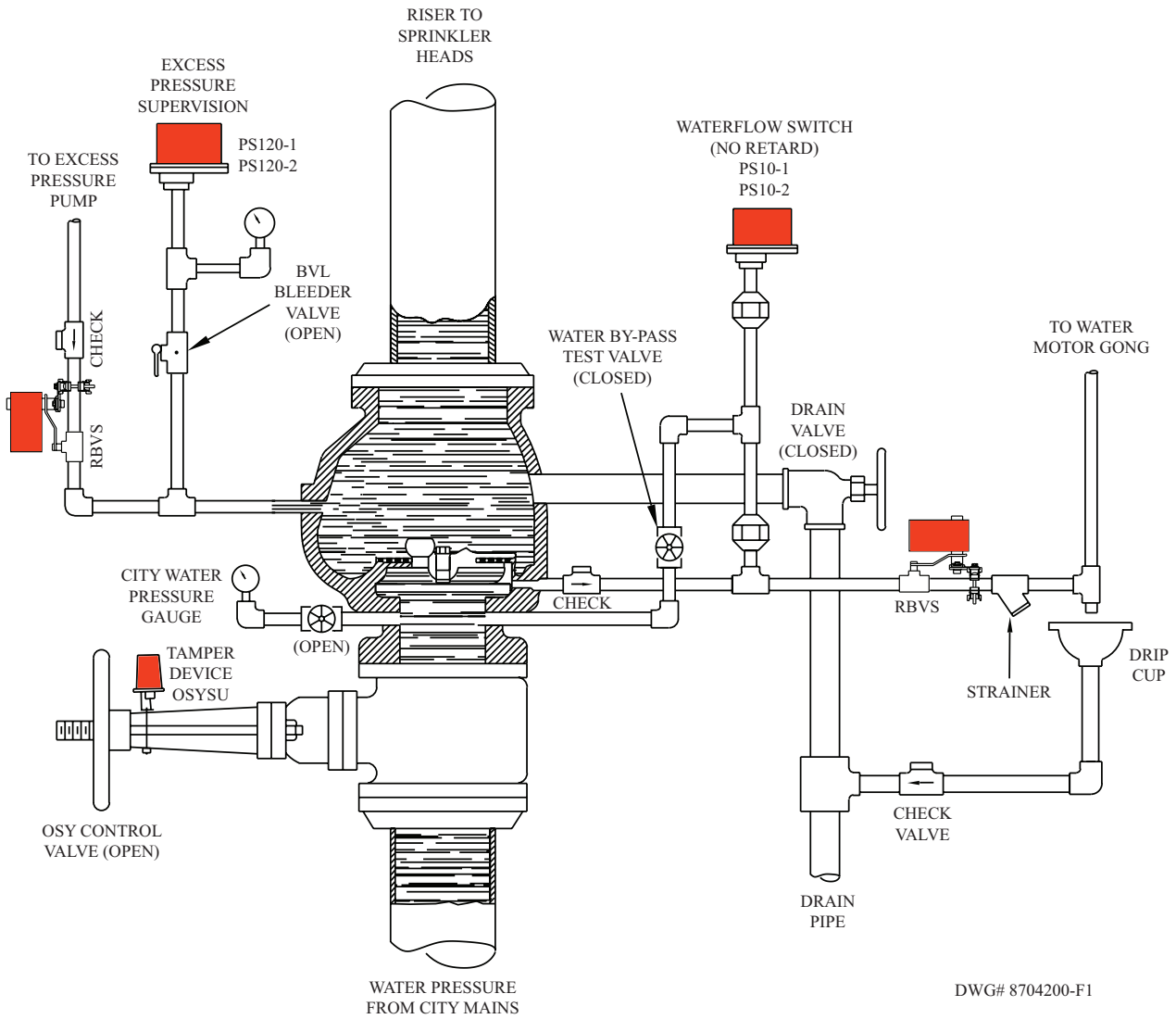
A pressure type flow switch is connected to the alarm port of the alarm check valve.

Activation of a sprinkler head in the system results in a loss of excess pressure, this allows the alarm check valve to open. When the valve opens, the alarm port is exposed to the incoming water supply. The waterflow pressure switch detects this increase in pressure and sends an alarm signal when the pressure in the alarm line reaches 6 psi.

Note: All water control valves shall be supervised per NFPA 13 2016, 8.16.1.1.2.1.

Wet System With Excess Pressure (Waterflow With Pressure Supervision)

Fig. 6



Unless excess pressure is pumped into system, the waterflow device should have a retard per NFPA 72 2016 17.12. There shall be no shut-off valve in line to a pressure type waterflow switch, unless the shut-off is electrically supervised. Per NFPA 72 2016 23.8.5.10.4, the Potter Model RBVS is designed to electrically supervise ball valves.

Dry Pipe Systems

Dry pipe systems are usually installed in unheated buildings or where there is the danger of sprinkler pipes freezing. They have pressurized air in the sprinkler piping, this allows for supervision of the system and prevents water from entering the pipes. The dry pipe valve and associated equipment shall be protected in accordance with NFPA 13 2016, 7.2.5.

This type of system uses a dry pipe valve which has an intermediate chamber or alarm port. Under normal conditions, this section of piping has no water or air pressure in it. A pressure type flow switch would be installed on the alarm port, this could also be connected to a water motor gong on the outside of the building. Waterflow switches on dry systems do not need retards as there should not be any water surges.

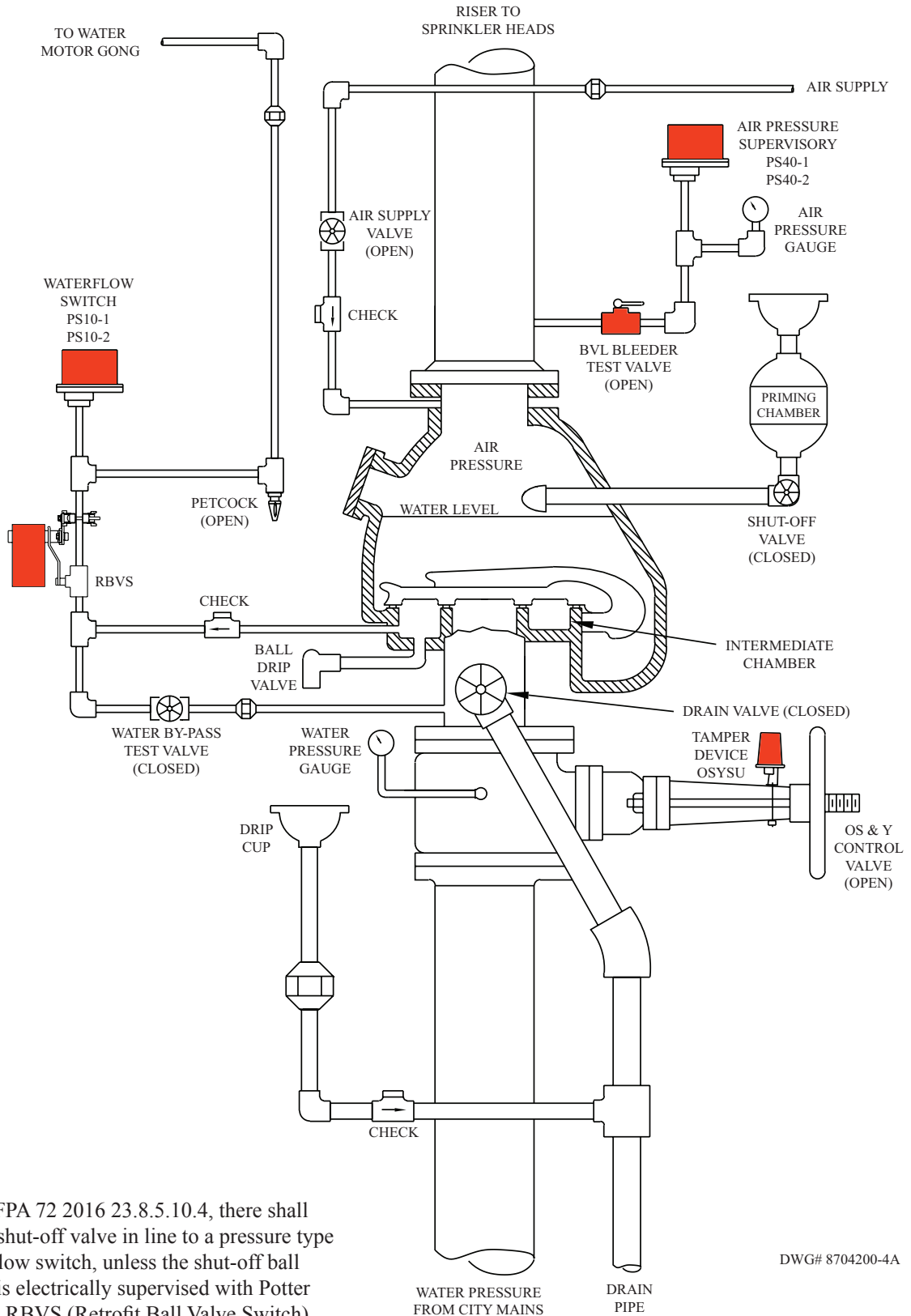
When a sprinkler head opens due to fire, the air pressure is released from the system, this allows the water supply to open the dry pipe valve and enter the system piping. When the clapper of the dry pipe valve opens, it exposes the alarm port to the incoming water supply. The pressure type flow switch senses this increase in pressure and sends an alarm signal.

Dry pipe systems should also have a supervisory pressure switch installed to monitor the system air pressure. This switch should be adjusted to send a low air signal when the system pressure drops 10 psi below normal. This will prevent accidental tripping of the dry pipe valve due to low air pressure from a compressor failure. They should also be monitored for high air pressure as too much pressure will delay the time it takes to bleed enough pressure off the system to allow the water pressure to open the dry pipe valve.

- Notes:** All water control valves shall be supervised per NFPA 13 2016 8.16.1.1.2.1.
The room temperature where the dry pipe valve is located should be monitored to Prevent the valve from freezing.
A bleeder valve and pressure gauge should be installed in line with the air supervisory switch for test purposes.
A WCS (Water Column Switch) can be used to comply with NFPA13 2016, 7.2.5.4.1

Dry Pipe Valve System Waterflow Alarm Installation

Fig. 7



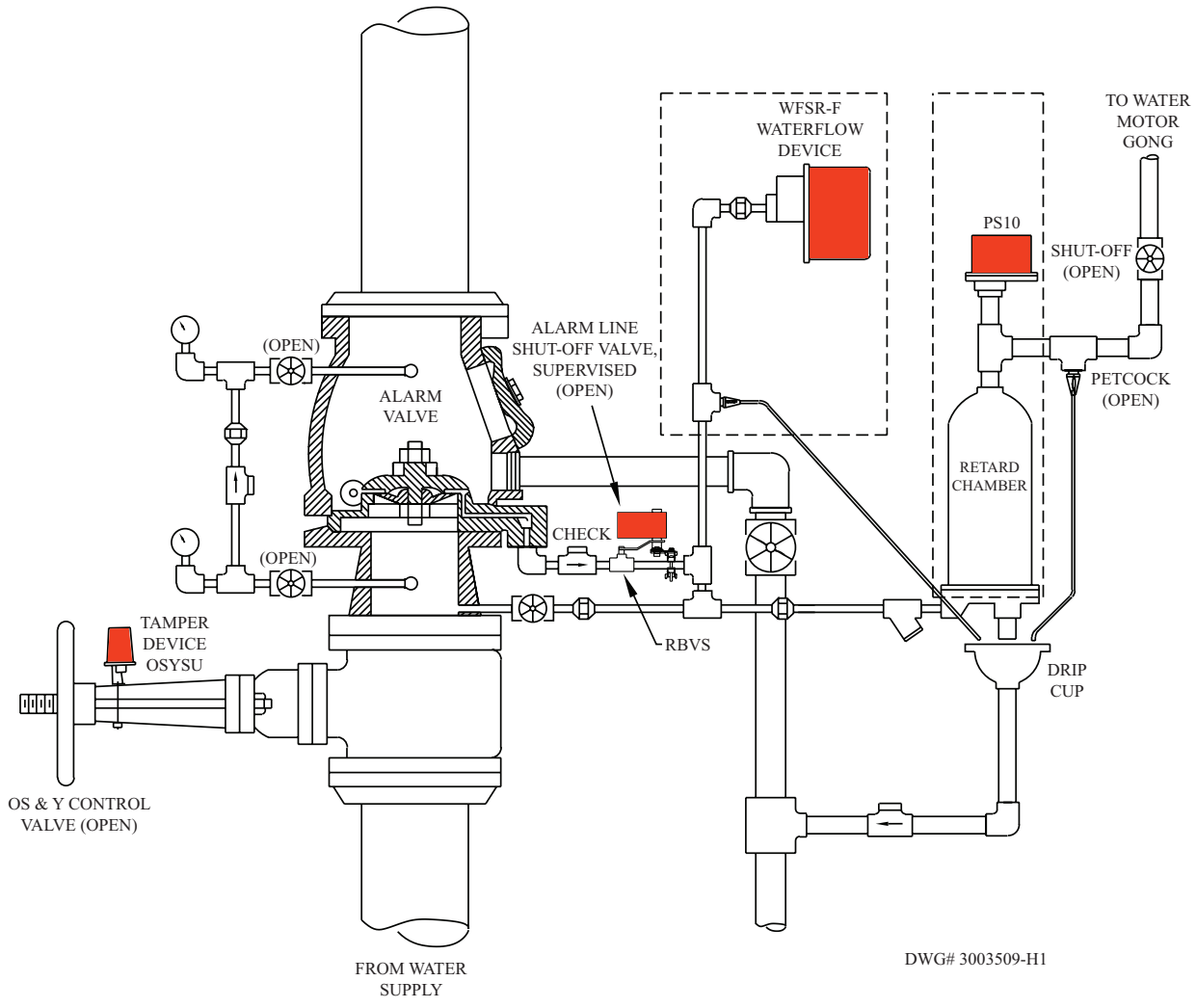
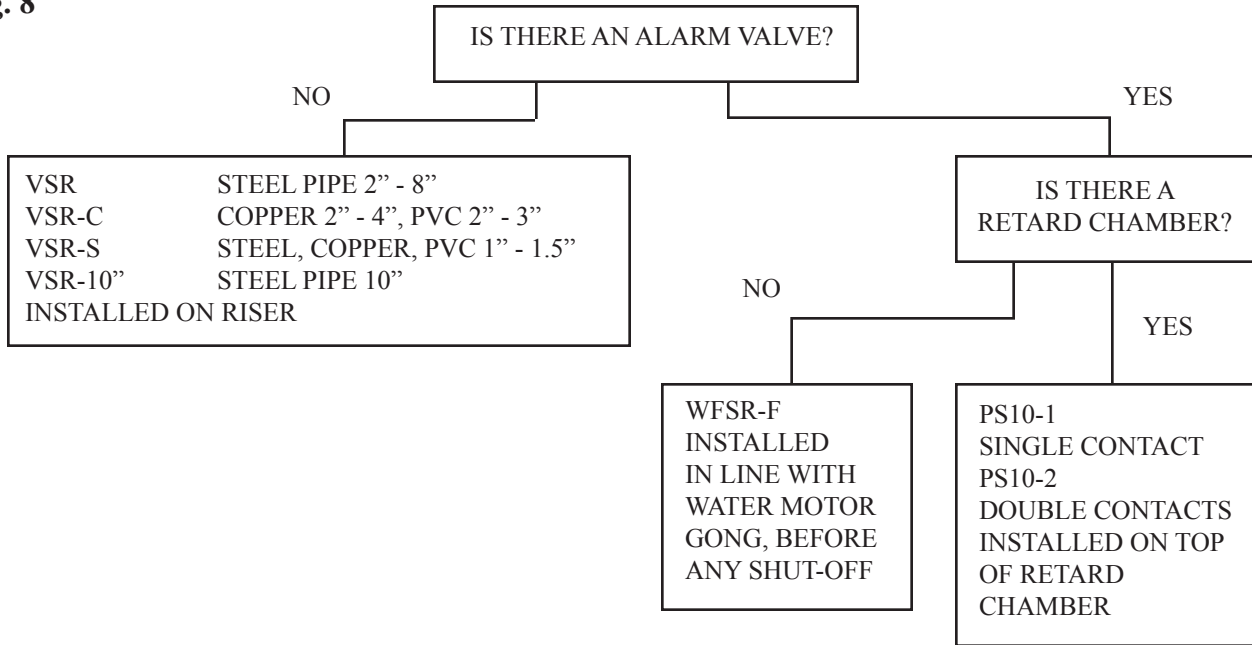
Note:

Per NFPA 72 2016 23.8.5.10.4, there shall be no shut-off valve in line to a pressure type waterflow switch, unless the shut-off ball valve is electrically supervised with Potter Model RBVS (Retrofit Ball Valve Switch).

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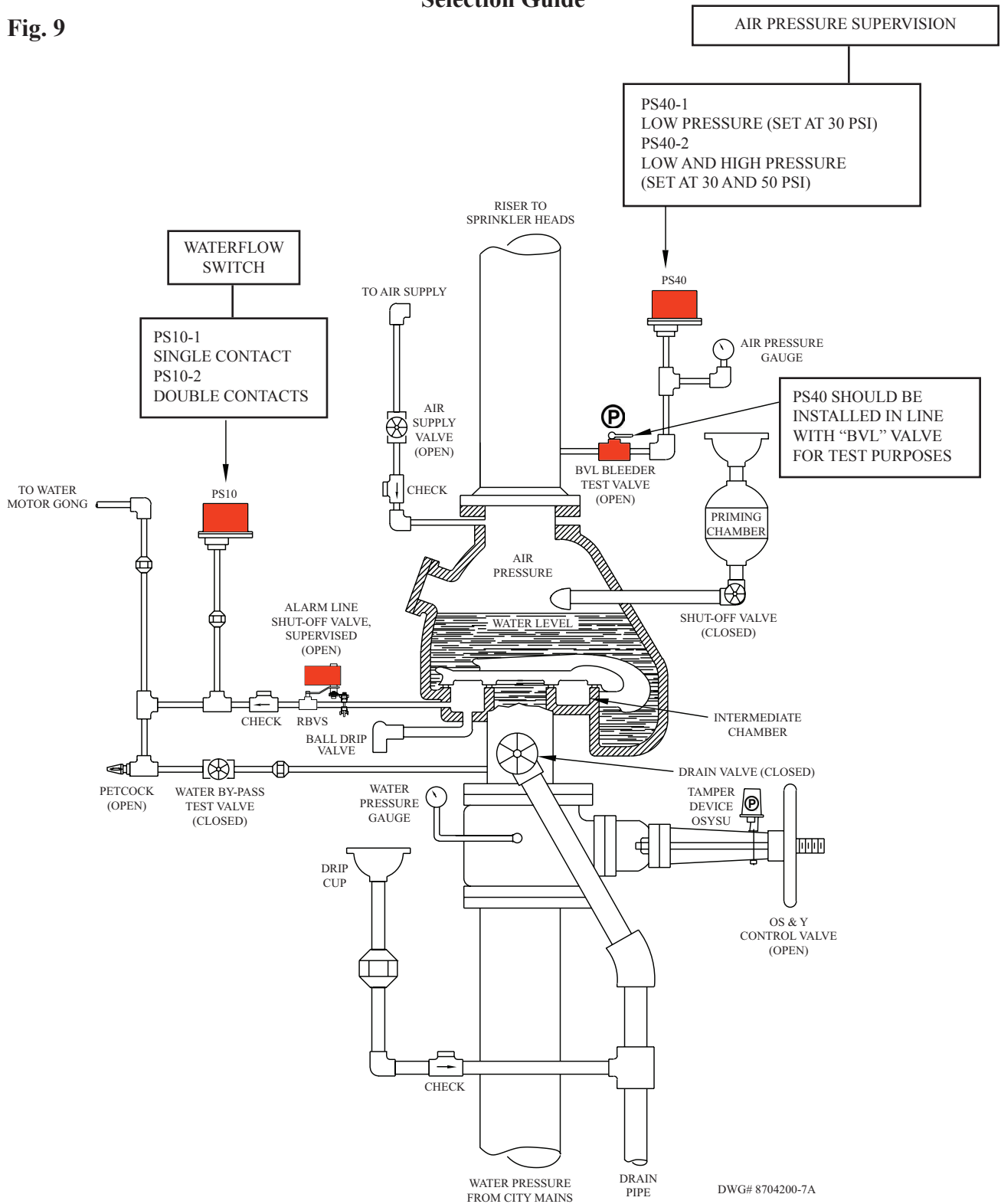
Typical Wet System Waterflow Switch Selection Guide

Fig. 8



Dry Pipe System Waterflow And Air Supervisory Switch Selection Guide

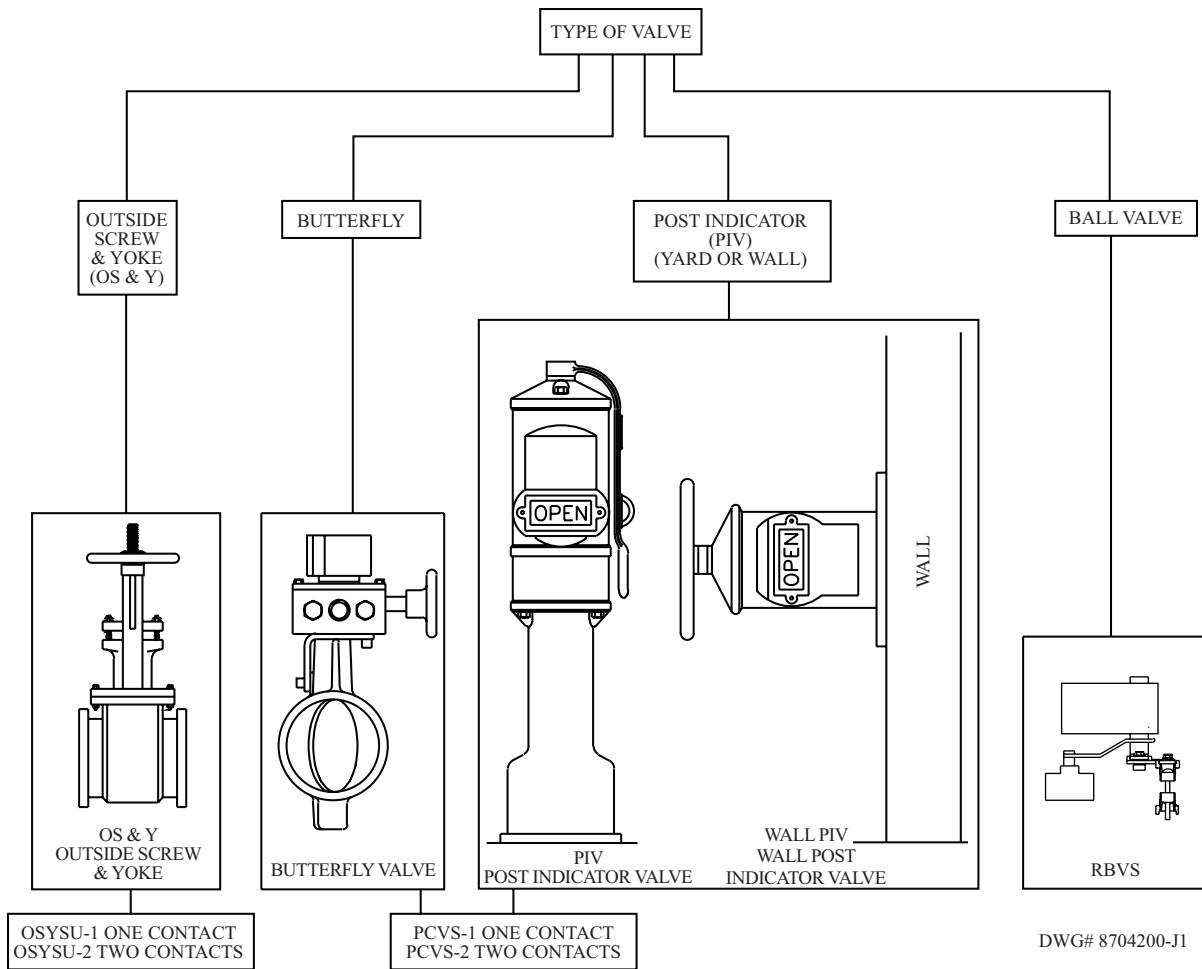
Fig. 9



Note: Unless excess pressure is pumped into the system, the waterflow device should have a retard. Per NFPA 72 2016 23.8.5.10.4, there shall be no shut-off valve in line to a pressure type waterflow switch, unless the shut-off is electrically supervised. Potter Model RBVS can electrically supervise shut-off ball valves.

Valve Supervision (Tamper Switch) Selection Guide

Fig. 10



Installation of Waterflow Switches

Read and follow the manufacturers instructions.

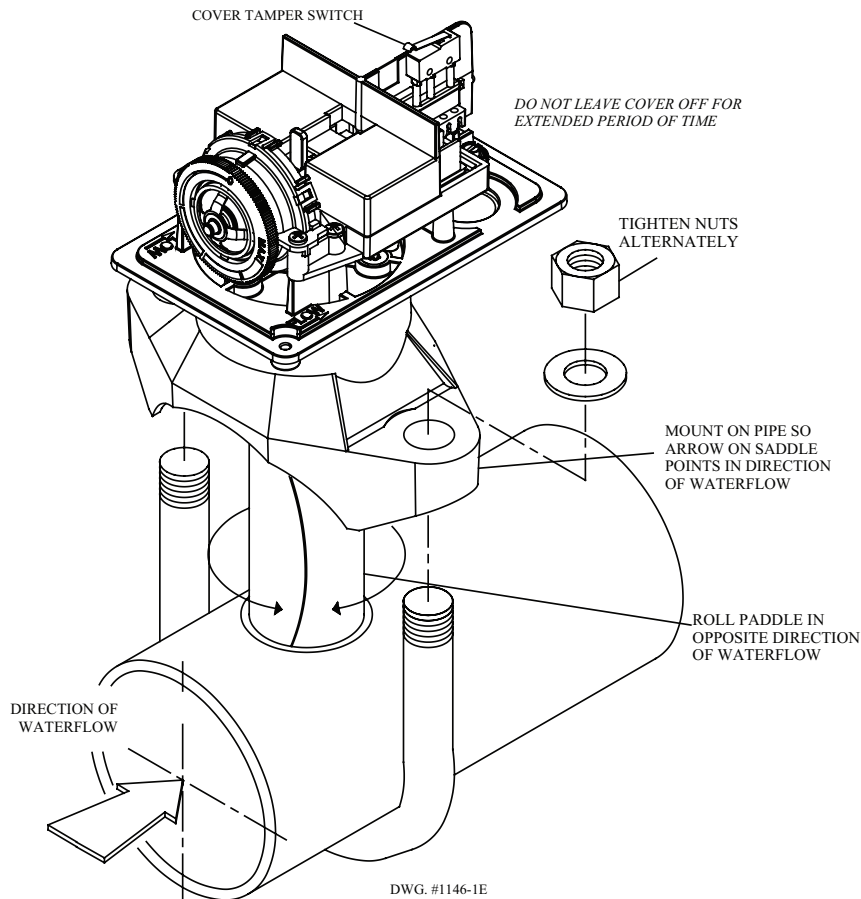
Vane (Paddle) type: For use in wet pipe systems only!

Vane type water flow switches can be installed in either vertical or horizontal sections of pipe. If they are installed in a horizontal section, they must be installed on the top half of the pipe. This is to prevent any debris in the pipe from falling into the throat area of the flow switch and affecting the paddle movement. They should never be installed on the bottom half of the pipe.

After shutting off the water to the system and draining it, drill the correct size hole for the flow switch. The hole should be de-burred and the inside of the pipe should be cleaned of any rust, scale or corrosion. **Do not trim the paddle.** The most likely area for a paddle to hang up is the area immediately upstream of the hole in the pipe, on the same side of the pipe as the hole. When water flows through the system, the paddle is pressed against the inside of the pipe.

The flow switch should be centered in the pipe and the “U” bolt should be tightened evenly according to the manufacturer’s specifications. This will prevent the paddle from dragging on the inside of the pipe and prevent the flow switch from leaking.

Fig. 11



When filling the system, first open any valves at the end of the system or branch lines. Slowly open the water supply valve, let the water flow out of the valves until it is flowing smoothly. This will prevent air from entering the system and help bleed any trapped air out of the system.

When installing the smaller flow switches that screw into a tee fitting, the proper size tee must be used. **Never use a reducing bushing to make the switch fit the tee.** Bushings prevent the paddle from being in the proper location in the tee. Also make certain that the correct paddle for the size and type of piping is being used and that the paddle is on the stem tight. **The flow switch must be screwed into the tee the proper depth.**

After the installation is complete, slowly open the water control valve and open the inspector's test valve. This will help prevent air from being trapped in the system.

Fig. 12

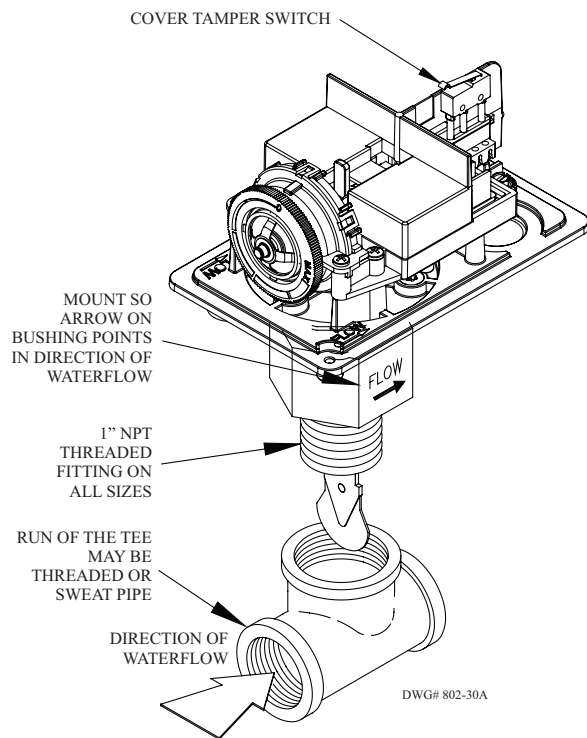
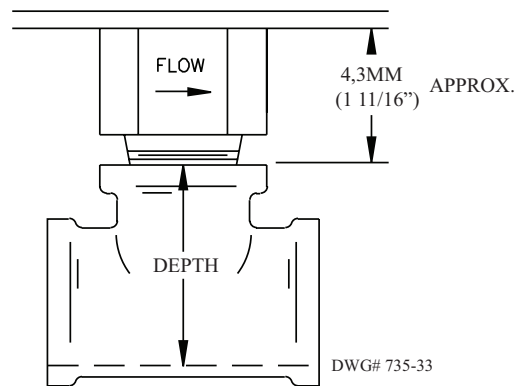


Fig. 13

Screw the device into the TEE fitting as shown. Care must be taken to properly orient the device for the direction of the waterflow.



Pressure Type

Pressure type flow switches can be installed on wet systems that have an alarm check valve. They must be installed on dry sprinkler systems. Pressure switches should only be installed with the threaded connection down.

On wet systems, the flow switch should have a retard. This can be accomplished one of two ways:

One is to install a pressure switch on top of a retard chamber. A retard chamber is a metal container capable of holding a few gallons of water. When a water surge happens, the chamber fills with water and absorbs the pressure before the pressure switch trips. There is a small drip valve at the bottom of the chamber to allow the water to drain out before the next surge. Retard chambers require periodic maintenance to prevent the drip valve from becoming clogged with rust or scale and causing false alarms. The time delay also varies depending on how fast the water fills the chamber.

The other way is to install a pressure switch that has a retard built into it. It is installed in place of the retard chamber. This eliminates the cost of the retard chamber and the time consuming maintenance associated with it. This type of switch also provides a much more accurate retard time.

Dry sprinkler systems must use a pressure type flow switch. Vane type flow switches are not permitted on dry systems per NFPA 13 2016, 6.8.2.4. Since dry systems are not subject to water surges, they do not require the use of a retard. A pressure type flow switch would be installed in the alarm port of the dry pipe valve.

Since pressure type flow switches are installed on the alarm port of the valves, where there is no water or air pressure under normal conditions, they can be installed or replaced without disabling the sprinkler system.

Air Pressure Supervisory Switches

Dry sprinkler systems should have an air pressure supervisory switch installed. Per NFPA 72 2016, 17.16.2.2.2, this switch would trip if the air pressure dropped 10 psi below the normal system pressure, or increased 10 psi above normal. The purpose of low air supervision is to prevent accidental tripping of the system due to compressor failure. High pressure supervision prevents the system from having too much air which would increase the time it takes to bleed enough pressure off the system to allow the dry pipe valve to trip. Supervisory air pressure is typically about 40 psi. The supervisory pressure switch should be set to operate at 10 psi below or above the normal system pressure. The Potter PS40-2 is factory set to trip at 30 psi for low pressure and 50 psi for high pressure.

Low pressure switches should be installed in line with a bleeder valve and a pressure gauge. A bleeder valve is a valve with a small orifice in it. The purpose of the valve is to exhaust the pressure between the bleeder valve and the pressure switch. This allows testing of the switch without any possibility of an accidental tripping of the dry pipe valve. It also speeds up the testing process since such a small amount of air is being released.

Installation of Valve Supervisory Switches

The main reason for sprinkler system failure is due to the water control valves being closed. Therefore, every water control valve that can disable any portion of a sprinkler system should be electrically supervised in the open position.

The main types of valves used are, outside screw and yoke [OS&Y], butterfly and wall or post indicator [PIV] valves.

OS&Y valves have a large handwheel with a threaded shaft through the center of the handwheel. There is also a bracket or “yoke” that runs on both sides of the threaded shaft, from the body of the valve to the handwheel. When the valve is open, the shaft protrudes through the handwheel. As the valve is closed, the shaft is being screwed into the body of the valve. Most tamper switches for these valves mount on the yoke of the valve using either “J” hooks or carriage bolts and a mounting bracket. The switches have a “trip rod” that rests in a groove on the threaded shaft of the valve. Some valve manufacturers put the groove on the stem, with other valves the installer must file a 1/8” deep groove using a 3/8” rat tail, (round not tapered), file. As the valve is closed, the trip rod rises out of the groove and trips the switch. The switch must stay tripped throughout the entire travel of the valve. It must not alternate between “tripped” and “normal” as the trip rod is rolling across the threads of the stem. The switch must also trip if the switch is removed from the valve.

Post Indicator Valves use a different switch than OS&Y valves. For PIV valves, the switch screws into a 1/2” NPT fitting on the side of the valve. The switch has a trip rod that rides on the target of the valve. The target is the portion of the valve that shows “open” or “shut”. When the valve is fully open, the target should be pushing the trip rod against the spring force of the rod. As the valve is closed, the spring force causes the rod to follow the target of the valve, tripping the switch.

Butterfly Valves use the same switch as PIV valves. It also screws into a 1/2” NPT fitting on the valve. The trip rod is operated by a cam inside of the valve that rotates as the valve is closed. Partially close the valve, remove the nipple from the switch and screw it into the valve. Loosen the set screw that holds the trip rod in the housing and extend the trip rod. Slide the PCVS over the nipple, observing which direction the rod will move when the valve is closed. Orient the device so the cam of the valve is pushing against the spring force of the PCVS when the valve is open. As the trip rod touches the cam, it will push the trip rod back into the housing. If the trip rod is too long, remove the rod from the switch housing, note that there is a groove cut into the rod 1” from the end of the rod that was in the housing, this can be broken off with a pair of pliers. After the cam of the valve pushes the trip rod back into the housing, remove the PCVS and slide the trip rod 1/32” farther into the housing before tightening the set screw. This will prevent any imperfections on the cam from affecting the operation of the PCVS. Slide the PCVS over the nipple and tighten the set screw.

Ball Valves. The Potter Model RBVS can be used to supervise ball valves.

Special Valves. For non-rising stem valves a “plug type switch” can be used. These are switches that are UL listed for special applications and are subject to the approval of the authority having jurisdiction. A receptacle is mounted on a wall or section of pipe, a plug with a length of cable is plugged into the receptacle. The other end of the cable is looped through the handwheel of the valve or through a hole drilled into the handle of the valve, then hard wired back into the receptacle. When the valve is closed it unplugs the plug from the receptacle and trips a switch. If the cable is cut it also opens the circuit. The cable must be stretched tight enough so operation of the valve will cause the plug to pull out of the receptacle.

Note: Valve supervisory switches shall trip within 2 revolutions of the handwheel, or 1/5 of the travel of the valve, per NFPA 72 2016, 17.16.1.2.

Other Types of Supervision

Low Water Supply Pressure

Loss of water supply pressure in the sprinkler supply mains can be monitored with a supervisory pressure switch. Care must be taken to adjust the pressure switch below the lowest pressure available during peak demand periods to avoid nuisance alarms.

Fire Pumps

Fire pumps are automatically started in the event of water flow in a sprinkler system in order to supply more water pressure to the system. Power to an electric pump should be supervised for loss of phase or phase reversal. A pump running signal can be obtained by installing a pressure switch in the discharge line of the pump.

Pressure Tanks

These tanks are pressurized water reservoirs used to supply a limited amount of water for sprinkler systems. The tanks are usually located above the highest sprinkler heads under the main roof, or in a heated room on the roof. Each tank is kept 2/3 full of water with a maintained pressure of approximately 75 psi in the tank. Supervision includes: Water level, low and high pressure, low temperature, and water control valves.

Gravity Water Tanks

Gravity tanks are tower or roof mounted reservoirs and can immediately supply a large volume of water for sprinkler systems. The tank may have a heating element to prevent freezing. Supervision includes: Water level, low temperature, and water control valves.

Building Temperature

It is recommended that premises protected by wet sprinkler systems, or the room that a dry pipe valve is located in, be monitored for low temperature of 40° F. This will prevent sprinkler pipes or dry pipe valves from freezing should the building heating equipment fail.

Test Procedures

Waterflow Switches - Wet Pipe Systems

Vane Type

There should be a valve downstream of the flow switch, preferably at the far end of the system, but it may be immediately after the flow switch. The valve should be marked **Inspectors Test Valve** per NFPA 13 2016, 6.6.4.1. The alarm test connection shall comply with NFPA 2016, 8.17.4.1.1. The output of the valve should be piped to a spot where it will not cause any water damage.

Open the valve and allow the water to flow, after the retard time expires, the switch will trip. If the device does not operate check to make sure 10 gpm is flowing out of the test valve. If possible, place a 5 gallon bucket under the output of the valve. If the bucket can be filled in 30 seconds then the valve is flowing 10 gpm.

If a hose needs to be connected to the test valve to prevent water damage, the hose should be 5/8" ID, and as short as possible to reduce friction loss.

If the device still does not trip it may be installed too close to a valve or change in direction of pipe which is causing turbulence or back pressure in the water, or paddle may have been trimmed. *Never trim the paddle.*

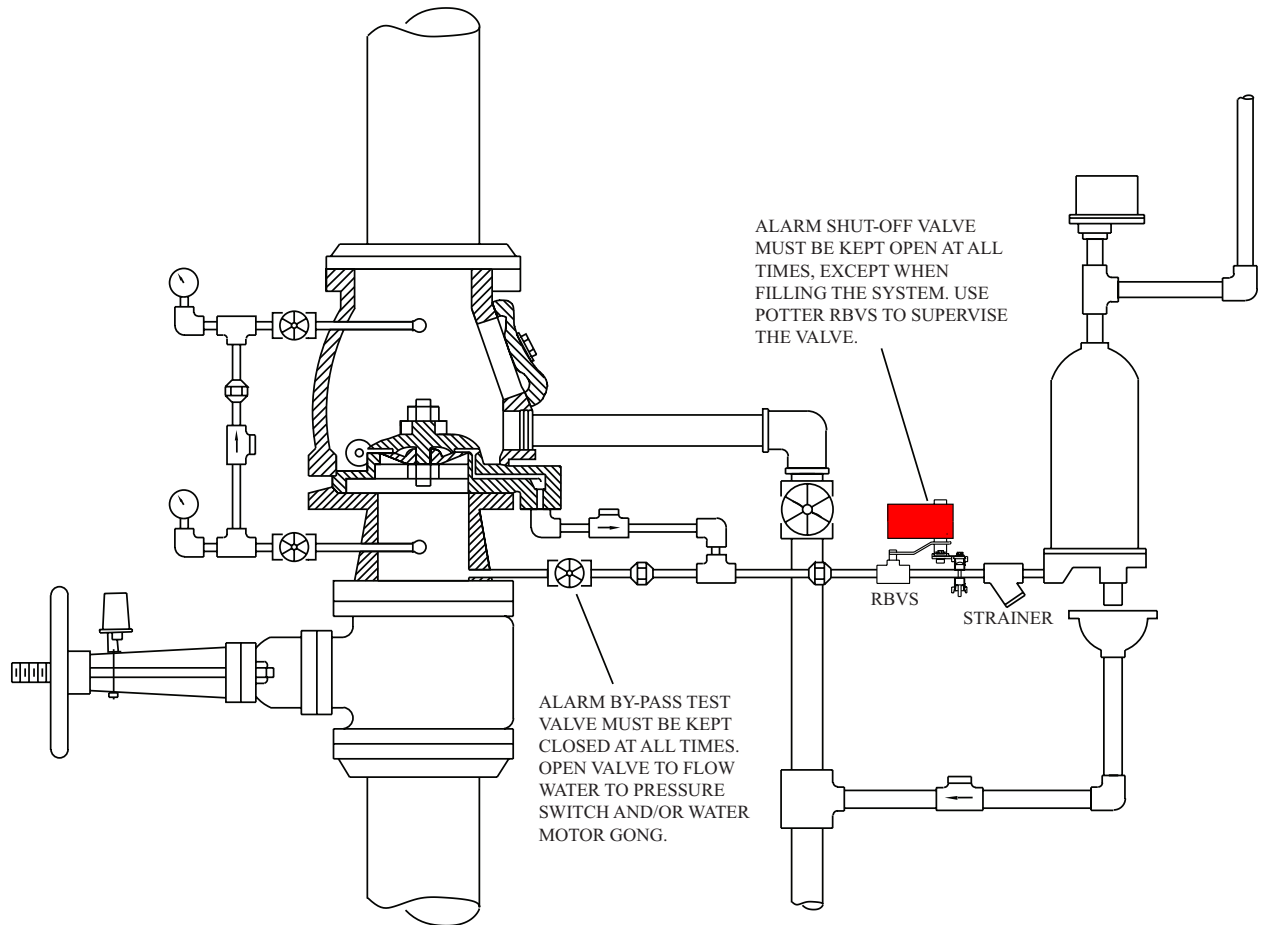
Pressure Type

The preferred method is to open the inspectors test valve at the end of the system similar to the method for testing vane type flow switches. This test also causes the clapper of the alarm valve to open.

Another test method is to open the normally closed alarm by-pass valve that connects the supply water directly to the pressure switch. This is usually a 1/2" or 3/4" ball valve. On most systems there will be two ball valves between the pressure switch and the alarm valve. One of these is the normally closed by-pass valve that is only opened for testing. The other valve is a normally open alarm shut off valve. It is used to either silence the pressure switch in an actual alarm or to disable it if water must be flowed into the system.

The pressure switch should be installed on top of a retard chamber or a pressure switch with a built-in retard should be used. If the switch is installed on top of the retard chamber, it will activate as soon as the retard chamber fills. The time delay provided by a retard chamber will vary depending on the water supply pressure at the time. The time delay provided by a pressure switch with a built-in retard will remain constant. As long as the pressure at the switch is at least 6 psi, the switch will trip after the retard times expires.

Fig. 14



Dry Pipe Systems

Waterflow Switch - Pressure Type

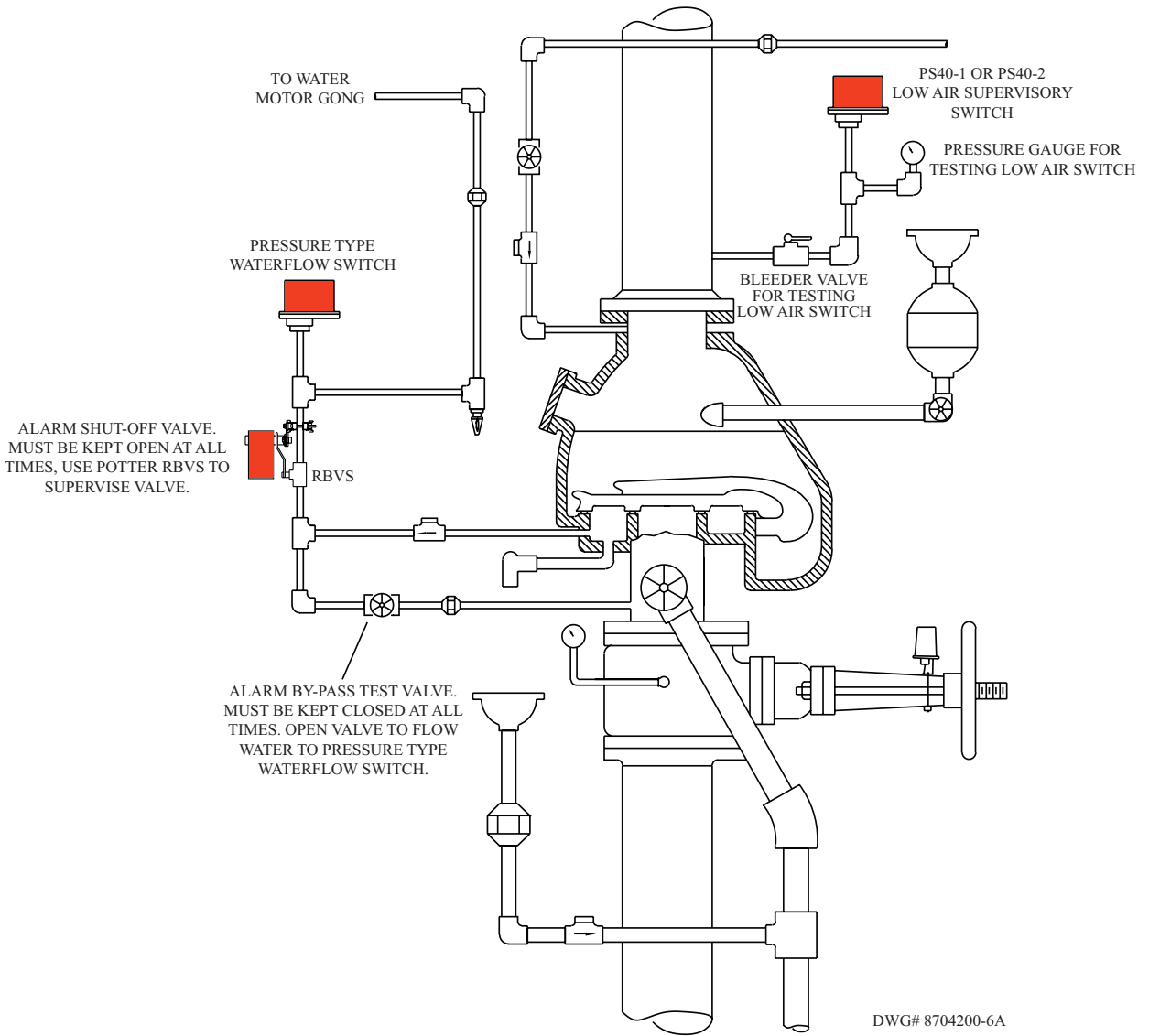
Unless an annual trip test is being done, open the alarm by-pass valve. This will allow water to flow from the water supply directly to the pressure type flow switch, as soon as the pressure reaches 6 psi, the flow switch should trip. This is usually a 1/2" or 3/4" ball valve. On most systems there will be two ball valves between the pressure switch and the alarm valve. One of these is the normally closed by-pass valve that is only opened for testing. The other valve is a normally open alarm shut-off valve. It is used to either silence the pressure switch in an actual alarm or to disable it if water must be flowed into the system.

Low Air Supervisory Switch

The low air switch should have a bleeder valve installed in line with the switch and a pressure gauge. A bleeder is a 1/2" ball valve with a small orifice drilled in one end of the valve. When the valve is closed it bleeds off the air pressure between the valve and the pressure switch. A pressure gauge should be installed on the pressure switch side of the bleeder valve so it can be determined at exactly what pressure the switch trips at. The low pressure switch should trip at 10 psi below the normal air pressure which should also be 10 psi above the trip point of the dry pipe valve. After the switch trips, open the bleeder valve.

If a bleeder valve is not installed: Shut off the water supply to the system. Shut off the air compressor. Slowly bleed air off the system while observing the the pressure gauge so it can be determined at what pressure the low air switch trips at. To bleed air off, a pipe union may need to be loosened or the inspector's test valve partially opened. After the switch trips, close the inspector's test valve or tighten the pipe union, turn on the air compressor. After the air pressure returns to normal, very slowly open the water supply valve.

Fig. 15



Sprinkler System Supervision Includes:

Water Pressures

Water Flow

Water Supply Control Valves

Fire Pump Status

Water Tank, Levels, Pressures and Temperatures

Air Pressure on Dry Pipe Systems

Building Temperature

Water supply control valves shall be supervised to obtain a distinctive signal when in an off normal position, within 2 revolutions of the handwheel, or when the valve has moved 1/5 from its normal position.

The switch shall not restore to a normal condition throughout the entire travel of the valve, until it is restored to a fully open position.

When connected to a fire alarm panel, a Supervisory signal must be visually or audibly distinctive from both Alarm and Trouble signals.

Water flow and supervisory devices cannot be connected on the same initiating circuit so that the closing of a valve is annunciated as a “trouble” condition.

Inspection testing and maintenance of water based fire protection systems shall be conducted in accordance with applicable NFPA codes and standards such as NFPA 25 and/or the Authority Having Jurisdiction. Please refer to NFPA 25.2017 Annex B for forms and reports.

Visual Inspections *Inspections are required at various frequencies as noted below.*

Daily

Dry Pipe Systems:

- During freezing weather, the heated enclosure for the dry pipe valve should be checked to assure it is adequately heated.

Weekly

All Sprinkler Systems:

- Inspect control valves (if sealed).
- Water supply valves, including post indicator and roadway valves, should be checked weekly if sealed and monthly if locked or supervised to assure that they are open.
- Inspect condition of sprinkler heads.
- Heads should be checked to make sure they are not damaged or blocked by storage and have not been painted or otherwise impaired.
Note: An 18 inch (457-mm) clear space must be maintained below the sprinklers to assure an adequate discharge pattern. Attachment of 18-inch-long paper or plastic streamers to the sprinkler piping helps remind people working in storage areas of the minimum clear space requirement.

Dry Pipe Sprinkler Systems:

- Inspect air pressure and water pressure gauges. Be sure that air and water pressures are within the normal range for that particular system.
- Record pressure readings. It is recommended that the normal pressure be noted on the gauge or a tag attached to it. A loss of pressure of more than 10 percent should be investigated.

Monthly

All Sprinkler Systems:

- Inspect fire department connections. Connections should be accessible and visible at all times. Caps or plugs should be in place and threads clean, undamaged and lightly lubricated with graphite.
The connection should be drained through the ball drip from the check valve to assure it will not freeze.
- Inspect control valves (if locked), including post indicator and roadway valves to assure they are open
- Water supply valves, including post indicator and roadway valves, should be checked to assure that they are open.

Quarterly

- Determine dry pipe system priming water level, if required by manufacturer by slowly opening the priming water level test valve. If only air escapes, close the test valve and add priming water. This is done by closing the lower priming valve, opening the upper priming valve, and adding approximately 1 quart of water through the priming funnel. The upper priming valve is then closed and the lower priming valve opened, which allows the water to run into the dry pipe valve. Again, check the test valve. If water does not run out, repeat the procedure. When sufficient water has been added so that water drains from the test valve, allow it to drain until air begins to escape, then close the valve securely. Also be sure the upper and lower priming valves are closed securely.

Semi-annually

- Check cold weather valves (if provided) in the Fall, before freezing weather. The valves should be closed and that portion of the system drained. In the Spring, as soon as freezing weather has passed, the cold weather valve should be reopened.

Note: Cold weather valves are sometimes used to isolate a portion of a sprinkler system that might be subject to freezing temperatures. During cold weather, the valve is closed and that portion of the system is drained. However, cold weather valves are not desirable, as protection is not provided during cold weather or if valve is inadvertently left closed. Also, NFPA 13 does not recognize cold weather valves. A preferred arrangement would be to provide a dry pipe system in the unheated area, or an antifreeze loop in a small area.

Sprinkler Testing Quick Guide

Sprinkler	Testing^{1,2} or replacement required at:	Repeat testing required at:
All sprinklers not specified below	50 years from in-service date	10 year intervals until 75th year, then 5 year intervals ³
Quick Response	20 years from in-service date	10 year intervals
Dry sprinklers	10 years	10 years
Sprinklers in harsh environments ⁴	5 years	5 years
Extra high temperature or higher solder-type exposed to semi-continuous to continuous maximum allowable ambient temperature	5 years	5 years
Sprinklers manufactured prior to 1920	Replace	N/A

¹Where historical data indicate, NFPA 25 permits longer intervals between testing.

²Testing of a representative sample (minimum of 1% and no less than 4 sprinklers) must be done by a recognized testing laboratory acceptable to the AHJ.

³For example, testing or replacement is required at 50, 60, 70, 75, 80 (and every 5 years beyond).

⁴For guidance on examples of harsh environments, see annex section A.5.3.1.1.2 of the 2014 edition of NFPA 25.

Please refer to NFPA 25 2017, Chapter 5 for additional information on testing intervals for sprinkler components and piping inspection

Sprinkler Testing: *Testing is required at various frequencies as noted below.*

Quarterly

All Sprinkler Systems:

- Flow test main drains.

This involves noting and recording the pressure of the gauge on the lower side of the sprinkler valve (Figure 2-2 above). (This is the static water supply pressure.) Open the 2-inch main drain fully; after the flow has stabilized, note and record the pressure on the gauge again. (This is the residual water supply pressure.) If the pressure readings vary significantly from those readings previously recorded, there is indication that something may be wrong with the water supply — such as a closed valve or blocked pipe. Loss of pressure of more than 10 percent should be investigated immediately to determine its cause. The effect that the drop in pressure will have on the sprinkler system operation, as well as time to return to static, should also be determined to assure that the system will perform satisfactorily.

Wet Pipe System:

- Test water flow alarms.

Test alarms by opening the inspector's test connection. This simulates the flow of water from one sprinkler head and will activate the water motor alarm as well as the flow switch or pressure switch. (When freezing weather prohibits using the inspector's test, the alarm by-pass connection can be used. However, use of the alarm by-pass does not test the operation of the valve clapper and is not considered as good a test as using the inspector's test connection.)

Dry Pipe System:

- Test low air pressure alarm.

This test is conducted as follows:

1. Close the water supply valve so the system will not be accidentally tripped.
2. Slowly release air from the system by gently opening the inspector's test valve.
3. The low air pressure alarm should sound when the pressure drops to that recommended by the manufacturer. Do not allow pressure to drop sufficiently to trip the dry pipe valve.
4. After the test, make sure that the air supply valve is open and that the system air pressure has returned to normal, then reopen the water supply valve.

- Test water flow alarm.

Open the alarm by-pass valve. Use of the inspector's test connection is not desirable as it will cause the dry pipe valve to trip.

Semi-Annually

Deluge Sprinkler System:

- Test the fire detection system for proper operation. See Chapter 1 for additional information.

Preaction Sprinkler System:

- Test the fire detection system for proper operation. See Chapter 1 for additional information.

Annually

Wet Pipe Sprinkler Systems:

- Test the freezing point of antifreeze solutions if used. This is done by measuring the specific gravity with a hydrometer. Adjust the solution as necessary to maintain the freezing point of the solution below the estimated minimum temperature and within concentrations permitted

Dry Pipe Sprinkler Systems:

- Trip test the dry pipe valve at partial flow.
Before the trip test, the main drain valve should be fully opened and the water supply flushed out until the water flows clean. If a hydrant is located on the system supply, it should be flushed before the main drain is flushed. This flushing will help to reduce the amount of debris getting into the dry pipe system. Each dry pipe valve, including quick opening devices if provided, should be trip tested. This test should be done in the Spring after freezing weather, with the water supply control valve only partially open. Once the valve trips, the water control valve can be quickly closed so that the system is not filled with water. (*Caution:* Some dry pipe valves will not operate properly without an adequate flow of water to fully lift the clapper valve.) The valve is tripped by opening the inspector's test valve which releases air pressure within the system.
After the test, open the 2-inch main drain valve to drain the system. Remove the valve cover and thoroughly clean the valve interior. Renew worn or damaged parts as required, reset the valve, and replace the cover. Add priming water and open the air supply to fill the system with air. When the air pressure has reached its proper level, open the 2-inch main drain to reduce the chance of a water hammer tripping the system, then slowly open the water supply valve. When the water supply valve is fully open, slowly close the 2-inch main drain.

Every 3 years

- Trip test the dry pipe valve at full flow.
The dry pipe valve should be trip tested with the water supply valve fully open. The test should be terminated when clean water flows from the inspector's test connection.
A full trip test should also be conducted whenever the sprinkler system undergoes a major alteration or extension.

Every 5 years

All Sprinkler Systems:

- Remove a representative sample of sprinklers with temperature classification of Extra High (325°F or 163°C) or greater which are located in an area in which the temperature frequently exceeds the maximum allowable ceiling temperature. (See Table 2-1.) Provide new sprinklers of the same rating to replace the removed sprinklers. The removed sprinklers should be sent to a laboratory for operational testing in accordance with NFPA 13. If sprinklers fail to perform satisfactorily during the operational tests, all of the Extra High and higher temperature heads should be replaced with new sprinklers of similar rating.

Every 10 years

- Dry sprinklers that have been in service for 10 years shall be replaced or representative samples shall be tested and then retested at 10-year intervals.

Every 20 years

Sprinklers made with a fast response element and have been in service for 20 years shall be replaced or shall have a representative sample tested, and then new samples shall be tested every 10 years

Every 50 years

Remove a representative sample of standard response sprinklers from service and provide new sprinklers in their place. Send the removed sprinklers to a testing lab for operational testing in accordance with NFPA 13. If the sprinklers fail to perform satisfactorily during the operational tests, all of them should be replaced with new sprinklers of similar rating. After the 50-year operational test, the test should be repeated every 10 years.

Note: A representative sample consists of the larger of 1% or no less than four sprinklers per sampling area

Every 75 years

Sprinklers piping shall be replaced or representative samples from one or more sample areas shall be submitted to a recognized testing laboratory acceptable to the authority having jurisdiction for field service testing and repeated at 5-year intervals.

Smoke/Heat Detector Replacement See NFPA 72

Detector placement is critical to early warning functions. In order to provide an effective early warning of a developing fire situation, smoke detectors should be installed in all areas of the protected premises. Local codes or ordinances may not be adequate for early detection. The location, quantity and zoning of detectors should be engineered to provide maximum life safety, as opposed to meeting minimum requirements of local codes.

Defining The Smoke Chamber

The continuous, smoke resistant perimeter boundary of a room or area to be protected. Between the upper surface of the floor and the lower surface of the ceiling. The smoke barrier does not have to be a solid structure from floor to ceiling. A solid structure that extends 18" or more from the ceiling would constitute a smoke barrier.

Open "grid" material is considered solid when:

- The openings are less than 1/4" in the least dimension.
- The thickness of the material exceeds the least dimension.
- The openings constitute less than 70% of the area of the perforated material.

For Areas With Smooth And Flat Ceilings Ten Feet In Height

All points on the ceiling shall have a detector within a distance equal to .7 times the listed spacing.

Spot type detectors shall be located on the ceiling or, if on a sidewall, between the ceiling and 12" down from the ceiling to the top of the detector.

The distance between detectors shall not exceed their listed spacing. There shall be detectors within one-half the listed spacing, measured at right angles, from all side walls.

Detectors shall not be recessed mounted unless specifically listed for recess mounting.

Spot type smoke detectors must be a minimum 36" from air diffusers, and may not be in a direct airflow exceeding their air velocity, regardless of distance.

Detectors shall be supported independently of their attachment to circuit conductors.

Spot type detectors should be mounted at least 6' from florescent lights.

Except in cases where "stratification" is expected, detectors shall never be mounted more than 12" below ceiling level.

Detectors must be wired to ensure supervision of the detector head. Removal of the detector head must cause a trouble condition on the panel.

Ceilings

Smooth Ceiling Spacing - Spot Type Smoke Detectors

In the absence of specific performance-based design criteria, smoke detectors shall be permitted to be located using 9.1 m (30 ft) spacing. NFPA 72, 2016, 17.7.3.2.3.1

Solid Joist and Beam Construction

Solid joists shall be considered equivalent to beams for smoke detector spacing guidelines. NFPA 72, 2016, 17.7.3.2.4.1

Level Ceilings

1. For ceilings with beam depths of less than 10 percent of the ceiling height (0.1 H), smooth ceiling spacing shall be permitted. Spot-type smoke detectors shall be permitted to be located on ceilings or on the bottom of beams.
2. For ceilings with beam depths equal to or greater than 10 percent of the ceiling height (0.1 H), the following shall apply:
 - a. Where beam spacing is equal to or greater than 40 percent of the ceiling height (0.4 H), spot-type detectors shall be located on the ceiling in each beam pocket.
 - b. Where beam spacing is less than 40 percent of the ceiling height (0.4 H), the following shall be permitted for spot detectors:
 - i. Smooth ceiling spacing in the direction parallel to the beams and at one-half smooth ceiling spacing in the direction perpendicular to the beams.
 - ii. Location of detectors either on the ceiling or on the bottom of the beams
3. For beam pockets formed by intersecting beams, including waffle or pan-type ceilings, the following shall apply:
 - a. For beam depths less than 10 percent of the ceiling height (0.1 H), spacing shall be in accordance with 17.7.3.2.4.2

- b. For beam depths greater than or equal to 10 percent of the ceiling height (0.1 H), spacing shall be in accordance with 17.7.3.2.4.2
- 4. For corridors 15 ft (4.6 m) in width or less having ceiling beams or solid joists perpendicular to the corridor length, the following shall apply:
 - a. Smooth ceiling spacing shall be permitted.
 - b. Location of spot-type smoke detectors on ceilings, sidewalls, or the bottom of beams or solid joists
- 5. For rooms of 900 ft² (84 m²) or less, the following shall be permitted:
 - a. Use of smooth ceiling spacing
 - b. Location of spot-type smoke detectors on ceilings or on the bottom of beams

NFPA 72 2016, 17.7.3.2.4.2 See NFPA 72 2016, 17.7.3.2.3.1 and 17.7.3.2.4.4

Sloped/Peaked Ceilings

Sloped Ceiling - Having a slope of more than 1.5 inches per foot

Peaked Ceiling - Having a slope of more than 1.5 inches per foot in two directions from its highest point. May include domed or curved ceilings.

To determine if a ceiling is sloped or peaked:

Divide the difference between the height of the low wall and the highest point of the ceiling in inches by the width of the building in feet. If the answer is 1.5 or less, the ceiling is considered flat. (Highest point of ceiling in inches) minus (top of low wall in inches) divided by (width of building in feet).

Smoke and heat detector placement on sloped ceilings

Make all measurements parallel to the floor, not along the ceiling. Locate the point on the ceiling which is 3 ft. from the high sidewall. Locate the first detector anywhere within that three feet, except the four inches nearest the wall. The remaining detectors shall be located in the remaining area on the basis of the horizontal projection of the ceiling, spaced in accordance with the type of construction.

Smoke and heat detector placement on peaked ceilings

Detectors shall first be spaced and located within 3 ft of the peak, measured horizontally. The number and spacing of additional detectors, if any, shall be based on the horizontal projection of the ceiling NFPA 72 2016, 17.7.3.3.

Raised Floors and Suspended Ceilings

Spaces beneath raised floors and above suspended ceilings shall be treated as separate rooms for smoke detector spacing purposes. Detectors installed beneath raised floors or above suspended ceilings, or both, including raised floors and suspended ceilings used for environmental air, shall not be used in lieu of providing detection within the room. NFPA 72 2016, 17.7.3.5

To minimize dust contamination, smoke detectors, where installed under raised floors, shall be mounted only in an orientation for which they have been listed. NFPA 72 2016, 17.7.3.2.2

Protection During Construction

Where detectors are installed for signal initiation during construction, they shall be cleaned and verified to be operating in accordance with the listed sensitivity, or they shall be replaced prior to the final commissioning of the system.

Where detectors are installed but not operational during construction, they shall be protected from construction debris, dust, dirt, and damage in accordance with the manufacturer’s recommendations and verified to be operating in accordance with the listed sensitivity, or they shall be replaced prior to the final commissioning of the system.

Where detection is not required during construction, detectors shall not be installed until after all other construction trades have completed cleanup.

NFPA72, 2016 17.7.1.11

Heat Detectors Only

On ceilings 10 ft. to 30 ft. high, heat detector spacing shall be reduced.

Ceiling Height		% of Listed Spacing
Above	Up To	
0	10	100%
10	12	91%
12	14	84%
14	16	77%
16	18	71%

Ceiling Height		% of Listed Spacing
Above	Up To	
20	22	58%
22	24	52%
24	26	46%
26	28	40%
28	30	34%

Temperature Classification for Heat-Sensing Fire Detectors NFPA 72, 2016 Table 17.6.2.1

Note: The difference between the detectors rated temperature and the maximum ambient ceiling temperature should be as small as possible to minimize response time.

Temperature Classification	Temperature Rating Range		Maximum Ceiling Temperature		Color Code
	°C	°F	°C	°F	
low*	39-57	100-134	28	80	uncolored
ordinary	58-79	135-174	47	115	uncolored
intermediate	80-121	175-249	69	155	white
high	122-162	250-324	111	230	blue
extra high	163-204	325-399	152	305	red
very extra high	205-259	400-499	194	380	green
ultra high	260-302	500-575	249	480	orange

* Intended only for installation in controlled ambient areas. Units shall be marked to indicate maximum ambient installation temperature.

Release Systems General Information and Terminology

Single Zone Activation - Any single alarm condition will cause the release circuit to trip.

Cross Zone Activation - An alarm condition must be present on two or more zones simultaneously, before the release circuit will be energized.

Note: Cross zoning is used to help prevent false activation of the release circuit by requiring two or more detectors on two or more zones to alarm. It is mainly used on deluge or dry chemical systems where accidental discharge of the extinguishing agent must be prevented.

Or on double interlock systems where a smoke or heat detector must trip and a low air switch must also trip to indicate a loss of air pressure in the system due to an open sprinkler.

Pre-Discharge Time - The time between when the panel detects an alarm and when the release circuit is activated.

Note: The pre-discharge time is generally an adjustable timer on the release panel. It is primarily used on dry chemical systems. The purpose of the timer is to allow the appropriate personnel time to investigate the situation, or to allow people to evacuate the area and shut the doors before the chemical is released.

Discharge Time - The amount of time the release panel will energize the solenoid. If there is any doubt as to the amount of time this should be programmed for, set it for continuous. This will prevent the valve from accidentally slamming shut due to a momentary drop in water pressure. In the case of a double interlock system, it will insure that the valve will open regardless of the amount of time between when the panel detects an alarm, and a sprinkler opens to remove pressure from the system.

Suppression systems or groups of systems shall be controlled by a single control unit that monitors the associated initiating device(s), actuates the associated releasing device(s), and controls the associated agent release notification appliances. If the releasing control unit is located in a protected premises having a separate fire alarm system, it shall be monitored for alarm, supervisory, and trouble signals, but shall not be dependent on or affected by the operation or failure of the protected premises fire alarm system.

Exception: If the configuration of multiple control units is listed for releasing device service, and if a trouble condition or manual disconnect on either control unit causes a trouble or supervisory signal, the initiating devices on one control unit shall be permitted to actuate releasing devices on another control unit.

NFPA 72, 2016 23.11.8 - 23.11.10 **Water Flow Switch: PS10-1, PS10-2**

Water flow switches on single or double interlock systems, or deluge systems must be a pressure type device. The switch is installed in line with the intermediate chamber or alarm port. This section of piping may run to a water motor gong or just to a drain. Under normal (no alarm) condition, there is no water or pressure in this

section of piping. When water flows into the system, it also flows into this port. The flow switch will operate when the pressure reaches 6 psi. These devices do not need a retard as there should be no water surges. This device does not need adjusting.

The waterflow switch will not trip until after the release panel goes into alarm and operates the release circuit which opens the valve and allows water to flow into the system.

Low Air Pressure Switch: PS40-1, PS40-2, PS10-1, PS10-2

The pressure on single and double interlock systems must be monitored to ensure the integrity of the piping. On double interlock systems, a low air switch with two switches can be used. One switch could be set to trip first for a low air SUPERVISORY condition which would indicate a loss of air pressure possibly due to a failed compressor. The other switch could be set to trip a few psi lower for the low air ALARM. Then when a smoke or heat detector and the low air ALARM switch are both in alarm at the same time, the release panel will trip the solenoid. On systems with 5-15 psi, the PS10-1 will provide a low signal at 4 psi. It can be adjusted to trip between 4-15 psi. For systems with more than 15 psi, the PS40-2 will provide a low signal at 30 psi. It can be adjusted to trip between 10-60psi. To change the pressure settings, remove pressure from the device. Adjust the thumb wheel until the top of the wheel corresponds with the desired pressure setting on the scale. The switch should trip at approximately that pressure on a drop. Pressure supervisory switches should have a bleeder valve, model BVL installed in line for testing purposes.

Pre-Action (Single-Interlock) Systems

Pre-Action systems are basically dry pipe systems, except they use an electrically operated valve to hold back the water supply instead of a dry pipe valve. They are designed to overcome the operational delay of conventional dry pipe systems, and to eliminate the possibility of accidental water damage caused by accidental damage to the sprinkler heads or system piping.

The water supply valve is operated independently of the opening of sprinklers. The valve is opened by the operation of a releasing panel which is monitoring initiating devices such as smoke or heat detectors, not by the fusing of sprinklers.

Single interlock systems use closed sprinklers attached to a piping system containing supervisory air pressure. The water is held back by an electrically operated valve. The valve is connected to a compatible releasing panel. The panel is monitoring initiating devices such as smoke or heat detectors, and manual stations, that are located in the same area as the sprinkler heads. These devices are connected to the releasing panels alarm initiating zones. A low air pressure supervisory switch is used to monitor the supervisory pressure in the piping system, it is connected to a supervisory zone on the release panel.

If the system pressure drops due to an open sprinkler, damaged pipe, or air compressor failure, the pressure switch will cause a supervisory condition on the release panel, the valve will not open. If the smoke or heat detectors operate or if a manual station is activated, the release panel will go into an alarm condition, causing the release circuit on the panel to energize which will allow the valve to open and water to flow into the system piping, even if no sprinklers have opened.

Typical System Configuration (PFC-4410RC Program #1)

Initiating [inputs]

Zone #1 - Conventional Alarm Zone - Smoke or Heat detectors

Zone #2 - Conventional Alarm Zone - Smoke or Heat detectors

Zone #3 - Waterflow Zone - Pressure type waterflow switch

Zone #4 - Manual Station Zone - Pull Stations

Sup #1 - Supervisory Zone - Valve tamper and/or low air supervision

Sup #2 - Supervisory Zone - Valve tamper and/or low air supervision

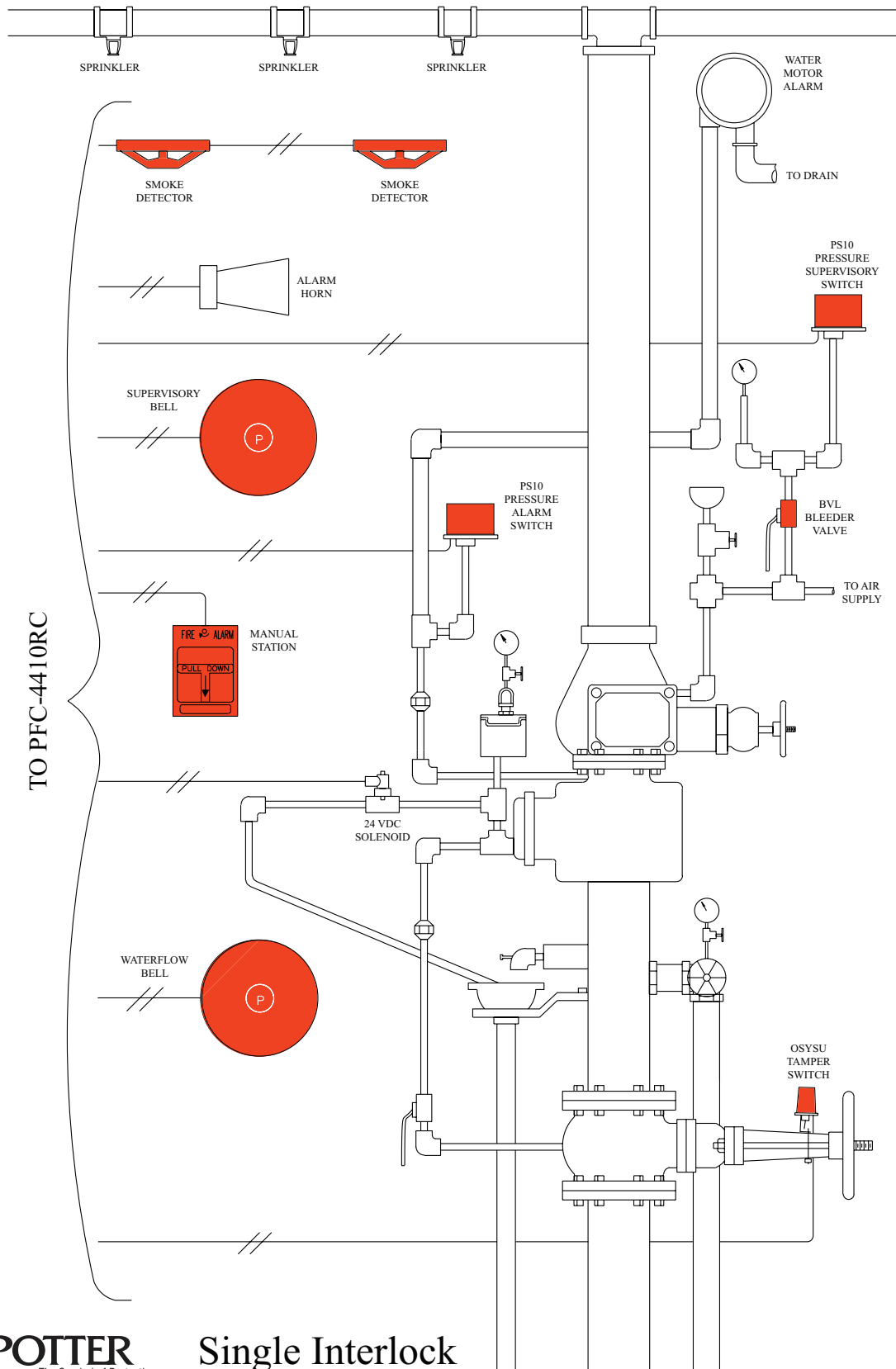
Indicating (outputs)

#1 - General Alarm - Operates as soon as the panel detects an alarm condition.

#2 - Waterflow Bell - Operates when the waterflow switch detects water flowing into the system.

#3 - Release - Opens the Solenoid to allow water into the system after the panel goes into alarm.

#4 - Supervisory - Bell or horn to indicate a supervisory condition.



Pre-Action (Double-Interlock) Systems

The double interlock system is designed for applications such as refrigerated areas, requiring maximum protection against inadvertent operation.

Double interlock systems use closed sprinklers attached to a piping system containing supervisory air pressure. The water is held back by an electrically operated valve. The valve is connected to a compatible releasing panel. The panel is monitoring initiating devices such as smoke or heat detectors, and manual stations that are located in the same area as the sprinkler heads. These devices are connected to the releasing panels alarm initiating zones.

The supervisory air pressure in the piping system is also monitored. A low air switch on a double interlock system may perform two functions. One is to send a supervisory signal if the air pressure drops to a certain point such as if an air compressor failed. This would be connected to a supervisory zone on the release panel. The other would be an alarm condition if the air pressure dropped farther such as from a sprinkler opening due to fire. This would be connected to an alarm initiating zone on the release panel and is one of the two events necessary for the panel to operate the release circuit. The other event is a smoke or heat detector going into alarm. On some release panels the low air switch may only cause a supervisory condition not an actual alarm condition even though it is still one of the two events necessary to operate the release circuit.

In order to trip the release circuit, two independent events must occur. The sprinkler system piping must lose air pressure due to the operation of one or more heads which causes the low air pressure switch to trip, and the release panel must detect an alarm from an initiating device such as a smoke or heat detector.

If the system pressure drops due to an open sprinkler, damaged pipe, or compressor failure, the pressure switch will cause a supervisory and/or an alarm condition on the release panel. If a smoke or heat detector or manual station has not operated, the release circuit will not trip because only one event has happened.

If a smoke or heat detector operates or a manual station is activated, the release panel will go into alarm. If the low air switch has not tripped, the release circuit on the panel will not operate because only one event has happened.

Typical System Configuration (PFC-4410RC Program #11)

Initiating (inputs)

Zone #1 - Conventional Alarm Zone - Smoke or Heat detectors

Zone #2 - Conventional Alarm Zone - Low Air Alarm switch

Zone #3 - Waterflow Zone - Pressure type waterflow switch

Zone #4 - Manual Station Zone - Pull Stations

Sup #1 - Supervisory Zone - Valve tamper and low air supervisory switch

Sup #2 - Supervisory Zone - Valve tamper and low air supervisory switch

Indicating (outputs)

#1 - Alarm - General alarm. Bell, horn, strobe, etc.

#2 - Alarm - Waterflow bell

#3 - Release - Solenoid on valve

#4 - Supervisory - Bell or horn to indicate supervisory condition

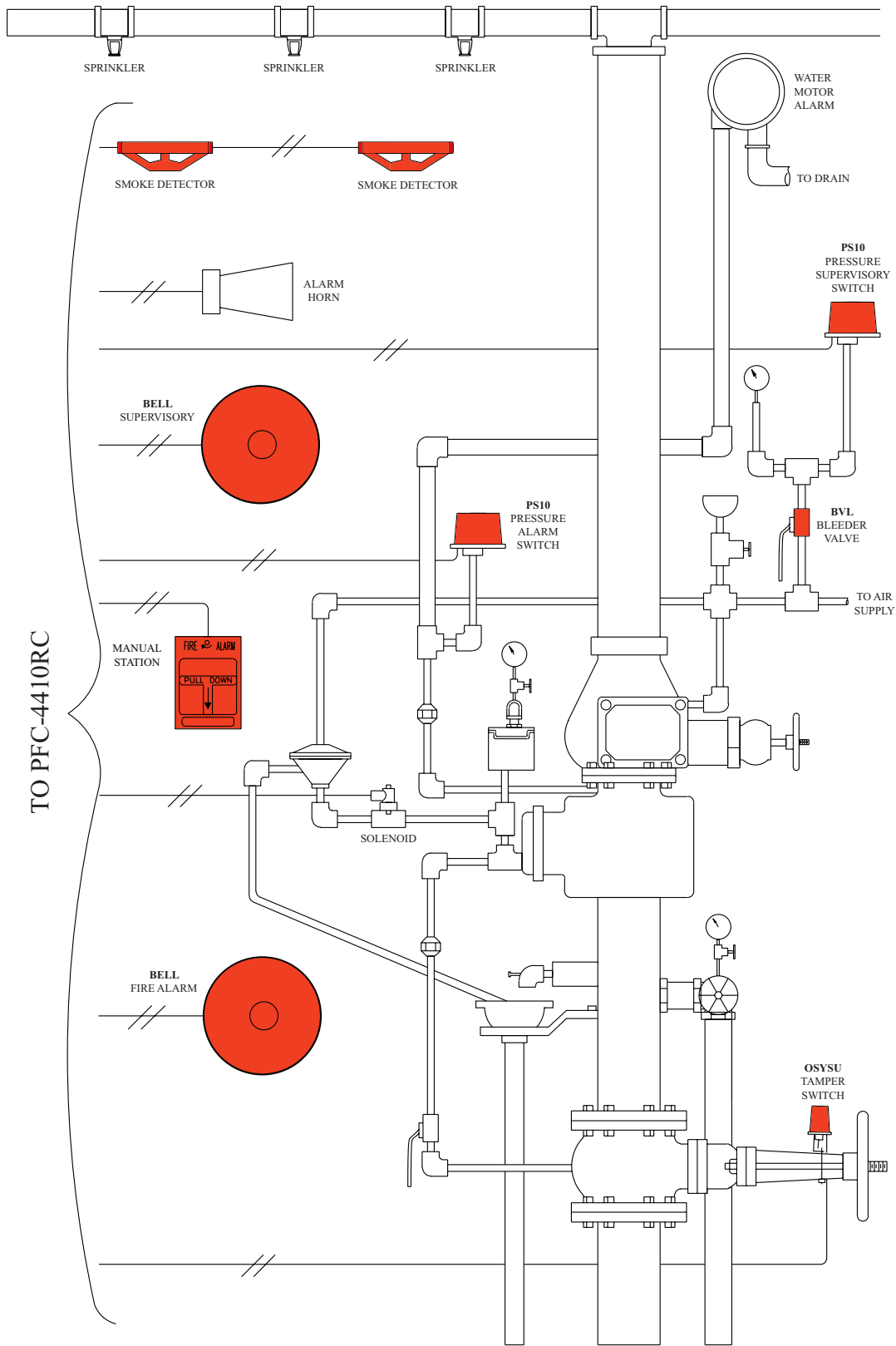
Theory of Operation

When both zones 1 and 2 are in alarm at the same time or if the manual station zone is activated, the release circuit and the general alarm outputs, will operate.

Activation of zone 1 or zone 2 will operate the general alarm output.

Activation of the waterflow zone will operate the waterflow output.

Activation of the supervisory zone will operate the supervisory output.



Double Interlock System

Deluge Systems

The purpose of a deluge system is to deliver water immediately to the protected area. It wets down an entire area by dispensing water through sprinklers or spray nozzles that are normally open. Since the operation of a deluge system does not rely on the opening of sprinkler heads, they are suitable for extra hazard occupancies in which flammable liquids are handled or stored.

The water for a deluge system is held back by an electrically operated valve. The valve is connected to a compatible release panel. The panel is monitoring initiating devices such as smoke or heat detectors, and pull stations. When the panel detects an alarm condition, the release circuit is energized. This allows the valve to open and water to flow into the system piping and out of the normally open sprinklers or spray nozzles.

In order to prevent an accidental discharge of water, deluge systems are sometimes crosszoned. This requires two initiating zones with one device in each zone to be in alarm before the panel will energize the release circuit. A manual station zone will override the cross zoning feature and cause the release circuit to be energized immediately.

Typical Configuration

Initiating (inputs)

Zone #1 - Conventional Alarm Zone - Smoke or Heat detectors

Zone #2 - Conventional Alarm Zone - Smoke or Heat detectors

Zone #3 - Waterflow Zone - Pressure type waterflow switch

Zone #4 - Manual Station Zone - Pull Stations

Sup #1 - Supervisory Zone - Valve tamper

Sup #2 - Supervisory Zone - Valve tamper

Note: If the panel is programmed for cross zone operation, both zones 1 and 2 would have to be in alarm before the release circuit would become energized. The manual station zone would override the cross zoning feature.

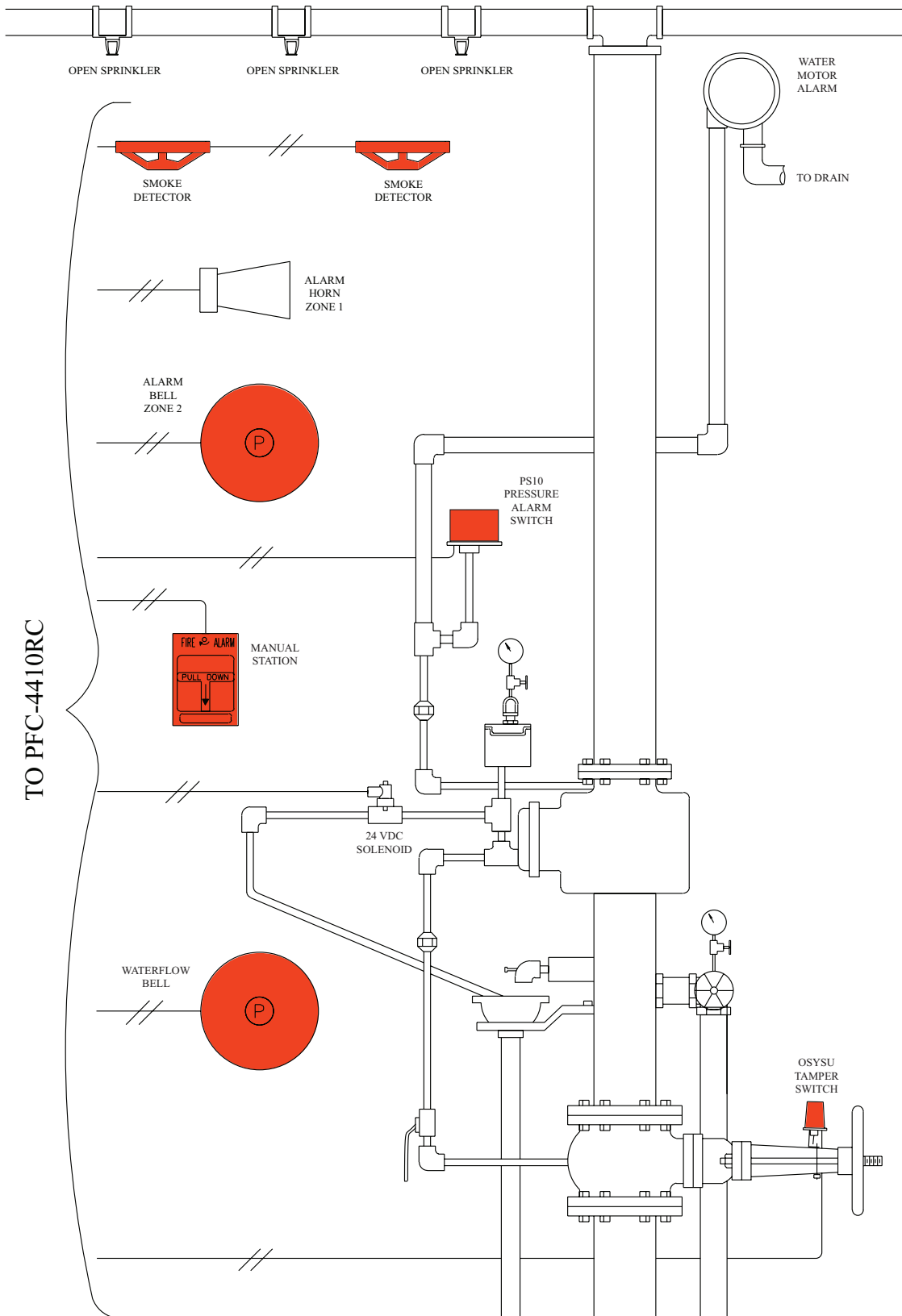
Indicating (outputs)

#1 - Alarm - General alarm. Bell, horn, strobe, etc.

#2 - Alarm - Waterflow bell

#3 - Release - Solenoid on valve

#4 - Supervisory - Bell or horn to indicate supervisory condition



**DELUGE VALVE
SYSTEM**

DWG# 8704200-K

System Installation

- Read and Understand All Instructions Before Proceeding
- Follow the manufacturers instructions
- Never connect or disconnect wiring or circuit boards with any power applied!
- Test release panel completely before bringing it to the job site. This will eliminate the possibility of installing a defective panel
- Perform power calculations to determine if system power supply and wiring are sufficient
- Perform battery calculations to determine proper battery size
- Fire circuits cannot be run in the same raceway, cable or conduit as high voltage circuits
- When not in conduit, fire circuits should not be strapped to high voltage conduit, as electrical “noise” can interfere with the fire circuits
- Prepare a carefully laid out drawing of the complete system, including wiring hookup. A copy of this drawing should be secured in the panel cabinet
- Locate the panel for convenience and serviceability
- Carefully remove the panel and any associated modules from the cabinet
- Mount the cabinet and complete all conduit connections
- Pull all system wiring through conduit, tag and mark wires
- Install panel and any associated modules in cabinet
- Check integrity of field wiring

Before making any external circuit connections:

1. Power up the panel using only the end of line devices. The panel should be in a normal condition
2. Power down
3. Connect one circuit
4. Power up, panel should be in a normal condition
5. Repeat steps 2-4 until installation is complete

Battery Size Calculations

To use Calculation Table

1. List in column #1 all devices used in the system, include all modules, bells, horns, door holders, and smoke detectors (see table #1 or manufacturers specifications).
2. List in column #2 the quantity of each device.
3. List in column #3 the standby current of each device (exclude all signal indicating devices).
4. List in column #5 the alarm current of each device.
5. For each line, multiply the figure in column #2 by the figure in column #3 and enter the product in column #4. Then multiply the figure in column #2 by the figure in column #5 and enter the product in column #6.
6. Add the figures in columns #3 and #6, enter the sums in the appropriate Total mA box.
7. Convert these figures from mill amperes to amperes by multiplying by 0.001, enter the product in the appropriate Total A box.
8. Multiply the standby total amperes by required time in hours from table 2.
9. Divide the alarm total amperes by 12 (5 mins.).
10. Add the standby AH and the alarm AH and divide this sum by 0.85 (efficiency factor). Select a battery that has an AH rating above this figure but not less than 6.5AH.

Battery Size Requirements and Maintenance

These panels require a 24 volt gel-cell battery for proper operation. 24 hours of standby power is required for Local Systems and Central Station (NFPA-72).

The chart below will assist you in selecting the proper size battery: (Does not include LED Annunciator)

Number of Smoke Detectors	Number of Bells (100mA each)	Auxiliary Power Requirements	Standby Hours Required	Battery Size (2 Required)	Part/Stock Number
0-100	0-10	0-25mA	24	8AH	BT-80/5130084
0-100	0-10	0-30mA	90	18AH	BT-180/5130086

Note: Maximum allowed battery size for UL Listings is 12AH. FM and others may require more than 24 hours of standby time and may use larger batteries (Potter stock model 1000015). Mark the purchase date on the batteries. Test the batteries at least semi annually according to the battery test methods in NFPA72 or the battery manufacturers instructions. Replace the batteries if they either fail the test or after four years of use.

Table 1 Current Requirements

Module/Device	Standby mA*	Alarm mA*
PFC-4410RC	121	274
RA-4410RC	11	13

*Add 23 mA plus current requirement of all devices connected for each output programmed as Trouble Bell
 **Includes one zone short circuit current.

Table 2 Secondary Power Supply Requirements

Service Use	Standby Time	Alarm Time
NFPA 72 • Central Station (PPU) • Local	24 hrs. 24 hrs.	5 mins. 5 mins.
FMRC 1011 and 1012, Deluge and Pre-action Systems Where requested by FM or others. 90 Hours is not a UL requirement.	90 hrs.	10 mins.

Calculation Table

1	2	3	4	5	6
Module/Device	Quantity	Standby mA Per Unit	Total Standby Current	Alarm mA Per Unit	Total Alarm Current
Total mA				Total mA	
Convert to A			x 0.001	Convert to A	x 0.001
Total A				Total A	
Multiply by hours from table 2			x ___	5 min/12 or 10 min/6	÷ ___
Total Standby AH				Total Alarm AH	
				+ Total Standby AH	
				Total AH	
				Efficiency Factor	÷ 0.80
				Required AH	

Use a battery with a higher AH rating than Required AH

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Features

- Multi-Hazard Operation
- Programmable Cross Zoning
- Supervised Microprocessor
- Custom Banner Message and Zone Description text
- Releasing Circuits Protected From False Activation
- Continuous or Timed Discharge
- 40 Event History Buffer
- Walktest with Automatic Time-out
- Alarm, Trouble Supervisory, and Waterflow relays
- Optional Class A Initiating Zone and output module
- 24 Standard Programs in Panel Memory
- Suitable for agent or water-based extinguishing
- Programmable pre-discharge timers*
- One Class B Abort circuit* (Defaults to additional supervisory zone in water based mode.)
- Four Abort modes*

* Available in Chemical mode only

** One zone programmable as abort in chemical mode.



General Description

The Potter Model PFC-4410RC is a flexible multi-hazard releasing control panel that is well suited for a number of applications. The PFC-4410RC is listed for use with pre-action and deluge sprinkler suppression systems and agent based fire suppression systems.

The panel utilizes a microprocessor-based system that has 24 Standard Programs, which covers a majority of installations. The simple to follow Menu Structure programs the entire system in a matter of minutes. In addition to the Standard Programs, the panel allows custom programming to accommodate any installation.

The panel is Ninth Edition UL listed, ULC listed, Factory Mutual, California State Fire Marshal (CSFM), New York Materials Equipment Acceptance (MEA) Approved, CE Marked, and RoHS Compliant.

The PFC-4410RC is housed in a durable steel cabinet with removable door and key lock. The panel is available in either a red or white finish and an optional flush mount trim ring is available. The cabinet contains knockouts on the side, back and top of the cabinet to ease installation. In addition, the cabinet will house up to 18 amp-hour batteries that will provide in excess of 90 hours of standby power.

Technical Specifications

Dimensions	18 1/2" H x 14 1/4 W x 4 3/4" D
Enclosure	18 gauge cold rolled steel with removable locked door with Lexan viewing window
AC Mains	120VAC, (60 Hz, 165VA) 220VAC, (50/60 Hz, 185VA)
Battery	121 mA Standby 247 mA Alarm
Temperature and Humidity Range	32° to 120° (0°C to 49°C) with a maximum humidity of 93% non-condensing.
Standards	NFPA 72, NFPA12, NFPA12A, NFPA-13, NFPA-15, NFPA-16, NFPA-17, NFPA-17A, NFPA-750, and NFPA-2001.

Architects/Engineers Specifications

The control panel for the extinguishing agent releasing system shall be a microprocessor based control capable of protecting multiple hazards in one control panel. It shall be Underwriters Laboratories Inc. listed under Standard 864 Ninth Edition and Underwriters Laboratories of Canada for Local Control Units for Releasing Service. The control shall also be approved by Factory Mutual Research Corporation and be compliant with the requirements of NFPA-72 (Local: A, M, SS service types; DAC and NC signaling type) and NFPA12, NFPA12A, NFPA-13, NFPA-15, NFPA-16, NFPA-17, NFPA-17A, NFPA-750, and NFPA-2001.

The control shall be housed in an 18 gauge steel cabinet that has a hinged, removable door with a key lock. The finish shall be baked enamel and available in red or off-white with contrasting trim and logo. An optional matching bezel should be available for semi-flush mounting. The cabinet shall have adequate space to house 18 AH standby batteries capable of operating the system for at least 90 hours.

The control shall include a fully supervised integral power supply/battery charger capable of providing 200mA to the auxiliary power circuit. It shall also be capable of providing 2.5 Amps to all releasing and notification appliance circuits combined. All initiating, output and auxiliary power circuits shall be power limited.

The control shall have a 32 character (16 characters, 2 lines) backlit LCD display and a 34 LED supplemental display. All diagnostic and alarm event information shall be viewable in text form on this display. A field programmable custom banner message with the current date and time shall be displayed when no current alarm or diagnostic information exists.

All operational features of the control panel shall be field programmable using menu driven selections on the alpha-numeric display and on board controls. No special programmer will be required and jumpers or switches to configure operational features shall not be permitted. Alarm and trouble indications shall resound when required.

The control panel shall be equipped with 24 programs built into the panel memory, 15 for water based extinguishing and 9 for agent extinguishing. In addition, the panel shall have the ability to add custom programs. All programming functions shall be password protected.

The control shall have four fully supervised Class B (Style B) initiating circuits capable of supporting the operation of 25 compatible 2-wire smoke detectors on each circuit.

The individual circuits shall be selectable through the programming sequence to operate in one of the following modes: Conventional, Waterflow, Linear Heat Detection (up to 700 ohms per zone), Manual Release, Low Air Alarm, Supervisory, Tamper, Low Air or High Air.

Optional Class A modules, CA2Z, may be added for Class A operation.

The panel shall have a Low Air Zone that creates a supervisory condition and can be mapped to a release output.

The control shall have two fully supervised Class B (Style B) supervisory circuits. These circuits shall be selectable through the programming sequence to operate in one of the following modes: Supervisory, Tamper, Low Air or High Air.

The control shall have one fully supervised class B (style B) Abort circuit with 4 different operating modes, ULI, IRI, and NYC, and 30 second.

The control shall have four fully supervised Class B (Style Y) output circuits. These circuits shall be selectable through the programming sequence to operate as one of the following: Alarm Notification Appliance, Supervisory Notification Appliance, Trouble Notification Appliance or Releasing. The optional CAM module may be added to convert the outputs to Class A.

The panel shall have an RS-485 output and auxiliary power outputs for connection and supervision of up to 4 remote annunciators or an ARM-44 Relay Module and 3 annunciators.

The releasing circuits shall be supervised for short circuit conditions and shall be programmable for cross zoning operation when required. The discharge timer for these releasing circuits shall be programmable for times of 7, 8, 9, 10, 20 minutes or continuous. All initiating and output circuits shall be capable of being individually disabled or enabled. In addition, when in the agent extinguishing mode there shall be a pre-discharge timer adjustable from 0-60 seconds from an alarm zone or 0-30 seconds from a manual release zone.

The control shall have a test mode that will automatically disable all releasing circuits. The test mode shall operate in such a manner as to automatically reset the initiating circuit and indicating circuits after detecting each alarm condition initiated by the test. All testing shall be recorded in the 40 event history buffer. The test mode will automatically terminate after twenty minutes of inactivity.

The control shall have four integral relay contacts rated 3 Amps at 30 VDC for connection to external auxiliary equipment. One relay shall operate when an alarm condition occurs, another when a trouble signal occurs, the third when a supervisory condition occurs, and the fourth during a waterflow condition.

Ordering Information

Model	Description	Stock No.
PFC-4410RC	4 Zone Releasing Control (White Cabinet)	3992360
PFC-4410RC	4 Zone Releasing Control (Red Cabinet)	
PFC-4410RC-PCA	Replacement Motherboard	
PFC-TW	Bezel for Semi-Flush Mounting (White)	
PFC-TR	Bezel for Semi-Flush Mounting (Red)	
BT-80	Battery, 12V 8AH for 24 hour standby (2 Req'd)	
BT-120	Battery, 12V 12AH for 24 hour standby (2 Req'd)	
BT-180	Battery, 12V, 18AH for 90 hour standby (2 Req'd)	
CA2Z	2 Zone Class A Initiating Circuit Module	
CAM	Class A Indicating Circuit Module	
ARM-44	Relay Module for PFC-4410RC	
ARM-2	Auxiliary Relay Module	
RA-4410RC	Remote Annunciator	
BB-RA-44R	Surface Mount Back Box for RA-4410RC (Red)	

Features

- Listed for indoor and outdoor use
- Outdoor use requires BBK-1 or HC-BB weatherproof back box
- Indoor use mounts directly to standard 4" box
- Low current draw
- High dB output
- AC and DC models
- DC models are motor driven, polarized, and have built in transient protection for supervised alarm circuits
- Available in 6", 8" and 10" sizes



* ULC on MBA-DC Only

Description

These vibrating type bells are designed for use as fire or general signaling devices. They have low power consumption and high decibel ratings. The unit mounts on a standard 4" (101mm) square electrical box for indoor use or on a model BBK-1 or HC-BB weatherproof backbox for outdoor applications. Weatherproof backbox model BBK-1 or HC-BB, Stock No. 1500001.

Notes

1. Minimum dB ratings are calculated from integrated sound pressure measurements made at Underwriters Laboratories as specified in UL Standard 464. UL temperature range is -30° to 150°F (-34° to 66°C)
2. Typical dB ratings are calculated from measurements made with a conventional sound level meter and are indicative of output levels in an actual installation.
3. ULC only applies to MBA DC bells.

Technical Specifications

Dimensions	6" (150mm), 8" (200mm) and 10" (250mm)
Enclosure	Cover: Steel Finish: Red Powder Coat Base: non-corrosive composite material All parts have corrosion resistant finishes Model BBK-1 or HC-BB weatherproof backbox (optional)
Voltages Available	24VAC 120VAC 12VDC (10.2 to 15.6) Polarized 24VDC (20.4 to 31.2) Polarized
Environmental Limitations	Indoor or outdoor use (See Note 1) -40° to 150°F (-40° to 66°C) (Outdoor use requires weatherproof backbox.)
Termination	AC Bells - 4 No. 18 AWG stranded wires DC Bells - Terminal strip
Service Use	NFPA 13, 72, local AHJ

Size inches (mm)	Voltage	Model Number	Stock Number	Current (Max.)	Typical dB at 10 ft. (3m) (2)	Minimum dB at 10 ft. (3m) (1)
6 (150)	12VDC	MBA-6-12	1750070	.12A	85	76
8 (200)	12VDC	MBA-8-12	1750080	.12A	90	77
10 (250)	12VDC	MBA-10-12	1750060	.12A	92	78
6 (150)	24VDC	MBA-6-24	1750100	.06A	87	77
8 (200)	24VDC	MBA-8-24	1750110	.06A	91	79
10 (250)	24VDC	MBA-10-24	1750090	.06A	94	80
6 (150)	24VAC	PBA246	1806024*	.17A	91	78
8 (200)	24VAC	PBA248	1808024*	.17A	94	77
10 (250)	24VAC	PBA2410	1810024*	.17A	94	78
6 (150)	120VAC	PBA1206	1806120*	.05A	92	83
8 (200)	120VAC	PBA1208	1808120*	.05A	99	84
10 (250)	120VAC	PBA12010	1810120*	.05A	99	86

*Specifications subject to change without notice.

⚠ WARNING

- Installation must be performed by qualified personnel and in accordance with all national and local codes and ordinances.
- Shock hazard. Disconnect power source before servicing. Serious injury or death could result.
- Risk of explosion. Not for use in hazardous locations. Serious injury or death could result.

⚠ WARNING

In outdoor or wet installations, bell must be mounted with weatherproof backbox, BBK-1 or HC-BB. Standard electrical boxes will not provide a weatherproof enclosure. If the bell and/or assembly is exposed to moisture, it may fail or create an electrical hazard.

All DC bells are polarized and have built-in transient protection. * Does not have ULC listing.

Installation

The bell shall be installed in accordance with NFPA 13, 72, or local AHJ. The top of the device shall be no less than 90" AFF and not less than 6" below the ceiling.

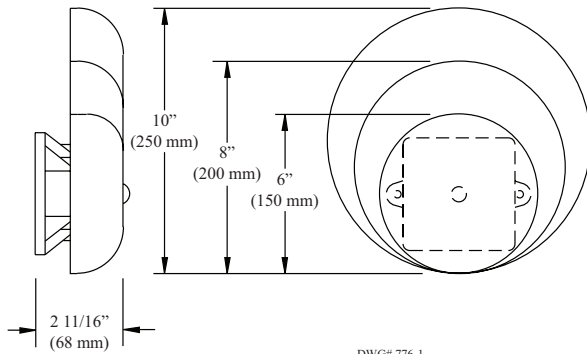
1. Remove the gong.
2. Connect wiring (see Fig. 3).
3. Mount bell mechanism to backbox (bell mechanism must be mounted with the striker pointing down).
4. Reinstall the gong (be sure that the gong positioning pin, in the mechanism housing, is in the hole in the gong).
5. Test all bells for proper operation and observe that they can be heard where required (bells must be heard in all areas as designated by the authority having jurisdiction).

WARNING

Failure to install striker down will prevent bell from ringing.

Bell Dimension Inches (mm)

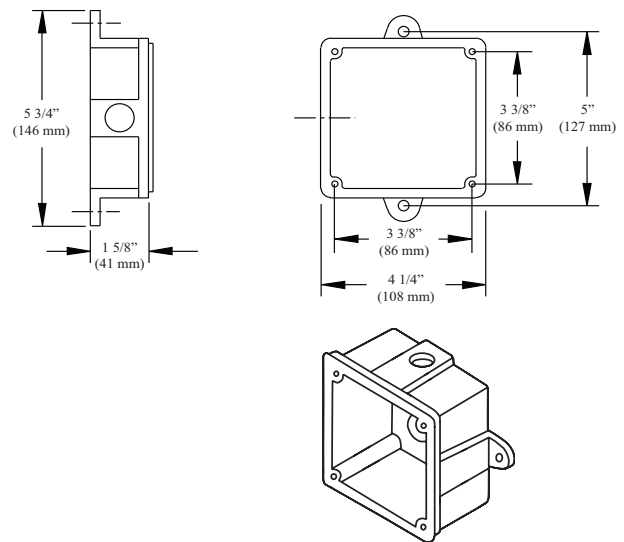
Fig 1



Weatherproof Backbox Dimensions Inches (mm)

MODEL BBK-1 OR HC-BB

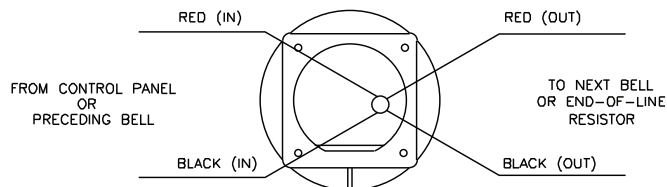
Fig 2



Wiring Rear View

Fig 3

D.C. BELLS (OBSERVE POLARITY)

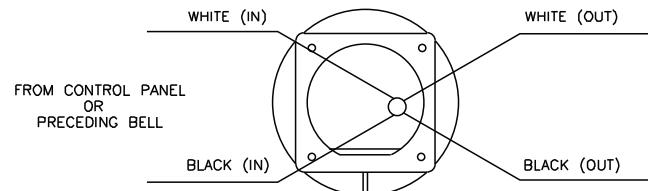


CAUTION:
WHEN ELECTRICAL SUPERVISION IS REQUIRED USE IN AND OUT LEADS AS SHOWN.

NOTES:

1. OBSERVE POLARITY TO RING D.C. BELLS.
2. RED WIRES POSITIVE (+).
3. BLACK WIRES NEGATIVE (-).
4. EOL RESISTOR IS SUPPLIED BY FIRE ALARM CONTROL PANEL.

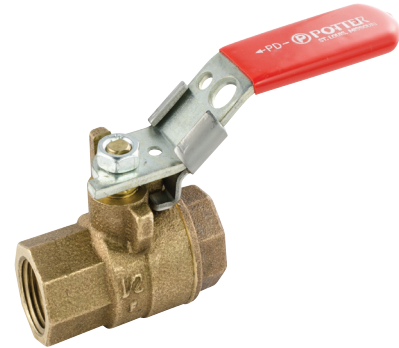
A.C. BELLS



CAUTION:
WHEN ELECTRICAL SUPERVISION IS REQUIRED USE IN AND OUT LEADS AS SHOWN.

NOTES:

1. WHEN USING A.C. BELLS, TERMINATE EACH EXTRA WIRE SEPERATELY AFTER LAST BELL.
2. END-OF-LINE RESISTOR IS NOT REQUIRED ON AC BELLS .



Installation

The BVL should be installed in-line to the alarm or supervisory device with the “PD” (Potter Device) stamp, or with the arrow pointing toward the alarm or supervisory device that is to be tested.

Wiring Instructions

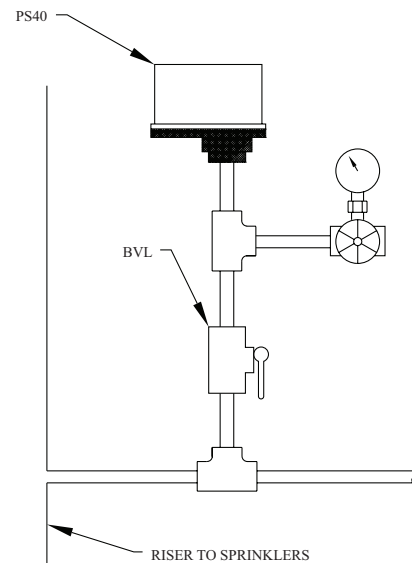
The Model BVL, lever type bleeder valve, is for use as a test valve for pressure operated devices on wet pipe sprinkler systems that have excess pressure, or dry pipe sprinkler systems.

The BVL should be installed in-line with the pressure device. It provides a convenient means for removal or testing the pressure actuated device without affecting the pressure in the system. Closing the valve (moving the valve handle perpendicular to the 1/2” pipeline) shuts off the water or air from the supply and opens a small orifice (pin-hole) to exhaust the pressure between the valve and the pressure device. This should provide a low pressure actuation of the pressure device, testing its operation.

Technical Specifications

Exhaust Orifice	.125” (3mm)
Material	Valve Body: Bronze Handle: Zinc Plated Steel
Connection	1/2” NPT male
Maximum System Pressure	300 PSI (20,68 BAR)

*Specifications subject to change without notice.



CAUTION

The BVL should be installed so the exhaust orifice is pointed in a safe direction.

Features

- NEMA 4X* (IP 65) and 6P (IP 67)
- **Enclosure is 4X. For additional corrosion protection of mounting hardware, use model OSYSU-2 CRH*
- -40° to 140° (-40°C to 60°C) operating temperature range
- Visual switch indicators
- Two conduit entrances
- Adjustable length trip rod
- Accommodates up to 12AWG wire
- Three position switch detects tampering and valve closure
- Knurled mounting bracket prevents slipping
- Fine adjustment feature for fast, easy installation
- RoHS compliant
- One or two SPDT contact models (-1,-2)



NOTICE

Before any work is done on the fire sprinkler or fire alarm system, the building owner or their authorized representative shall be notified. Before opening any closed valve, ensure that opening the valve will not cause any damage from water flow due to open or missing sprinklers, piping, etc.

Important: This document contains important information on the installation and operation of OS&Y valve supervisory switches. Please read all instructions carefully before beginning installation. A copy of this document is required by NFPA 72 to be maintained on site.

Description

The OSYSU is used to monitor the open position of an OS&Y (outside screw and yoke) type gate valve. This device is available in two models; the OSYSU-1, containing one set of SPDT (Form C) contacts and the OSYSU-2, containing two sets of SPDT (Form C) contacts. These switches mount conveniently to most OS&Y valves ranging in size from 2" to 12" (50mm to 300mm). They will mount on some valves as small as 1/2" (12,5mm).

The cover is held in place by two tamper resistant screws that require a special tool to remove. The tool is furnished with each device.

Testing

The operation of the OSYSU and its associated protective monitoring system shall be inspected, tested, and maintained in accordance with all applicable local and national codes and standards and/or the Authority Having Jurisdiction (manufacturer recommends quarterly or more frequently). A minimum test shall consist of turning the valve wheel towards the closed position. The OSYSU shall operate within the first two revolutions of the wheel. Fully close the valve and ensure that the OSYSU does not restore. Fully open the valve and ensure that the OSYSU restores to normal only when the valve is fully opened.

CAUTION

Close the valve fully to determine that the stem threads do not activate the switch. The switch being activated by the stem threads could result in a **false valve open** indication.

Technical Specifications

Dimensions	See Fig 8
Weight	1.6 lbs (0,73 kg)
Enclosure	Cover: Die Cast Finish: Red Powder Coat Base: Die Cast Finish: Black Powder Coat All parts have corrosion resistant finishes
Cover Tamper	Tamper Resistant Screws Optional Cover Tamper Switch Available
Contact Ratings	OSYSU-1: One Set of SPDT (Form C) OSYSU-2: Two Sets of SPDT (Form C) 10.0 Amps at 125/250 VAC 2.0 Amps at 30VDC Resistive 10 mAmps minimum at 24 VDC
Environmental Limitations	-40° F to 140°F (-40°C to 60°C) NEMA 4X (IP 65) and NEMA 6P (IP 67) Enclosure (Use suitably rated conduit and connector) Indoor or Outdoor Use (See OSYSU-EX Bulletin 5400705 for Hazardous locations)
Conduit Entrances	Two Knockouts for 1/2" conduit provided (See Notice on Page 6 and Fig. 9 on Page 5)
Service Use	NFPA 13, 13D, 13R, 72

Specifications subject to change without notice

Theory of Operation

The OSYSU is a 3 position switch. The center position is the normal installation position. Normal is when the switch is installed on the OS&Y valve, the valve is fully open and the trip rod of the OSYSU is in the groove of the valve stem. Closing the valve causes the trip rod to ride up out of the groove and activates the switches. Removing the OSYSU from the valve causes the spring to pull the trip rod in the other direction and activates the switches.

Visual Switch Status Indication

There are 3 visual indicators to determine the status of the switches.

Fig 1; the actuator button of the micro switches are on the raised section of the switch actuator.

Fig 2; the trip rod is perpendicular to the base and lined up with the alignment mark on the mounting bracket.

Fig 3; the white visual indicator is visible through the window on the back of the switch actuator.

A final test is to meter the contacts marked COM and N.O. to ensure they are an open circuit when the valve is open and that they close and have continuity within 2 revolutions of turning the valve handwheel towards the closed position and the contacts remain closed as the valve is completely closed and until the valve is completely opened when the trip rod drops back into the groove in the valve stem.

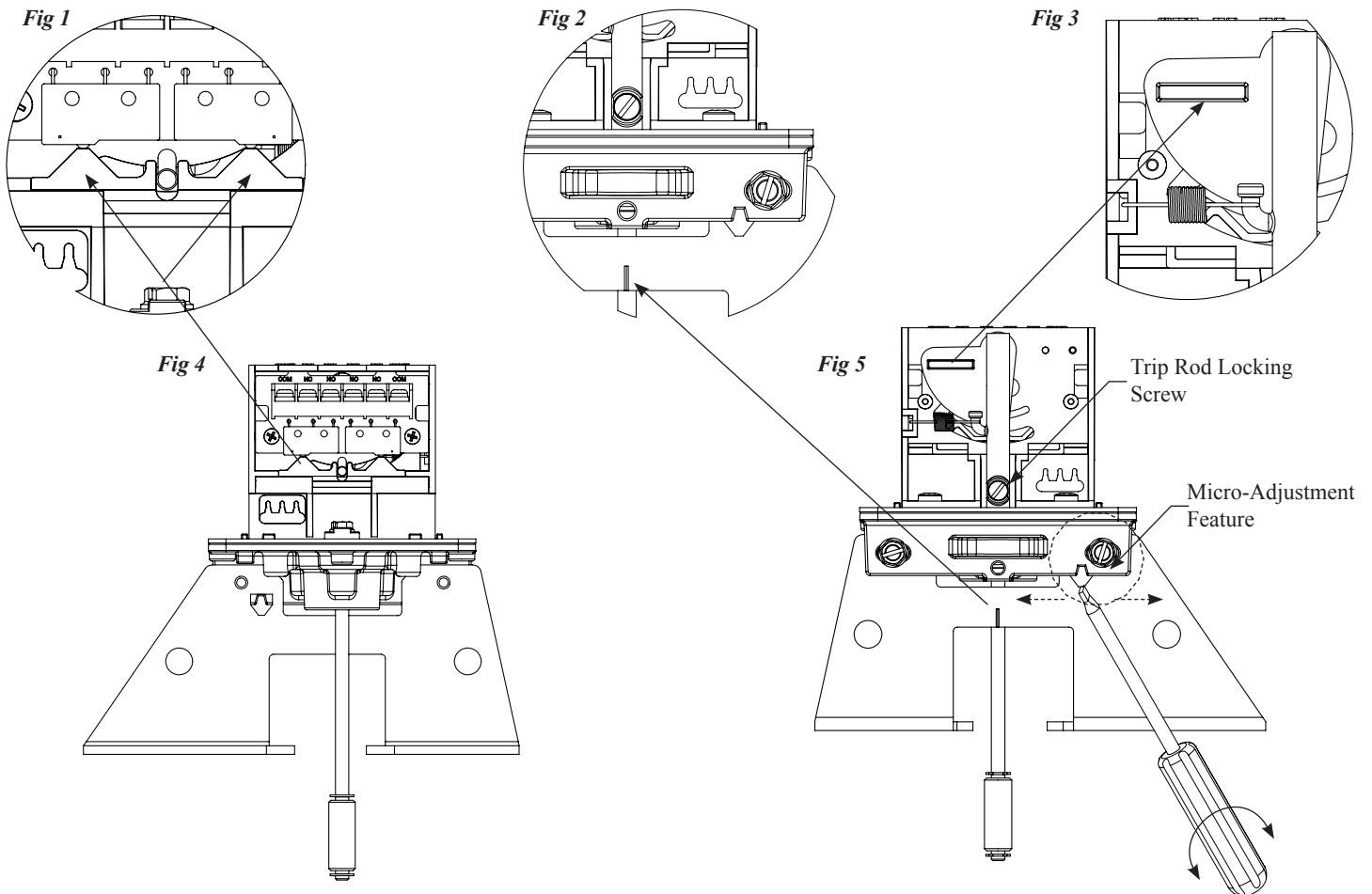
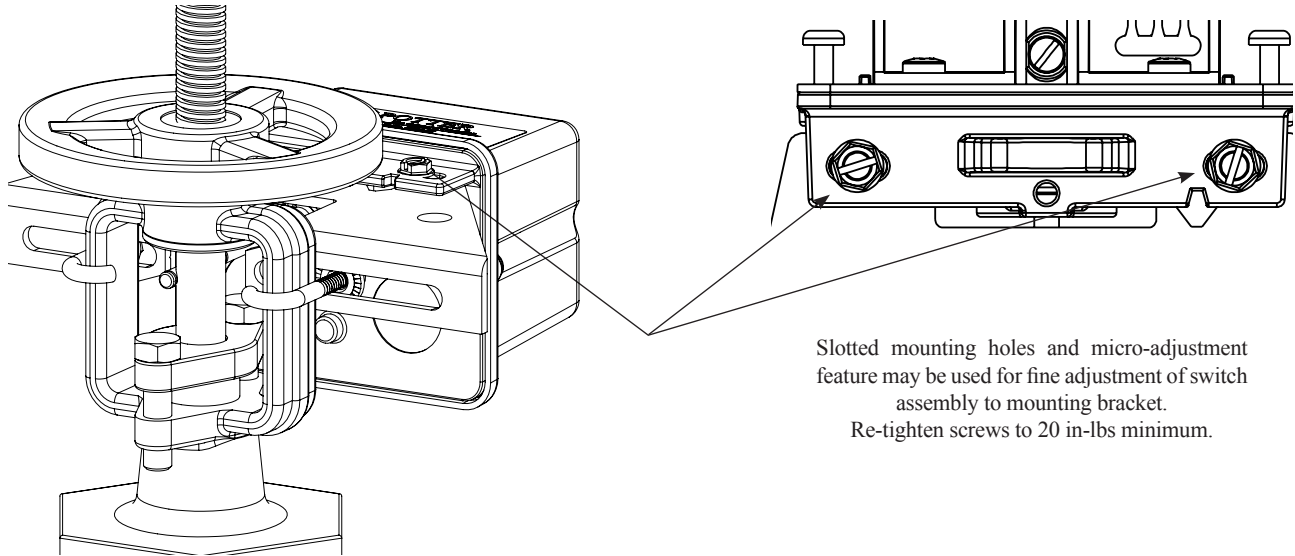


Fig 6

Small Valve Installation - 1/2" Through 2 1/2" Sizes



Slotted mounting holes and micro-adjustment feature may be used for fine adjustment of switch assembly to mounting bracket.
Re-tighten screws to 20 in-lbs minimum.

Small Valve Installation

NOTE: If the valve stem is pre-grooved at 1/8" minimum depth; proceed to step 7.

1. Remove and discard "E" ring and roller from the trip rod.
2. With the valve in the FULL OPEN position, locate the OSYSU across the valve yoke as far as possible from the valve gland so that the spring loaded trip rod of the OSYSU is pulled against the non threaded portion of the valve stem. Position the OSYSU with the bracket near the handwheel as shown in Fig. 6 if possible to avoid creating a pinch point between the wheel and the OSYSU.
3. Loosen the locking screw that holds the trip rod in place and adjust the rod length (see Fig. 5). When adjusted properly, the rod should extend past the valve screw, but not so far that it contacts the clamp bar. Tighten the locking screw to 5 in-lbs minimum to hold the trip rod in place and properly seal the enclosure.

NOTE: If trip rod length is excessive, loosen the locking screw and remove the trip rod from the trip lever. Using pliers, break off the one (1) inch long notched section (see Fig. 10). Reinstall trip rod and repeat Step 3 procedure.

4. Mount the OSYSU loosely with the carriage bolts and clamp bar supplied. On valves with limited clearance use J-hooks supplied instead of the carriage bolts and clamp bar to mount the OSYSU.
5. Mark the valve stem at the center of the trip rod.
6. Remove the OSYSU. Utilizing a 3/16" or 1/4" diameter straight file, file a 1/8" minimum depth groove centered on the mark on the valve stem. Deburr and smooth the edges of the groove to prevent damage to the valve packing and to allow the trip rod to move easily in and out of the groove as the valve is operated.

NOTE: A groove depth of up to approximately 3/16" can make it easier to install the OSYSU so that it does not restore as it rolls over by the threads of the valve stem.

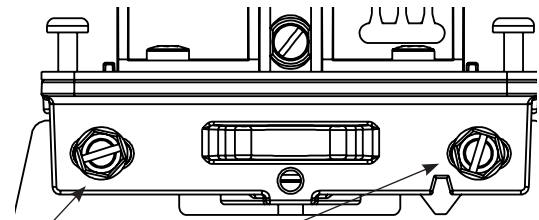
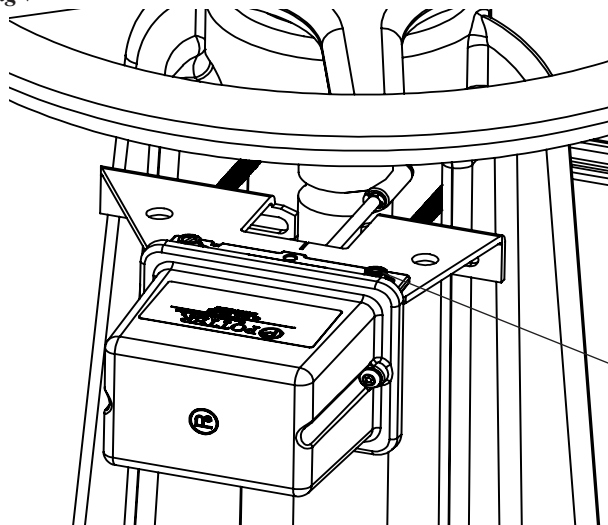
7. Mount the OSYSU on the valve yoke with the spring loaded trip

rod of the OSYSU pulled against the valve stem and centered in the groove of the stem. If possible, position the OSYSU with the flat side of the bracket toward the hand wheel, as shown in Fig. 6, to help avoid creating a pinch point between the wheel and OSYSU. When in this preferred mounting position, it is usually best to use the white indicator visible through the window, as illustrated in Fig. 3, to aid in initially locating the OSYSU in the correct position on the yoke. If the unit must be installed inverted with the white indicator no longer easily visible, use the visual indicators of the actuator buttons on the micro-switches, as illustrated in Fig. 1, or the trip rod alignment mark on the bracket, as illustrated in Fig. 2, to aid in initially locating the OSYSU.

8. Final adjustment can be made by slightly loosening the two screws on the bracket and using the fine adjustment feature (see Fig. 5). The adjustment is correct when the plungers on the switches are depressed by the actuator and there is no continuity between the COM and NO terminals on the switches.
9. Tighten the adjustment screws and all mounting hardware securely (20 in-lbs minimum). Check to insure that the rod moves out of the groove easily and that the switches activate within two turns when the valve is operated from the FULL OPEN towards the CLOSED position.
10. Reinstall the cover and tighten the cover screws to 15 in-lbs minimum to properly seal the enclosure.

 CAUTION
<p>Close the valve fully to determine that the stem threads do not activate the switch. The switch being activated by the stem threads could result in a <i>false valve open</i> indication.</p>

Fig 7 **Large Valve Installation - 3" Through 12" Sizes**



Slotted mounting holes and micro-adjustment feature may be used for fine adjustment of switch assembly to mounting bracket. Re-tighten screws to 20 in-lbs minimum.

Large Valve Installation

NOTE: If the valve stem is pre-grooved at 1/8" minimum depth; proceed to step 6.

1. With the valve in the FULL OPEN position, locate the OSYSU across the valve yoke as far from the valve gland as possible so that the spring loaded trip rod of the OSYSU is pulled against the non threaded portion of the valve stem. Position the OSYSU with the bracket near the handwheel as shown in Fig. 7 if possible to avoid creating a pinch point between the wheel and the OSYSU.
2. Mount the OSYSU loosely with the carriage bolts and clamp bar supplied.
3. Loosen the locking screw that holds the trip rod in place and adjust the rod length (see Fig. 5). When adjusted properly, the rod should extend past the valve screw, but not so far that it contacts the clamp bar. Tighten the locking screw to 5 in-lbs minimum to hold the trip rod in place and properly seal the enclosure.

NOTE: If trip rod length is excessive, loosen the locking screw and remove the trip rod from the trip lever. Using pliers, break off the one (1) inch long notched section (see Fig. 10). Reinstall trip rod and repeat Step 3 procedure.

4. Mark the valve stem at the center of the trip rod.
5. Remove the OSYSU. Utilizing a 3/8" or 1/2" diameter straight file, file a 1/8" minimum depth groove centered on the mark on the valve stem. Deburr and smooth the edges of the groove to prevent damage to the valve packing and to allow the trip rod to move easily in and out of the groove as the valve is operated.

NOTE: A groove depth of up to approximately 3/16" can make it easier to install the OSYSU so that it does not restore as it rolls over by the threads of the valve stem.

6. Mount the OSYSU on the valve yoke with the spring loaded trip rod of the OSYSU pulled against the valve stem and centered in the groove of the stem. If possible, position the OSYSU with the

flat side of the bracket toward the hand wheel, as shown in Fig. 7, to help avoid creating a pinch point between the wheel and OSYSU. When in this preferred mounting position, it is usually best to use the white indicator visible through the window, as illustrated in Fig. 3, to aid in initially locating the OSYSU in the correct position on the yoke. If the unit must be installed inverted with the white indicator no longer easily visible, use the visual indicators of the actuator buttons on the micro-switches, as illustrated in Fig. 1, or the trip rod alignment mark on the bracket, as illustrated in Fig. 2, to aid in initially locating the OSYSU.

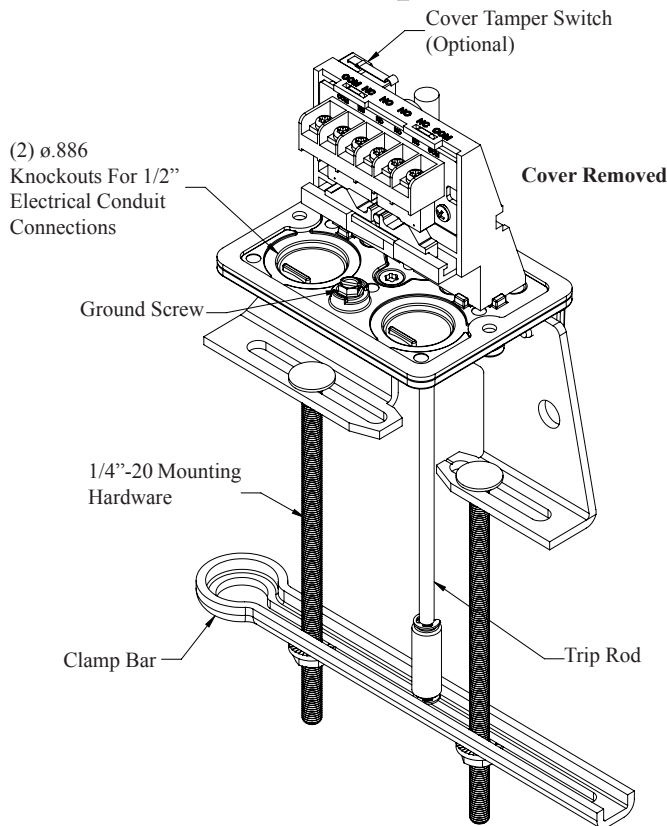
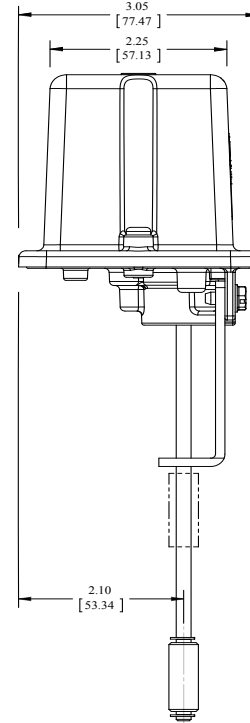
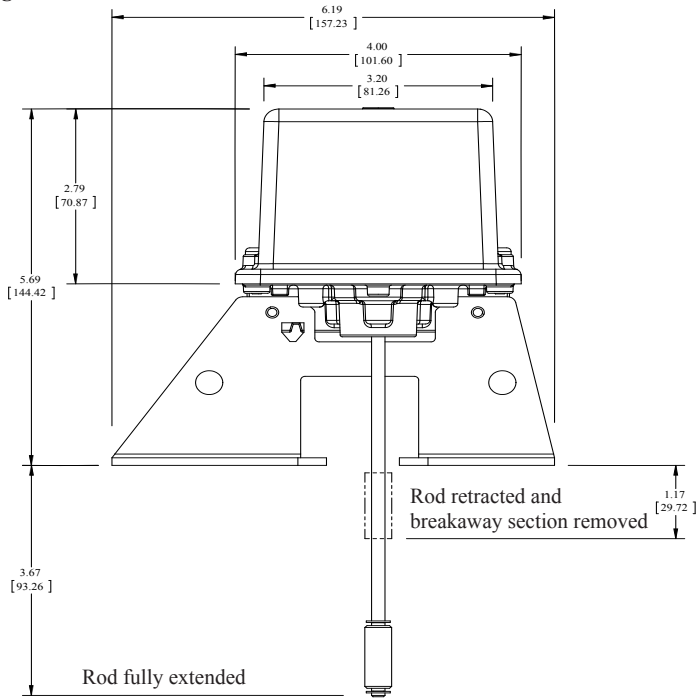
7. Final adjustment can be made by slightly loosening the two screws on the bracket and using the fine adjustment feature (see Fig. 5). The adjustment is correct when the plungers on the switches are depressed by the actuator and there is no continuity between the COM and NO terminals on the switches.
8. Tighten the adjustment screws and mounting hardware securely (minimum 20 in-lbs). Check to insure that the rod moves out of the groove easily and that the switches activate within two turns when the valve is operated from the FULL OPEN towards the CLOSED position.
9. Reinstall the cover and tighten the cover screws to 15 in-lbs minimum to properly seal the enclosure.

CAUTION

Close the valve fully to determine that the stem threads do not activate the switch. The switch being activated by the stem threads could result in a **false valve open** indication.

Dimensions

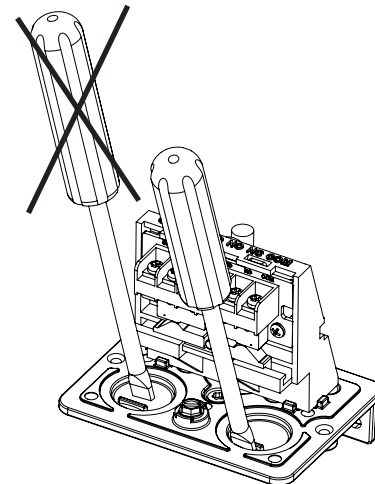
Fig 8



Knockout Removal

Fig 9

To remove knockouts: Place screwdriver at inside edge of knockouts, not in the center.



NOTE: Do not drill into the base as this creates metal shavings which can create electrical hazards and damage the device. Drilling voids the warranty.

Breaking Excessive Rod Length

Fig 10



**Switch Terminal Connections
Clamping Plate Terminal**

Fig 11



⚠ WARNING

An uninsulated section of a single conductor should not be looped around the terminal and serve as two separate connections. The wire must be severed, thereby providing supervision of the connection in the event that the wire become dislodged from under the terminal. Failure to sever the wire may render the device inoperable risking severe property damage and loss of life. Do not strip wire beyond 3/8" of length or expose an uninsulated conductor beyond the edge of the terminal block. When using stranded wire, capture all strands under the clamping plate.

NOTICE

All conduit and connectors selected for the installation of this product shall be suitable for the environment for which it is to be used and shall be installed to the manufacturer's installation instructions. For NEMA 4, 4X, 6, 6P installations, the cover screws are recommended to be tightened to 15 in-lbs minimum and the trip rod locking screw tightened to 5 in-lbs minimum to properly seal the enclosure.

Typical Electrical Connections

Fig 12



Ordering Information

Model	Description	Stock No.
OSYSU-1	Outside Screw & Yoke Supervisory Switch (Single switch)	1010102
OSYSU-2	Outside Screw & Yoke Supervisory Switch (Double switch)	1010202
OSYSU-2 CRH	Outside Screw & Yoke Supervisory Switch (Double Switch). Corrosion resistant hardware of 316 stainless steel & nickel plated to ASTM B377 Type V Brackets	1010210
	Cover Screw	5490424
	Hex Key for Cover Screws and Installation Adjustments	5250062
	Optional Cover Tamper Switch Kit	0090200

Engineering Specifications: OS&Y Valves

UL, CUL Listed / FM Approved and CE Marked valve supervisory switches shall be furnished and installed on all OS&Y type valves that can be used to shut off the flow of water to any portion of the fire sprinkler system, where indicated on the drawings and plans and as required by applicable local and national codes and standards. The supervisory switch shall be NEMA 4X and 6P rated and capable of being mounted in any position indoors or out and be completely submerged without allowing water to enter the enclosure. The enclosure shall be held captive by tamper resistant screws. The device shall contain two 1/2" conduit entrances and one or two Single Pole Double Throw (SPDT) switches. There shall be a visual indicator to display the status of the switches. To aid in installation, it shall be possible to make fine adjustments to the position of the switch on the valve without loosening the mounting bracket from the valve. The device shall contain an adjustable length trip rod and roller, the trip rod shall be held captive by a set screw accessible upon removal of the cover. The switch contacts shall be rated at 10A, 125/250VAC and 2A, 30VDC. OS&Y Valve supervisory switch shall be model OSYSU-1 for the single switch model and OSYSU-2 for the two switch model manufactured by Potter Electric Signal Company LLC.

NOTICE

Supervisory switches have a normal service life of 10-15 years. However, the service life may be significantly reduced by local environmental conditions.

Features

- NEMA 4X* (IP 65) and 6P (IP 67)
**Enclosure is 4X. For additional corrosion protection of mounting hardware, use model PCVS-2 CRH*
- -40° to 140° (-40°C to 60°C) operating temperature range
- Visual Switch Indicators
- Two conduit entrances
- Adjustable length trip rod
- Accomodates up to 12AWG wire
- Switch detects tampering and valve closure
- RoHS compliant
- Two SPDT contacts



NOTICE

Before any work is done on the fire sprinkler or fire alarm system, the building owner or their authorized representative shall be notified. Before opening any closed valve, ensure that opening the valve will not cause any damage from water flow due to open or missing sprinklers, piping, etc.



Important: This document contains important information on the installation and operation of PCVS valve supervisory switches. Please read all instructions carefully before beginning installation. A copy of this document is required by NFPA 72 to be maintained on site.

Description

The Model PCVS is a weather proof and tamper resistant switch for monitoring the open position of fire sprinkler control valves of the wall and yard post indicator and butterfly types. Two SPDT (Form C) contacts are provided which will operate when the valve position is altered from an open state.

The unit mounts in a 1/2" NPT tapped hole in the post indicator or butterfly valve housing. The device is engaged by the indicating assembly of the post indicator or the operating mechanism of the butterfly valve, actuating switches when the valve is fully open. The unit should be installed where it is accessible for service.

The cover is held in place by two tamper resistant screws that require a special tool to remove. The tool is furnished with each device.

Testing

The operation of the PCVS and its associated protective monitoring system shall be tested upon completion of the installation and inspected, tested and maintained in accordance with all applicable local and national codes and standards and/or the Authority Having Jurisdiction, (manufacturer recommends quarterly or more frequently). A minimum test shall consist of turning the valve operating mechanism towards the closed position. The PCVS shall operate within the first two revolutions of the operating mechanism. Fully close the valve and ensure the PCVS does not restore. Fully open the valve and ensure that the PCVS restores to normal.

Technical Specifications

Dimensions	See Fig 10
Weight	1.0 lbs (0,45 kg)
Enclosure	Cover: Die Cast Finish: Red Powder Coat Base: Die Cast Finish: Black Powder Coat All parts have corrosion resistant finishes
Cover Tamper	Tamper Resistant Screws Optional Cover Tamper Switch Available
Contact Ratings	PCVS-2: Two Sets of SPDT (Form C) 10.0 Amps at 125/250 VAC 2.0 Amps at 30VDC Resistive 10 mAmps minimum at 24 VDC
Environmental Limitations	-40° F to 140°F (-40°C to 60°C) NEMA 4X (IP 65) and NEMA 6P Enclosure (IP67)(Use suitably rated conduit and connector) Indoor or Outdoor Use (See PIVSU-EX Bulletin 5400694 for Hazardous locations)
Conduit Entrances	Two Knockouts for 1/2" conduit provided (See Notice on Page 7 and Fig. 11 on Page 6)
Service Use	NFPA 13, 13D, 13R, 72

Specifications subject to change without notice

Theory Of Operation

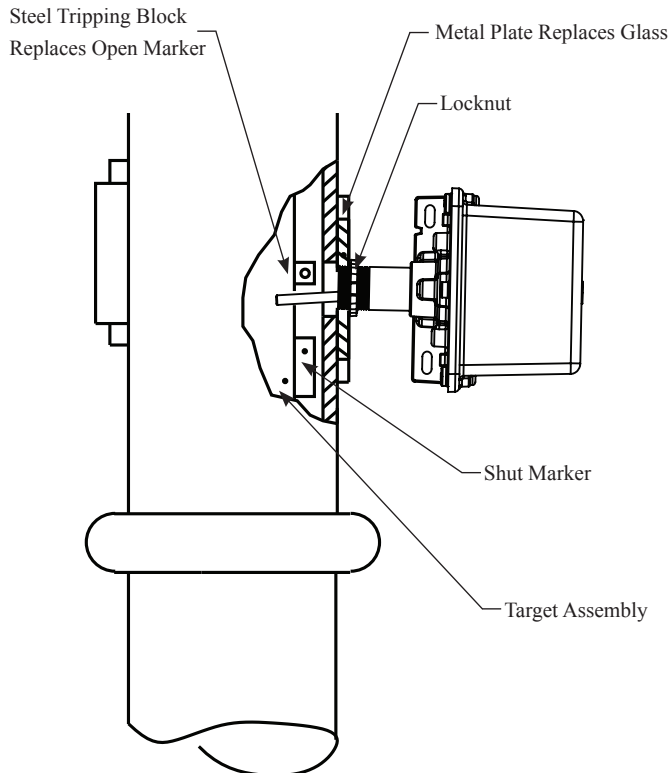
The PCVS is a spring loaded switch. It is in normal position when the trip rod is pulling against the spring force. Normal is when the switch is installed on the valve and the valve is fully open. As the valve closes, the valve actuator moves away from the trip rod of the PCVS and the spring on the PCVS pulls the trip rod over and trips the switch.

Alternate Window Installation and Moving Hood Installation

Target Moves Up as Valve is Shut

Fig 1

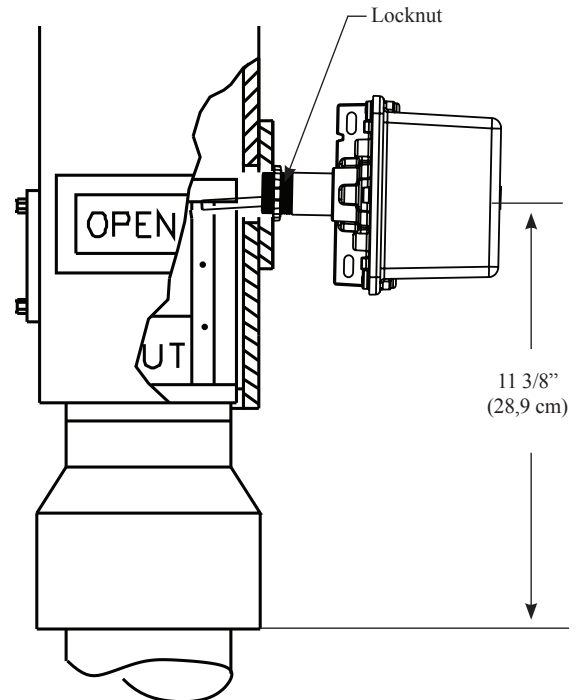
Subject to the approval of the “authority having jurisdiction” the alternate method of installation shown in Fig. 1 may be used. In this method, one of the glass windows of the housing is replaced with a 1/4” thick metal plate that is cut to fit in place of the glass and drilled and tapped to receive 1/2” NPT pipe nipple. In some cases it may be necessary to attach an angle bracket to the target assembly to engage the PCVS trip rod.



Hood Moves Down as Valve is Shut

Fig 2

If the target is stationary and a hood arrangement is used, such as is shown in Fig. 2, the hood must be drilled with a 23/32” drill and tapped with a 1/2” NPT. The center line of this hole should be 1/8” below the portion of target assembly that strikes the PCVS trip rod. The 11 3/8” dimension shown is for a Clow Valve. Flexible conduit must be used for this type of installation. (More on pg. 3).



Typical Installations On Post Indicator Valve Housings

Fig 3

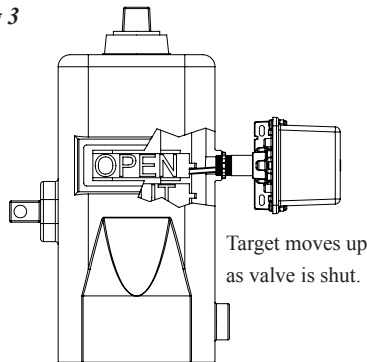
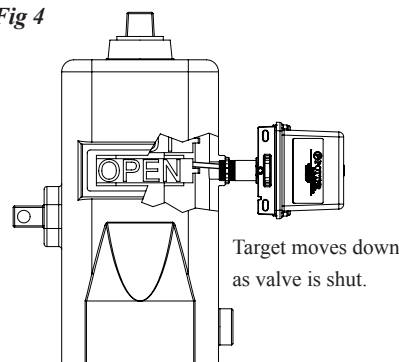


Fig 4



NOTE: Before any work is done on the fire sprinkler or fire alarm system, the building owner or their authorized representative shall be notified. Before opening any closed valve, ensure that opening the valve will not cause any damage from water flow due to open or missing sprinklers, piping, etc.

1. Position the valve to fully open ("OPEN" should appear in the window of the housing). Partially close the valve while observing the direction that the target assembly moves. Reopen the valve. If the valve housing is predrilled with a 1/2" NPT for installation of a monitoring switch, remove the 1/2" plug and fully open the valve. Make sure that "OPEN" appears in the window of the housing. GO TO STEP NO. 6.
2. If the valve is not pre-drilled for 1/2" NPT, remove the head and target assembly (consultation with valve manufacturer is recommended).
3. If the target assembly moved up as the valve was closed, measure the distance from the bottom of the head to the lower part of the target assembly that will contact the trip rod of the PCVS (see Fig. 3). This is usually a plate or bar on the target assembly, on a side adjacent to the "OPEN/SHUT" plates. Subtract 1/8" from the measurement. If the target moved down as the valve was closed, measure the distance from the bottom of the head to the upper portion of the target assembly that will contact the trip rod of the PCVS (see Fig. 4). Add 1/8" (3,2mm) to this measurement.
4. Mark the housing at the proper location. Using a 23/32" (18,2mm) drill bit, drill and then tap a 1/2" NPT in the housing on the side that coincides with the portion of the target assembly that will engage the trip rod of the PCVS.
5. Replace the head and target assembly.
6. Loosen the socket head screw that holds the nipple in the PCVS and remove the nipple.
7. Screw the locknut that is provided onto the nipple.
8. Screw the nipple into the 1/2" NPT hole in the valve housing hand tighten. Tighten the locknut against the valve housing to secure the nipple firmly in place.
9. Insert a scale or probe thru the nipple to measure the distance from the open end of the nipple to the target assembly. Subtract 1/2" (12,5mm) from this measurement.

NOTE: In some cases, it may be necessary to attach an angle bracket to the target assembly to engage the PCVS trip rod.

10. Using the special tool provided, loosen the two cover screws and remove the cover from the PCVS.
 11. Loosen the locking screw that holds the trip rod in place and adjust the rod length, from the end of the collar to the end of the rod, using the dimension determined in Step 9. Tighten the locking screw to 5 in-lbs minimum to hold the rod in place and properly seal the enclosure.
 12. Partially close the valve to move the target assembly away (3 to 4 revolutions of the handle/hand wheel).
 13. With the PCVS positioned so the spring will pull the trip rod to follow the target as the valve is closing, slide the PCVS over the nipple. Tighten the socket head screw in the collar.
 14. Carefully open the valve to the fully open position. As the target moves to the open position it should engage the trip rod and actuate the switch(es). There should be a minimum overtravel of 1/2 revolution of the handle/hand wheel after the switch(es) actuate (a continuity meter connected to each set of contacts is one method that could be used to determine this).
 15. Slowly close the valve. The switch must operate during the first two revolutions of the handle/hand wheel or during 1/5 of the travel distance of the valve control apparatus from its normal condition.
- NOTE:** Small adjustments of the target position may be necessary (consultation with valve manufacturer is recommended).
16. Complete the required electrical wiring, connections and tests. The valve should be operated through the entire cycle of fully closed and fully open to determine the integrity of the PCVS installation and the signaling system. Check that all electrical and mechanical connections are secure.
 17. Reinstall the cover and tighten the cover screws to 15 in-lbs minimum to properly seal the enclosure.
 18. When the installation and testing are complete, return valve to its proper position.
 19. Alternative installation for other post indicator valve housing shown in Fig. 1 and 2.

Typical Installation on a Butterfly Valve

Fig 5 Typical Indicating Butterfly Valve

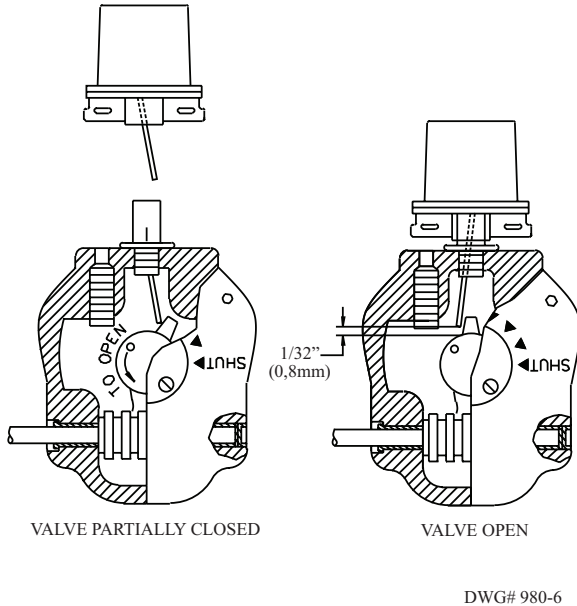
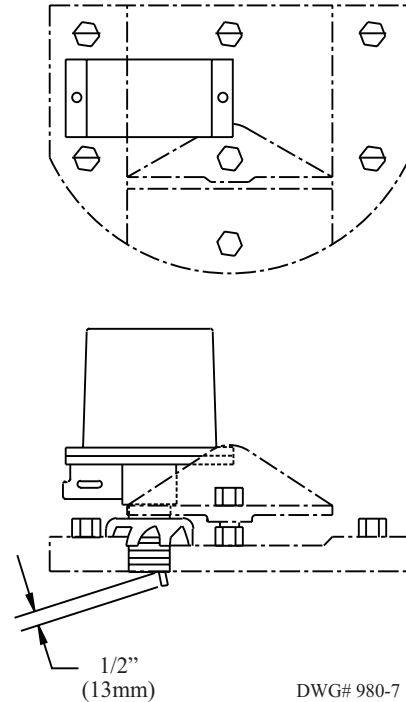


Fig 6 Dresser Indicating Butterfly Valve



1. Remove the 1/2" NPT plug from the gear operator case.
2. Loosen the set screw that holds the nipple in the PCVS and remove the nipple.
3. Screw the locknut that is provided onto the nipple.
4. Screw the nipple into the 1/2" NPT hole in the gear operator-hand tighten. Tighten the locknut against the case, to secure the nipple firmly in place
5. Partially close the valve to move the boss on the gear hub out of the way (3 or 4 revolutions of the hand wheel or crank).
6. Using the special tool provided, loosen the two cover screws and remove the cover from the PCVS.
7. Orient the PCVS so the spring will pull up the trip rod to follow the actuating cam inside the valve.

NOTE: If trip rod length is excessive, loosen the locking screw and remove the trip rod from the trip lever. Using pliers, break off the one (1) inch long notched section (see Fig. 12). Reinstall the trip rod, tightening the screw to 5 in-lbs minimum, and repeat Step 7 procedure.

8. Remove device from nipple and shorten the trip rod 1/32" (0,80mm) (this is to prevent the trip rod from dragging on the gear hub inside the valve). Tighten the locking screw to hold the rod in place. Re-install the device on the nipple. Tighten the screw in the collar against the nipple.

NOTE: In some cases it may be necessary to remove the

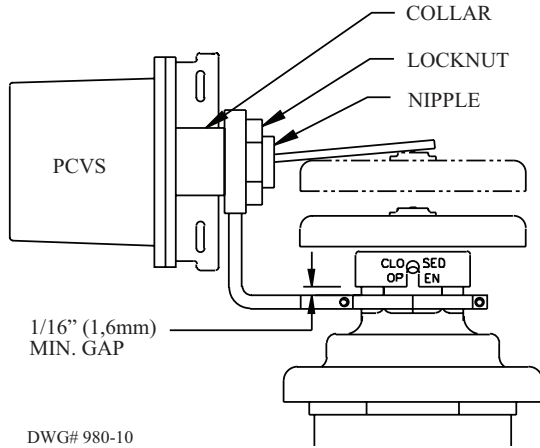
- gear box cover to ensure correct operation (consultation with the valve manufacturer is recommended).
9. Carefully open the valve to its full open position, as the boss on the gear hub moves to the open position it must engage the PCVS trip rod and actuate the switch(es). There should be a minimum overtravel or revolution of the crank or hand wheel after the switch(es) actuate (a continuity meter connected to each set of contacts is one method that could be used to determine this).

NOTE: Slight adjustment of gear stops may be necessary to prevent overtravel of the trip rod (consultation with valve manufacture is recommended).

10. Carefully close the valve. The switch(es) must operate during the first two revolutions of the crank or hand wheel or during 1/5 of the travel distance of the valve control apparatus from its normal condition.
11. Complete the required electrical wiring, connections and tests. The valve should be operated through the entire cycle of fully closed and fully open to determine the integrity of the PCVS installation and signaling system.
12. Reinstall the cover and tighten the screws to 15 in-lbs minimum to properly seal the enclosure.
13. When the installation and testing are complete, return valve to its proper position.

Typical Pressure Reducer Type Valve Installation

Fig 7

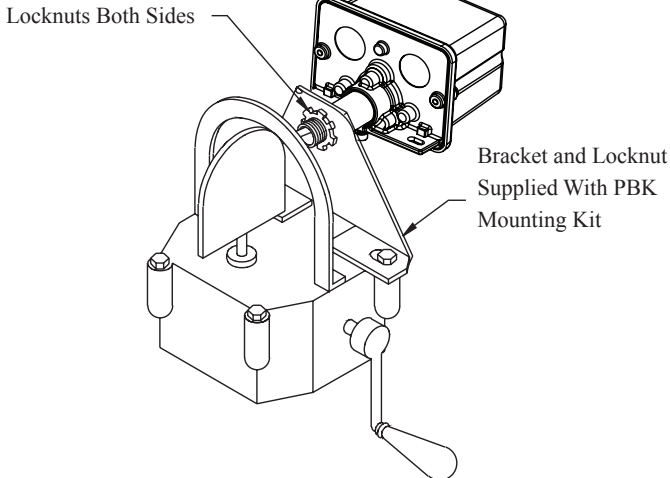


This figure shows the Model PCVS mounted on the valve yoke, with a bracket supplied by the valve manufacturer, to supervise a pressure reducer type valve.

NOTE: This application is subject to the approval of the authority having jurisdiction.

PBK - Butterfly Valve Kit for Valves with Internal Supervisory Switches

Fig 8



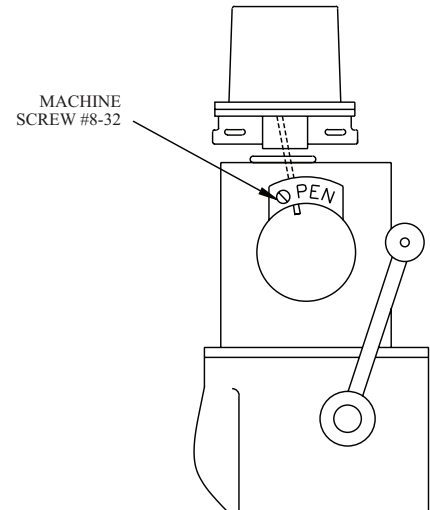
Pratt Butterfly Valve Kit as used to mount a PCVS on a Pratt Model IBV Valve.

Kits contain: Bracket, nuts and instructions

NOTE: Due to changes in valves, brackets may need to be modified by installer. This application is subject to the approval of the authority having jurisdiction.

PVK - Pratt PIVA Post Indicator Valve Kit

Fig 9

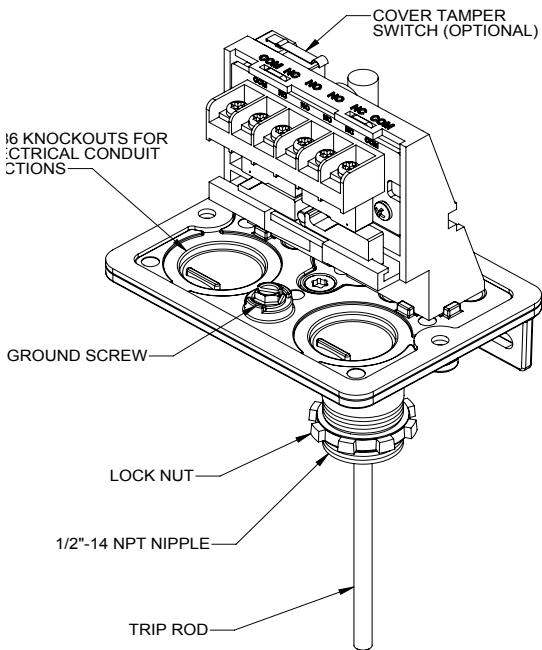
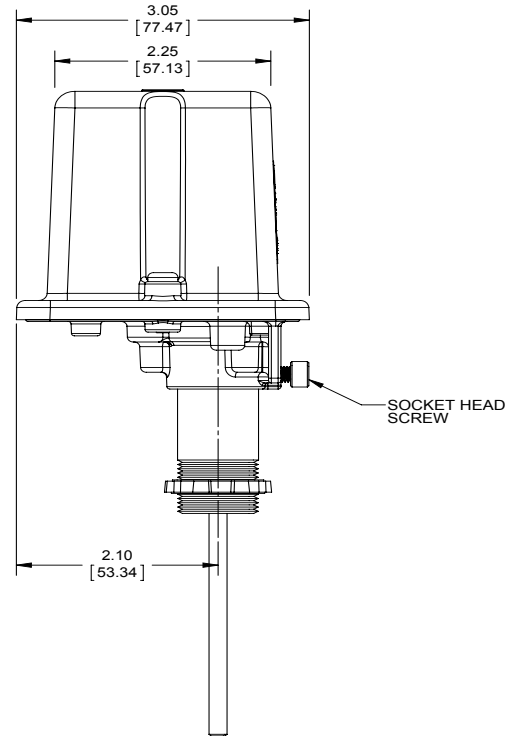
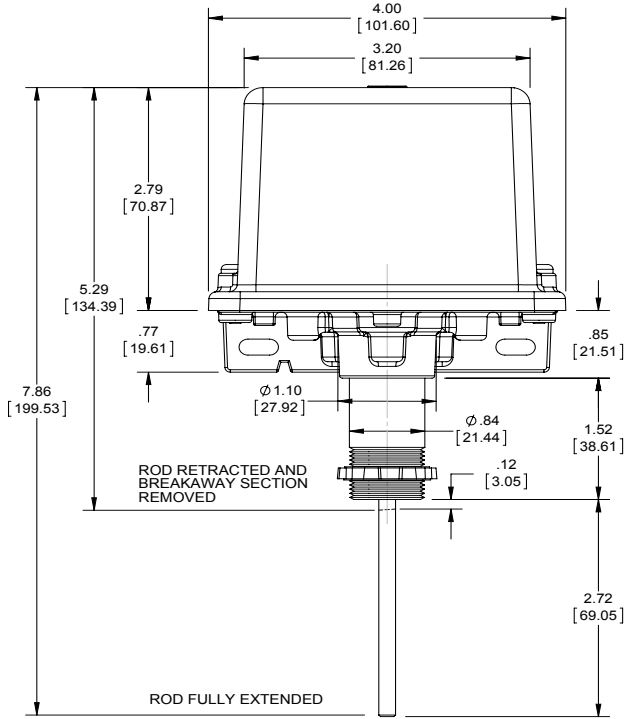


Pratt Valve Kit as used to mount a PCVS on a Pratt Model PIVA Valve. Kit contains: Instructions, template, screw and nut.

NOTE: This application is subject to the approval of the authority having jurisdiction.

Dimensions

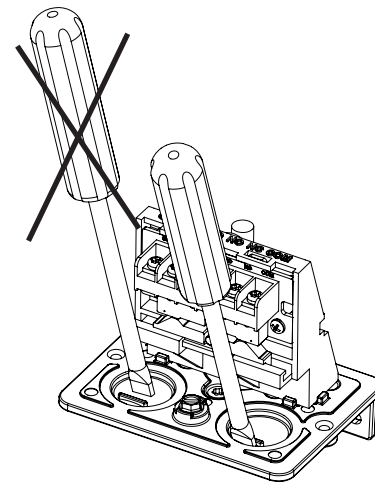
Fig 10



Knockout Removal

Fig 11

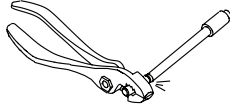
To remove knockouts: Place screwdriver at inside edge of knockouts, not in the center.



NOTE: Do not drill into the base as this creates metal shavings which can create electrical hazards and damage the device. Drilling voids the warranty.

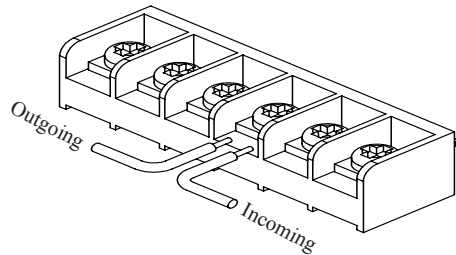
Breaking Excessive Rod Length

Fig 12



Switch Terminal Connections Clamping Plate Terminal

Fig 13



WARNING

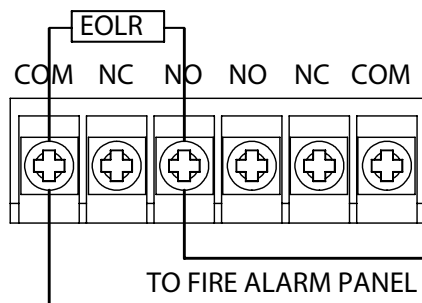
An uninsulated section of a single conductor should not be looped around the terminal and serve as two separate connections. The wire must be severed, thereby providing supervision of the connection in the event that the wire become dislodged from under the terminal. Failure to sever the wire may render the device inoperable risking severe property damage and loss of life. Do not strip wire beyond 3/8" of length or expose an uninsulated conductor beyond the edge of the terminal block. When using stranded wire, capture all strands under the clamping plate.

NOTICE

All conduit and connectors selected for the installation of this product shall be suitable for the environment for which it is to be used and shall be installed to the manufacturer's installation instructions. For NEMA 4, 4X, 6, 6P installations, the cover screws are recommended to be tightened to 15 in-lbs minimum and the trip rod locking screw tightened to 5 in-lbs minimum to properly seal the enclosure.

Typical Electrical Connections

Fig 14



Ordering Information

Model	Description	Stock No.
PCVS-2	Potter Control Valve Switch (double switch)	1010203
PCVS-2 CRH	Potter Control Valve Switch (double switch). Corrosion resistant 316 stainless steel hardware.	1010211
--	Cover Screw	5490424
--	Hex Key for Cover Screws and Installation Adjustments	5250062
PBK-S	Pratt Butterfly Valve Kit - 3" (75mm) to 12" (30mm)	0090133
PBK-M	Pratt Butterfly Valve Kit - 14" (355 mm) and 16" (406 mm)	0090146
PBK-L	Pratt Butterfly Valve Kit - 18" (457mm) to 24" (610 mm)	0090132
PVK	Pratt Valve Kit	1000060
--	Optional Cover Tamper Switch Kit	0090200
KBK	Kennedy Butterfly Valve Kit	0090143
TBK	Tycho Butterfly Valve Kit	0090150

For pressure reducer type valve installation kits (if required) contact valve manufacturer.

Engineering Specifications: Post Indicator & Butterfly Valves

UL, CUL Listed / FM Approved and CE Marked valve supervisory switches shall be furnished and installed on all post Indicator and Butterfly valves that can be used to shut off the flow of water to any portion of the fire sprinkler system, where indicated on the drawings and plans and as required by applicable local and national codes and standards. The supervisory switch shall be NEMA 4X and 6P rated and capable of being mounted in any position indoors or out and be completely submerged without allowing water to enter the enclosure. The enclosure shall be held captive by tamper resistant screws. The device shall contain two conduit entrances and two Single Pole Double Throw (SPDT) switches. The device shall contain a removable 1/2" NPT nipple and adjustable trip rod, the trip rod shall be held captive by a set screw accessible upon removal of the cover. The switch contacts shall be rated at 10A, 125/250VAC and 2A, 30VDC. Post Indicator and Butterfly Valve supervisory switch shall be model PCVS-2 manufactured by Potter Electric Signal Company LLC

NOTICE

Supervisory switches have a normal service life of 10-15 years. However, the service life may be significantly reduced by local environmental conditions.

Features

- One and two switch models available.
- Independent switch adjustment, no tools needed.
- Two conduit / cable entrances.
- Separate isolated wiring chambers.
- Non-corrosive pressure connection.
- Solid metal enclosure.



Installation

The Potter PS10 Series Pressure Actuated Switches are designed for the detection of a waterflow condition in automatic fire sprinkler systems of particular designs such as wet pipe systems with alarm check valves, dry pipe, preaction, or deluge valves. The PS10 is also suitable to provide a low pressure supervisory signal; adjustable between 4 and 15 psi (0,27 and 1,03 BAR).

1. Apply Teflon tape to the threaded male connection on the device. (Do not use pipe dope)
2. Device should be mounted in the upright position (threaded connection down).
3. Tighten the device using a wrench on the flats on the device.

Wiring Instructions

1. Remove the tamper resistant screw with the special key provided.
2. Carefully place a screwdriver on the edge of the knockout and sharply apply a force sufficient to dislodge the knockout plug. See Fig 9.
3. Run wires through an approved conduit connector and affix the connector to the device.
4. Connect the wires to the appropriate terminal connections for the service intended. See Figures 2,4,5, and 6. See Fig 7 for two switch, one conduit wiring.

Technical Specifications

Dimensions	3.78"(9,6cm)Wx3.20"(8,1cm)Dx4.22"(10,7cm)H
Differential	2 PSI (0,13 BAR) typical
Enclosure	Cover: Die Cast Finish: Red Powder Coat Base: Die Cast All parts have corrosion resistant finishes
Factory Adjustment	4 - 8 PSI (0,27 - 0,55 BAR)
Switch Contacts	SPDT (Form C) 10.1 Amps at 125/250 VAC, 2.0 Amps at 30 VDC One SPDT in PS10-1, Two SPDT in PS10-2
Environmental Limitations	-40° F to 140°F (-40°C to 60°C) NEMA 4/IP66 Rated Enclosure indoor or outdoor when used with NEMA 4 conduit fittings
Conduit Entrances	Two knockouts for 1/2" conduit provided. Individual switch compartments and ground screw suitable for dissimilar voltages
Service Use	NFPA 13, 13D, 13R, 72
Pressure Connection	Nylon 1/2" NPT male
Maximum System Pressure	300 PSI (20,68 BAR)

*Specifications subject to change without notice.

Testing

The operation of the pressure alarm switch should be tested upon completion of installation and periodically thereafter in accordance with the applicable NFPA codes and standards and/or the authority having jurisdiction (manufacturer recommends quarterly or more frequently).

Wet System

Method 1: When using PS10 and control unit with retard - connect PS10 into alarm port piping on the input side of retard chamber and electrically connect PS10 to control unit that provides a retard to compensate for surges. Insure that no unsupervised shut-off valves are present between the alarm check valve and PS10.

Method 2: When using the PS10 for local bell application or with a control that does not provide a retard feature - the PS10 must be installed on the alarm outlet side of the retard chamber of the sprinkler system.

Testing: Accomplished by opening the inspector's end-of-line test valve. Allow time to compensate for system or control retard.

NOTE: Method 2 is not applicable for remote station service use, if there is an unsupervised shut-off valve between the alarm check valve and the PS10.

Wet System With Excess Pressure

Connect PS10 into alarm port piping extending from alarm check valve. Retard provisions are not required. Insure that no unsupervised shut-off valves are present between the alarm check valve and the PS10.

Testing: Accomplished by opening the water by-pass test valve or the inspector's end-of-line test valve. When using end-of-line test, allow time for excess pressure to bleed off.

Dry System

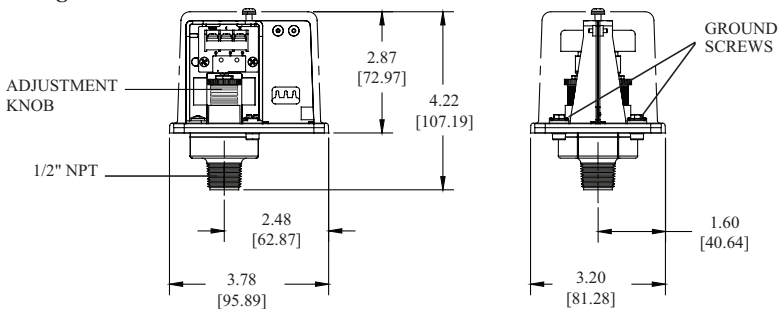
Connect PS10 into alarm port piping that extends from the intermediate chamber of the alarm check valve. Install on the outlet side of the in-line check valve of the alarm port piping. Insure that no unsupervised shut-off valves are present between the alarm check valve and the PS10.

Testing: Accomplished by opening the water by-pass test valve.

NOTE: The above tests may also activate any other circuit closer or water motor gongs that are present on the system.

Dimensions

Fig 1

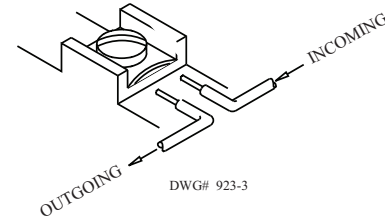


NOTE: To prevent leakage, apply Teflon tape sealant to male threads only.

DWG# 930-1

Switch Clamping Plate Terminal

Fig 2

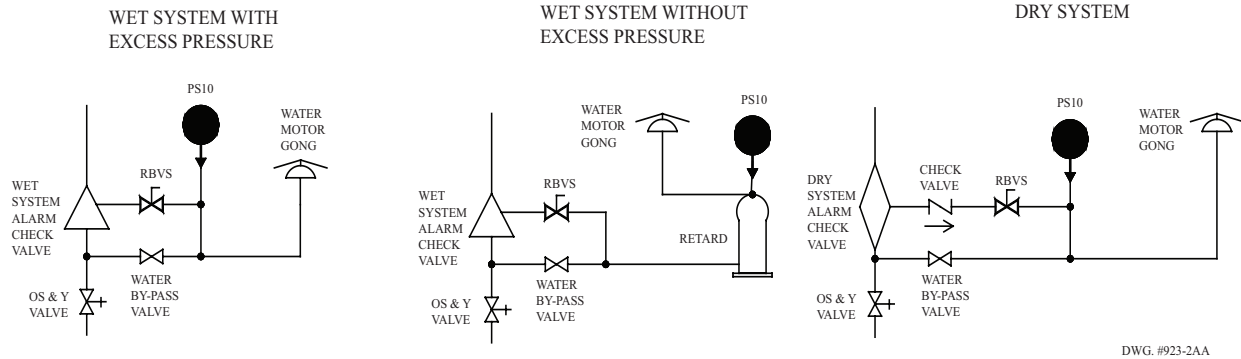


WARNING

An uninsulated section of a single conductor should not be looped around the terminal and serve as two separate connections. The wire must be severed, thereby providing supervision of the connection in the event that the wire becomes dislodged from under the terminal.

Typical Sprinkler Applications

Fig 3

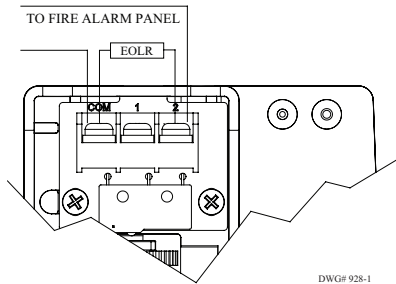


CAUTION

Closing of any shutoff valves between the alarm check valve and the PS10 will render the PS10 inoperative. To comply with NFPA-72 any such valve shall be electrically supervised with a supervisory switch such as Potter Model RBVS.

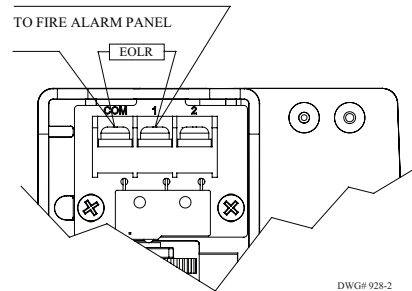
Low Pressure Signal Connection

Fig 4



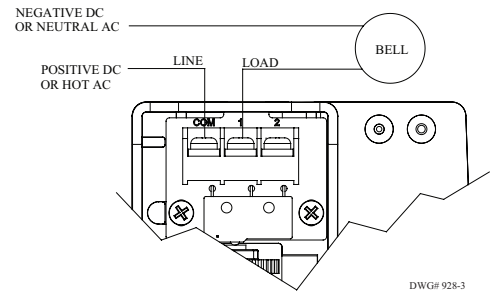
Waterflow Signal Connection

Fig 5



Local Bell For Waterflow Connection

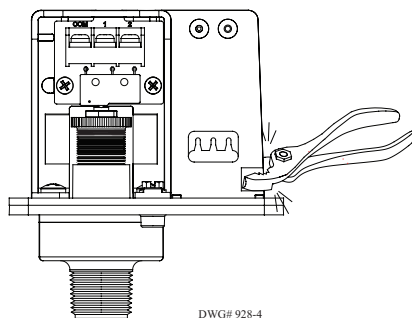
Fig 6



One Conduit Wiring

Fig 7

Break out thin section of divider to provide path for wires when wiring both switches from one conduit entrance.

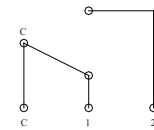


Switch Operation

Fig 8

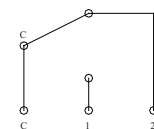
Terminal
C: Common
1: Closed when installed under normal system pressure.
2: Open when installed under normal system pressure. Closes on pressure drop. Use for low pressure supervision

W/ PRESSURE APPLIED



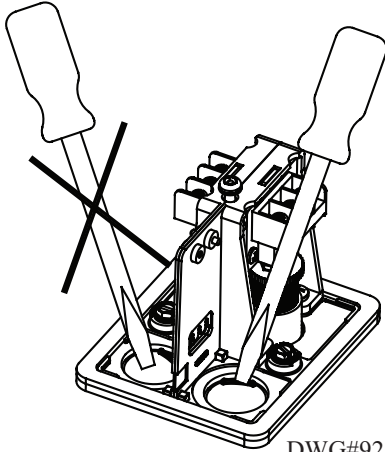
Terminal
1: Open with no pressure supplied. Closes upon detection of pressure. Use for waterflow indication.
2: Closed with no pressure applied.

W/O PRESSURE APPLIED



Removing Knockouts

Fig 9



Engineer/Architect Specifications Pressure Type Waterflow Switch

Pressure type waterflow switches; shall be a Model PS10 as manufactured by Potter Electric Signal Company, St Louis MO., and shall be installed on the fire sprinkler system as shown and or specified herein.

Switches shall be provided with a 1/2" NPT male pressure connection and shall be connected to the alarm port outlet of; Wet Pipe Alarm Valves, Dry Pipe Valves, Pre-Action Valves, or Deluge Valves. The pressure switch shall be actuated when the alarm line pressure reaches 4 - 8 PSI (0,27 - 0,55 BAR).

Pressure type waterflow switches shall have a maximum service pressure rating of 300 PSI (20,68 BAR) and shall be factory adjusted to operate on a pressure increase of 4 - 8 PSI (0,27 - 0,55 BAR)

Pressure switch shall have one or two form C contacts, switch contact rating 10.1 Amps at 125/250 VAC, 2.0 Amps at 30 VDC.

Pressure type waterflow switches shall have two conduit entrances one for each individual switch compartment to facilitate the use of dissimilar voltages for each individual switch.

The cover of the pressure type waterflow switch shall be Zinc die-cast with rain lip and shall attach with one tamper resistant screw. The Pressure type waterflow switch shall be suitable for indoor or outdoor service with a NEMA 4/IP66 rating.

The pressure type waterflow switch shall be UL Ulc and CSFM listed, FM and LPC approved and NYMEA accepted.

Tamper

Cover incorporates tamper resistant fastener that requires a special key for removal. One key is supplied with each device. For optional cover tamper switch kit, order Stock No. 0090200. See bulletin #5401200 PSCTSK.

WARNING

- Installation must be performed by qualified personnel and in accordance with all national and local codes and ordinances.
- Shock hazard. Disconnect power source before servicing. Serious injury or death could result.
- Read all instructions carefully and understand them before starting installation. Save instructions for future use. Failure to read and understand instructions could result in improper operation of device resulting in serious injury or death.
- Risk of explosion. Not for use in hazardous locations. Serious injury or death could result.

CAUTION

- Do not tighten by grasping the switch enclosure. Use wrenching flats on the bushing only. Failure to install properly could damage the switch and cause improper operation resulting in damage to equipment and property.
- To seal threads, apply Teflon tape to male threads only. Using joint compounds or cement can obstruct the pressure port inlet and result in improper device operation and damage to equipment.
- Do not over tighten the device, standard piping practices apply.

Ordering Information

Model	Description	Part Number
PS10-1	Pressure switch with one set SPDT contacts	1144402
PS10-2	Pressure switch with two sets SPDT contacts	1144425
Hex Key		5250062
Cover Tamper Switch Kit		0090200

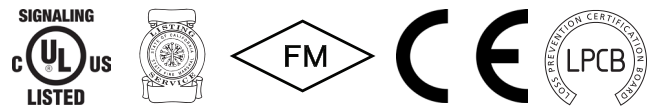
Features

- One and two switch models available.
- Independent switch adjustment, no tools needed.
- Two conduit / cable entrances.
- Separate isolated wiring chambers.
- Non-corrosive pressure connection.
- Solid metal enclosure.



NOTICE

This document contains important information on the installation and operation of PS40 pressure switches. Please read all instructions carefully before beginning installation. A copy of this document is required by NFPA 72 to be maintained on site.



Installation

The Potter PS40 Series Supervisory Pressure Actuated Switches are designed primarily to detect an increase and/or decrease from normal system pressure in automatic fire sprinkler systems. Typical applications are: air/nitrogen supervision in dry pipe and pre-action systems, pressure tanks, air supplies, and water supplies. The PS40-1 has one switch and is factory set to activate at approximately 30 psi (2,1 BAR) on a decrease in pressure. The PS40-2 has two switches. The Low switch is factory set to activate at approximately 30 psi (2,1 BAR) on a decrease in pressure. The High switch is factory set to activate at approximately 50 psi (3,5 BAR) on an increase in pressure. NFPA 72 requires a supervisory signal if the pressure increases or decreases by 10 psi from normal. The PS40 is factory set for a normal air pressure of 40 psi. See section heading Adjustments and Testing if other than factory set point is required.

1. Connect the PS40 to the system side of any shutoff or check valve.
2. Apply Teflon tape to the threaded male connection on the device. (Do not use pipe dope)
3. Device should be mounted in the upright position. (Threaded connection down)
4. Tighten the device using a wrench on the flats on the device.

Technical Specifications

Dimensions	3.78"(9,6cm)Wx3.20"(8,1cm)Dx4.22"(10,7cm)H
Differential	Typical 1 lb. at 10 PSI (.07 at ,7 BAR) 4 lbs at 60 PSI (.28 at 4,1 BAR)
Enclosure	Cover: Die Cast Finish: Red Powder Coat Base: Die Cast All parts have corrosion resistant finishes
Cover Tamper	Cover incorporates tamper resistant fastener that requires a special key for removal. One key is supplied with each device.
Factory Adjustment	PS40-1 operates on decrease at 30 PSI (2,1 BAR) PS40-2 operates on increase at 50 PSI (3,5 BAR) and on decrease at 30 PSI (2,1 BAR)
Contact Ratings	SPDT (Form C) 10.1 Amps at 125/250 VAC, 2.0 Amps at 30 VDC One SPDT in PS40-1, Two SPDT in PS40-2
Environmental Limitations	-40° F to 140°F (-40°C to 60°C) NEMA 4/IP66 Rated Enclosure indoor or outdoor when used with NEMA 4 conduit fittings
Conduit Entrances	Two knockouts for 1/2" conduit provided. Individual switch compartments and ground screw suitable for dissimilar voltages
Service Use	NFPA 13, 13D, 13R, 72
Pressure Connection	Nylon 1/2" NPT male
Pressure Range	10-60 PSI (.7-4,1 BAR)
Maximum System Pressure	300 PSI (20,68 BAR)

Wiring Instructions

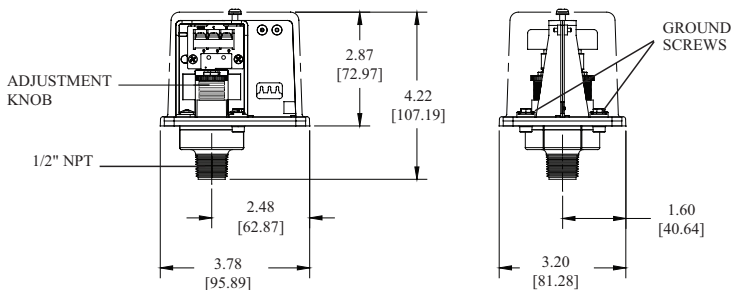
1. Remove the tamper resistant screw with the special key provided.
2. If it is necessary to remove the sealed knockouts, carefully place a screwdriver on the edge of the knockout and sharply apply a force sufficient to dislodge the knockout plug. See Fig. 9.
3. Run wires through an approved conduit connector and affix the connector to the device. A NEMA-4 rated conduit fitting is required for outdoor use.
4. Connect the wires to the appropriate terminal connections for the service intended. See Figures 2,4,5,6 and 8.

Adjustment and Testing

NOTE: Testing the PS40 may activate other system connected devices. The operation of the pressure supervisory switch should be tested upon completion of installation and periodically thereafter in accordance with the applicable local, national and NFPA codes and standards and/or the authority having jurisdiction (manufacturer recommends quarterly or more frequently). The use of a Potter BVL (see product bulletin 5400799 for details) is recommended to facilitate setting and testing of the PS40 pressure switch. When a BVL (bleeder valve) is used, the pressure to the switch can be isolated and bled from the exhaust port on the BVL without affecting the supervisory pressure of the entire system. See Fig. 3. The operation point of the PS40 Pressure Switch can be adjusted to any point between 10 and 60 PSI (0,7 - 4,11 BAR) by turning the adjustment knob(s) clockwise to raise the actuation point and counter clockwise to lower the actuation point. In the case of the PS40-2, both switches operate independent of each other. Each switch may be independently adjusted to actuate at any point across the switch adjustment range. If the pressure needs to be adjusted from the factory settings, adjust the system pressure to the desired trip point. Use an ohmmeter on the appropriate contact (COM and 2 for pressure decrease and COM and 1 for pressure increase). Adjust the knurled knob until the meter changes state. At that point the switch is set for that particular pressure. Final adjustments should be verified with a pressure gauge. The position of the top of the adjustment knob across to the printed scale on the switch bracket can be used to provide an approximate visual reference of the pressure switch setting.

Dimensions

Fig 1



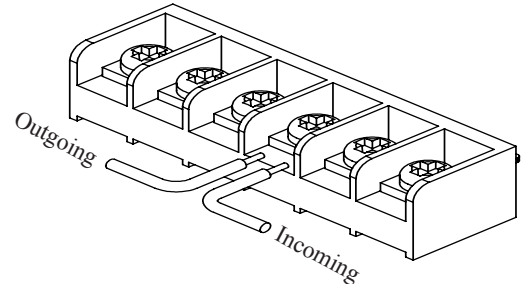
NOTE: To prevent leakage, apply Teflon tape sealant to male threads only.

DWG# 930-1

Switch Terminal Connections

Clamping Plate Terminal

Fig 2

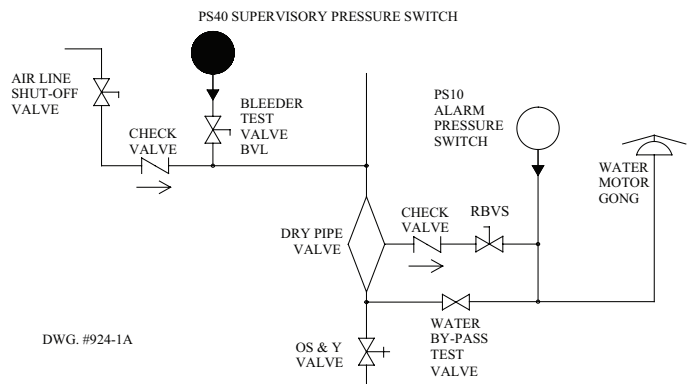


CAUTION

An uninsulated section of a single conductor should not be looped around the terminal and serve as two separate connections. The wire must be severed, thereby providing supervision of the connection in the event that the wire becomes dislodged from under the terminal.

Typical Sprinkler Applications

Fig 3

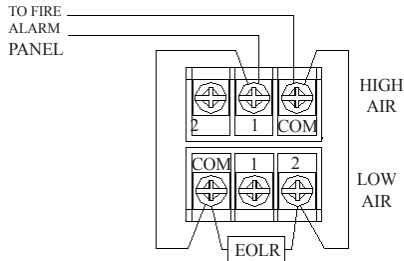


CAUTION

Closing of any shutoff valves between the alarm check valve and the PS40 will render the PS40 inoperative. To comply with IBC, IFC, and NFPA-13, any such valve shall be electrically supervised with a supervisory switch such as Potter Model RBVS.

Typical Electrical Connections

Fig 4

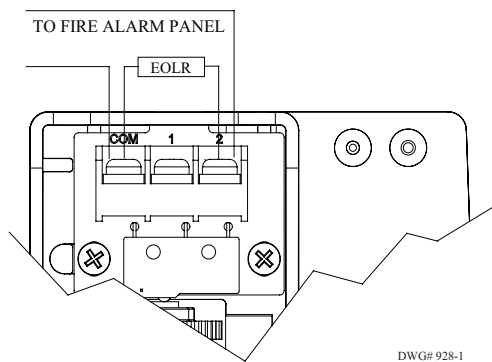


With normal system pressure applied high - Terminal 1 will close on pressure release.

With normal system pressure applied low - Terminal 2 will close on pressure drop.

Low Pressure Signal Connection

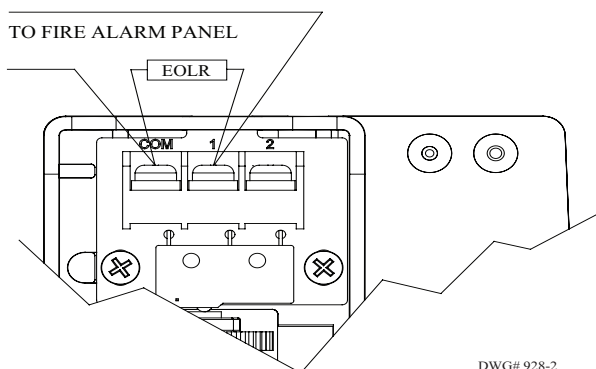
Fig 5



DWG# 928-1

High Pressure Signal Connection

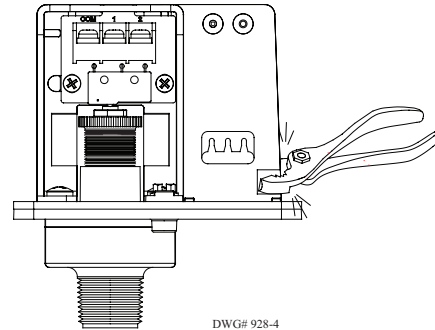
Fig 6



DWG# 928-2

One Conduit Wiring

Fig 7

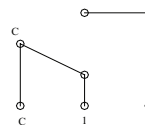


DWG# 928-4

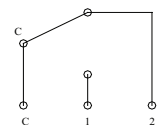
Changing Pressure

Fig 8

Low Pressure Switch



High Pressure Switch



Terminal
C: Common

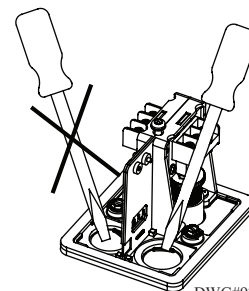
1. Closed when installed under normal system Pressure.
2. Open when installed under normal system pressure. Closes on pressure drop. Use for low air signal.

Terminal

1. Open when installed under normal system pressure. Closes on increase in pressure. Use for high air signal.
2. Closed under normal system pressure.

Removing Knockouts

Fig 9



DWG#928-5

Engineer/Architect Specifications Pressure Type Waterflow Switch

Pressure type supervisory switches; shall be a Model PS40 as manufactured by Potter Electric Signal Company, St. Louis, MO., and shall be installed on the fire sprinkler system as shown and or specified herein. Switches shall be provided with a 1/2" NPT male pressure connection to be connected into the air supply line on the system side of any shut-off valve. A Model BVL bleeder valve as supplied by Potter Electric Signal Company of St. Louis, MO., or equivalent shall be connected in line with the PS40 to provide a means of testing the operation of the supervisory switch. (See Fig. 3)

The switch unit shall contain SPDT (Form C) switch(es). One switch shall be set to operate at 30 psi (2,1 BAR) on a pressure decrease. If two switches are provided, the second switch shall be set to operate at a 50 psi (3,5 BAR) on a pressure increase.

Switch contacts shall be rated at 10.1 Amps at 125/250VAC and 2.0 Amps at 30VDC. The units shall have a maximum pressure rating of 300 PSI (20,68 BAR) and shall be adjustable from 10 to 60 PSI (0,7 to 4,1 BAR).

Pressure switches shall have two conduit entrances, one for each individual switch compartment to facilitate the use of dissimilar voltages for each individual switch.

The cover of the pressure switch shall be zinc die-cast with rain lip and shall attach with one tamper resistant screw. The pressure switch shall be suitable for indoor or outdoor service with a NEMA-4/IP66 rating. The pressure switch shall be UL, ULC, and CSFM listed, FM and LPC approved and NYMEA accepted.

Ordering Information

Model	Description	Stock No.
PS40-1	Pressure Switch with one set SPDT contacts	1340403
PS40-2	Pressure Switch with two sets SPDT contacts	1340404
	Hex Key	5250062
BVL	Bleeder Valve	1000018
	Optional Cover Tamper Switch Kit	0090200

WARNING

- Installation must be performed by qualified personnel and in accordance with all national and local codes and ordinances.
- Shock hazard. Disconnect power source before servicing. Serious injury or death could result.
- Read all instructions carefully and understand them before starting installation. Save instructions for future use. Failure to read and understand instructions could result in improper operation of device resulting in serious injury or death.
- Risk of explosion. Not for use in hazardous locations. Serious injury or death could result.

CAUTION

- Do not tighten by grasping the switch enclosure. Use wrenching flats on the bushing only. Failure to install properly could damage the switch and cause improper operation resulting in damage to equipment and property.
- To seal threads, apply Teflon tape to male threads only. Using joint compounds or cement can obstruct the pressure port inlet and result in improper device operation and damage to equipment.
- Do not over tighten the device, standard piping practices apply.
- Do not apply any lubricant to any component of the pressure switch.

Features

- One and two switch models available.
- Independent switch adjustment, no tools needed.
- Two conduit / cable entrances.
- Separate isolated wiring chambers.
- Non-corrosive pressure connection.
- Solid metal enclosure.



Installation

The Potter PS120 Series Supervisory Pressure Actuated Switches are designed primarily to detect an increase and/or decrease from normal system pressure in automatic fire sprinkler systems. Typical applications are: Wet pipe systems with excess pressure, pressure tanks, air supplies, and water supplies. The PS120 switch is factory set for 120 PSI (8,3 BAR) normal system pressure. The switch marked with the word LOW is set to operate at a pressure decrease of 10 PSI (0,7 BAR) at 110 PSI (7,6 BAR). The switch marked with the word HIGH is set to operate at a pressure increase of 10 PSI (0,7 BAR) at 130 PSI (9 BAR). See section heading **Adjustments and Testing** if other than factory set point is required.

1. Connect the PS120 to the system side of any shutoff or check valve.
2. Apply Teflon tape to the threaded male connection on the device. (Do not use pipe dope)
3. Device should be mounted in the upright position. (Threaded connection down)
4. Tighten the device using a wrench on the flats on the device.

Wiring Instructions

1. Remove the tamper resistant screw with the special key provided.
2. Carefully place a screwdriver on the edge of the knockout and sharply apply a force sufficient to dislodge the knockout plug. See Fig 9.
3. Run wires through an approved conduit connector and affix the connector to the device. A NEMA-4 rated conduit fitting is required for outdoor use.
4. Connect the wires to the appropriate terminal connections for the service intended. See Figures 2,4,5, and 6. See Fig 7 for two switch, one conduit wiring.

Technical Specifications

Dimensions	3.78"(9,6cm)Wx3.20"(8,1cm)Dx4.22"(10,7cm)H
Differential	Typical 2 lbs. at 25 PSI (0,14 at 1,7 BAR) 8 lbs at 175 PSI (55 at 12,1 BAR)
Enclosure	Cover: Die Cast Finish: Red Powder Coat Base: Die Cast All parts have corrosion resistant finishes
Factory Adjustment	PS120-1 operates on decrease at 110 PSI (7,6 BAR) PS120-2 operates in increase at 130 PSI (9 BAR) and on decrease at 110 PSI (7,6 BAR)
Switch Contacts	SPDT (Form C) 10.1 Amps at 125/250 VAC, 2.0 Amps at 30 VDC One SPDT in PS120-1, Two SPDT in PS120-2
Environmental Limitations	-40° F to 140°F (-40°C to 60°C) NEMA 4/IP66 Rated Enclosure indoor or outdoor when used with NEMA 4 conduit fittings
Conduit Entrances	Two knockouts for 1/2" conduit provided. Individual switch compartments and ground screw suitable for dissimilar voltages
Service Use	NFPA 13, 13D, 13R, 72
Pressure Connection	Nylon 1/2" NPT male
Maximum System Pressure	300 PSI (20,68 BAR)

*Specifications subject to change without notice.

Testing

The operation of the pressure alarm switch should be tested upon completion of installation and periodically thereafter in accordance with the applicable NFPA codes and standards and/or the authority having jurisdiction (manufacturer recommends quarterly or more frequently).

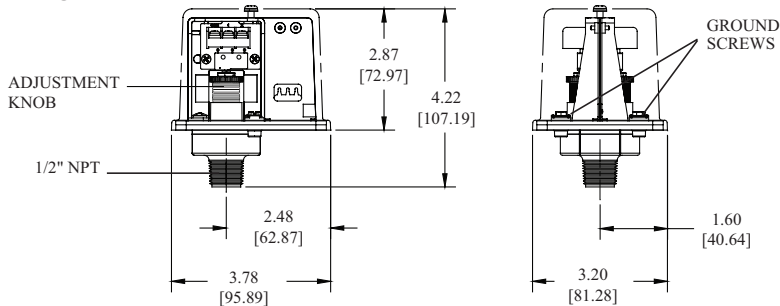
Wet System

NOTE: Testing the PS120 may activate other system connected devices. The use of a Potter BVL (see product bulletin 8900067 for details) is recommended to facilitate setting and testing of the PS120 pressure switch. When a BVL (bleeder valve) is used, the pressure to the switch can be isolated and bled from the exhaust port on the BVL without effecting the supervisory pressure of the entire system. See Fig. 3

The operation point of the PS120 Pressure Switch can be adjusted to any point between 25 and 175 PSI (1,7 - 12,1 BAR) by turning the adjustment knob(s) clockwise to raise the actuation point and counter clockwise to lower the actuation point. In the case of the PS120-2, both switches operate independent of each other. Each switch may be independently adjusted to actuate at any point across the switch adjustment range. Initial adjustment can be made with a visual reference from the top of the adjustment knob across to the printed scale on the switch bracket. Final adjustments should be verified with a pressure gauge.

Dimensions

Fig 1

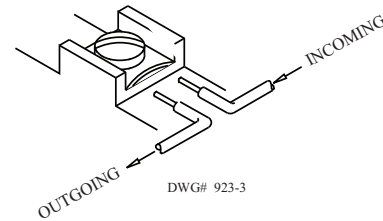


NOTE: To prevent leakage, apply Teflon tape sealant to male threads only.

DWG# 930-1

Switch Clamping Plate Terminal

Fig 2

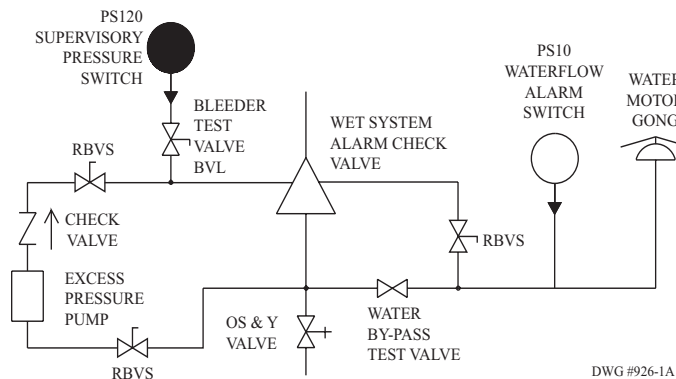


WARNING

An uninsulated section of a single conductor should not be looped around the terminal and serve as two separate connections. The wire must be severed, thereby providing supervision of the connection in the event that the wire becomes dislodged from under the terminal.

Typical Sprinkler Applications

Fig 3



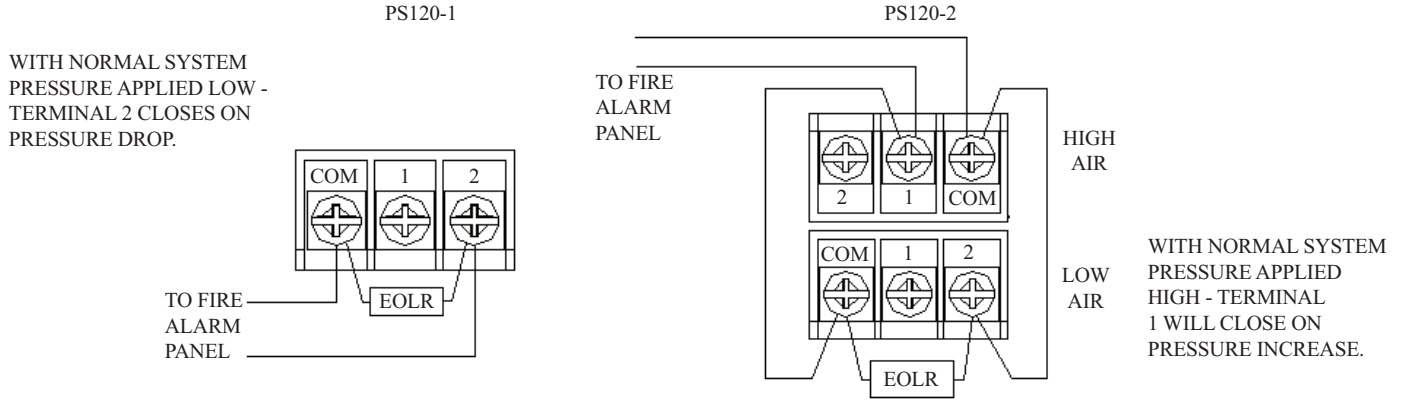
DWG #926-1A

CAUTION

Closing of any shutoff valves between the alarm check valve and the PS120 will render the PS120 inoperative. To comply with NFPA-72 any such valve shall be electrically supervised with a supervisory switch such as Potter Model RBVS.

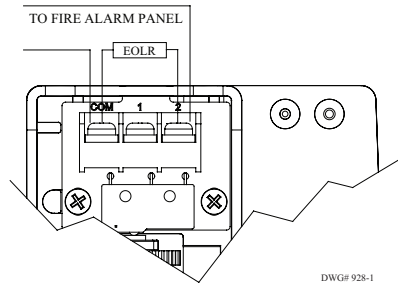
Typical Connections

Fig 4

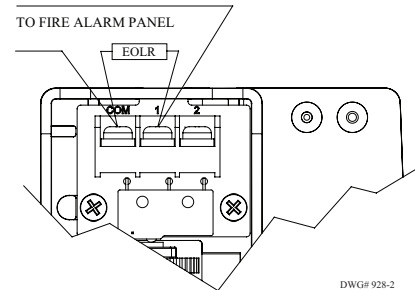


DWG# 933-1

Low Pressure Signal Connection
Fig 4



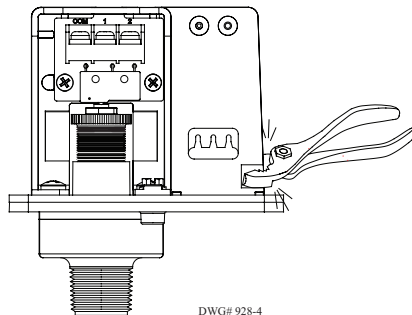
High Pressure Signal Connection
Fig 5



One Conduit Wiring

Fig 7

Break out thin section of divider to provide path for wires when wiring both switches from one conduit entrance.



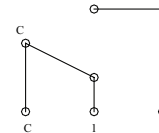
Changing Pressure

(With normal system pressure)

Fig 8

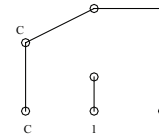
Terminal
1: Closed under normal system pressure.
2: Open under normal system pressure, closes on pressure drop. Use for low pressure signal.

LOW PRESSURE SWITCH



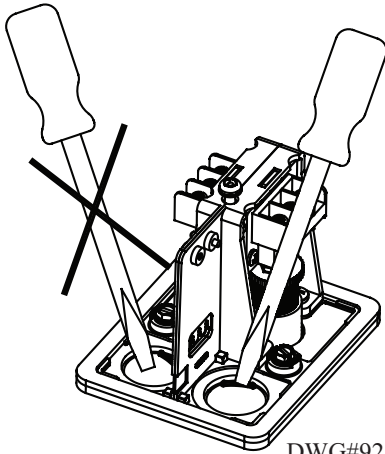
Terminal
1: Open under normal system pressure, closes on pressure increase. Use for high pressure signal.
2: Closed under normal system pressure.

HIGH PRESSURE SWITCH



Removing Knockouts

Fig 9



Engineer/Architect Specifications Pressure Type Waterflow Switch

Pressure type supervisory switches; shall be a Model PS120 as manufactured by Potter Electric Signal Company, St. Louis, MO., and shall be installed on the fire sprinkler system as shown and or specified herein.

Switches shall be provided with a 1/2" NPT male pressure connection to be connected into the air supply line on the system side of any shut-off valve.

A Model BVL bleeder valve as supplied by Potter Electric Signal Company of St. Louis, MO., or equivalent shall be connected in line with the PS120 to provide a means of testing the operation of the supervisory switch. (See Fig. 3)

The switch unit shall contain SPDT (Form C) switch(es). One switch shall be set to operate at a pressure decrease of 10 PSI (0,7 BAR) from normal. If two switches are provided, the second switch shall be set to operate at a pressure increase of 10 PSI (0,7 BAR) from normal.

Switch contact shall be rated at 10.1 Amps at 125/250VAC and 2.0 Amps at 30VDC. The units shall have a maximum pressure rating of 300 PSI (20,68 BAR) and shall be adjustable from 25 to 175 PSI (1,7 to 12,1 BAR).

Tamper

Cover incorporates tamper resistant fastener that requires a special key for removal. One key is supplied with each device. For optional cover tamper switch kit, order Stock No. 0090200. See bulletin #5401200 PSCTSK.

WARNING

- Installation must be performed by qualified personnel and in accordance with all national and local codes and ordinances.
- Shock hazard. Disconnect power source before servicing. Serious injury or death could result.
- Read all instructions carefully and understand them before starting installation. Save instructions for future use. Failure to read and understand instructions could result in improper operation of device resulting in serious injury or death.
- Risk of explosion. Not for use in hazardous locations. Serious injury or death could result.

CAUTION

- Do not tighten by grasping the switch enclosure. Use wrenching flats on the bushing only. Failure to install properly could damage the switch and cause improper operation resulting in damage to equipment and property.
- To seal threads, apply Teflon tape to male threads only. Using joint compounds or cement can obstruct the pressure port inlet and result in improper device operation and damage to equipment.
- Do not over tighten the device, standard piping practices apply.

Ordering Information

Model	Description	Part Number
PS120-1	Pressure switch with one set SPDT contacts	1341203
PS120-2	Pressure switch with two sets SPDT contacts	1341204
Hex Key		5250062
Cover Tamper Switch Kit		0090200
BVL	Bleeder valve	1000018

Features

- Small and large clamp models available
- Non-corrosive composite housing
- Built-in housing cover tamper switch
- Assembled in the USA



Description

The Model RBVS is designed to monitor the fully open position of a ball valve installed in a sprinkler system. The unit will fit on most ball valves installed on back-flow-preventers and alarm trim lines of dry, alarm, and deluge sprinkler valves. The switch operates if the ball valve handle is moved from the open position. However, the switch does not track the position of the handle or ball. When the ball valve handle is in the open position, a spring-loaded switch button will contact the valve handle. When the handle is moved from the open position, this switch button extends to the tripped position, and the RBVS contacts change state, thereby opening or closing a circuit. A cover tamper switch is available and is activated by the removal of the RBVS housing cover. If an attempt is made to remove the RBVS by the removal of the mounting brackets, the unit will be set into the tripped mode by this action.

The RBVS can be mounted to the hex portion of the ball valve or back-flow-preventer or to the adjoining pipe via two clamps. The RBVS is shipped with two sets of mounting clamps to accommodate various pipe and valve sizes, refer to Table 1. An "L" shaped and offset bracket for mounting the switch enclosure and an extension bracket add to the mounting flexibility of the RBVS. See "Typical Mounting Diagram" and "Installation and Operation" on the following pages

Testing

The RBVS and its associated protective monitoring system should be tested in accordance with applicable NFPA codes and standards and/or the authority having jurisdiction (manufacturer recommends quarterly or more frequently).

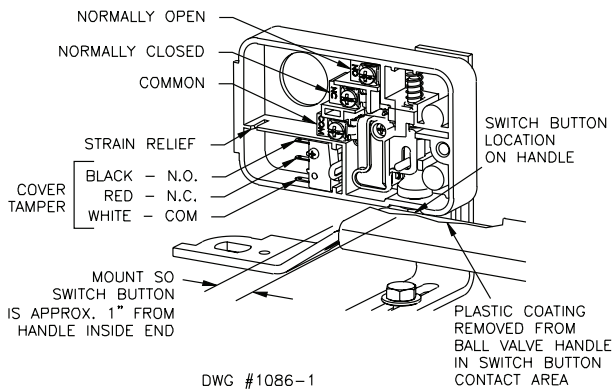
Technical Specifications

Dimensions	Large Clamps:	6" L x 5" W x 5.2" H 15,2 cm L x 12,7 cm W x 13,2 cm H
	Small Clamps:	6" L x 4" W x 5.2" H 15,2 cm L x 10,2 cm W x 13,2 cm H
Weight	With Large Clamps:	13.6 oz. (386,9 g.)
	With Small Clamps:	11.0 oz. (311,2 g.)
Contact Ratings	SPDT Contacts:	10A at 125/250 VAC 2A at 30 VDC
	SPDT Cover Tamper:	3A at 250 VAC
Environmental Limitations	NEMA 4 rated enclosure when proper electrical fittings are used. (IP67) Temperature range: -40°F to 150°F (-40°C to 65°C) Not for use in hazardous locations	
Probe Fitting Thread Connection:	½" and ¾" NPT	
Environmental Specifications	NEMA Type 1 for indoor use only. Formed sheet metal with powder coat/paint finish. Four openings for ½" conduit fittings. Temperature range: 40° F to 120° F (4,5° C to 49° C)	
Service Use	Dry Pipe/Pre-Action Automatic Sprinkler Systems NFPA 13	

US Patent No. 6,945,509

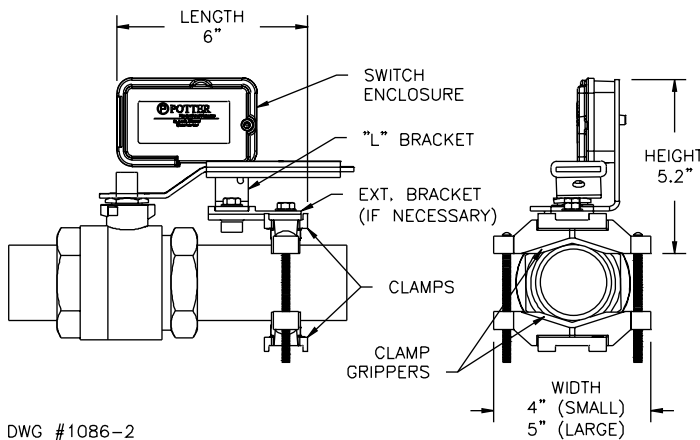
Internal Components

Fig.1



Typical Mounting Diagram

Fig. 2



Installation On Lever Handle

(See Fig. 2)

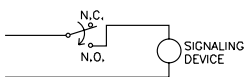
1. Select clamps and clamping bolts based upon pipe/valve size, see Table 1.
2. Insert rubber clamp grippers into clamps, see Fig. 2.
3. Place one clamp on top of pipe/ball valve near the valve handle and insert clamping bolts through it.
4. Place other clamp over clamping bolts from beneath the installation and thread hex nuts onto the clamping bolts, but do not fully tighten, (be sure hex nuts seat properly in clamp hex recesses). (NOTE: Some installations may require one of the mounting bolts to be inserted from the bottom of the brackets and then trimmed to allow the extension bracket to clear. See Fig. 4)
5. Attach extension bracket (if necessary to use for positioning) to top clamp using 1/4-20 X 3/4" Hex bolt and washer, but do not fully tighten.
6. Attach "L" bracket (RBVS switch enclosure is loosely attached to "L" bracket) to extension bracket using 1/4-20 X 3/4" Hex bolt and washer, but do not fully tighten.
7. Be sure ball valve is in the fully open position.
8. Slide loosely assembled RBVS switch enclosure to a position that permits the switch button to contact the valve handle approximately 1" from its inside end. See Fig. 1 for approximate location. Cut and remove the plastic coating from the ball valve handle to allow the RBVS switch button to contact (and be activated by) the metal of the handle.
9. Tighten clamping screws alternately to an eventual 30 in.-lbs. (minimum) of torque.
10. Maintain position of switch enclosure over valve handle and secure bolt that holds the extension bracket to the clamping assembly. It may be necessary to close valve to access this bolt.
11. Position "L" bracket so that it contacts the back edge of the valve handle, and secure its bolt. It may be necessary to close valve to access this bolt.
12. With the actuator fully retracted, position RBVS switch enclosure to contact the valve handle squarely, see Fig. 1.
13. With RBVS switch enclosure held squarely in contact with valve handle, securely tighten the two tamper resistant screws on the backside of the enclosure.
14. Close and open the valve to verify operation. The actuator should easily retract when the valve handle is in the open position.
15. Fully open the valve.
16. Remove the cover and wire main switch and tamper switch if applicable. Carefully route tamper switch wires through strain relief channel in switch enclosure. Fully seat the wires into the bottom of the channel. See Fig. 1.
17. Replace RBVS switch enclosure cover and securely tighten cover screw.

Table 1 Clamp Sizing

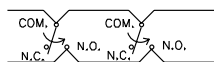
Pipe Valve/Size	Clamp	Clamping Bolts
1/2" to 3/4" (12,5 to 19mm)	Small	10-32 x 2 1/2
1" to 2" (25 to 50mm)	Large	1/4-20 x 4"

Typical Electrical Connections

LOCAL CIRCUIT
TRANSFORMER OR BATTERY POWER



STYLE D (CLASS A) SUPERVISED LOOP



STYLE B (CLASS B) SUPERVISED CIRCUIT

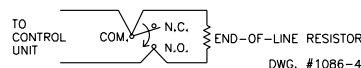


Fig. 3

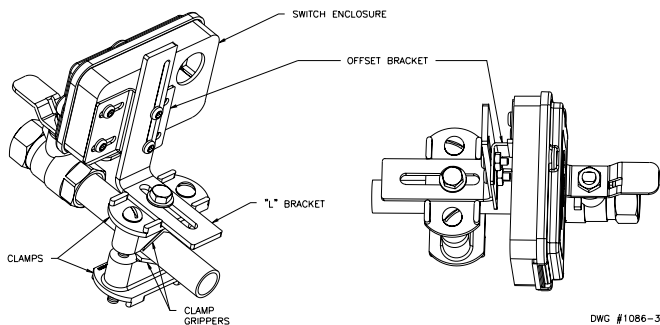
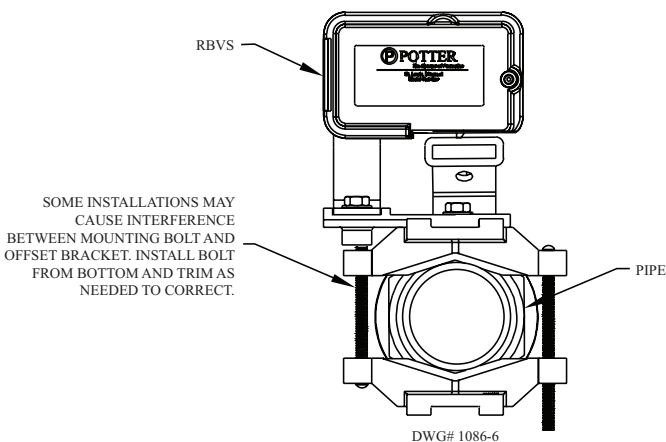


Fig. 4



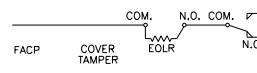
Installation on Tee Handle

(See Fig. 3)

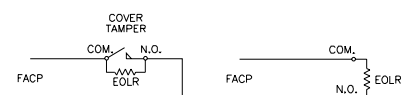
1. Select clamps and clamping bolts based upon pipe/valve size, see Table 1.
2. Insert rubber clamp grippers into clamps, See Fig. 3.
3. Place one clamp on top of pipe/ball valve near the valve handle and insert clamping bolts through it.
4. Place other clamp over clamping bolts from beneath the installation and thread hex nuts onto the clamping bolts, but do not fully tighten, (be sure hex nuts seat properly in clamp hex recesses).
5. Loosely attach "L" bracket to the "offset" bracket and "offset" bracket to the RBVS housing.
6. Be sure ball valve is in the fully open position.
7. Slide loosely assembled RBVS switch enclosure to a position that permits the switch button to contact the valve handle approximately 1/2" from the end of the handle. Cut and remove the plastic coating from the ball valve handle to allow the RBVS switch button to contact (and be activated by) the metal of the handle.
8. Tighten clamping screws alternately and 1/4-20 X 3/4" bolt to 30 in-lbs. (minimum) of torque.
9. With the valve handle fully open, slide the RBVS housing down until the switch operates plus 1/8 inch. Tighten the screws holding the RBVS to the "offset" bracket.
10. Remove the RBVS switch enclosure cover.
11. Close and open the valve to verify operation. The actuator should easily retract up when the valve handle is in the open position.
12. Fully open the valve.
13. Wire main switch and tamper switch (if applicable). Carefully route tamper switch wires through strain relief channel in switch enclosure. Fully seat the wires into the bottom of the channel. See Fig. 1.
14. Replace RBVS switch enclosure cover and securely tighten cover screw.

Tamper Switch Connections

COVER TAMPER & RBVS CONNECTED TO THE SAME ZONE ON THE FACP



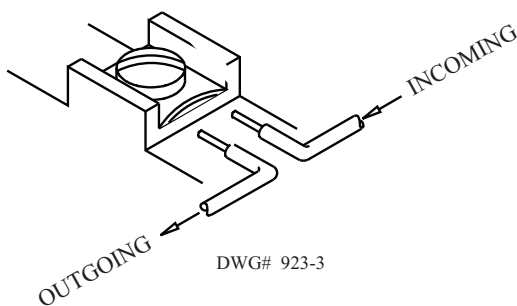
COVER TAMPER & RBVS WIRED TO SEPARATE ZONES



DWG. #1086-5

Switch Terminal Connections

Clamping Plate Terminal



WARNING

An uninsulated section of a single conductor should not be looped around the terminal and serve as two separate connections. The wire must be severed, thereby providing supervision of the connection in the event that the wire become dislodged from under the terminal. Failure to sever the wire may render the device inoperable risking severe property damage and loss of life. Do not strip wire beyond 3/8" of length or expose an uninsulated conductor beyond the edge of the terminal block. When using stranded wire, capture all strands under the clamping plate.

Ordering Information

Model	Description	Part Number
RBVS	Retrofit ball valve switch (w/o Cover Tamper)	1000040
RBVS-T	Retrofit ball valve switch (w/ Cover Tamper)	1000035
	Optional Cover Tamper Kit	0090201

Features

- Assembled in USA
- Visual and audible switch activation
- 0-90 second field replaceable electronic retard
- Two SPDT (form C) contacts
- Weatherproof
- Works on Schedule 5-40 pipe
- Easy to read wire terminal designations
- Easy to read retard time delay adjustment knob



CAUTION

Waterflow switches that are monitoring wet pipe sprinkler systems shall not be used as the sole initiating device to discharge AFFF, deluge, or chemical suppression systems. Waterflow switches used for this application may result in unintended discharges caused by surges, trapped air, or short retard times.



Important: This document contains important information on the installation and operation of the VSR waterflow switches. Please read all instructions carefully before beginning installation. A copy of this document is required by NFPA 72 to be maintained on site.

Description

The Model VSR is a vane type waterflow switch for use on wet sprinkler systems. It is UL Listed for use on a steel pipe; schedules 5 through 40, sizes 2" - 6" and is UL Listed and FM Approved for use on steel pipe; schedules 10 through 40, sizes 2" thru 8" (50 mm thru 200 mm). LPC approved sizes are 2" thru 8" (50 mm thru 200 mm). See Ordering Information chart.

The VSR may also be used as a sectional waterflow detector on large systems. The VSR contains two single pole, double throw, snap action switches and an adjustable, instantly recycling pneumatic retard. The switches are actuated when a flow of 10 GPM (38 LPM) or more occurs downstream of the device. The flow condition must exist for a period of time necessary to overcome the selected retard period.

Enclosure

The VSR switches and retard device are enclosed in a general purpose, die-cast housing. The cover is held in place with two tamper resistant screws which require a special key for removal. A field installable cover tamper switch is available as an option which may be used to indicate unauthorized removal of the cover. See bulletin number 5401103 for installation instructions of this switch.

WARNING

- Installation must be performed by qualified personnel and in accordance with all national and local codes and ordinances.
- Shock hazard. Disconnect power source before servicing. Serious injury or death could result.
- Risk of explosion. Not for use in hazardous locations. Serious injury or death could result.

Technical Specifications

Service Pressure	450 PSI (31 BAR) - UL	
Flow Required for Alarm	10 GPM (38 LPM) - UL	
Maximum Surge	18 FPS (5,5 m/s)	
Enclosure	Die-cast, red enamel finish Cover held in place with tamper resistant screws	
Contact Ratings	Two sets of SPDT (Form C) 10.0 Amps at 125/250VAC 2.0 Amps at 30VDC Resistive	
Conduit Entrances	Two knockouts provided for 1/2" conduit. Individual switch compartments suitable for dissimilar voltages.	
Environmental Specifications	NEMA-4/IP64 Rated enclosure suitable for indoor or outdoor use with factory installed gasket and die-cast housing when used with appropriate conduit fitting. Temperature range: 40° F to 120° F, (4,5° C to 49° C) UL	
Service Use	Automatic Sprinkler One or two family dwelling Residential occupancy up to four stories National Fire Alarm Code	NFPA-13 NFPA-13D NFPA-13R NFPA-72

*Specifications subject to change without notice.

Installation

These devices may be mounted on horizontal or vertical pipe. On horizontal pipe they shall be installed on the top side of the pipe where they will be accessible. The device should not be installed within 6" (15 cm) of a fitting which changes the direction of the waterflow or within 24" (60 cm) of a valve or drain.

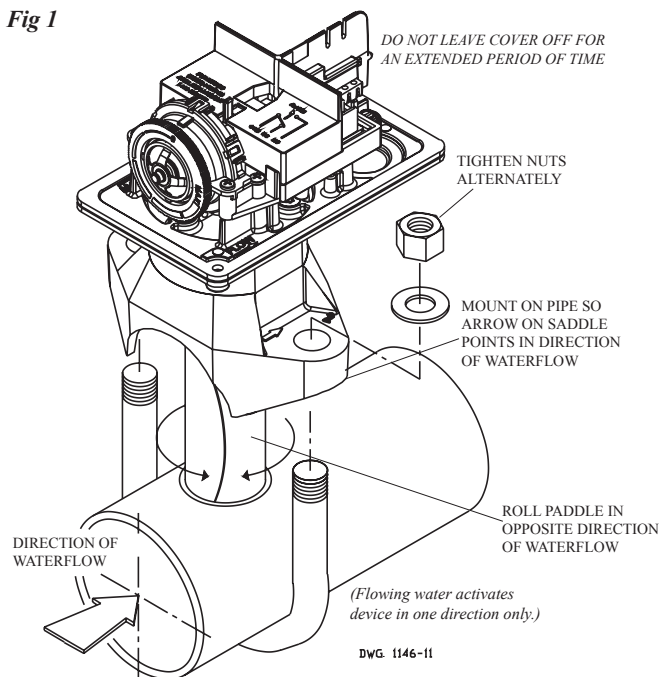
NOTE: Do not leave cover off for an extended period of time.

Drain the system and drill a hole in the pipe using a hole saw in a slow speed drill (see Fig. 1). Clean the inside pipe of all growth or other material for a distance equal to the pipe diameter on either side of the hole. Roll the vane so that it may be inserted into the hole; do not bend or crease it. Insert the vane so that the arrow on the saddle points in the direction of the waterflow. Take care not to damage the non-corrosive bushing in the saddle. The bushing should fit inside the hole in the pipe. Install the saddle strap and tighten nuts alternately to required torque (see the chart in Fig. 1). The vane must not rub the inside of the pipe or bind in any way.

WARNING

Do not trim the paddle. Failure to follow these instructions may prevent the device from operating and will void the warranty. Do not obstruct or otherwise prevent the trip stem of the flow switch from moving when water flows as this could damage the flow switch and prevent an alarm. If an alarm is not desired, a qualified technician should disable the alarm system.

Fig 1

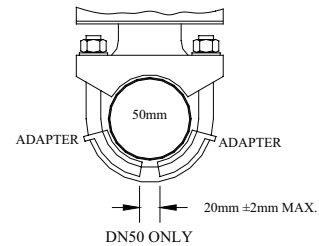
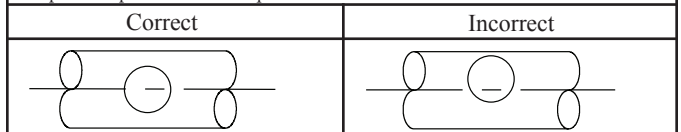


Retard Adjustment

The delay can be adjusted by rotating the retard adjustment knob from 0 to the max setting (60-90 seconds). The time delay should be set at the minimum required to prevent false alarms

CAUTION

Hole must be drilled perpendicular to the pipe and vertically centered. Refer to the Compatible Pipe/Installation Requirements chart for size.



USE (2) 5180162 ADAPTERS AS SHOWN ABOVE

DWGH 1146-1F

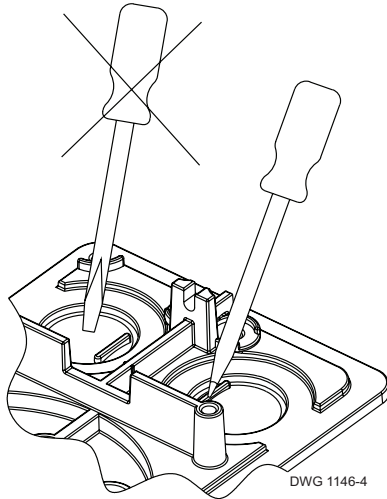
Compatible Pipe/ Installation Requirements

Model	Nominal Pipe Size		Nominal Pipe O.D.		Pipe Wall Thickness										Hole Size		U-Bolt Nuts Torque	
	inch	mm	inch	mm	Lightwall		Schedule 10 (UL)		Schedule 40 (UL)		BS-1387 (LPC)		DN (VDS)		inch	mm	ft-lb	n-m
VSR-2	2	DN50	2.375	60.3	.065	1.651	0.109	2.77	0.154	3.91	0.142	3.6	0.091	2.3	1.25 + .125/- .062	33.0 ± 2.0	20	27
VSR-2 1/2	2.5	-	2.875	73.0	.084	2.134	0.120	3.05	0.203	5.16	-	-	-	-				
VSR-2 1/2	-	DN65	3.000	76.1	-	-	-	-	-	-	0.142	3.6	0.102	2.6				
VSR-3	3	DN80	3.500	88.9	.083	2.108	0.120	3.05	0.216	5.49	0.157	4.0	0.114	2.9	2.00 ± .125	50.8 ± 2.0		
VSR-3 1/2	3.5	-	4.000	101.6	-	-	0.120	3.05	0.226	5.74	-	-	-	-				
VSR-4	4	DN100	4.500	114.3	.084	2.134	0.120	3.05	0.237	6.02	0.177	4.5	0.126	3.2				
VSR-5	5	-	5.563	141.3	-	-	0.134	3.40	0.258	6.55	-	-	-	-				
VSR-6	6	DN150	6.625	168.3	.115	2.921	0.134	3.40	0.280	7.11	0.197	5.0	0.157	4.0				
VSR-8	8	DN200	8.625	219.1	-	-	0.148	3.76	0.322	8.18	0.248	6.3	0.177	4.5				

Knockout Removal

To remove knockouts: Place screwdriver at inside edge of knockouts, not in the center.

Fig 2

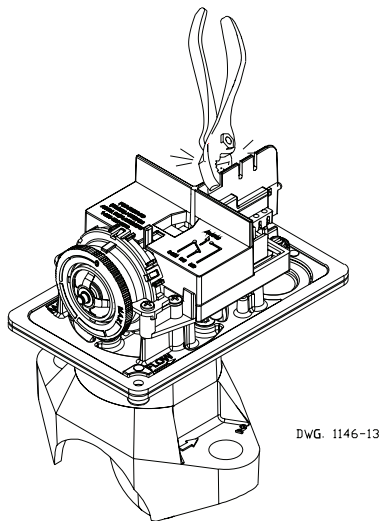


NOTICE

Do not drill into the base as this creates metal shavings which can create electrical hazards and damage the device. Drilling voids the warranty.

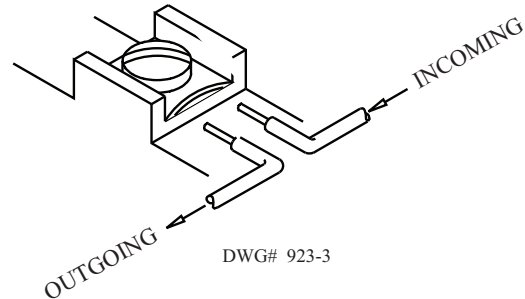
Break out thin section of cover when wiring both switches from one conduit entrance.

Fig 3



Switch Terminal Connections Clamping Plate Terminal

Fig 4

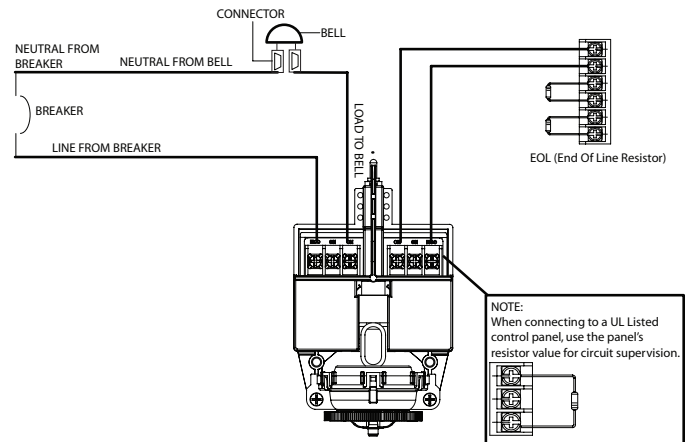


WARNING

An uninsulated section of a single conductor should not be looped around the terminal and serve as two separate connections. The wire must be severed, thereby providing supervision of the connection in the event that the wire become dislodged from under the terminal. Failure to sever the wire may render the device inoperable risking severe property damage and loss of life. Do not strip wire beyond 3/8" of length or expose an uninsulated conductor beyond the edge of the terminal block. When using stranded wire, capture all strands under the clamping plate.

Typical Electrical Connections

Fig 5



NOTES:

1. The Model VSR has two switches, one can be used to operate a central station, proprietary or remote signaling unit, while the other contact is used to operate a local audible or visual annunciator.
2. For supervised circuits, see "Switch Terminal Connections" drawing and warning note (Fig. 4).

Testing

The frequency of inspection and testing for the Model VSR and its associated protective monitoring system shall be in accordance with applicable NFPA Codes and Standards and/or the authority having jurisdiction (manufacturer recommends quarterly or more frequently).

If provided, the inspector's test valve shall always be used for test purposes. If there are no provisions for testing the operation of the flow detection device on the system, application of the VSR is not recommended or advisable.

A minimum flow of 10 GPM (38 LPM) is required to activate this device.

NOTICE

Advise the person responsible for testing of the fire protection system that this system must be tested in accordance with the testing instructions.

Maintenance

Inspect detectors monthly. If leaks are found, replace the detector. The VSR waterflow switch should provide years of trouble-free service. The retard and switch assembly are easily field replaceable. In the unlikely event that either component does not perform properly, please order replacement retard switch assembly stock #1029030 (see Fig. 8). There is no maintenance required, only periodic testing and inspection. Vane type waterflow switches have a normal service life of 10-15 years. However, the service life may be significantly reduced by local environmental conditions.

Mounting Dimensions

Fig 6

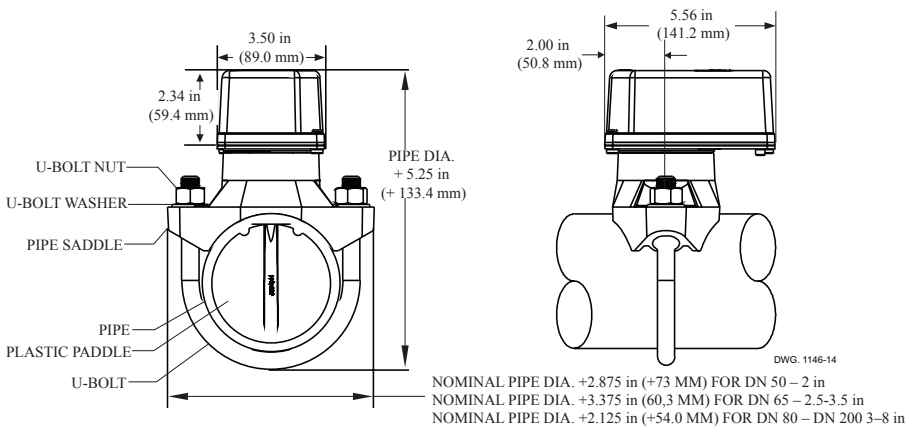
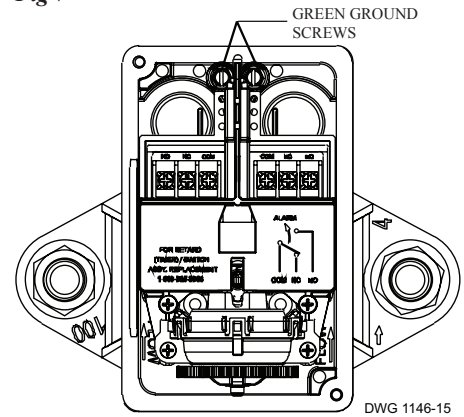


Fig 7

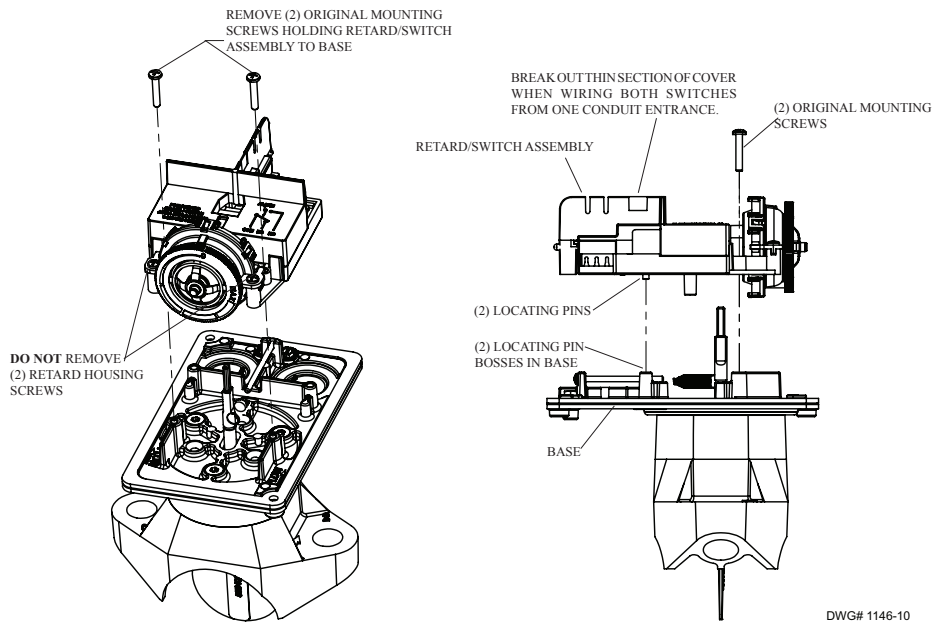


Retard/Switch Assembly Replacement

NOTE: The Retard/Switch Assembly is field-replaceable without draining the system or removing the waterflow switch from the pipe.

1. Make sure the fire alarm zone or circuit connected to the waterflow switch is bypassed or otherwise taken out of service.
2. Disconnect the power source for local bell (if applicable).
3. Identify and remove all wires from the waterflow switch.
4. Remove the (2) mounting screws holding retard/switch assembly to the base. **Do not** remove the (2) retard housing screws.
5. Remove the retard assembly by lifting it straight up over the tripstem.
6. Install the new retard assembly. Make sure the locating pins on the retard/switch assembly fit into the locating pin bosses on the base.
7. Re-install the (2) original mounting screws.
8. Reconnect all wires. Perform a flow test and place the system back in service.

Fig 8



Removal of Waterflow Switch

- To prevent accidental water damage, all control valves should be shut tight and the system completely drained before waterflow detectors are removed or replaced.
- Turn off electrical power to the detector, then disconnect wiring. Loosen nuts and remove U-bolts. Gently lift the saddle far enough to get your fingers under it. With your fingers, roll the vane so it will fit through the hole while continuing to lift the waterflow detector saddle.
- Lift detector clear of pipe.

Ordering Information

Ordering Information			
Nominal Pipe Size		Model	Part Number
2"	DN50	VSR-2	1144402
2 1/2"	DN65	VSR-2 1/2	1144425
3"	DN80	VSR-3	1144403
3 1/2"	-	VSR-3 1/2	1144435

Nominal Pipe Size		Model	Part Number
4"	DN100	VSR-4	1144404
5"	-	VSR-5	1144405
6"	DN150	VSR-6	1144406
8"	DN200	VSR-8	1144408

Optional: Cover Tamper Switch Kit, stock no. 0090148

Replaceable Components: Retard/Switch Assembly, stock no. 1029030

Features

- Assembled in USA
- 0-90 second field replaceable electronic retard
- Fits 1" to 2" CPVC, copper, or iron TEE's
- Comes with all necessary paddles
- Two SPDT (form C) contacts
- Weatherproof
- Easy to read wire terminal designations
- Easy to read time delay adjustment knob



CAUTION

Waterflow switches that are monitoring wet pipe sprinkler systems shall not be used as the sole initiating device to discharge AFFF, deluge, or chemical suppression systems. Waterflow switches used for this application may result in unintended discharges caused by surges, trapped air, or short retard times.



Important: This document contains important information on the installation and operation of the VSR waterflow switches. Please read all instructions carefully before beginning installation. A copy of this document is required by NFPA 72 to be maintained on site.

Description

The Model VSR-S is a vane type waterflow switch for use on wet sprinkler systems that use 1" (25mm), 1 1/4" (32mm), 1 1/2" (38mm) or 2" (50mm) pipe size. The unit may also be used as a sectional waterflow detector on large systems.

The unit contains two single pole double throw snap action switches and an adjustable, instantly recycling pneumatic retard. The switches are actuated when a flow of 10 gallons per minute (38 LPM) or more occurs downstream of the device. The flow condition must exist for a period of time necessary to overcome the selected retard period.

Enclosure

The VSR-S switches and retard device are enclosed in a general purpose, die-cast housing. The cover is held in place with two tamper resistant screws which require a special key for removal. A field installable cover tamper switch is available as an option which may be used to indicate unauthorized removal of the cover. See bulletin number 5401103 for installation instructions of this switch.

WARNING

- Installation must be performed by qualified personnel and in accordance with all national and local codes and ordinances.
- Shock hazard. Disconnect power source before servicing. Serious injury or death could result.
- Risk of explosion. Not for use in hazardous locations. Serious injury or death could result.

Technical Specifications

Service Pressure	Up to 300 PSI (20,7 BAR)
Flow Required for Alarm	10 GPM (38 LPM)-UL To ensure a minimum flow rate of 10 gpm, a minimum pressure is required at all sprinklers with a k-factor of 3 or less. K3: 10 PSI - K2.8: 12 PSI If used at less than 10 GPM, it is the installers responsibility to conduct a calibrated flow test at the lowest expected flow rate to ensure proper rotation of flowswitch.
Maximum Surge	18 FPS (5,5 m/s)
Enclosure	Die-cast, red enamel finish Cover held in place with tamper resistant screws
Contact Ratings	Two sets of SPDT (Form C) 10.0 Amps at 125/250VAC 2.0 Amps at 30VDC Resistive
Conduit Entrances	Two knockouts provided for 1/2" conduit. Individual switch compartments suitable for dissimilar voltages.
Usage	Listed plastic, copper and schedule 40 iron pipe. Fits pipe sizes - 1" (25mm), 1 1/4" (32mm), 1 1/2" (38mm) and 2" (50mm) NOTE: 12 paddles are furnished with each unit, one for each pipe size of threaded and sweat TEE, one for 1" (25mm) CPVC, one for 1" (25mm) CPVC (Central), one for 1" threaded Nibco CPVC, and one for 1 1/2" (38mm) threaded (Japan).
Environmental Specifications	NEMA-4/IP65 Rated enclosure suitable for indoor or outdoor use with factory installed gasket and die-cast housing when used with appropriate conduit fitting. Temperature range: 40° F to 120° F, (4,5° C to 49° C) UL
Service Use	Automatic Sprinkler One or two family dwelling Residential occupancy up to four stories National Fire Alarm Code NFPA-13 NFPA-13D NFPA-13R NFPA-72

*Specifications subject to change without notice.

Installation

These devices may be mounted in horizontal or vertical pipe. On horizontal pipe they should be installed on the top side of the pipe where they will be accessible. The units should not be installed within 6" (15cm) of a valve, drain or fitting which changes the direction of the waterflow. Select the proper paddle for the pipe size and type of TEE used see Fig. 1 for instructions on changing paddle. The unit has a 1" NPT bushing for threading into a non-corrosive TEE. See Fig. 2 for proper TEE size, type and installation. Use no more than three wraps of teflon tape.

Screw the device into the TEE fitting as shown in Fig. 2. Care must be taken to properly orient the device for the direction of waterflow.

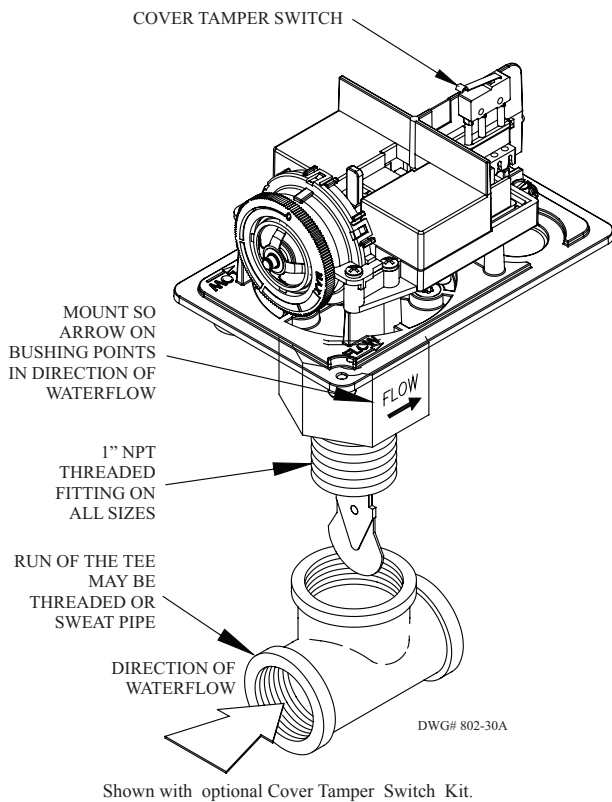
The vane must not rub the inside of the TEE or bind in any way. The stem should move freely when operated by hand.

Note: Do not leave cover off for an extended period of time.

⚠ WARNING

Do not trim the paddle. Failure to follow these instructions may prevent the device from operating and will void the warranty. Do not obstruct or otherwise prevent the trip stem of the flow switch from moving when water flows as this could damage the flow switch and prevent an alarm. If an alarm is not desired, a qualified technician should disable the alarm system.

Fig 1



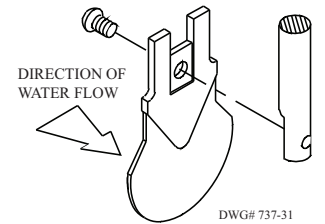
Retard Adjustment

The delay can be adjusted by rotating the retard adjustment knob from 0 to the max setting (60-90 seconds). The time delay should be set at the minimum required to prevent false alarms.

Screw the device into the tee fitting as shown. Care must be taken to properly orient the device for the direction of waterflow. On sweat tees, no threaded bushings, inserts, or adapters are permitted, unless they comply with the dimensions listed in the chart below.

Important - The depth to the inside bottom of the tee should have the following dimensions:

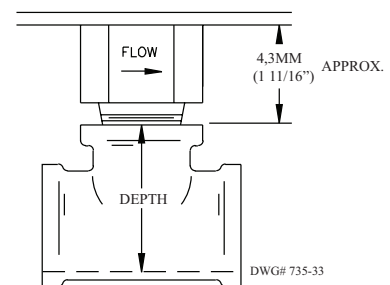
Approximate Depth Requirement			
Tee Size	Threaded	Sweat	CPVC
1" x 1" x 1"	2 1/16"	1 3/4"	2 7/16"
1 1/4" x 1 1/4" x 1"	2 7/16"	2 7/16"	N/A
1 1/2" x 1 1/2" x 1"	2 11/16"	2 1/4"	N/A
2" x 2" x 1"	3 3/16"	2 3/4"	N/A



⚠ WARNING

There are 12 paddles furnished with each unit. One for each size of threaded, sweat or plastic TEE as described in Fig. 2. These paddles have raised lettering that shows the pipe size and type of TEE that they are to be used with. The proper paddle must be used. The paddle must be properly attached (see drawing) and the screw that holds the paddle must be securely tightened.

Fig 2



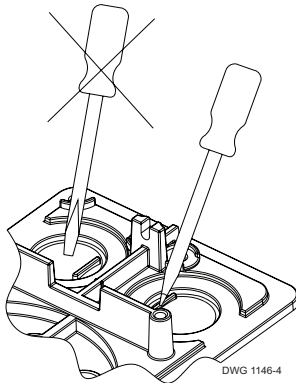
NOTICE

Use only factory TEE's with a 1" NPT boll. Reducing bushings, mechanical TEE's and weld-o-lets are not allowed.
* Do not use more than three wraps of teflon tape.

Knockout Removal

To remove knockouts: Place screwdriver at inside edge of knockouts, not in the center.

Fig 3

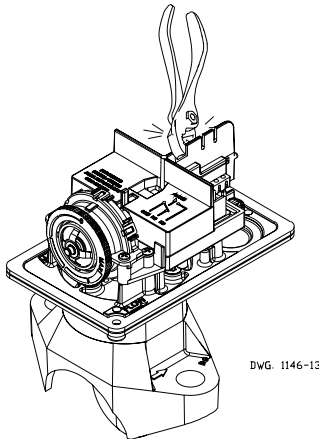


NOTICE

Do not drill into the base as this creates metal shavings which can create electrical hazards and damage the device. Drilling voids the warranty.

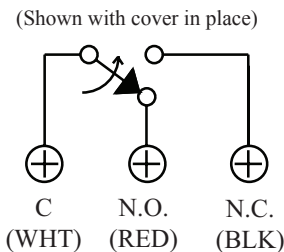
Fig 4

Break out thin section of cover when wiring both switches from one conduit entrance.



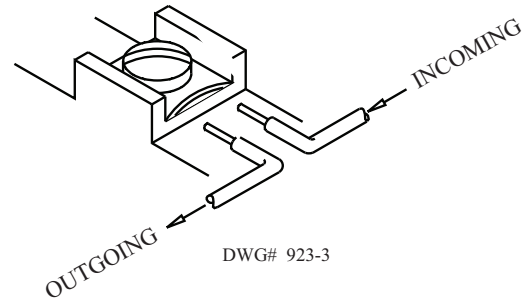
Cover Tamper Switch Wiring

Fig 5



Switch Terminal Connections Clamping Plate Terminal

Fig 6

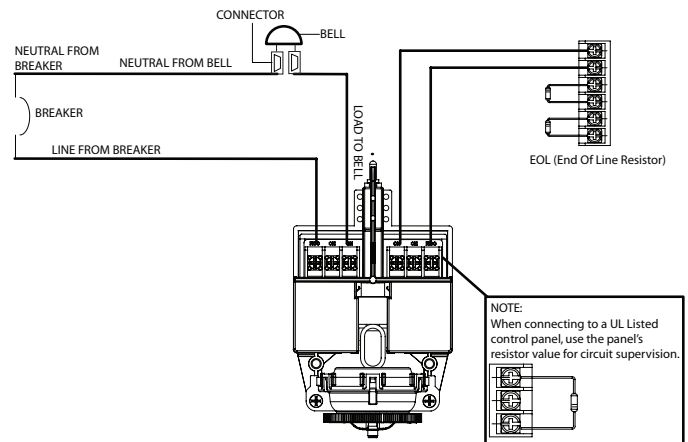


WARNING

An uninsulated section of a single conductor should not be looped around the terminal and serve as two separate connections. The wire must be severed, thereby providing supervision of the connection in the event that the wire become dislodged from under the terminal. Failure to sever the wire may render the device inoperable risking severe property damage and loss of life. Do not strip wire beyond 3/8" of length or expose an uninsulated conductor beyond the edge of the terminal block. When using stranded wire, capture all strands under the clamping plate.

Typical Electrical Connections

Fig 7



NOTES:

1. The Model VSR has two switches, one can be used to operate a central station, proprietary or remote signaling unit, while the other contact is used to operate a local audible or visual annunciator.
2. A condition of LPC Approval of this product is that the electrical entry must be sealed to exclude moisture.
3. For supervised circuits, see "Switch Terminal Connections" drawing and warning note (Fig. 6).

Testing

The frequency of inspection and testing for the Model VSR-S and its associated protective monitoring system should be in accordance with applicable NFPA Codes and Standards and/or the authority having jurisdiction (manufacturer recommends quarterly or more frequently.)

An inspector's test valve shall always be used for test purposes. If there are no provisions for testing the operation of the flow detection device on the system, application of the VSR-S is not recommended or advisable.

A minimum flow of 10 gpm (38 Lpm) is required to activate this device.

Important Notice

Please advise the person responsible for testing of the fire protection system that this system must be tested in accordance with the testing instructions.

Maintenance

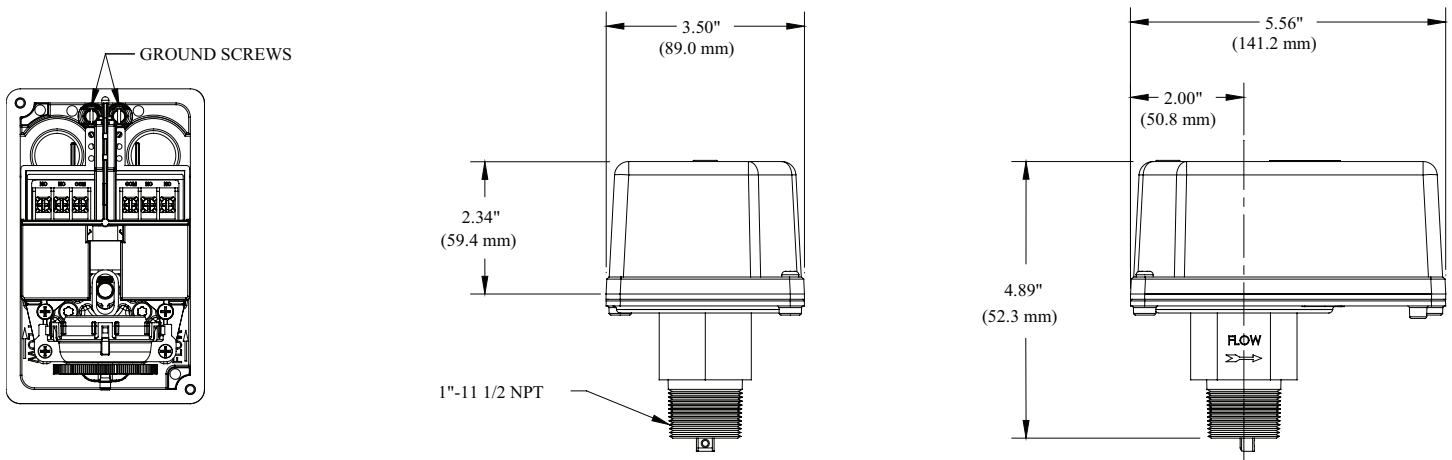
Inspect detectors monthly for leaks. If leaks are found, replace the detector. The VSR-S waterflow switch should provide years of trouble-free service. The retard and switch assembly are easily field replaceable. In the unlikely event that either component does not perform properly, please order replacement retard switch assembly stock #1029030. There is no maintenance required, only periodic testing and inspection. Vane type waterflow switches have a normal service life of 10-15 years. However, the service life may be significantly reduced by local environmental conditions.

Removal

- To prevent accidental water damage, all control valves should be shut tight and the system completely drained before waterflow detectors are removed or replaced.
- Turn off electrical power to the detector, then disconnect wiring.
- Use a wrench on the flats of the bushing. Turn the switch counterclockwise to disengage the pipe threads.
- Gently lift with your fingers, roll the vane so it will fit through the hole while continuing to lift the waterflow detector.
- Lift detector clear of pipe.

Mounting Dimensions

Fig 8



Ordering Information

Model	Description	Stock No.
VSR-S	Vane Type Waterflow Alarm Switch with Retard	1144440

Optional: Cover Tamper Switch Kit, Stock No. 0090148
(See Fig. 4 for terminations)

Replaceable Components: Retard/Switch Assembly, stock no. 1029030
Paddle Tree, stock no. 5559001
Paddle Tree, stock no. 5490374

Features

- Assembled in USA
- 0-90 second field replaceable electronic retard
- Fits 1" to 2" CPVC
- Comes with all necessary paddles
- Easy to read wire terminal designations
- Easy to read retard time delay adjustment knob
- Union coupling for installations in confined locations



CAUTION

Waterflow switches that are monitoring wet pipe sprinkler systems shall not be used as the sole initiating device to discharge AFFF, deluge, or chemical suppression systems. Waterflow switches used for this application may result in unintended discharges caused by surges, trapped air, or short retard times.



Description

The Model VSR-SG is a vane type waterflow switch for use on wet sprinkler systems using CPVC plastic fittings (manufactured by Tyco, Nibco, Victaulic, Ipex, and Spears Manufacturing Company) that use 1", 1 1/4", 1 1/2", or 2" pipe sizes. It is equipped with a union to accommodate installation in confined spaces.

The VSR-SG contains two single pole, double throw, snap action switches and an adjustable, instantly recycling pneumatic retard. The switches are actuated when a flow of 10 GPM (38 LPM) or more occurs downstream of the switch. The flow condition must exist for a period of time necessary to overcome the selected retard period.

Enclosure

The VSR-SG switches and retard switch are enclosed in a general purpose, die-cast housing. The cover is held in place with two tamper resistant screws which require a special key for removal. A field installable cover tamper switch is available as an option which may be used to indicate unauthorized removal of the cover. See bulletin number 5401103 for installation instructions of this switch.

Technical Specifications

Service Pressure	Up to 175 PSI (12,07 BAR)	
Flow Required for Alarm	4-10 GPM (15-38 LPM) - UL	
Maximum Surge	18 FPS (5,5 m/s)	
Contact Ratings	Two sets of SPDT (Form C) 10.0 Amps at 125/250VAC 2.0 Amps at 30VDC Resistive	
Conduit Entrances	Two knockouts provided for 1/2" conduit. Individual switch compartments suitable for dissimilar voltages.	
Environmental Specifications	NEMA-4/IP65 Rated enclosure suitable for indoor or outdoor use with factory installed gasket and die-cast housing when used with appropriate conduit fitting. Temperature range: 40° F to 120° F, (4,5° C to 49° C) UL	
Service Use	British Standard Automatic Sprinkler One or two family dwelling Residential occupancy up to four stories National Fire Alarm Code	B59251 NFPA-13 NFPA-13D NFPA-13R NFPA-72

WARNING

- Installation must be performed by qualified personnel and in accordance with all national and local codes and ordinances.
- Shock hazard. Disconnect power source before servicing. Serious injury or death could result.
- Risk of explosion. Not for use in hazardous locations. Serious injury or death could result.

Installation

These switches may be mounted on horizontal or vertical pipe. On horizontal pipe they shall be installed on the top side of the pipe where they will be accessible. The switch should not be installed within 6" (15 cm) of a fitting which changes the direction of the waterflow or within 24" (60 cm) of a valve or drain. The unit has a 1" male fitting for gluing into a CPVC plastic tee.

Note: Do not leave cover off for an extended period of time.

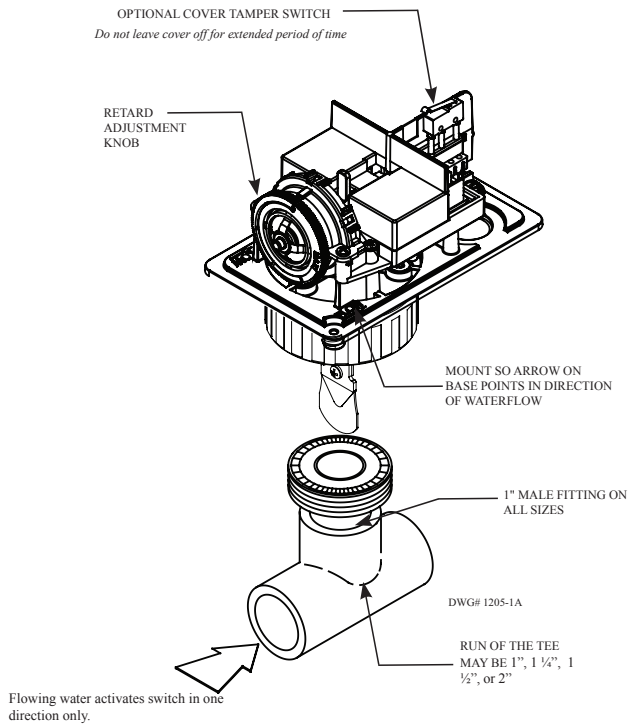
Loosen the union nut and separate the 1" male fitting from the VSR-SG. Glue the 1" male fitting into the TEE following the TEE manufacturer's instructions for preparation and gluing of CPVC piping systems. (Note: The 1" male fitting must bottom out on the stop of the TEE for proper operation of the VSR-SG. See Fig. 1.) Wait 2 to 4 hours to allow the glue to dry before attaching the VSR-SG to the 1" male fitting. Select the proper paddle for the pipe size and type of TEE used. See Fig. 3 for instructions on how to change paddle. **Verify that the o-ring is properly positioned in its groove.** Hand tighten the nut on the union after orienting the switch in the appropriate direction to detect waterflow as shown in Fig. 5 & Fig. 7.

The vane must not rub the inside of the TEE or bind in any way. The stem should move freely when operated by hand.

CAUTION

Do not trim the paddle. Failure to follow these instructions may prevent the switch from operating and will void the warranty.

Fig 1

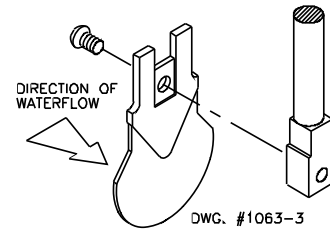


CAUTION

Do not over-tighten the union nut, hand tighten only. Use of a wrench may damage the union nut.

Retard Adjustment

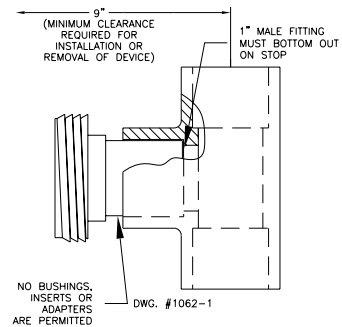
The delay can be adjusted by rotating the retard adjustment knob from 0 to the max setting (60-90 seconds). The time delay should be set at the minimum required to prevent false alarms



WARNING

11 paddles are furnished with each unit to accommodate the various sizes and manufacturers of TEES. The paddles have raised lettering that show the pipe size and the TEE manufacturer they are to be used with. The proper paddle must be used. The paddle must be properly attached (see Fig. 3) and the screw that holds the paddle must be securely tightened.

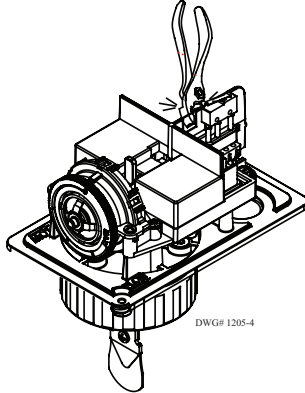
Fig 2



Glue the 1" male fitting into the TEE following the TEE manufacturer's instructions for preparation and gluing of CPVC piping systems. Wait 2 to 4 hours to allow the glue to dry before attaching the VSR-SG to the 1" male fitting.

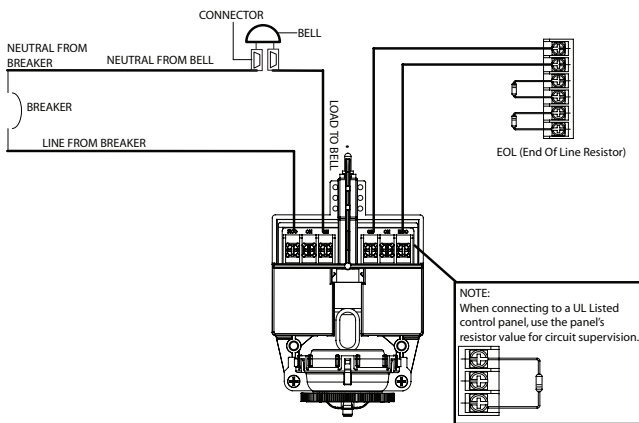
Break out thin section of cover when wiring both switches from one conduit entrance.

Fig 3



Typical Electrical Connections

Fig 4

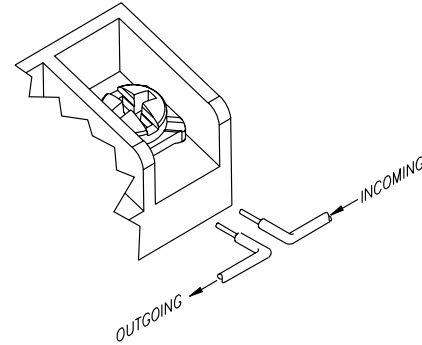


Notes:

1. The Model VSR-SG has two switches, one can be used to operate a central station, proprietary or remote signaling unit, while the other contact is used to operate a local audible or visual annunciator.
2. For supervised circuits, see "Switch Terminal Connections" drawing and warning note (Fig. 6).

Switch Terminal Connections Clamping Plate Terminal

Fig 5



WARNING

An uninsulated section of a single conductor should not be looped around the terminal and serve as two separate connections. The wire must be severed, thereby providing supervision of the connection in the event that the wire become dislodged from under the terminal. Failure to sever the wire may render the device inoperable risking severe property damage and loss of life. Do not strip wire beyond 3/8" of length or expose an uninsulated conductor beyond the edge of the terminal block. When using stranded wire, capture all strands under the clamping plate.

Testing

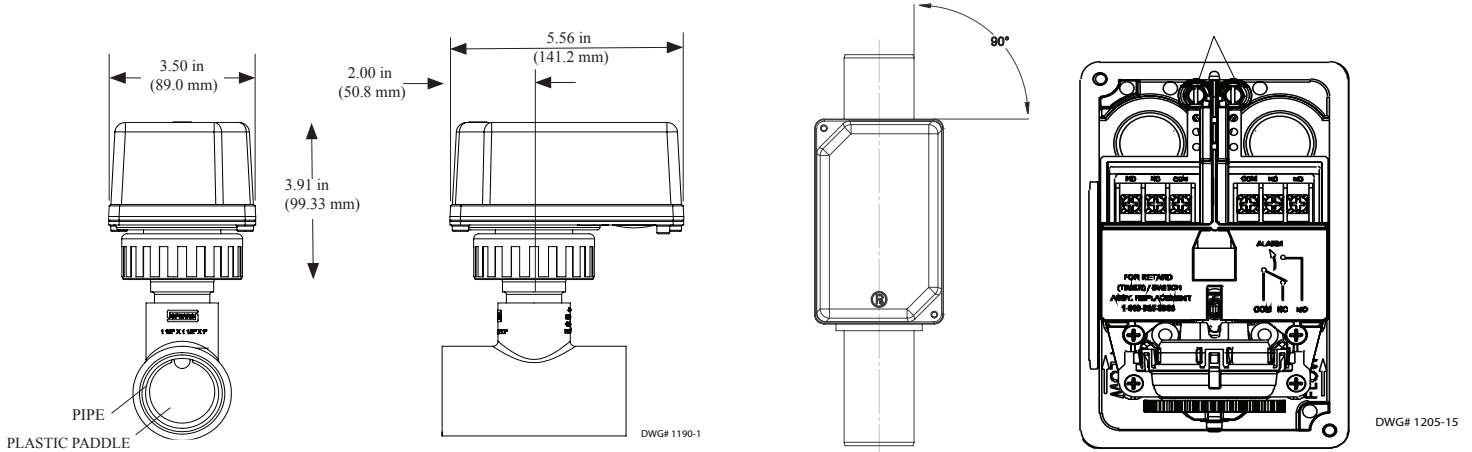
The frequency of inspection and testing for the Model VSR-SG and its associated protective monitoring system shall be in accordance with applicable NFPA Codes and Standards and/or the authority having jurisdiction (manufacturer recommends quarterly or more frequently). A method of testing the VSR-SG must be provided. The valve used for testing shall be easily reached and shall produce a minimum flow of 10 GPM to activate the switch. The discharge orifice shall be equal to the smallest sprinkler used in the system.

NOTICE

Advise the person responsible for testing of the fire protection system that this system must be tested in accordance with the testing instructions.

Mounting Dimensions

Fig 6



CAUTION

Flow switch must be properly orientated. Side of cover must be perpendicular with the pipe. Improper orientation could delay or prevent notification of waterflow.

Maintenance

Inspect the waterflow switch monthly. If leaks are found, replace the waterflow switch. The VSR-SG waterflow switch should provide years of trouble-free service. The retard and switch assembly are easily field replaceable. In the unlikely event that either component does not perform properly, please order replacement retard switch assembly stock #1029030 (see Fig. 9). There is no maintenance required, only periodic testing and inspection.

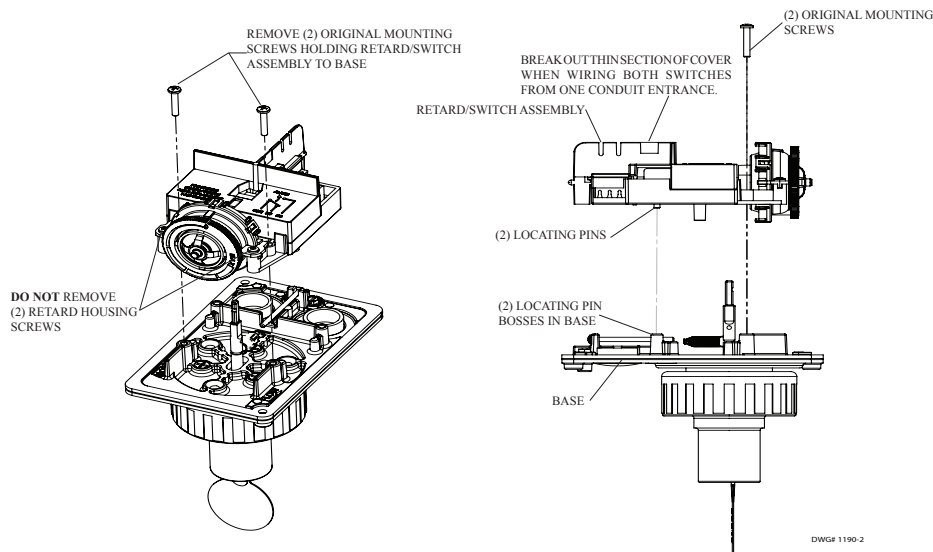
Retard/Switch Assembly Replacement

NOTICE

The Retard/Switch Assembly is field-replaceable without draining the system or removing the waterflow switch from the pipe.

1. Make sure the fire alarm zone or circuit connected to the waterflow switch is bypassed or otherwise taken out of service.
2. Disconnect the power source for local bell (if applicable).
3. Identify and remove all wires from the waterflow switch.
4. Remove the (2) mounting screws holding retard/switch assembly to the base. **Do not** remove the (2) retard housing screws.
5. Remove the retard assembly by lifting it straight up over the tripstem.
6. Install the new retard assembly. Make sure the locating pins on the retard/switch assembly fit into the locating pin bosses on the base.
7. Re-install the (2) original mounting screws.
8. Reconnect all wires. Perform a flow test and place the system back in service.

Fig 2



Removal of Waterflow Switch

- To prevent accidental water damage, all control valves should be shut tight and the system completely drained before waterflow detectors are removed or replaced.
- Turn off electrical power to the detector, then disconnect wiring.
- Loosen nuts and separate unit from the glued-in fittings.
- Gently lift the unit far enough to get your fingers under it. With your fingers, roll the vane so it will fit through the hole while continuing to lift the waterflow detector.
- Lift detector clear of pipe.

Ordering Information

Model	Description	Stock No.
VSR-SG	Vane Type Waterflow Alarm Switch with Retard and Glue-In Union	1144460

Optional: Cover Tamper Switch Kit, Stock No. 0090148
(See Fig. 4 for terminations)

Replaceable Components: Retard/Switch Assembly, stock no. 1029030

Features

- Assembled in USA
- 0-90 second field replaceable electronic retard
- Comes with all necessary paddles
- Easy to read wire terminal designations
- Easy to read retard time delay adjustment knob



⚠ WARNING

Installation must be performed by qualified personnel and in accordance with all national and local codes and ordinances.

Shock hazard. Disconnect power source before servicing. Serious injury or death could result.

Risk of explosion. Not for use in hazardous locations. Serious injury or death could result.

⚠ CAUTION

Do not over-tighten the union nut, hand tighten only.



Description

The Model VSR-ST is a vane type waterflow switch for use on wet sprinkler systems that use 1", 1-1/4", 1-1/2" or 2" pipe sizes. It is equipped with a union to accommodate installation in confined spaces. The unit contains two single pole double throw snap action switches and an adjustable, instantly recycling pneumatic retard. The switches are actuated when a flow of 10 gallons per minute (38 liters per minute) or more occurs downstream of the device. The flow condition must exist for a period of time necessary to overcome the selected retard period.

Installation

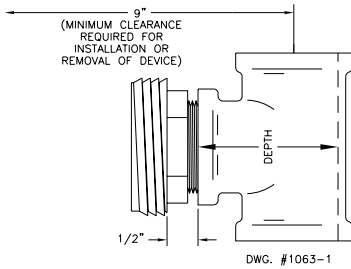
These devices may be mounted in horizontal or vertical pipe. On horizontal pipe they should be installed on the top side of the pipe where they will be accessible. The units should not be installed within 6" (15 cm) of a valve, drain or fitting which changes the direction of the waterflow. The unit has a 1" NPT fitting for threading into a non-corrosive TEE. See Fig. 1 for proper TEE size, type and installation. Select the proper paddle for the pipe size and type of TEE used. See Fig. 3 for instructions on how to change the paddle. Loosen the union nut and separate the 1" NPT fitting from the VSR-ST. Use no more than three wraps of teflon tape as thread lubricant. Reattach the VSR-ST to the 1" NPT fitting, verifying that the o-ring is properly positioned in its groove. Hand tighten the nut on the union after orienting the device in the appropriate direction to detect waterflow as shown in Fig. 2. The vane must not rub the inside of the TEE or bind in any way. The stem should move freely when operated by hand. The device can also be used in copper or plastic pipe installations with the proper adapters so that the specified TEE fitting may be installed on the pipe run.

Note: Do not leave cover off for an extended period of time.

Technical Specifications

Service Pressure	Up to 175 PSI (12,07 BAR)	
Flow Required for Alarm	10 GPM (38 LPM)	
Maximum Surge	18 FPS (5,5 m/s)	
Contact Ratings	Two sets of SPDT (Form C) 10.0 Amps at 125/250VAC 2.0 Amps at 30VDC Resistive	
Conduit Entrances	Two knockouts provided for 1/2" conduit. Individual switch compartments suitable for dissimilar voltages.	
Environmental Specifications	Suitable for indoor or outdoor use with factory installed gasket and die-cast housing. For NEMA 4/IP55 rated enclosure - use with appropriate conduit fitting and/or plugs. Temperature range: 40° F to 120° F (4,5° C to 49° C)	
Service Use	Automatic Sprinkler One or two family dwelling Residential occupancy up to four stories National Fire Alarm Code	NFPA-13 NFPA-13D NFPA-13R NFPA-72

Fig. 1



Screw the fitting into the TEE fitting as shown. On sweat TEE's, no threaded bushings, inserts or adapters are permitted unless they comply with the dimensions listed in the chart below.

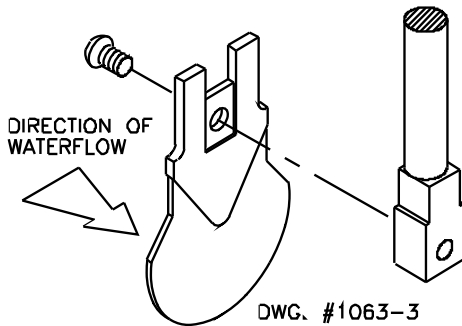
Important - the depth to the inside bottom of the TEE should have the following dimensions:

Approximate Depth Requirement			
Tee Size	Threaded	Sweat	CPVC
1" X 1" X 1"	2-1/16"	1-3/4"	2-7/16"
1-1/4" X 1-1/4" X 1"	2-7/16"	2-7/16"	N/a
1-1/2" X 1-1/2" X 1"	2-11/16"	2-1/4"	N/a
2" X 2" X 1"	3-3/16"	2-3/4"	N/a

CAUTION

To prevent leakage apply teflon tape sealant to the 1" NPT male fitting only. Do not use any other type of lubricant or sealant.

Fig. 3



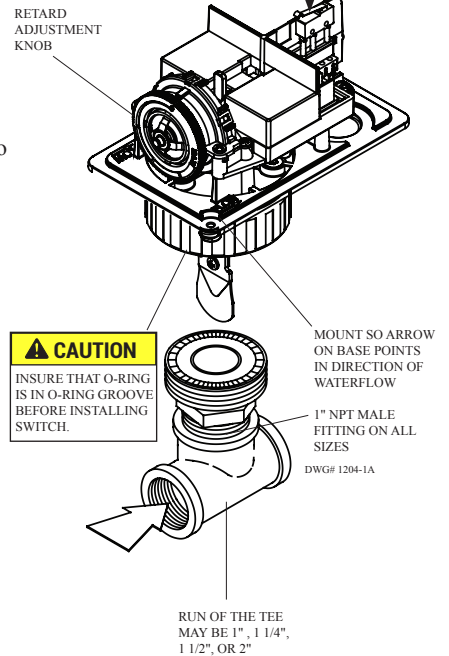
WARNING

There are 12 paddles furnished with each unit. One for each size of threaded, sweat or plastic TEE as described in Fig. 1. *The paddles have raised lettering that show the pipe size and type of TEE that they are to be used with. The proper paddle must be used.* The paddle must be properly attached (see Fig. 3) and the screw that holds the paddle must be securely tightened.

Fig. 2

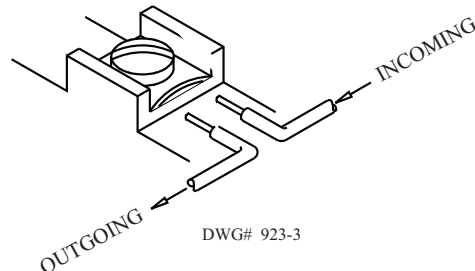
Retard Adjustment: The delay can be adjusted by rotating the retard adjustment knob from 0 to the max setting (60-90 seconds). The time delay should be set at the minimum required to prevent false alarms.

Shown with optional Cover Tamper Switch. Do not leave cover off for an extended period of time.



Switch Terminal Connections
Clamping Plate Terminal

Fig. 4



WARNING

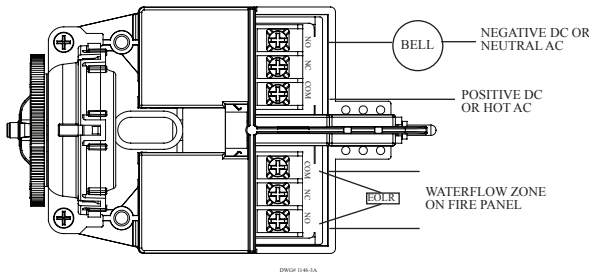
An uninsulated section of a single conductor should not be looped around the terminal and serve as two separate connections. The wire must be severed, thereby providing supervision of the connection in the event that the wire become dislodged from under the terminal. Failure to sever the wire may render the device inoperable risking severe property damage and loss of life. Do not strip wire beyond 3/8" of length or expose an uninsulated conductor beyond the edge of the terminal block. When using stranded wire, capture all strands under the clamping plate.

Typical Electrical Connections

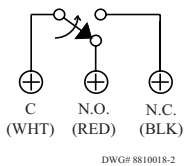
Fig. 5

Notes:

1. The model VSR-ST has two switches, one can be used to operate a central station, proprietary or remote signaling unit, while the other is used to operate a local audible or visual annunciator.
2. For supervised circuits see “Switch Terminal Connections” drawing and CAUTION note (Fig. 4).



Cover Tamper Switch
(Shown with cover in place)

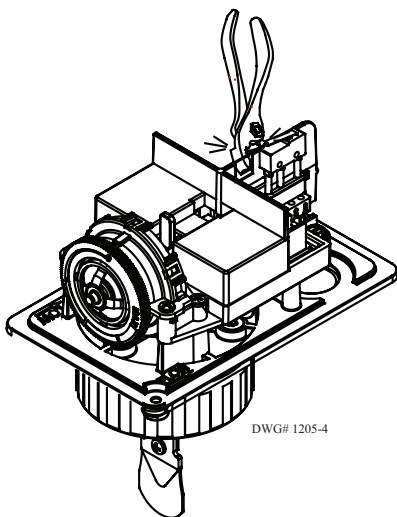


⚠ CAUTION

Waterflow switches that are monitoring wet pipe sprinkler systems shall not be used as the sole initiating device to discharge AFFF, deluge, or chemical suppression systems. Waterflow switches used for this application may result in unintended discharges caused by surges, trapped air, or short retard times.

Fig. 6

Break out thin section of cover when wiring both switches from one conduit entrance.



Testing

The frequency of inspection and testing for the Model VSR-ST and its associated protective monitoring system should be in accordance with applicable NFPA Codes and Standards and/or the authority having jurisdiction (manufacturer recommends quarterly or more frequently). If provided, the inspector’s test valve, that is usually located at the end of the most remote branch line, should always be used for test purposes. If there are no provisions for testing the operation of the flow detection device on the system, application of the VSR-ST is not recommended or advisable. A minimum flow of 10 GPM (38 LPM) is required to activate this device.

Maintenance

Inspect detectors monthly for leaks. If leaks are found, replace the detector. The VSR-ST waterflow switch should provide years of trouble-free service. The retard and switch assembly are easily field replaceable. In the unlikely event that either component does not perform properly, please order replacement retard switch assembly stock number 1029030. There is no maintenance required, only periodic testing and inspection.

Inspection and Testing

Check the operation of the unit by opening the inspector’s test valve at the end of the sprinkler line or the drain and test connection, if an inspector’s test valve is not provided. If there are no provisions for testing the operation of the flow detection device on the system, application of the VSR-ST is not recommended or advisable. The frequency of the inspection and testing and its associated protective monitoring system should be in accordance with the applicable NFPA Codes and Standards and/or authority having jurisdiction (manufacturer recommends quarterly or more frequently).

Important Notice

Please advise the person responsible for testing of the fire protection system that this system must be tested in accordance with the testing instructions.

Removal

- To prevent accidental water damage, all control valves should be shut tight and the system completely drained before waterflow detectors are removed or replaced
- Turn off electrical power to the detector, then disconnect wiring
- Loosen union nut and separate unit from the glued in fitting.
- Gently lift the unit far enough to get your fingers under it. With your fingers, roll the vane so it will fit through the fitting while continuing to lift the waterflow detector.
- Lift detector clear of pipe

Ordering Information

Model	Description	Stock No.
VSR-ST	Vane Type Waterflow Alarm Switch with Retard	1144465
VSR-ST	Vane Type Waterflow Alarm Switch with Retard w/TSK	1144466

Features

- Assembled in USA
- Automatically resets when water in the system is lowered below probe location



CAUTION

Not for use in hazardous locations.



General Information

The Water Column Switch is an electronic supervisory switch used to detect the presence of a conductive fluid (water) that can accumulate or become trapped in the piping directly above the clapper on a Dry-Pipe or Pre-Action valve. The electronic circuitry of the WCS is designed to indicate the presence of water accumulated to a specific elevation, that if left unattended could impair or prevent the operation of a dry pipe or pre-action automatic sprinkler valve. The yellow LED indicates the presence of water. The green LED indicates that the input voltage is present.

Probe Installation (See Fig. 1)

Note: Apply a small amount of pipe sealant to the external threads of the probe.

CAUTION

DO NOT use teflon tape. If a mechanical tee is used: A grounding wire from the pipe to the mechanical tee may be required to ensure proper operation.

1. Be sure the probe is installed above the priming water line and below the point where the riser exits the valves heated enclosure.
2. Be sure the exposed portion of the stainless steel probe is a minimum of 1/4" from any grounding surface inside the sprinkler system piping to prevent the probe from shorting. (See Fig. 1)
3. Tighten the probe into the connection point with a wrench, using the bushing flats provided.
4. Align the two mounting screws vertically along the center line of the riser. (See Fig. 2)

Control Unit Mounting Onto The Probe (See Fig. 3)

1. Make sure the heads of the two mounting screws in the probe bushing are loosened approximately 1/8" from the bushing surface.

Technical Specifications

Maximum Working Pressure	Up to 175 PSI (12,07 BAR)
Input Supply Voltage	120VAC unswitched
Contact Ratings	SPDT 10.0 Amps @ 120VAC 2.0 Amps @ 30V DC resistive
Conduit Entrances	Two knockouts provided for 1/2" conduit. Individual switch compartments suitable for dissimilar voltages.
Probe Fitting Thread Connection:	1/2" and 3/4" NPT
Environmental Specifications	NEMA Type 1 for indoor use only. Formed sheet metal with powder coat/paint finish. Four openings for 1/2" conduit fittings. Temperature range: 40° F to 120° F (4,5° C to 49° C)
Service Use	Dry Pipe/Pre-Action Automatic Sprinkler Systems NFPA 13

2. Then remove the first lock washer/nut from the probe threads.
3. Orient the slotted holes in the control unit over the heads of the mounting screws of the probe and turn the control unit counter-clockwise so that the ends of the slot are fully under the mounting screw heads. Tighten screws securely.
4. Replace the lock washer and nut onto the probe and tighten.

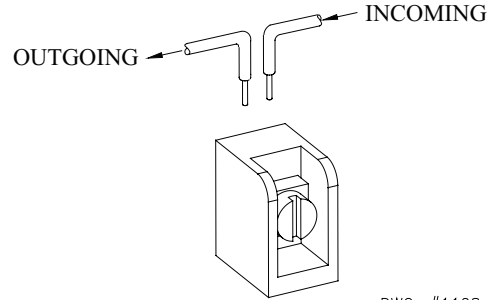
Testing Requirements

NFPA Standards (NFPA 25: 12.4.4.2.2.2 and 12.4.4.2.2.3)

Testing Procedure (See Fig. 4)

Test the dry and pre-action valves as directed by the valve manufacturer. During a partially open control valve test, the control valve must be left in the partially open position for a period of time sufficient to allow water to reach the probe location. When the yellow LED on the WCS becomes illuminated, close the control valve. Following the valve manufacturers instructions, drain the system and reset the valve. The WCS will automatically reset when the water level drops below the probe location. If priming water is required, make sure that the level of the priming water is in accordance with the valve manufacturers requirements and below the location of the probe.

Terminal Block Connections Clamping Plate Terminal



DWG. #1108-10

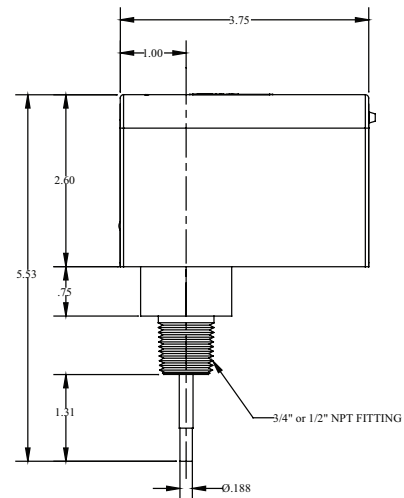
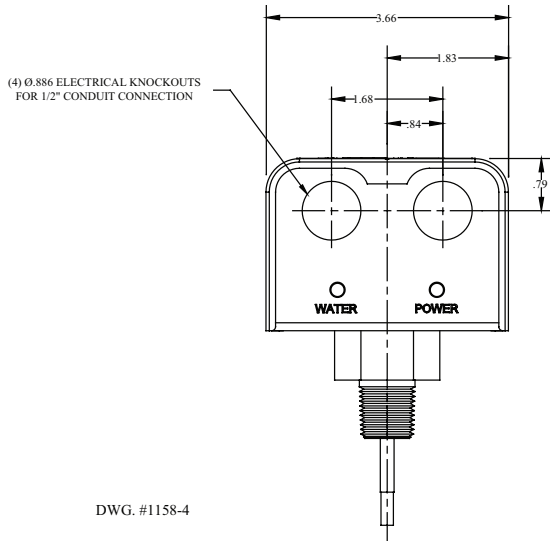
CAUTION

Make sure that water entering the system during test does not enter in to the system piping that is exposed to current freezing conditions.

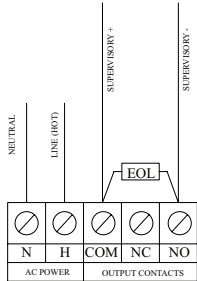
CAUTION

An insulated section of a single conductor should not be looped around the terminal and serve as two separate connections. The wire must be severed, thereby providing supervision of the connection in the event that the wire becomes dislodged from under the terminal. Use 18 AWG (min.), or as required by local code. Wire insulation rating must be at least 167°F (75°C).

Dimensions

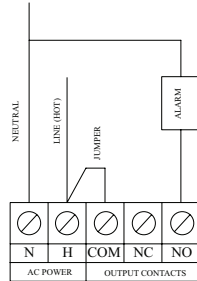


WCS WIRING DIAGRAM
USING PANEL SUPERVISORY
INPUTS



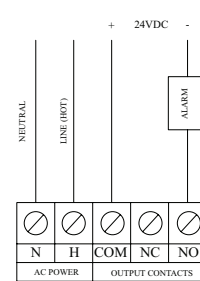
DWG. #1158-5

WCS WIRING DIAGRAM
USING 120VAC ALARM DEVICE ONLY



DWG. #1158-5

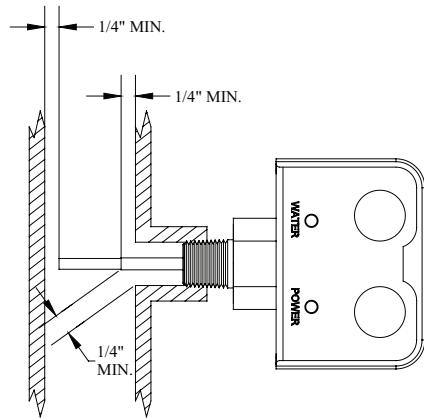
WCS WIRING DIAGRAM
USING 24VDC ALARM DEVICE



DWG. #1158-5

Probe Spacing Requirements

(Fig. 1)

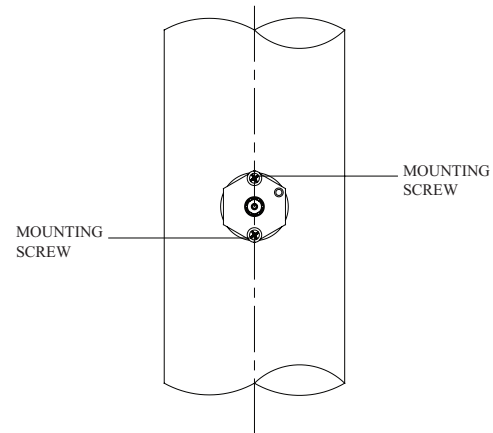


DWG. #1158-1

Note: Mount only with probe facing horizontally or vertically downward. Do not mount with probe angled upward. Maintain probe clearances as indicated.

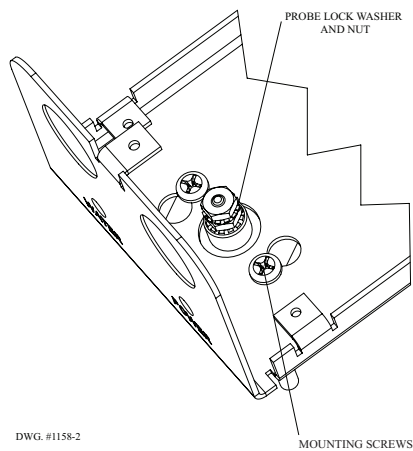
Probe Installation

(Fig. 2)



DWG. #1158-11

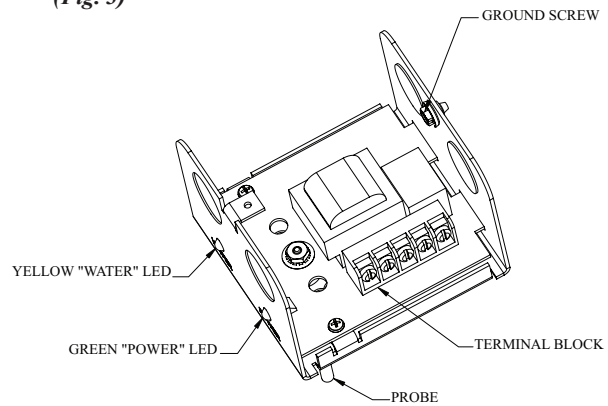
Control Unit Mounted On Probe



DWG. #1158-2

Installation

(Fig. 3)



DWG. #1158-3

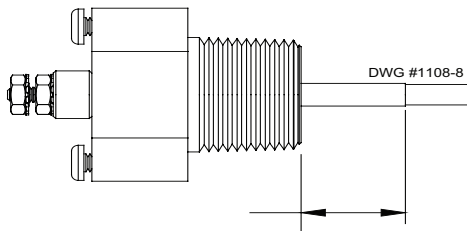
Probe Cleaning And Replacement

(Fig. 4)

Probe must be inspected annually for scale build-up. Clean all scale from probe and teflon sleeve taking care not to damage the teflon sleeve.

Probe should be replaced every 10 years.

The Control Unit should be replaced every 15 years. In areas of high humidity and heavy dust or other airborne contaminants, more frequent replacement may be required.



TEFLON SLEEVE INSULATOR
(Be careful not to damage during cleaning)

Ordering Information

Model	Description	Stock No.
WCS	WCS 1/2" NPT Probe	1010118
WCS	WCS 3/4" NPT Probe	1010119

Features

- Adjustable instant recycling pneumatic retard
- Independent switch adjustment, no tools needed.
- Two conduit / cable entrances.
- Separate isolated wiring chambers.
- Non-corrosive pressure connection.
- Solid metal enclosure.



CAUTION
This device is not intended for applications in explosive environments.

Description

The Model WFSR-F is a pressure operated switch with an adjustable, instantly recycling pneumatic retard to prevent false alarms due to water pressure variation. The WFSR-F is connected into the alarm port of a wet sprinkler system alarm check valve (see "WARNING", page 2).

Installation

A male 1/2" NPT pipe fitting is provided for connection to the alarm port of the alarm check valve. No additional mounting or support is required. Allow 5" (12,7cm) to the front of the unit for removal of the cover. Install with the pressure connection down.

Testing

Operation of the unit is checked by opening the by-pass test valve or inspector's test valve. The frequency of the inspection and testing for the Model WFSR-F and its associated protective monitoring system should be in accordance with applicable NFPA Codes and Standards and/or authority having jurisdiction (manufacturer recommends quarterly or more frequently).

Technical Specifications

Dimensions	5 9/16" H x 3 1/2" W x 5 7/8" D (14,1cm H x 8,9cm W x 14,9cm D)
Weight	1.5 lbs. (3,3 kg.)
Contact Ratings	Two Sets of SPDT (Form C) 15.0 Amps at 125/250VAC 2.0 Amps at 30VDC Resistive
Environmental Specifications	40°F to 120°F (4,5°C to 49°C) NEMA 4 Enclosure - when used with proper conduit fittings
Pressure Connection	1/2" Male NPT
Pressure Adjustments	Factory adjusted to operate between 5 and 8 PSI (0,35 and 0,55 BAR) on rising pressure
Maximum System Pressure	175 PSI (12,1 BAR)
Environmental Specifications	NEMA Type 1 for indoor use only. Formed sheet metal with powder coat/paint finish. Four openings for 1/2" conduit fittings. Temperature range: 40° F to 120° F (4,5° C to 49° C)
Service Use	Automatic Sprinkler NFPA-13 One or two family dwelling NFPA-13D Residential occupancy up to four stories NFPA-13R National Fire Alarm Code NFPA-72

WFSR-F

Fig. 1

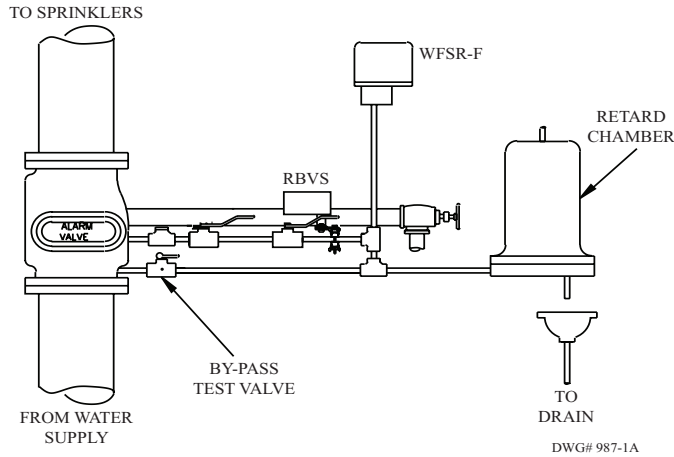
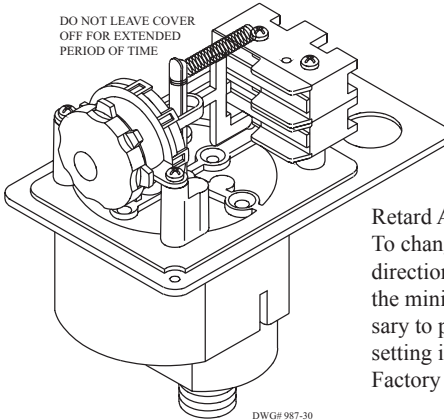


Fig. 3

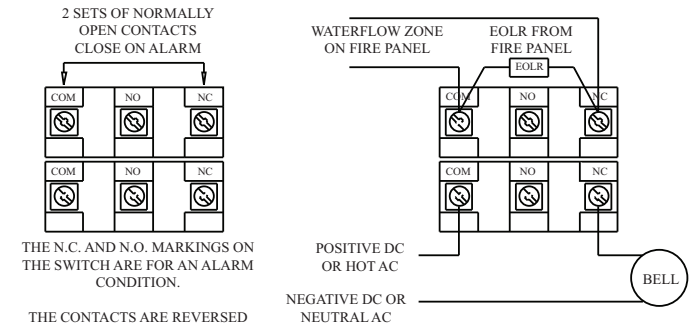


Retard Adjustment:
To change time turn knob (either direction) for desired time delay. Use the minimum amount of retard necessary to prevent false alarms, a "B" setting is usually adequate for this. Factory set at "B".

APPROX. RETARD SETTINGS (IN SEC.)					
0	A	B	C	D	E
0	10-25	20-40	35-55	50-70	60-90

Typical Electrical Connections

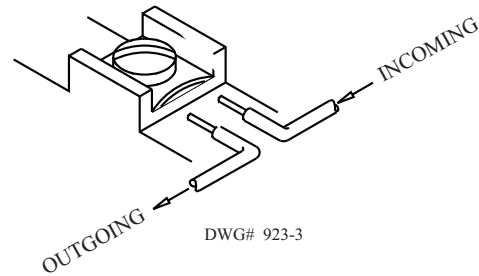
Fig. 2



Note: For supervised circuits see "Switch Terminal Connections" drawing and caution note (Fig. 4).

Switch Terminal Connections Clamping Plate Terminal

Fig. 4



WARNING

An uninsulated section of a single conductor should not be looped around the terminal and serve as two separate connections. The wire must be severed, thereby providing supervision of the connection in the event that the wire become dislodged from under the terminal. Failure to sever the wire may render the device inoperable risking severe property damage and loss of life.

Do not strip wire beyond 3/8" of length or expose an uninsulated conductor beyond the edge of the terminal block. When using stranded wire, capture all strands under the clamping plate.

Typical Wet System

Fig. 5

WARNING

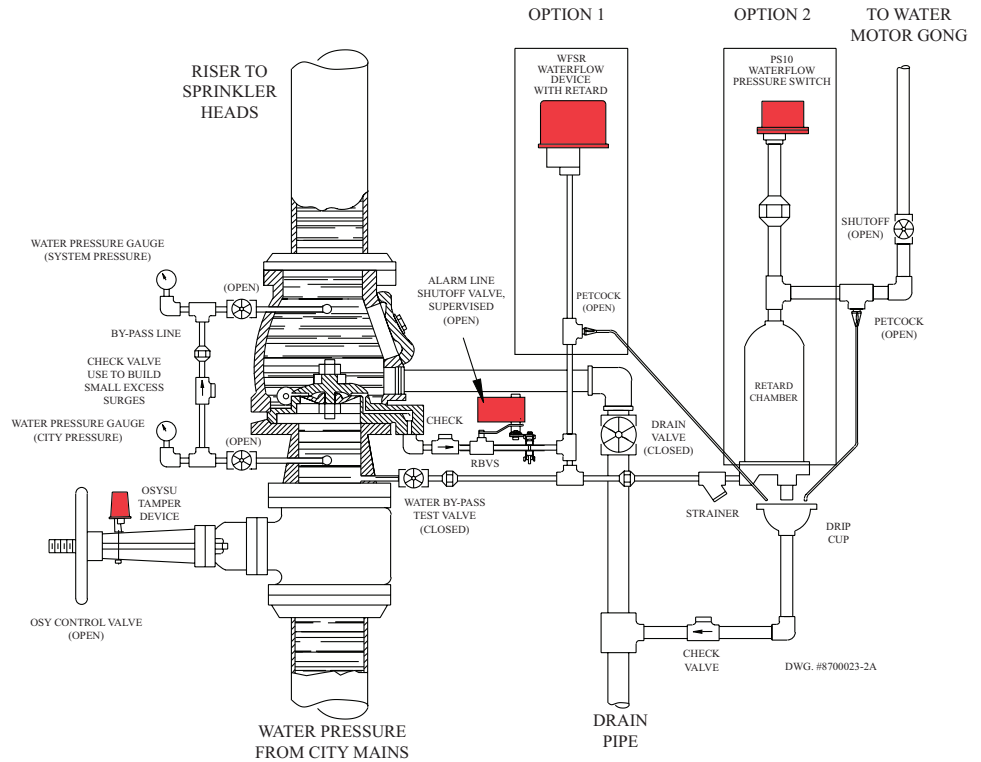
Use teflon tape sealant only. Apply only to male threads of connectors.

Use of pipe cement voids warranty as this material may obstruct pressure aperture resulting in loss of alarm signal.

Device must be installed before any shut off valve on alarm port line unless it is supervised by a supervisory switch such as Potter Model RBVS.

The system should be tested on a quarterly basis or more frequently to insure proper operation.

Due to the possibility of unintended discharges caused by pressure surges, trapped air, or short retard times, waterflow switches that are monitoring wet pipe sprinkler systems shall not be used as the sole initiating device to discharge AFFF, deluge, or chemical suppression systems.



Ordering Information

Model	Description	Stock No.
WFSR-F	Waterflow Alarm Switch with Retard	1010080

Notes:

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St. Louis, MO 63042

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