Reliable®

Special Hazards and Special Systems

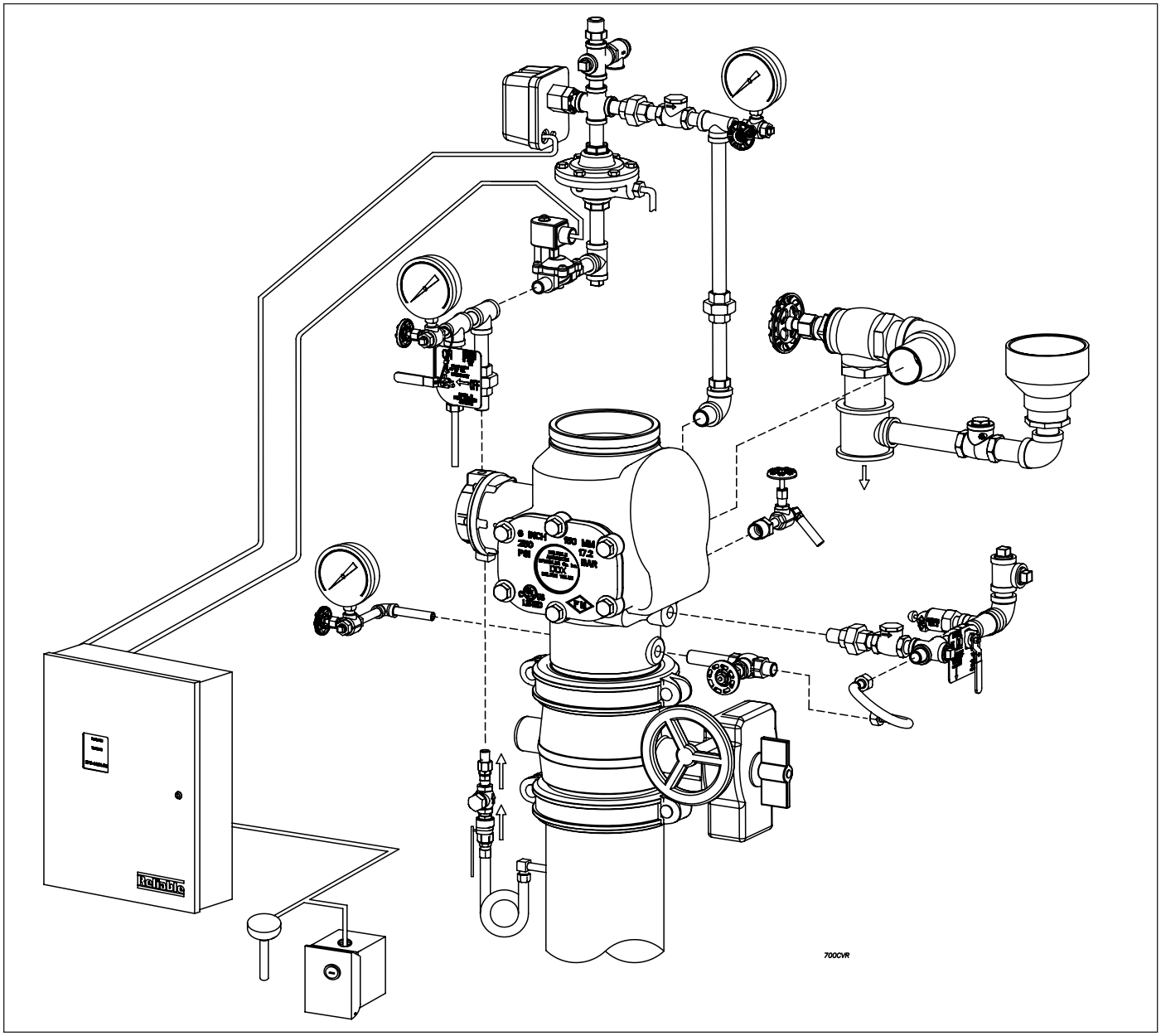
Bulletin 700

INTRODUCTION

This manual has been prepared by The Reliable Automatic Sprinkler Co., Inc. to provide a comprehensive source of information that will help users select and purchase Deluge, Preaction, and Low Pressure Dry Systems for a wide variety of fire protection applications. This manual is complemented by other Reliable Automatic Sprinkler Company bulletins that provide instructions for installation, operation and maintenance of the various systems.

Referencing the Table of Contents, Section 1 of this manual describes different types of special systems and provides guidance on selection and application. Section 2 provides technical data on the components manufactured and/or distributed by Reliable for use in special systems, and Section 3 provides a work sheet to simplify ordering procedures for the systems described in the manual.

Our objective is that users of this bulletin find the information beneficial and arranged in a user-friendly manner. Responsibility for the actual design and installation of any fire sprinkler system rests with the engineer of record, certified layout technician and/or the Authority Having Jurisdiction.



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1. SYSTEM DESCRIPTIONS

1.1 Deluge Systems

A deluge system utilizes open sprinklers or nozzles and non-pressurized system piping. When a deluge system is activated, all sprinklers or nozzles on that system flow water at the same time. Deluge systems are generally associated with high hazard occupancies that require large volumes of water. Examples include exposure protection, materials having high rates of heat release, conveyors, water curtains, fuel storage tanks, electrical transformers, aircraft hangars, and chemical plants. Deluge systems require an automatic detection system and/or manual releasing system which operates independently from the sprinkler system. A deluge system is capable of applying water to a fire more quickly than a system utilizing temperature sensitive closed sprinklers.

Figure 1

1.1.1 Model DDX Wet Pilot Line Trim

A wet pilot line is a non-electrical type of detection/release system that can be used in conditioned (i.e. freeze protected) areas. Closed sprinklers or fixed-temperature-release pilot line detectors are installed throughout the protected area on small diameter piping that contains water under pressure. The wet pilot line is an extension of the Model DDX Deluge Valve push-rod chamber. Upon activation of a pilot line sprinkler or pilot line detector, pressure is released from the pilot line and push-rod chamber allowing the Model DDX Deluge Valve to open and deliver water to the open sprinklers, nozzles, or other discharge devices in the protected area. Alarm devices are activated upon the flow of water into the sprinkler system piping. Wet pilot trim is the basis on which dry pilot line and electrical actuation systems are built; additional components are added to the wet pilot trim for each of these systems. ***It is important to note that the length and height of wet pilot lines may be limited by the available system water pressure (see bulletins referenced below).***

Approvals and technical data for Model DDX wet pilot deluge systems can be found on Reliable Automatic Sprinkler Company Bulletins 516 through 519.

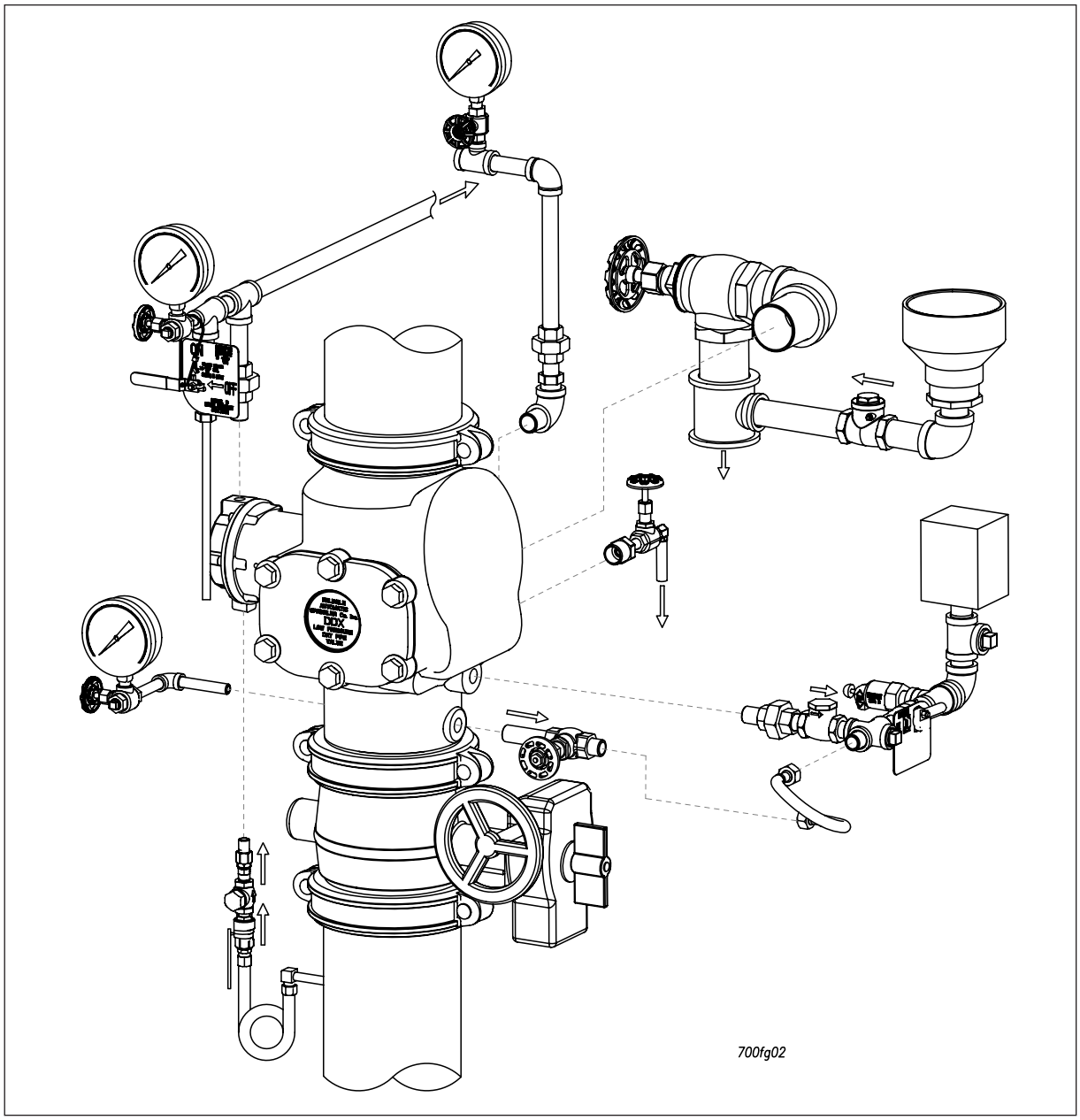

Figure 2

1.1.2 Model DDX Dry Pilot Line Trim

Where freezing conditions exist, or where height/distance limits of wet pilot lines are exceeded, a dry pilot line can be used. Closed sprinklers or fixed-temperature-release pilot line detectors are installed throughout the protected area on small diameter piping that contains pressurized air or nitrogen. A Model LP Dry Pilot Actuator is installed on the outlet of the Model DDX Deluge Valve push-rod chamber. This device provides a separation between the hydraulically pressurized push-rod chamber and the pneumatically pressurized pilot line. The dry pilot line is a pneumatic extension of the push-rod chamber pressurizing piping. Upon activation of a pilot line sprinkler or pilot line detector, pneumatic pressure is released from the piping allowing the dry pilot actuator to vent and release hydraulic pressure from the push-rod chamber. This allows the Model DDX Deluge Valve to open and deliver water to the open sprinklers, nozzles, or other discharge devices in the protected area. Alarm devices are activated upon the flow of water into the sprinkler system piping. Pneumatic pressure in the dry pilot line can be provided from a tank-mounted compressor, plant air system, or nitrogen cylinders, and must be maintained by a Reliable Model A-2 listed pressure maintenance device. To prevent accidental system activation, pneumatic pressure is monitored by a pressure switch* that will initiate a signal in the event of low pressure due to sprinkler damage, pipe damage, or failure of the compressed gas system.

**Note: System Sensor Model EPS 40-2 pressure switch is provided with the dry pilot trim.*

Approvals and technical data for Model DDX dry pilot deluge systems can be found on Reliable Automatic Sprinkler Company Bulletins 516 through 519.

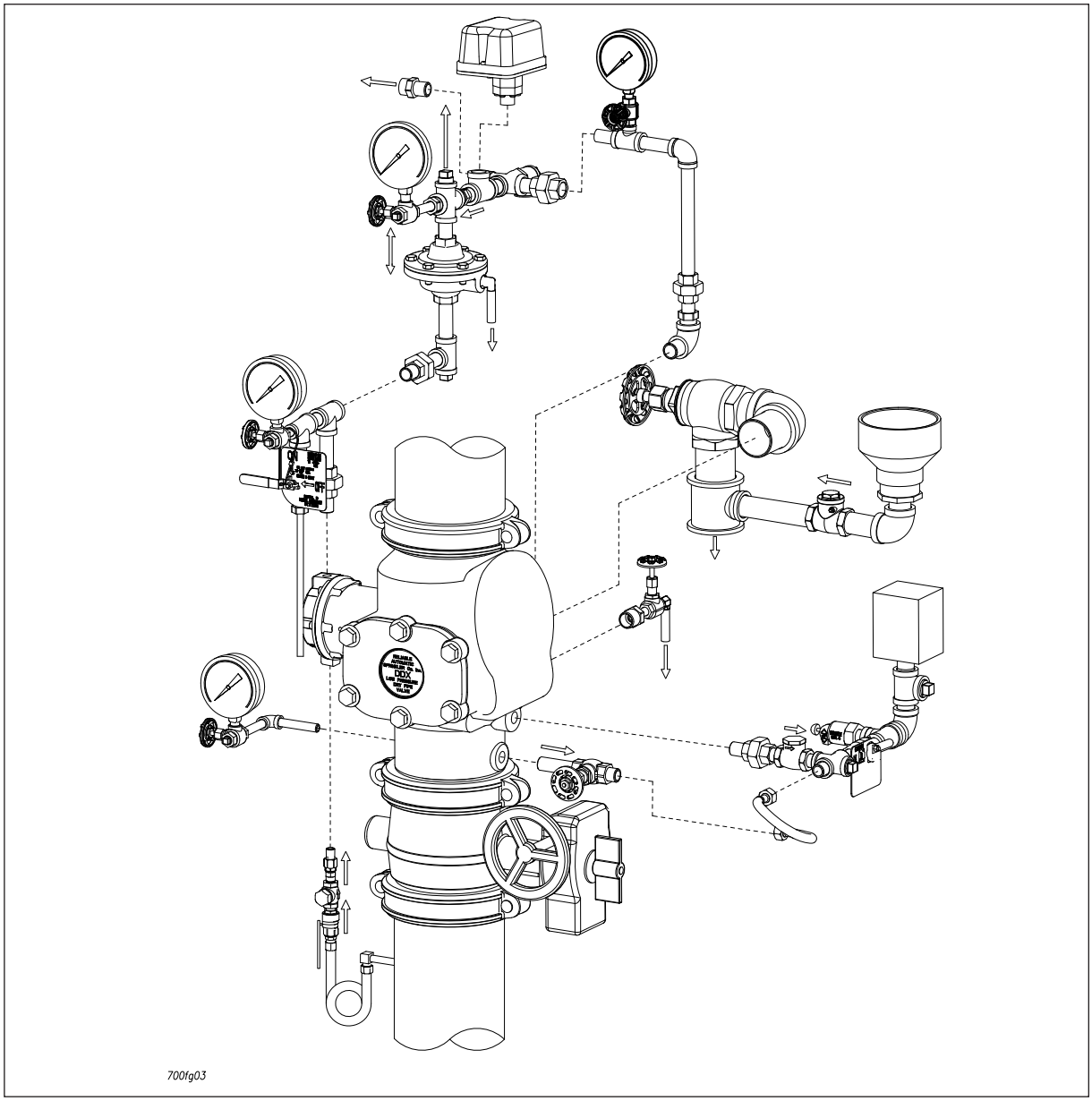

Figure 3

1.1.3 Model DDX Electrical Actuation Trim

Where electrical actuation of the system is preferred over wet or dry pilot lines, or where otherwise required by project specifications, a listed normally-closed (de-energized) solenoid valve is installed on the outlet of the Model DDX Deluge Valve push-rod chamber. The solenoid provides a separation between the hydraulically pressurized push-rod chamber and atmospheric pressure drain tubing. Upon receipt of a signal from the electric detection system, the release panel opens (energizes) the solenoid valve. Pressure is released from the push-rod chamber allowing the Model DDX Deluge Valve to open and deliver water to the open sprinklers, nozzles, or other discharge devices in the protected area. Alarm devices are activated upon the flow of water into the sprinkler system piping.

Approvals and technical data for Model DDX electrical actuation deluge systems can be found on Reliable Automatic Sprinkler Company Bulletins 516 through 519.

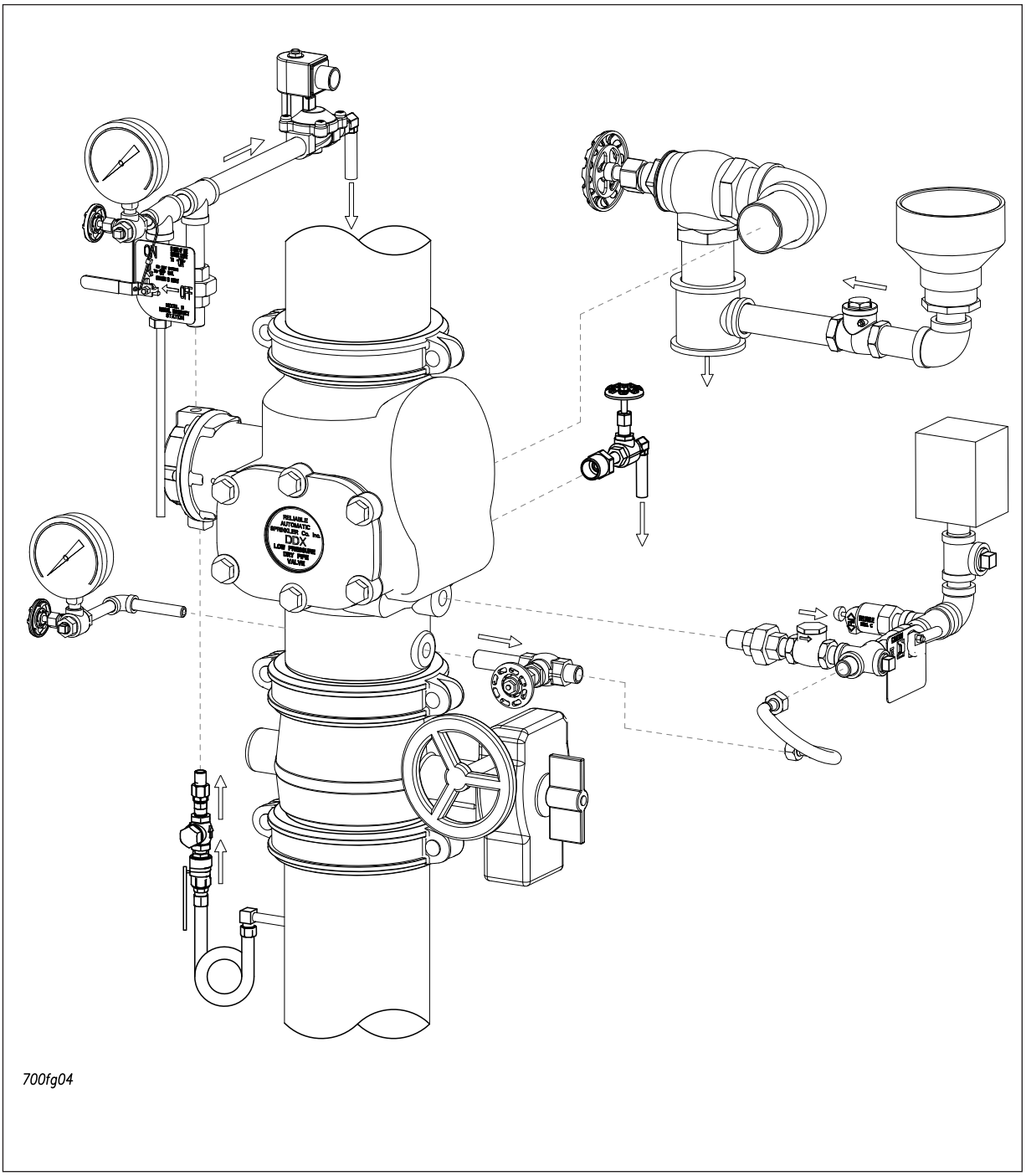

Figure 4

1.1.4 Model H Deluge Riser Assembly

The Reliable Model H 1-1/2" (40mm) Deluge Riser Assembly is an electrically actuated system that utilizes a normally closed, quick-opening hydraulically-operated diaphragm actuated solenoid as the main system control valve. In the normal condition (de-energized), water pressure is held at the solenoid valve inlet. Upon receipt of a signal from the electric detection system, the release panel opens (energizes) the solenoid valve allowing water to flow to open sprinklers, nozzles, or other discharge devices in the protected area. Alarm devices are activated by the System Sensor Model EPS 10-1 pressure switch (provided with assembly) upon the flow of water into the sprinkler system piping.

Approvals and technical data for the Model H Deluge Riser Assembly can be found on Reliable Automatic Sprinkler Company Bulletin 507.

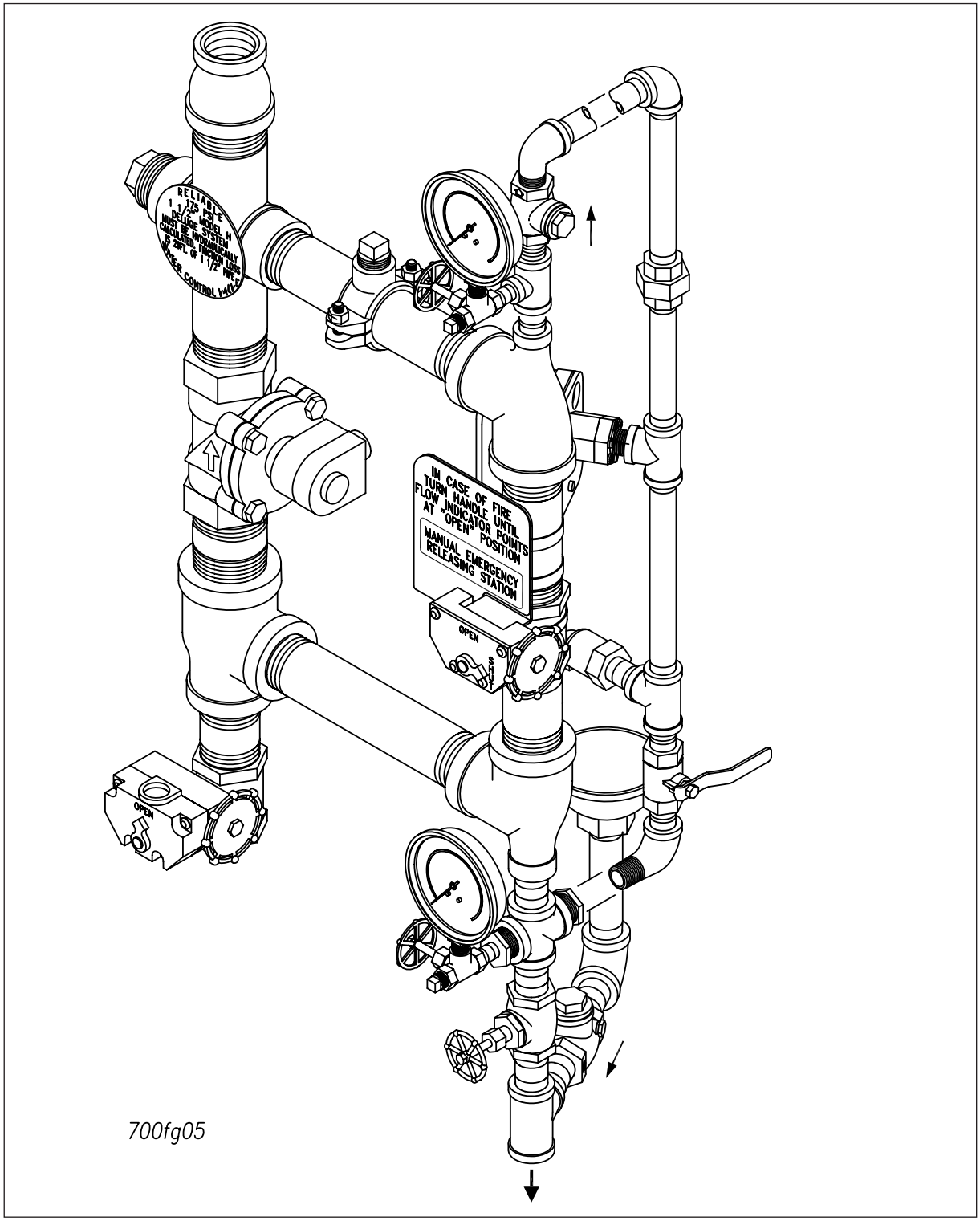

Figure 5

1.2 Single Interlock Preaction Systems

A single interlock preaction system is best described as a dry pipe system that is converted to a wet pipe system prior to activation of the sprinklers. Unlike deluge systems, preaction systems utilize closed sprinklers and piping. The closed sprinklers operate individually as needed following the actuation of the main system control valve. Similar to deluge systems, the single interlock preaction system requires a supplemental detection/release system that operates independently of the sprinkler system. Single interlock preaction systems are generally installed to protect water sensitive environments such as computer server rooms, museums, and hospital operating suites where the inadvertent release of water from a broken sprinkler may result in serious damage to the contents of the area. Single interlock preaction systems are not subject to the design penalties of dry systems (30% hydraulic remote area increase*, and specific water delivery requirements), and are therefore appropriate replacements for conventional dry pipe systems. Single interlock preaction system piping is generally pressurized with air or nitrogen, and is monitored by a pressure switch that will notify the owner in the event of falling pressure due to sprinkler or pipe damage, or failure of the compressed gas system. Loss of pneumatic pressure in a single interlock preaction system will NOT result in actuation of the main system control valve. Operation of the main system control valve occurs only upon activation of the wet pilot, dry pilot, or electrical release system.

**Note: 30% hydraulic remote area increase is required for preaction systems protecting storage occupancies governed by Chapter 12 of NFPA 13, Standard for the Installation of Sprinkler Systems.*

Figure 6

1.2.1 Model DDX Wet Pilot Line Single Interlock

A wet pilot line is a non-electrical type of detection/release system that can be used in conditioned (i.e. freeze protected) areas. Closed sprinklers or fixed-temperature-release pilot line detectors are installed throughout the protected area on small diameter piping that contains water under pressure. The wet pilot line is an extension of the Model DDX Deluge Valve push-rod chamber. Upon activation of a pilot line sprinkler or pilot line detector, pressure is released from the pilot line and push-rod chamber allowing the Model DDX Deluge Valve to open and fill the system piping in the protected area. ***Please note that water will discharge from the pilot line sprinkler or detector(s) upon activation.*** Alarm devices are activated upon the flow of water into the sprinkler system piping. In the event the fire continues to grow, individual fire sprinklers in the protected area will be activated similar to a wet pipe system. Wet pilot trim is the basis on which dry pilot line and electrical actuation systems are built; additional components are added to the wet pilot trim for each of these systems. ***It is important to note that the length and height of wet pilot lines may be limited by the available system water pressure (see bulletins referenced below).*** For supervised systems (required when there are more than 20 sprinklers), pneumatic pressure can be provided from a tank mounted compressor, plant air system, or nitrogen cylinders, and must be maintained by a listed pressure maintenance device such as the Reliable Model A-2. Pneumatic pressure is monitored by a pressure switch that will initiate a signal in the event of falling pressure due to sprinkler damage, pipe damage, or failure of the compressed gas system. The Reliable Model B-SI and Model C-SI Air Compressor Panels are specifically designed for single interlock preaction systems up to 200 gallon capacity and incorporate an air compressor, regulator, pressure switch, and output relays in a convenient wall mount cabinet (see section 2.3.1).

Approvals and technical data for Model DDX wet pilot line single interlock preaction systems can be found on Reliable Automatic Sprinkler Company Bulletin 749.

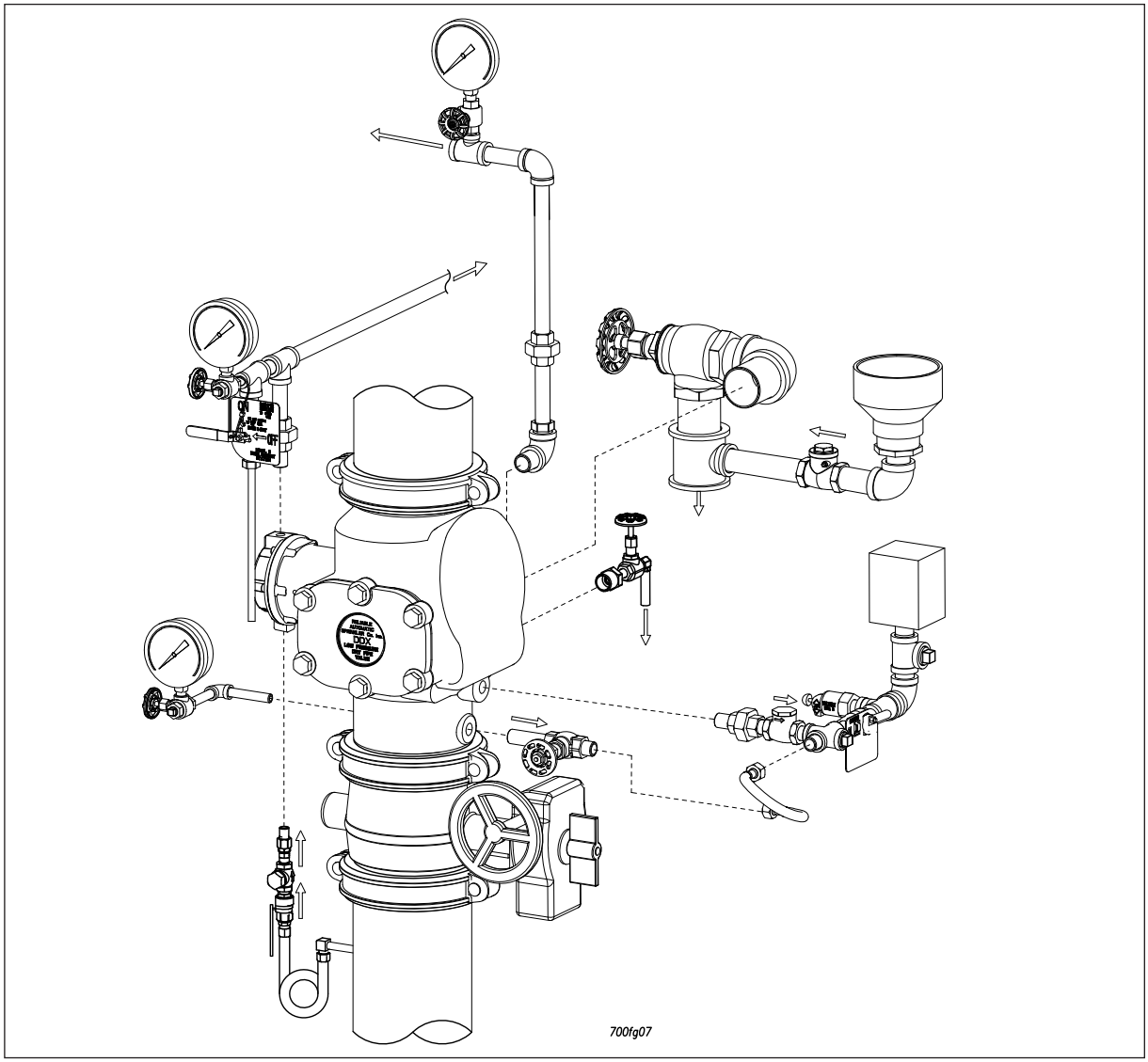

Figure 7

1.2.2 Model DDX Dry Pilot Line Single Interlock

Where freezing conditions exist, or where height/distance limits of wet pilot lines are exceeded, a dry pilot line can be used. Closed sprinklers or fixed-temperature-release pilot line detectors are installed throughout the protected area on small diameter piping that contains pressurized air or nitrogen. A Model LP Dry Pilot Actuator is installed on the outlet of the Model DDX Deluge Valve push-rod chamber. This device provides a separation between the hydraulically pressurized push-rod chamber and the pneumatically pressurized pilot line. The dry pilot line is a pneumatic extension of the push-rod chamber. Upon activation of a pilot line sprinkler or pilot line detector, pneumatic pressure is released from the piping allowing the dry pilot actuator to vent and release hydraulic pressure from the push-rod chamber. This allows the Model DDX Deluge Valve to open and fill the system piping in the protected area. Alarm devices are activated upon the flow of water into the sprinkler system piping. In the event the fire continues to grow, individual fire sprinklers in the protected area will be activated similar to a wet pipe system. A single pneumatic supply can serve the dry pilot line and supervise the piping system (required when there are more than 20 sprinklers on the system). Pneumatic pressure can be provided from a tank-mounted compressor, plant air system, or nitrogen cylinders, and must be maintained by a Reliable Model A-2 listed pressure maintenance device. To prevent accidental system activation and monitor the integrity of the system piping, pneumatic pressure is monitored by a pressure switch* that will notify the owner in the event of falling pressure due to sprinkler damage, pipe damage, or failure of the compressed gas system.

***Note: System Sensor Model EPS 10-2 Pressure Switch is provided with the dry pilot line trim.*

Approvals and technical data for Model DDX dry pilot line single interlock preaction systems can be found on Reliable Automatic Sprinkler Company Bulletin 749.

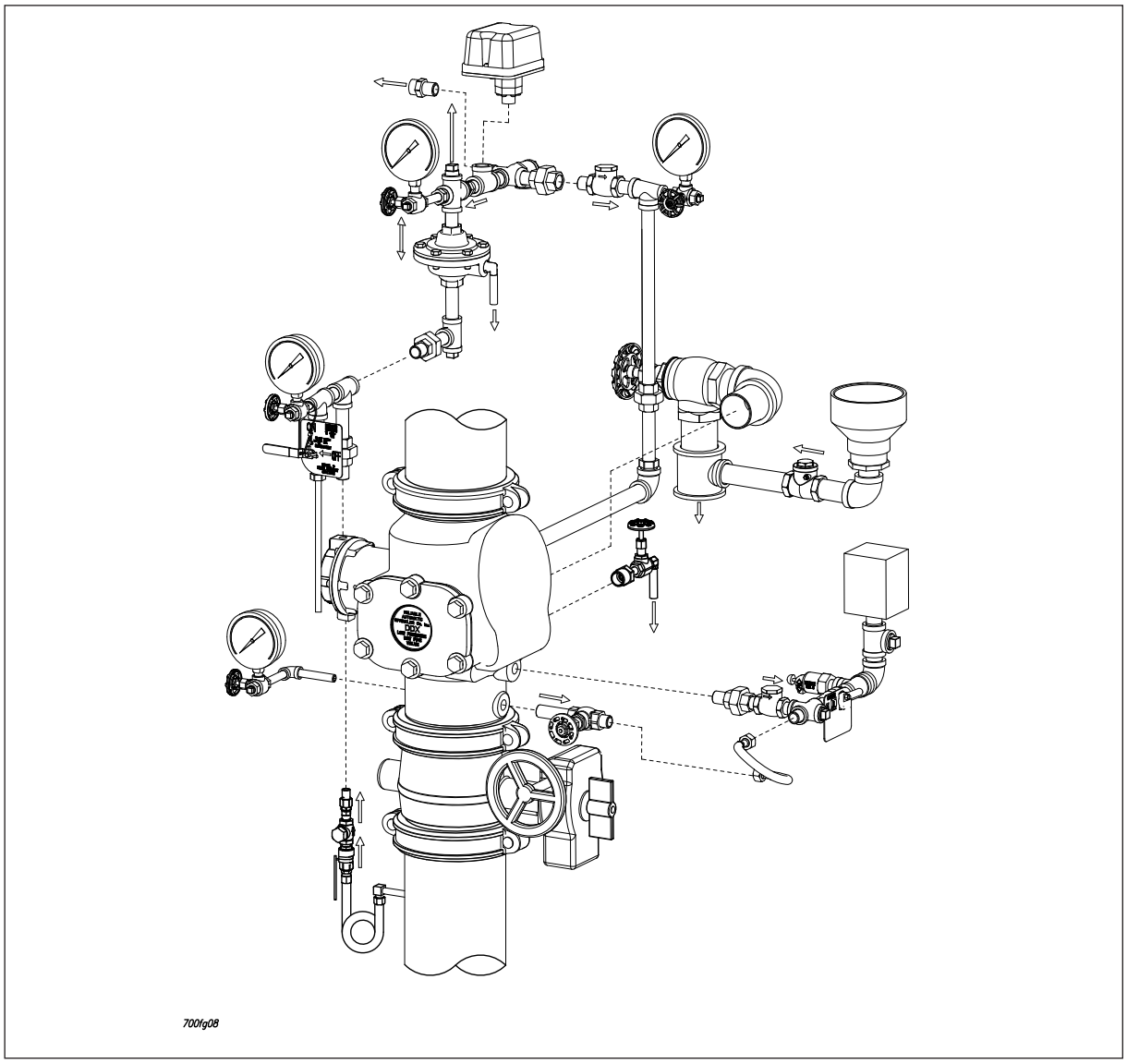

Figure 8

1.2.3 Model DDX Electrical Actuation Single Interlock

Where electrical actuation of the system is preferred over wet or dry pilot lines, or where otherwise required by project specifications, a listed normally-closed (de-energized) solenoid valve is installed on the outlet of the Model DDX Deluge Valve push-rod chamber. The solenoid provides a separation between the hydraulically pressurized push-rod chamber and atmospheric pressure drain tubing. Upon receipt of a signal from the electric detection system, the release panel opens (energizes) the solenoid valve. Pressure is released from the push-rod chamber allowing the Model DDX Deluge Valve to open and fill the system piping in the protected area. Alarm devices are activated upon the flow of water into the sprinkler system piping. In the event the fire continues to grow, individual fire sprinklers in the protected area will be activated similar to a wet pipe system. For supervised systems (required when there are more than 20 sprinklers), pneumatic pressure can be provided from a compressor, plant air system, or nitrogen cylinders. Pneumatic pressure is monitored by a pressure switch that will initiate a signal in the event of falling pressure due to sprinkler damage, pipe damage, or failure of the compressed gas system. The Reliable Model B-SI and Model C-SI Air Compressor Panels are specifically designed for single interlock preaction systems up to 200 gallon capacity and incorporate an air compressor, regulator, pressure switch, and output relays in a convenient wall mount cabinet (see section 2.3.1). Approvals and technical data for Model DDX electric release single interlock preaction systems can be found on Reliable Automatic Sprinkler Company Bulletin 749.

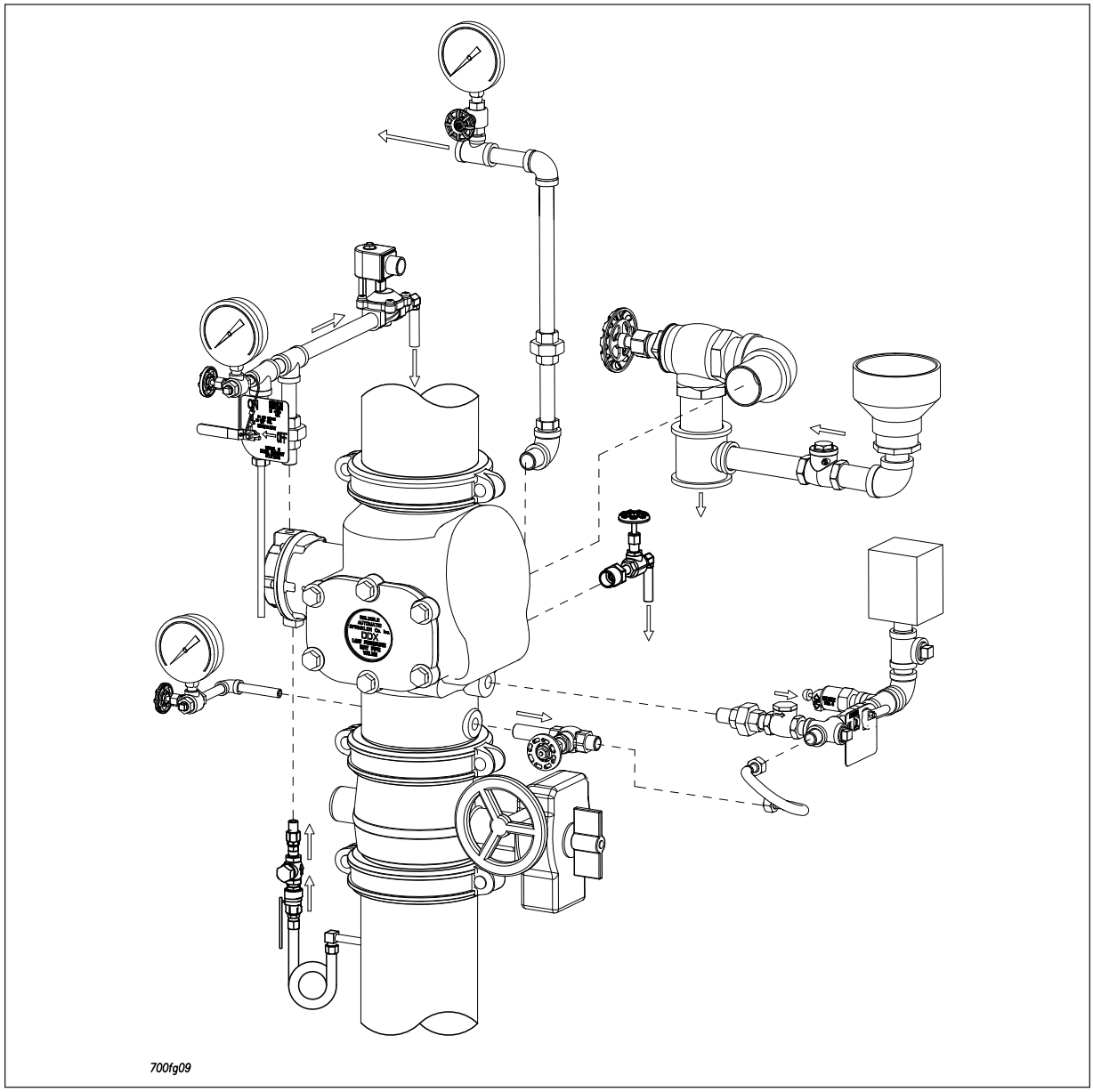

Figure 9

1.2.4 Model H Single Interlock Preaction System

The Reliable Model H 1-1/2" (40mm) Single Interlock Preaction system is an electrically actuated system that utilizes a normally closed, quick-opening hydraulically-operated diaphragm actuated solenoid as the main system control valve. When in the normal condition (de-energized) water pressure is held at the solenoid valve inlet. Upon receipt of a signal from the electric detection system, the release panel opens (energizes) the solenoid valve allowing water to flow to fill the piping network essentially converting the system into a wet pipe system. Alarm devices are activated by the System Sensor Model EPS 10-1 pressure switch (provided with assembly) upon the flow of water into the sprinkler system piping. In the event the fire continues to grow, individual fire sprinklers in the protected area will be activated similar to a wet pipe system. For supervised systems (required when there are more than 20 sprinklers), pneumatic pressure can be provided from a compressor, plant air system, or nitrogen cylinders. Pneumatic pressure is monitored by a pressure switch that will notify the owner in the event of falling pressure due to sprinkler damage, pipe damage, or failure of the compressed gas system. The Reliable Model B-SI and Model C-SI Air Compressor Panels are specifically designed for single interlock preaction systems up to 200 gallon capacity and incorporate an air compressor, regulator, pressure switch, and output relays in a convenient wall mount cabinet (see section 2.3.1).

Approvals and technical data for the Model H Single Interlock Preaction System can be found on Reliable Automatic Sprinkler Company Bulletin 719 (supervised) and 721 (non-supervised).

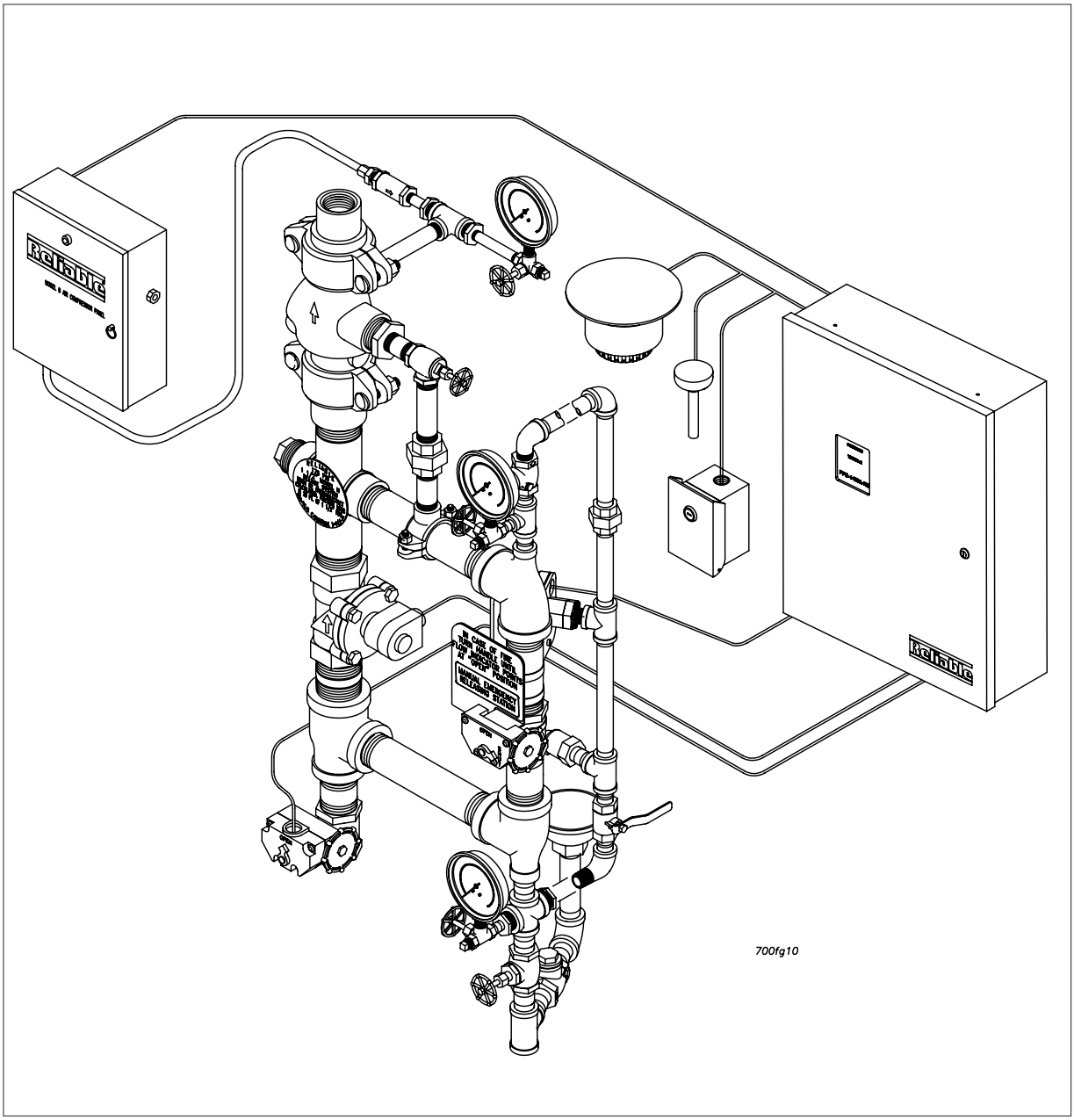

Figure 10

1.3 Double Interlock Preaction Systems

Double interlock preaction systems are designed to protect water sensitive environments where the inadvertent release of water into the protected area will result in serious disruption to critical control systems (e.g. data centers), and/or serious financial impact to business operations (e.g. freezers). Similar to deluge and single interlock preaction systems, the double interlock preaction system requires a supplemental detection/release system that operates independently of the sprinkler system. Double interlock preaction system piping is pressurized with air or nitrogen, and the pressure is monitored by a pressure switch. In addition to supervising the integrity of the piping, the pneumatic pressure serves as part of the main system control valve release sequence.

Double interlock preaction systems provide an extra level of protection against accidental system activation by requiring that two independent conditions coexist in order for the deluge valve to open. The two events can be either (a) activation of the electrical detection system and loss of pneumatic pressure in the system piping, or (b) loss of pneumatic pressure in a dry pilot line and loss of pneumatic pressure in the system piping. ***It is important to note that the existence of either condition without the other does NOT result in actuation of the main system control valve.*** Operation of the main system control valve occurs only when the two conditions coexist; when only one condition exists the building owner/occupant can respond (or "preact") to the condition and possibly prevent unnecessary release of water into the water sensitive environment.

Figure 11

1.3.1 Model DDX Type D

The Reliable Type D Double Interlock Preaction system utilizes a listed, normally closed (de-energized) electric solenoid valve on the outlet of the Model DDX Deluge Valve push-rod chamber. The solenoid provides a separation between the hydraulically pressurized push-rod chamber and atmospheric pressure drain tubing. When the programming logic of the release panel has been satisfied, the panel opens (energizes) the solenoid valve. Pressure is relieved from the push-rod chamber allowing the Model DDX Deluge Valve to open and flow water into the protected area. The Type D system is described as an electric/electric double interlock preaction system. Two independent conditions must coexist to satisfy the double interlock programming in the release panel. For the Type D system, these two conditions are (a) activation of the detection system and (b) signal of low pneumatic pressure in the system piping. Detection systems are more sensitive than the sprinklers on the system, and will activate prior to the sprinklers opening. The time period between fire detection/alarm and opening of the sprinklers from heat allows the building owner a chance to respond and possibly avoid unnecessary discharge of water into the water sensitive environment. In the event the alarm is not attended to, the fire will continue to grow eventually fusing one or more sprinklers and relieving pneumatic pressure in the system. Loss of pneumatic pressure results in a signal from the pressure switch. When this second condition (low pneumatic pressure signal) coexists with the first condition (detection), the release panel energizes (opens) the solenoid valve, in turn actuating the Model DDX Deluge Valve flowing water into the protected area. Alarm devices are activated upon the flow of water into the sprinkler system piping. Pneumatic pressure can be provided from a tank-mounted compressor, plant air system, or nitrogen cylinders, and must be maintained by a Reliable Model A-2 listed pressure maintenance device*. Pneumatic pressure is monitored by a pressure switch* that will notify the owner in the event of falling pressure due to sprinkler damage, pipe damage, or failure of the compressed gas system. A low pressure condition in the absence of a detection signal or a detection signal in the absence of a low pressure condition will NOT result in activation of the solenoid and main system control valve. The singular condition can be corrected and the system returned to normal service.

**Note: For Type D systems, the Reliable Model A-2 Pressure Maintenance Device and the System Sensor Model EPS 10-2 Pressure Switch are provided with the trim.*

Approvals and technical data for Model DDX Type D Double Interlock Preaction systems can be found on Reliable Automatic Sprinkler Company Bulletin 750.

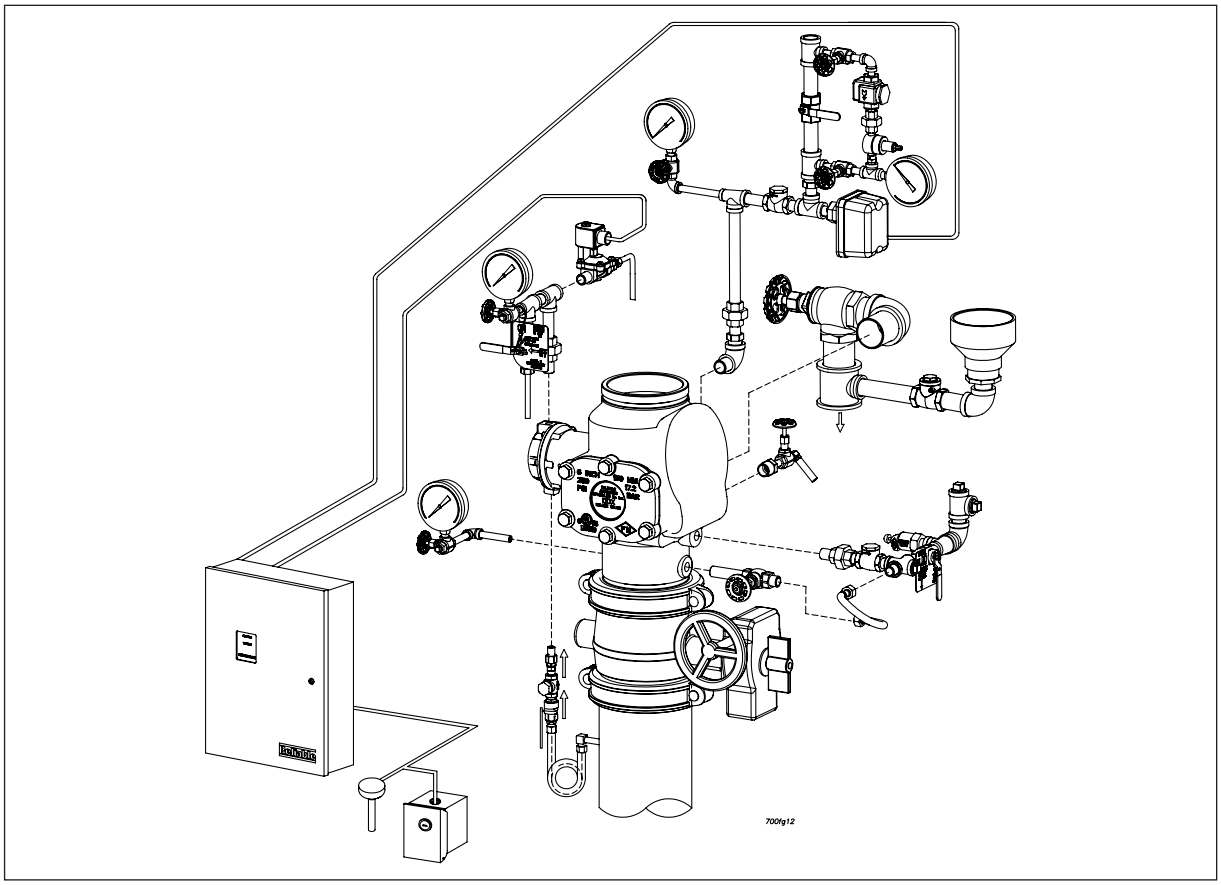

Figure 12

1.3.2 Model DDX Type F

The Reliable Type F Double Interlock Preaction system utilizes a Model LP Dry Pilot Actuator downstream of a listed, normally closed (de-energized) electric solenoid valve on the outlet of the Model DDX Deluge Valve push-rod chamber. The dry pilot actuator is held closed with system pneumatic pressure, and provides a separation between the hydraulically pressurized push-rod chamber and the system pneumatic pressure. When the programming logic of the release panel has been satisfied, the panel energizes (opens) the solenoid valve clearing the waterway to the dry pilot actuator. Subsequent loss of pneumatic pressure from the system due to a sprinkler opening operates the dry pilot actuator which vents to a drain, relieving pressure from the push-rod chamber and allowing the Model DDX Deluge Valve to open and flow water into the protected area. The Type F system is described as an electric/mechanical double interlock preaction system. Two independent conditions must coexist to actuate the Model DDX Deluge Valve and flow water into the system. These two conditions are (a) activation of the detection system and (b) loss of pneumatic pressure in the system piping. Detection systems are more sensitive than sprinklers on the system, and will activate prior to the sprinklers opening. The time period between fire detection/alarm and opening of the sprinklers allows the building owner a chance to respond and possibly avoid unnecessary discharge of water into the water sensitive environment. In the event the alarm is not attended to, the fire will continue to grow eventually fusing one or more sprinklers and relieving pneumatic pressure in the system. Loss of pneumatic pressure results in operation of the mechanical dry pilot actuator. When this second condition (loss of pneumatic pressure) coexists with the first condition (open solenoid), the Model DDX Deluge Valve operates and allows water into the protected area. Alarm devices are activated upon the flow of water into the sprinkler system piping. Pneumatic pressure can be provided from a tank-mounted air compressor, plant air system, nitrogen cylinders, or nitrogen generator, and must be maintained by a Reliable Model A-2 listed pressure maintenance device. Pressure is monitored by a pressure switch* that will notify the owner in the event of falling pressure due to sprinkler damage, pipe damage, or failure of the compressed gas system. A low pressure condition in the absence of a detection signal or a detection signal in the absence of a low pressure condition will NOT result in activation of the main system control valve. The singular condition can be corrected and the system returned to normal service.

Note: For Type F systems, system sensor Model EPS 10-2 pressure switch is provided with the trim.

Approvals and technical data for Model DDX Type F Double Interlock Preaction systems can be found on Reliable Automatic Sprinkler Company Bulletin 751.

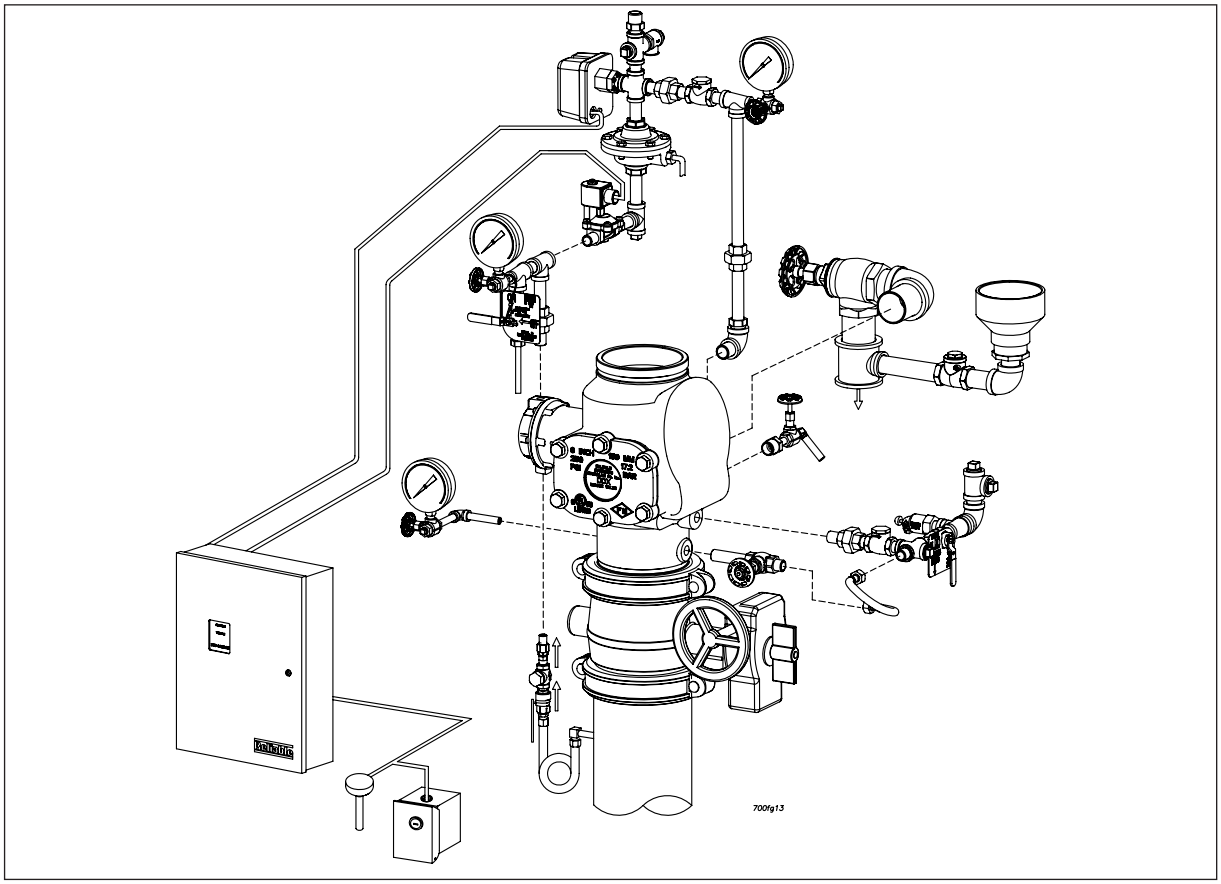

Figure 13

1.3.3 Model DDX Type PL

The Reliable Type PL Double Interlock Preaction system utilizes an LPDI Double Interlock Actuator on the outlet of the Model DDX Deluge Valve push-rod chamber. The lower chamber of the actuator is held closed with pneumatic pressure, and provides a separation between the hydraulically pressurized push-rod chamber and dry pilot line pneumatic pressure. The upper chamber of the actuator is held closed with system pneumatic pressure, and provides a separation between the lower (dry pilot line) pneumatic pressure and system pneumatic pressure. The Type PL system is described as a fully mechanical pneumatic/pneumatic double interlock preaction system. Two independent conditions must coexist to open the Model DDX Deluge Valve and flow water into the system. These two conditions are (a) loss of pneumatic pressure in the dry pilot line and (b) loss of pneumatic pressure in the system piping. Pilot line detectors are more sensitive than sprinklers on the system, and will activate and sound an alarm prior to the sprinklers opening. The time period between the pilot detectors opening and opening of the sprinklers allows the building owner a chance to respond and possibly avoid unnecessary discharge of water into the water sensitive environment. In the event the alarm is not attended to, the fire will continue to grow eventually fusing one or more sprinklers releasing pneumatic pressure from the system. Loss of pneumatic pressure from the system operates the dry pilot actuator which vents to a drain, relieving hydraulic pressure from the push-rod chamber and allowing the Model DDX Deluge Valve to open and flow water into the protected area. Alarm devices are activated upon the flow of water into the sprinkler system piping. Pneumatic pressure can be provided from a tank-mounted air compressor, plant air system, nitrogen cylinders, or nitrogen generator, and must be maintained by a Reliable Model A-2 Pressure Maintenance Device. Dry pilot line and system pneumatic pressures are independently monitored by pressure switches* that will initiate a signal in the event of falling pressure due to sprinkler damage, pipe damage, or failure of the compressed gas system. An independent low pressure condition in either the dry pilot line or in the system will NOT result in activation main system control. The singular condition can be corrected and the system returned to normal service.

**Note: For Type PL systems, System Sensor Model EPS 10-2 Pressure Switches are provided with the trim.*

Approvals and technical data for Model DDX Type PL Double Interlock Preaction systems can be found on Reliable Automatic Sprinkler Company Bulletin 752.

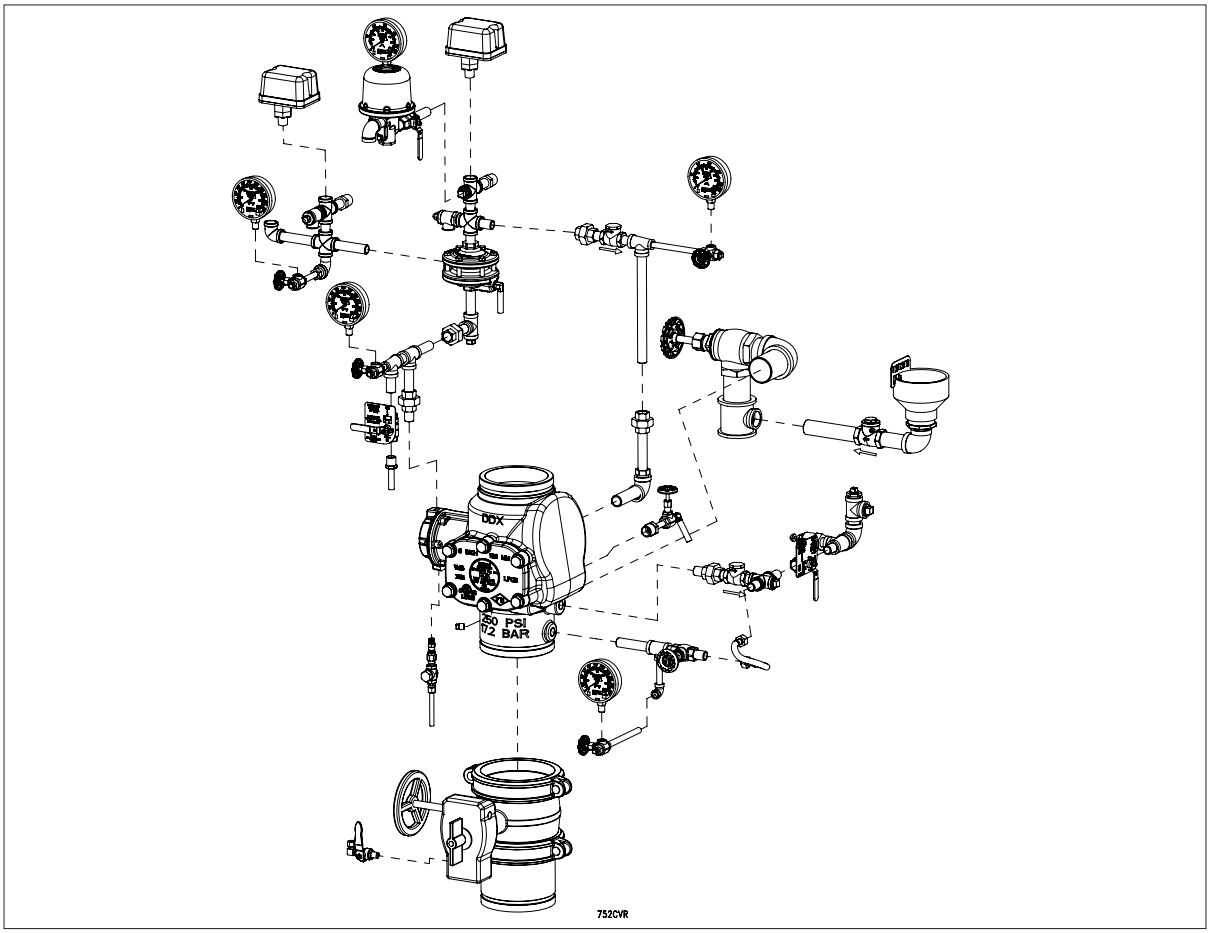

Figure 14

1.3.4 Model H Type D

The Reliable Model H 1-1/2" (40mm) Double Interlock Preaction System Type D is an electrically actuated system that utilizes a normally closed, quick-opening hydraulically-operated diaphragm actuated solenoid as the main system control valve. In the normal condition (de-energized), water pressure is held at the solenoid valve inlet. When the programming logic of the release panel has been satisfied, the panel opens (energizes) the solenoid valve allowing water flow into the protected area. The Type D system is described as an electric/electric double interlock preaction system. Two independent conditions must coexist to satisfy the double interlock programming in the release panel. For the Type D system, these two conditions are (a) activation of the detection system and (b) signal of low pneumatic pressure in the system piping. Detection systems are more sensitive than the sprinklers on the system, and will activate prior to the sprinklers opening. The time period between fire detection/alarm and opening of the sprinklers allows the building owner a chance to respond and possibly avoid unnecessary discharge of water into the water sensitive environment. In the event the alarm is not attended to, the fire will continue to grow eventually fusing one or more sprinklers and relieving pneumatic pressure in the system. Loss of pneumatic pressure results in a signal from the pressure switch. When this second condition (low pressure signal) coexists with the first condition (detection), the release panel energizes (opens) the solenoid valve flowing water into the protected area. Alarm devices are activated upon the flow of water into the sprinkler system piping. Pneumatic pressure can be provided from a tank-mounted compressor, plant air system, or nitrogen cylinders, and must be maintained by a Reliable Model A-2 listed pressure maintenance device*. Pneumatic pressure is monitored by a pressure switch* that will notify the owner in the event of falling pressure due to sprinkler damage, pipe damage, or failure of the compressed gas system. A low pressure condition in the absence of a detection signal or a detection signal in the absence of a low pressure condition will NOT result in activation of the solenoid and main system control valve. The singular condition can be corrected and the system returned to normal service.

**Note: For Type D systems, the Reliable Model A-2 Pressure Maintenance Device and the System Sensor Model EPS10-2 Pressure Switch are provided with the trim.*

Approvals and technical data for the Model H Double Interlock Preaction System Type D can be found on Reliable Automatic Sprinkler Company Bulletin 720.

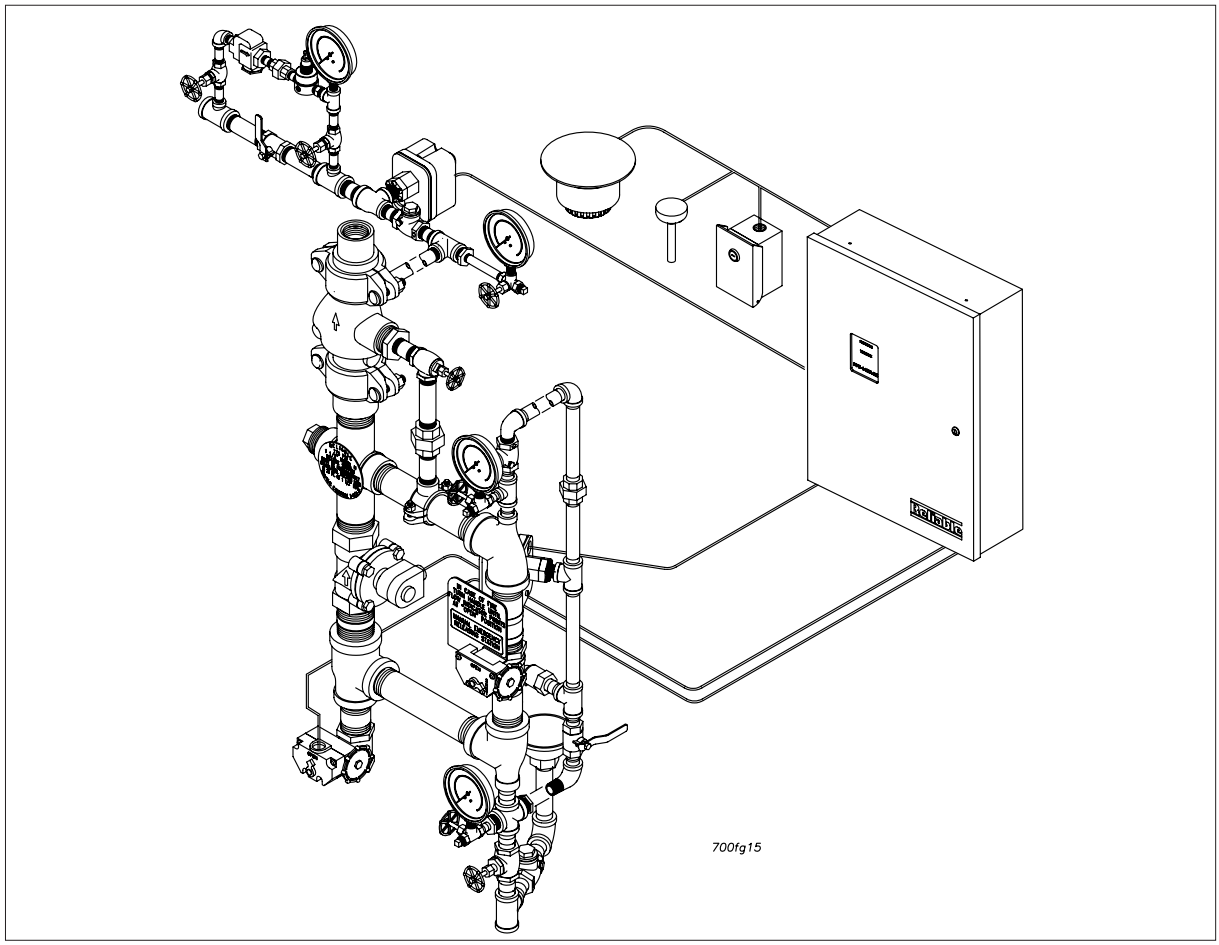

Figure 15

1.4 Non Interlock Preaction System

Non-interlock preaction systems combine the operational features of a single interlock preaction system and a dry system. Non-interlock systems are fully actuated by either a signal from a detection system (same as a single interlock system) OR from loss of pneumatic pressure (same as a dry system). A solenoid valve and a Dry Pilot Actuator are connected to the Deluge Valve push-rod chamber outlet and each is piped independently to atmospheric pressure via the drain cup. The solenoid provides a separation between the hydraulically pressurized push-rod chamber and atmospheric pressure drain tubing. Upon receipt of a signal from the electric detection system, the release panel energizes (opens) the solenoid valve. Pressure is released from the push-rod chamber allowing the Deluge Valve to open and fill the system piping in the protected area. Alarm devices are activated upon the flow of water into the sprinkler system piping. In the event the fire continues to grow, individual fire sprinklers in the protected area will be activated similar to a wet pipe system. The Dry Pilot Actuator provides a second separation between the hydraulically pressurized Deluge Valve push-rod chamber and system pneumatic pressure. Loss of pneumatic pressure in the system due to a sprinkler opening operates the Dry Pilot Actuator which vents to a drain, relieving hydraulic pressure from the push-rod chamber and allowing the Deluge Valve to open and flow water into the protected area. Alarm devices are activated upon the flow of water into the sprinkler system. Pneumatic pressure can be provided from a tank-mounted air compressor, plant air system, nitrogen cylinders, or nitrogen generator, and must be regulated with a Reliable Model A-2 Air Maintenance Device. Pneumatic pressure in the system is monitored by a pressure switch that will provide indication of falling pressure due to leaks or failure of the compressed gas system. When properly adjusted, the low pressure alarm will activate in advance of the dry pilot actuator, allowing the owner an opportunity to correct problems with the pressurizing system before the Deluge Valve opens. The Reliable Non-Interlock Preaction System is derived by adding the non-interlock trim option to the Reliable Model EX or DDX-LP dry system, and operates with pneumatic pressure between 8 and 28 PSI depending on the pressure of the incoming water supply.

Approvals and technical data for the Non-Interlock Preaction System can be found on Reliable Automatic Sprinkler Company Bulletins 358 & 359 (EX) and 337 & 338 (DDX-LP).

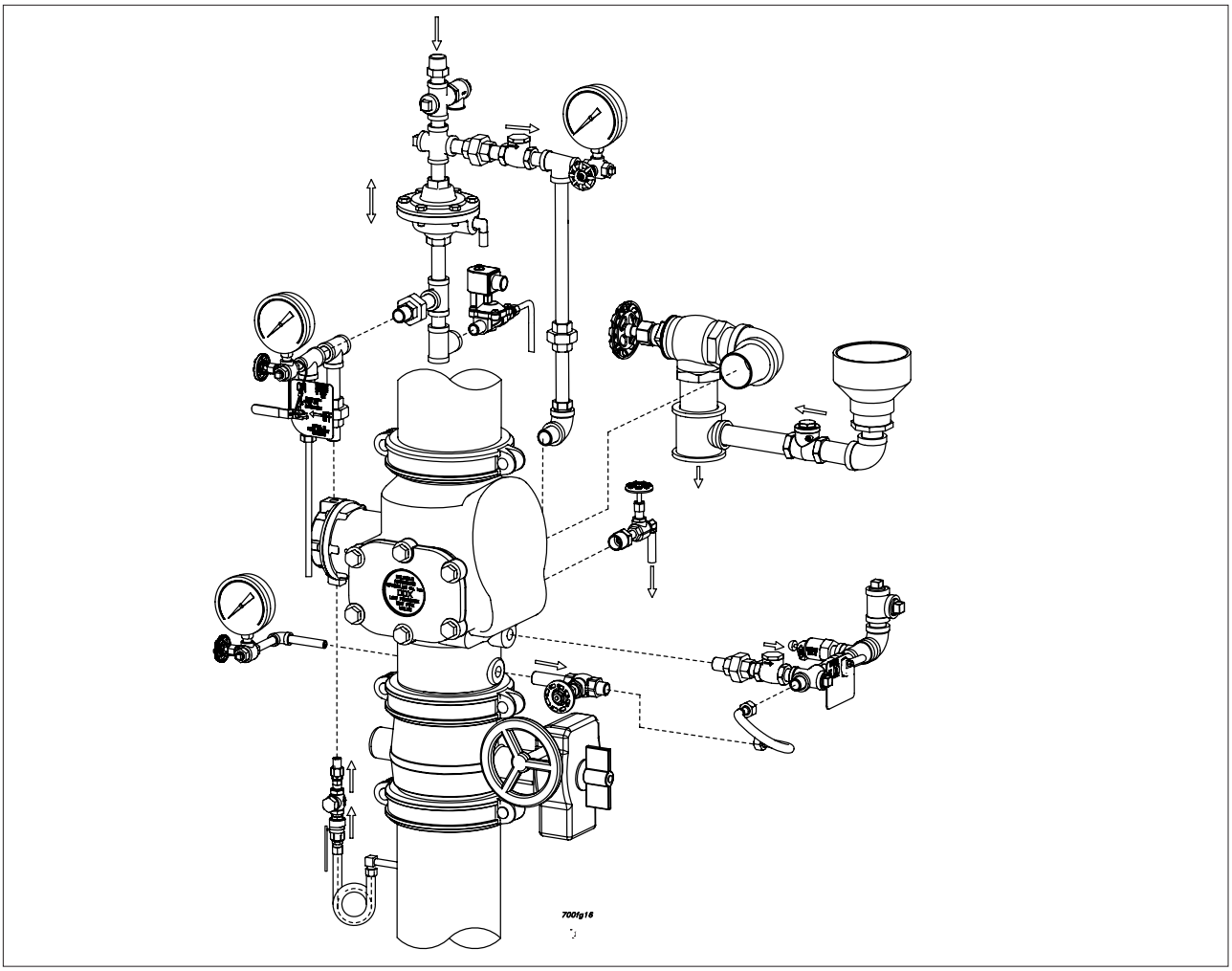

Figure 16

1.5 Low Pressure Dry System

Low pressure dry pipe systems offer numerous advantages over conventional systems. Conventional differential dry pipe systems rely on pneumatic pressure above a pool of priming water to hold a check valve clapper closed and prevent supply water from flowing into the system. When pneumatic pressure is lost, the clapper opens, and the incoming water works against the pressurized gas as it makes its way through the system piping. By lowering the pneumatic pressure in the system, water can move faster through the piping since there is less pneumatic pressure working against it. Faster water movement from the valve to the end of the system improves water delivery time, permits the installation of larger and possibly fewer dry systems, and often results in the elimination of accelerators. Lower pressures require smaller air compressors, nitrogen generators, and/or nitrogen tanks, and the DDX technology eliminates the need for priming water that evaporates over time resulting in excessive corrosion in the piping. Because conventional valves operate on a surface area differential principle and are non-latching, they can be subject to false activation in the event of pressure surges in the water supply. Reliable Model EX and DDX-LP dry systems incorporate a latching type clapper that is held closed by the incoming water supply. Any increase in water pressure attempting to force the clapper open is offset with equal pressure in the latching mechanism supply line. The Reliable Automatic Sprinkler Company offers two low pressure dry systems—the Model EX for domestic use, and the Model DDX-LP for domestic or international use.

Figure 17

Figure 18

1.5.1 Reliable Model EX Dry System

The Reliable Model EX Dry system utilizes a dry pilot actuator directly mounted to the push-rod chamber of a Model DDX deluge style valve. The dry pilot actuator can be held closed with pneumatic system pressure much lower than that required for a conventional dry valve, and provides a separation between the hydraulically pressurized push-rod chamber and system pneumatic pressure. Loss of pneumatic pressure in the system due to a sprinkler opening operates the dry pilot actuator which vents to a drain, relieving hydraulic pressure from the push-rod chamber and allowing the Model EX Dry Valve to open and flow water into the protected area. Alarm devices are activated upon the flow of water into the sprinkler system piping. Pneumatic pressure can be provided from a tank-mounted air compressor, plant air system, or nitrogen cylinders and must be regulated with a Reliable Model A-2 Air Maintenance Device. Pneumatic pressure in the system is monitored by a pressure switch that will provide indication of falling pressure due to leaks or failure of the compressed gas system. When properly adjusted, the low pressure alarm will activate in advance of the dry pilot actuator, allowing the owner an opportunity to correct problems with the pressurizing system before the dry valve opens. The Reliable EX Dry System operates with pneumatic pressure between 8 and 40 PSI depending on the pressure of the incoming water supply. Minimum pneumatic pressure when using the optional Model B-1 accelerator and/or an EPS40-2 high/low pressure switch is 15 PSI.

Approvals and technical data for the Model EX Dry System can be found on Reliable Automatic Sprinkler Company Bulletins 358 and 359.

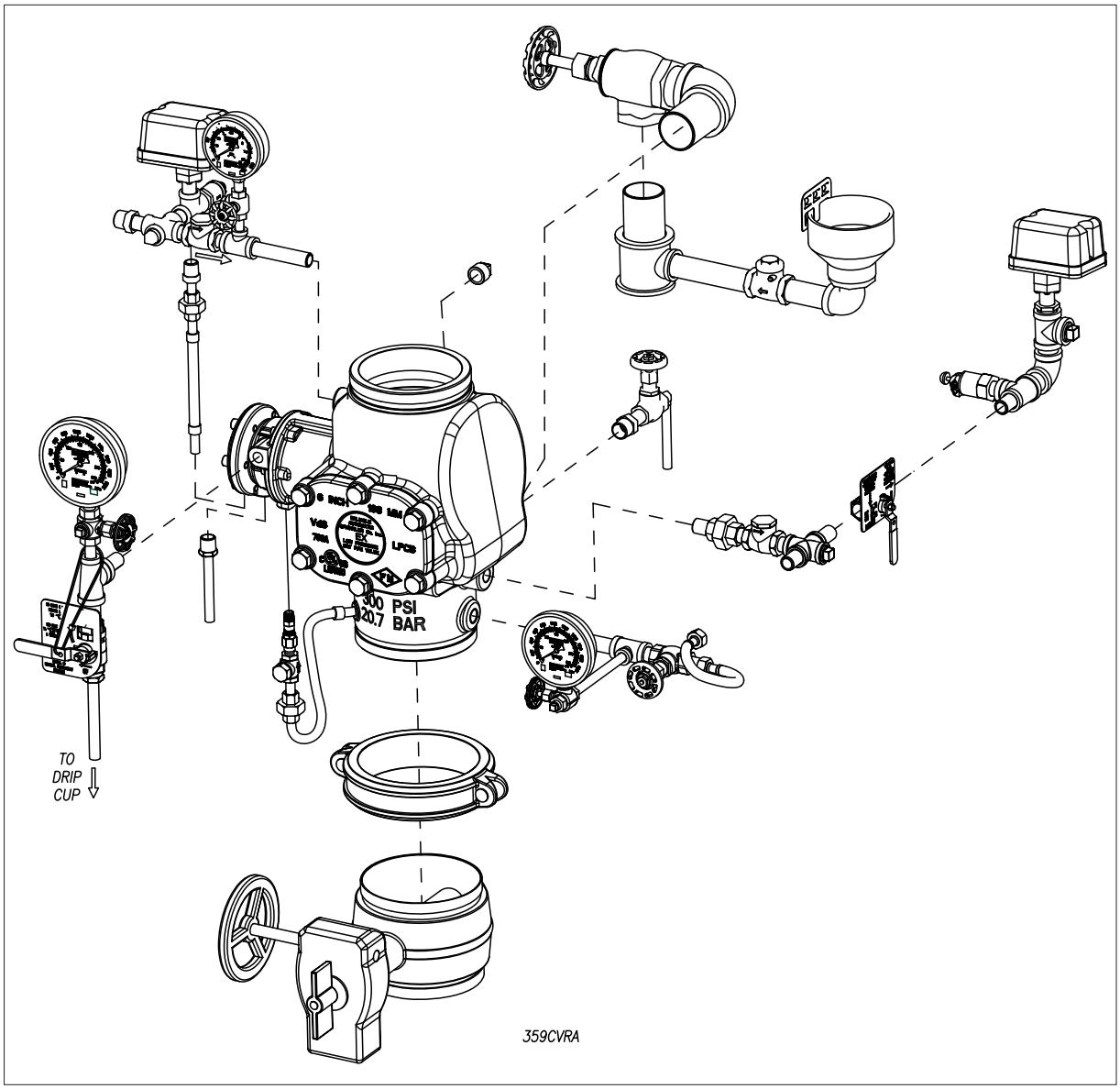

Figure 19

1.5.2 Reliable Model DDX-LP Dry System

The Reliable Model DDX-LP Dry system utilizes a Model LP Dry Pilot Actuator as the releasing device on the outlet of the Model DDX Deluge Valve push-rod chamber. The dry pilot actuator is held closed with pneumatic system pressure much lower than that required for a conventional dry valve, and provides a separation between the hydraulically pressurized push-rod chamber and system pneumatic pressure. Loss of pneumatic pressure in the system due to a sprinkler opening operates the dry pilot actuator which vents to a drain, relieving hydraulic pressure from the push-rod chamber and allowing the Model DDX Deluge Valve to open and flow water into the protected area. Alarm devices are activated upon the flow of water into the sprinkler system piping. Pneumatic pressure can be provided from a tank-mounted air compressor, plant air system, nitrogen cylinders, or nitrogen generator, and must be regulated with a Reliable Model A-2 Air Maintenance Device. Pneumatic pressure in the system is monitored by a pressure switch that will provide indication of falling pressure due to leaks or failure of the compressed gas system. When properly adjusted, the low pressure alarm will activate in advance of the dry pilot actuator, allowing the owner an opportunity to correct problems with the pressurizing system before the deluge valve opens. The Reliable DDX-LP Dry System operates with pneumatic pressure between 8 and 28 PSI depending on the pressure of the incoming water supply. Minimum pneumatic pressure when using the optional Model B-1 accelerator and/or an EPS40-2 high/low pressure switch is 15 PSI.

Approvals and technical data for the Model DDX-LP Dry System can be found on Reliable Automatic Sprinkler Company Bulletins 337 and 338.

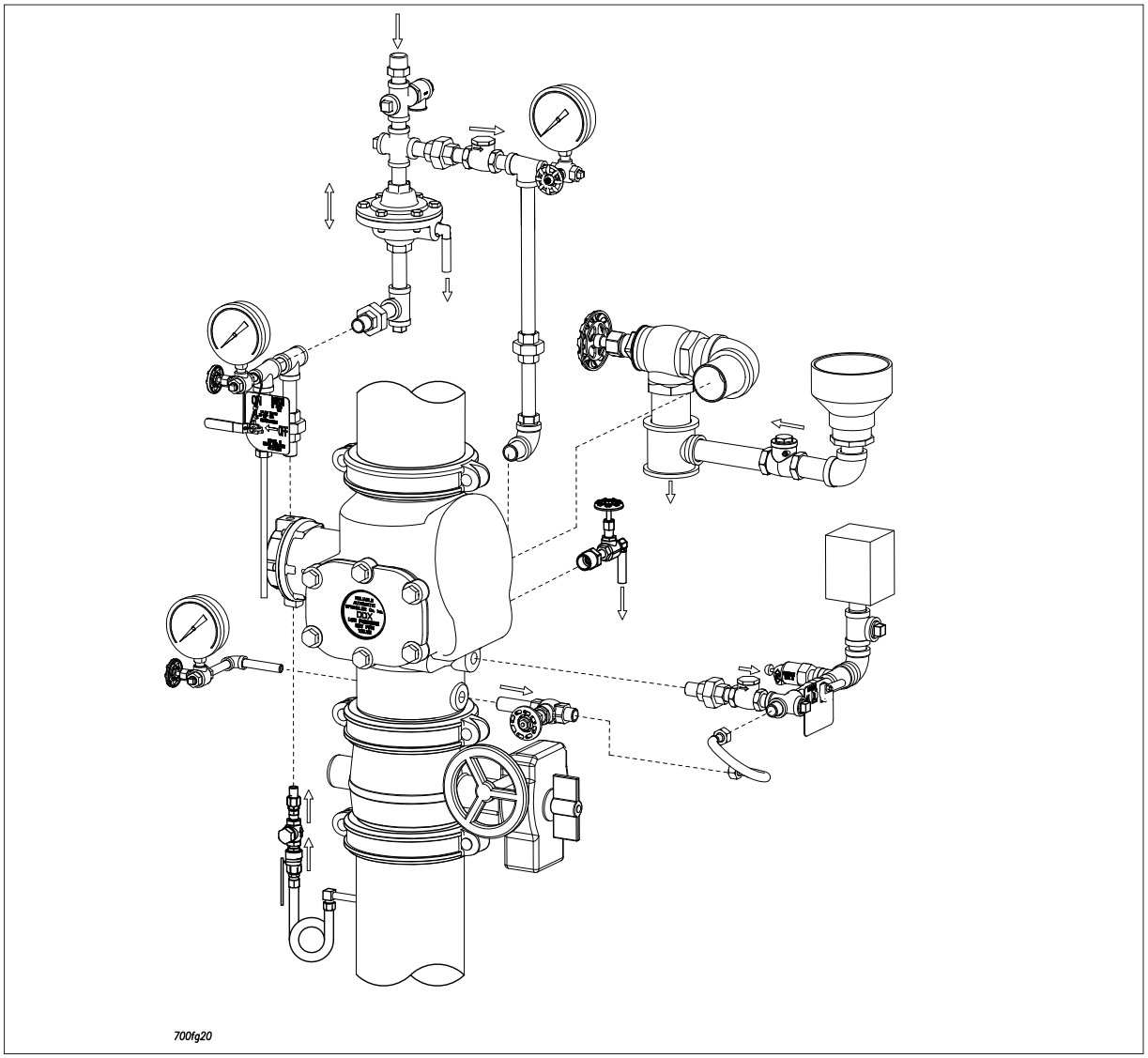

Figure 20

1.6 PrePak & DryPak

Reliable PrePaK Preaction and DryPak Low Pressure Dry systems are completely self-contained riser assemblies that can be readily installed within a small floor space. These cabinet mounted systems are substantially smaller and lighter than other manufacturer's systems and will fit through a standard 30" wide door. Installation of the units requires three piping connections: a supply line in, a system line out, and a drain line out. Locations of these connections are detailed in the appropriate product bulletins.

All internal electrical devices are factory wired and tested. Where applicable, an optional release panel can be mounted in the cabinet door. Reliable PrePaK Preaction Systems utilize the Potter Model PFC-4410 Releasing Control Panel. This fully programmable, microprocessor-based releasing panel is Underwriters Laboratories, Inc. listed and complies with NFPA 13 and NFPA 72. All device and release panel terminals are translated to two watertight terminal boxes inside the cabinet. Low voltage and line voltage field connections are made to these terminal boxes. Separate 120 VAC electrical connections are required for the release panel and air compressor when so equipped.

The Reliable PrePaK or DryPak System enclosure is powder-coated rustproof black on the exterior and white on the interior for improved visibility. Each 12 gauge steel cabinet contains the following components:

- Main system control valve, either:
  - — 1½" (40mm) Model H Deluge Riser Assembly (PrePak only), or
  - — 2" (50mm), 2½" (65mm), 3" (80mm), 4" (100mm), or 6" (150mm) Model DDX Deluge Valve (PrePak & DryPak)
- One Reliable Pressure Maintenance Device
- One Tank-Mounted Air Compressor (optional)
- One Potter Model PFC-4410 Fire Alarm/Releasing Panel (PrePak only; optional)
- All required piping, fittings, gauges, electrical connectors, and electrical devices to utilize the system in single interlock, double-interlock, or low pressure dry system applications

PrePaks and DryPaks are designed, manufactured, assembled and tested by Reliable in Liberty SC, USA. Operation and application of the various systems has been previously described in this bulletin.

Approvals and technical data for Model DDX PrePak Preaction Systems can be found on Reliable Automatic Sprinkler Company Bulletins 733, 740, & 747. Approvals and technical data for Model H PrePak Preaction Systems can be found on Reliable Automatic Sprinkler Company Bulletin 723. Approvals and technical data for Model DDX DryPak Low Pressure Dry Systems can be found on Reliable Automatic Sprinkler Company Bulletin 748.

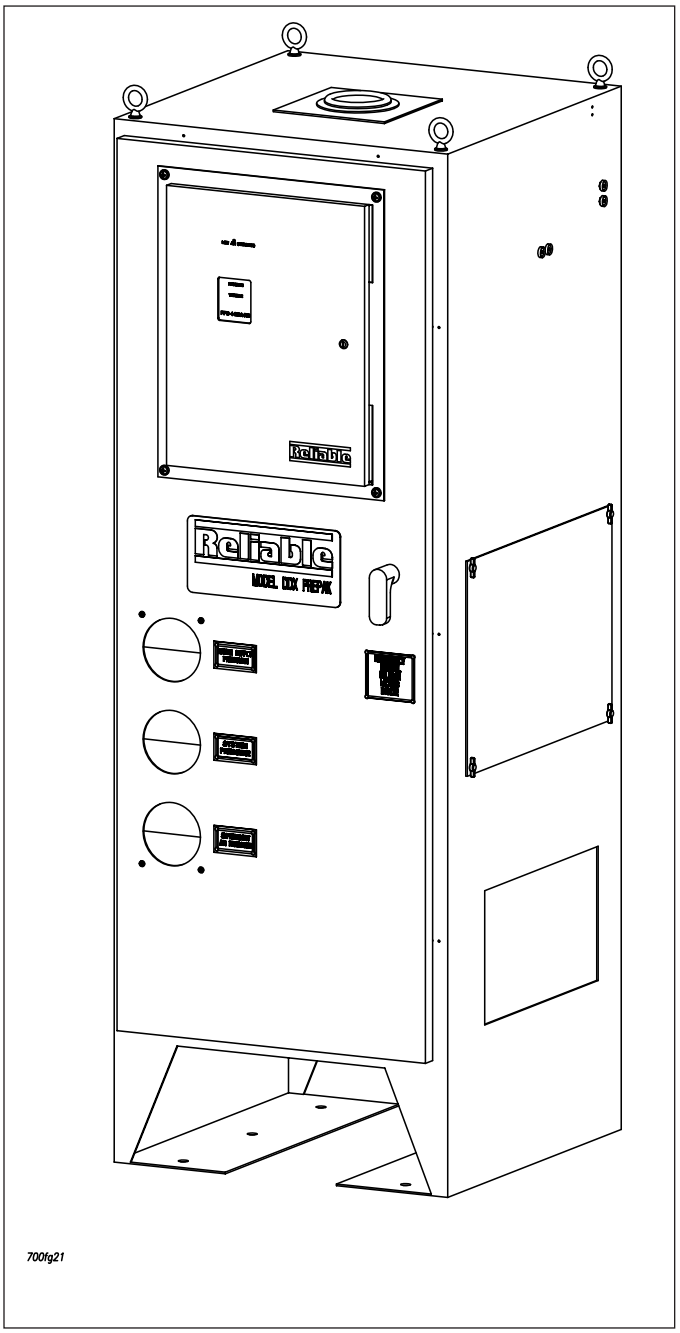

Figure 21

2. COMPONENT DESCRIPTIONS

2.1 Main System Control Valves

Special systems, whether deluge, preaction or low pressure dry, control the release of water to the protected area until a particular condition or set of conditions is met. The main system control valve is defined as the valve which separates the pressurized water supply source from piping in the protected area. Two types of main system control valves are used for Reliable Special Systems.

2.1.1 Model H

The Reliable Model H 1½" (40mm) Riser Assembly incorporates a normally closed, quick-opening hydraulically operated diaphragm actuated solenoid valve as the system control valve for both deluge and preaction fire protection systems. The Model H is listed by Underwriter Laboratories (UL) but is NOT Factory Mutual Approved. (If Factory Mutual Approval is required, refer to the Model DDX Deluge Valve in section 2.1.2 below.) The trim is factory assembled for every Model H Deluge Riser Assembly. Three field piping connections are required: an appropriate water supply, the system piping connection, and a ¾" NPT drain line connection.

When in the normal condition (de-energized), fire protection system supply water is held at the solenoid valve inlet. When the valve is energized by power from a releasing panel, the solenoid valve opens and water flows through the deluge riser assembly into the fire protection system piping. Alarm devices are activated upon the flow of water into the sprinkler system piping.

After the system is shut down and drained, the valve is easily reset without special tools. When the detection devices have returned to ready condition, the deluge riser assembly is placed back in service by simply resetting the releasing panel. This easy reset feature of the Model H Riser Assembly provides a means for simple, economical system testing which is an essential facet of a good maintenance program.

The Reliable Model H Riser Assembly may be used in any application requiring a deluge or preaction system with an electrical detection system. Actuation of the solenoid valve may be achieved with various types of detectors and a listed release control panel. Care should be taken to ensure that all components are listed for compatibility and for the intended application. Electrical connections are required between the listed release control panel and the solenoid valve, system control valve supervisory switch, the water flow alarm pressure switch, and low pressure supervisory switch (when applicable).

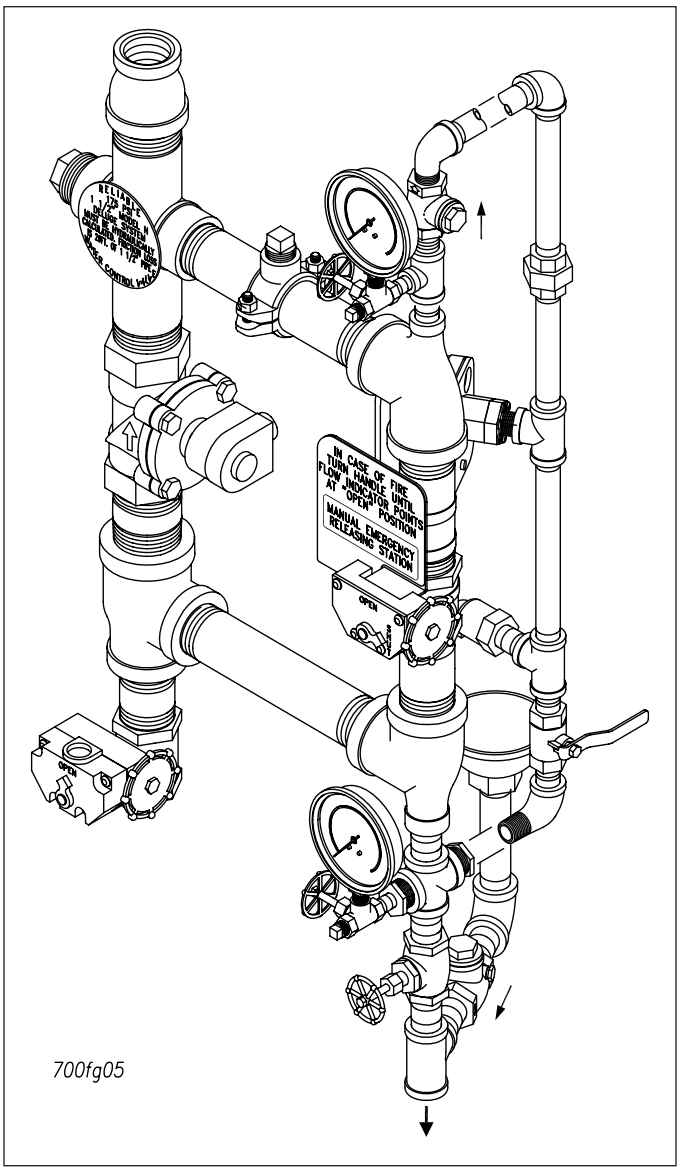

Figure 22

2.1.2 Model DDX

The Reliable Model DDX Deluge Valve is a hydraulically-operated, differential-type, latching valve with external reset designed for use as a main system control valve in deluge, preaction and low pressure dry fire protection systems. The Model DDX Deluge Valve can be trimmed to create several types of systems by utilizing manual, hydraulic, pneumatic, or electrical actuation devices or combinations of these devices. Using a Model DDX Deluge Valve as the main system control valve allows the end-user flexibility in changing the system type by reconfiguring the trim if the need arises; a new Model DDX Deluge Valve does not need to be purchased.

In the set position, the Model DDX Deluge Valve clapper is physically held closed by the lever and pushrod assembly (Figure A). In this position, supply pressure acts on the underside of the clapper and also on the push rod through the push rod chamber inlet. The resultant force on the push rod is multiplied by the mechanical advantage of the lever and holds the clapper closed against normal supply pressure surges. The push rod chamber supply valve remains in the open position when the valve is in the set condition; any surge or increase in water supply pressure acting on the underside of the clapper is equally transmitted to the push rod chamber to guard against accidental opening of the deluge valve

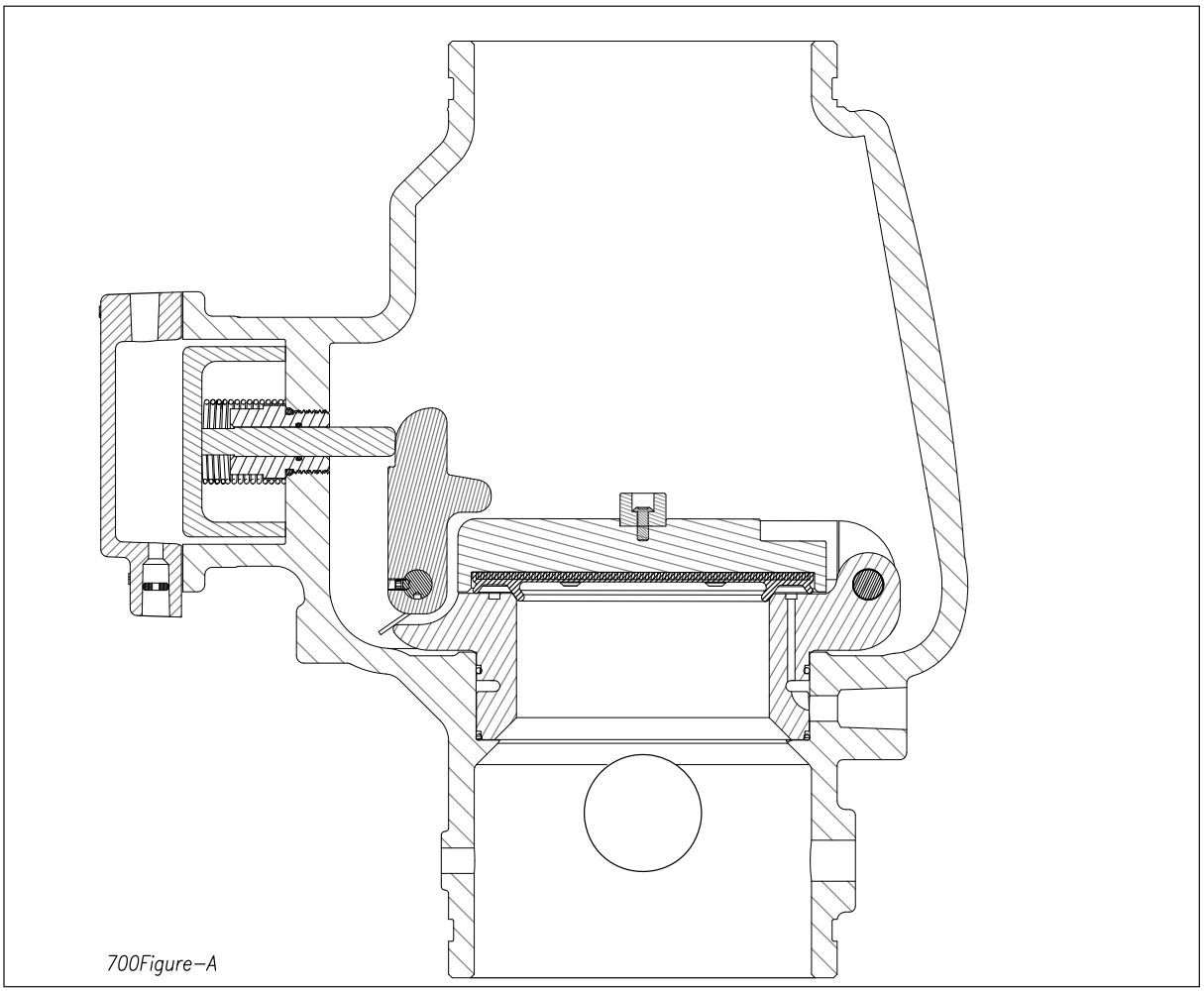

Figure A:
DDX VALVE SET POSITION

The Reliable Model DDX Deluge Valve may be operated by any listed or approved releasing device which opens sufficiently to vent the push rod chamber. When a releasing device activates, the push rod chamber vents to atmosphere through the chamber outlet. Since the pressure cannot be replenished through the inlet restriction as quickly as it is vented, the push rod chamber pressure falls rapidly. When the push rod chamber pressure approaches approximately one-third of the supply pressure, the upward force of the supply pressure acting beneath the clapper overcomes the reduced push-rod force allowing the clapper to open. When in a flowing condition, the clapper is pushed and held open by the flow of water to the system (Figure B).

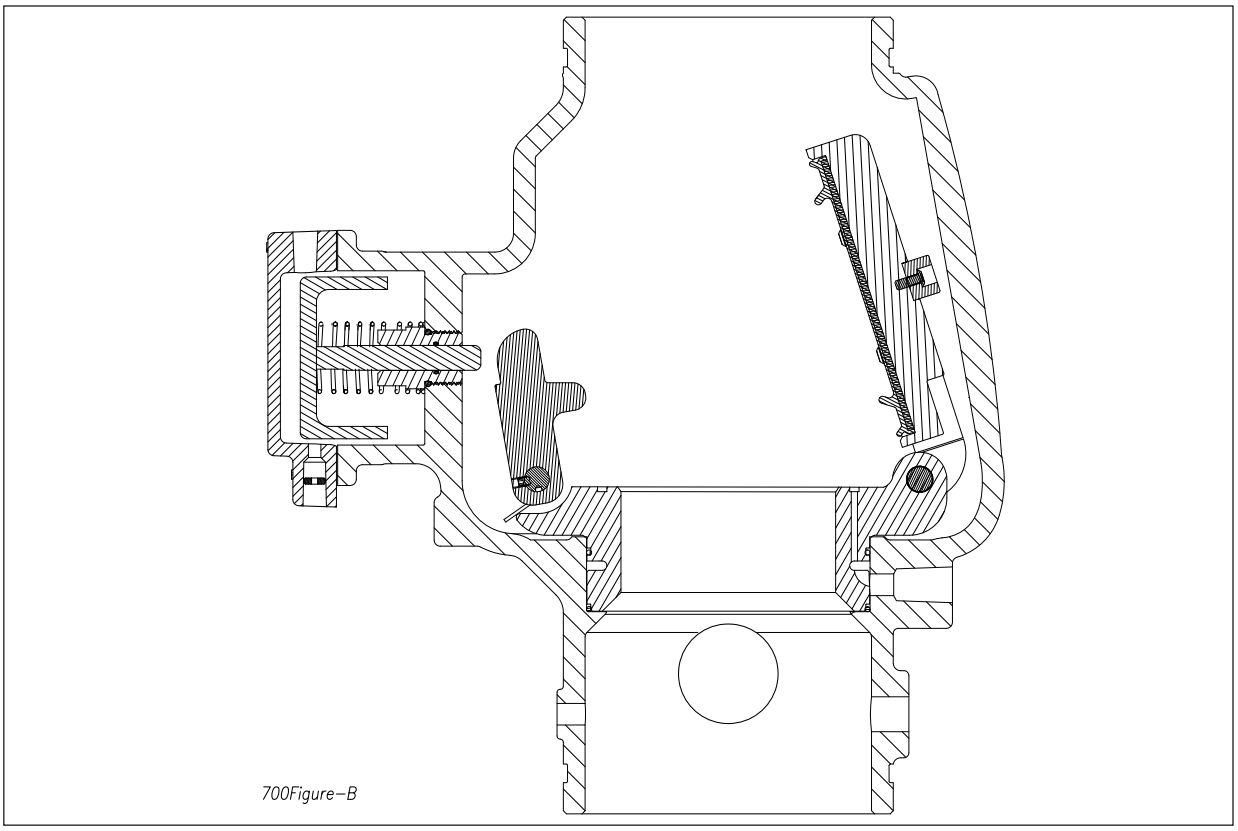

Figure B:
DDX VALVE OPEN POSITION

Alarm devices are activated via the alarm port upon flow of water into the sprinkler system piping. Once the flow of water has stopped, the clapper drops and the lever acts as a latch to prevent the clapper from returning to the closed position (Figure C).

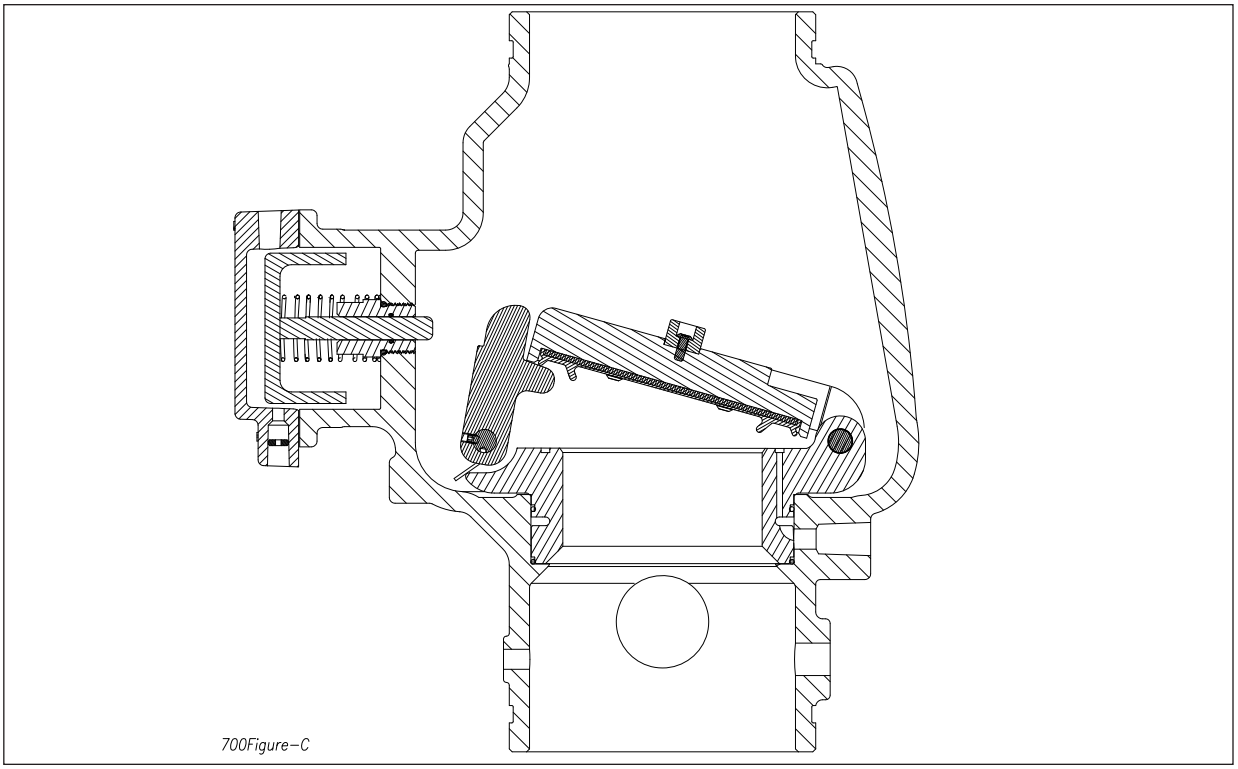

Figure C:
DDX VALVE LATCHED POSITION

An external reset knob on the back left hand (pushrod) side of the Model DDX Deluge Valve allows the user to reset the valve without removing the faceplate. (Figure D). It is important to note that ALL pressure must be relieved from the push rod chamber prior to resetting the valve. This can be accomplished by opening the emergency manual release valve provided on the front left of each Model DDX Deluge Valve assembly.

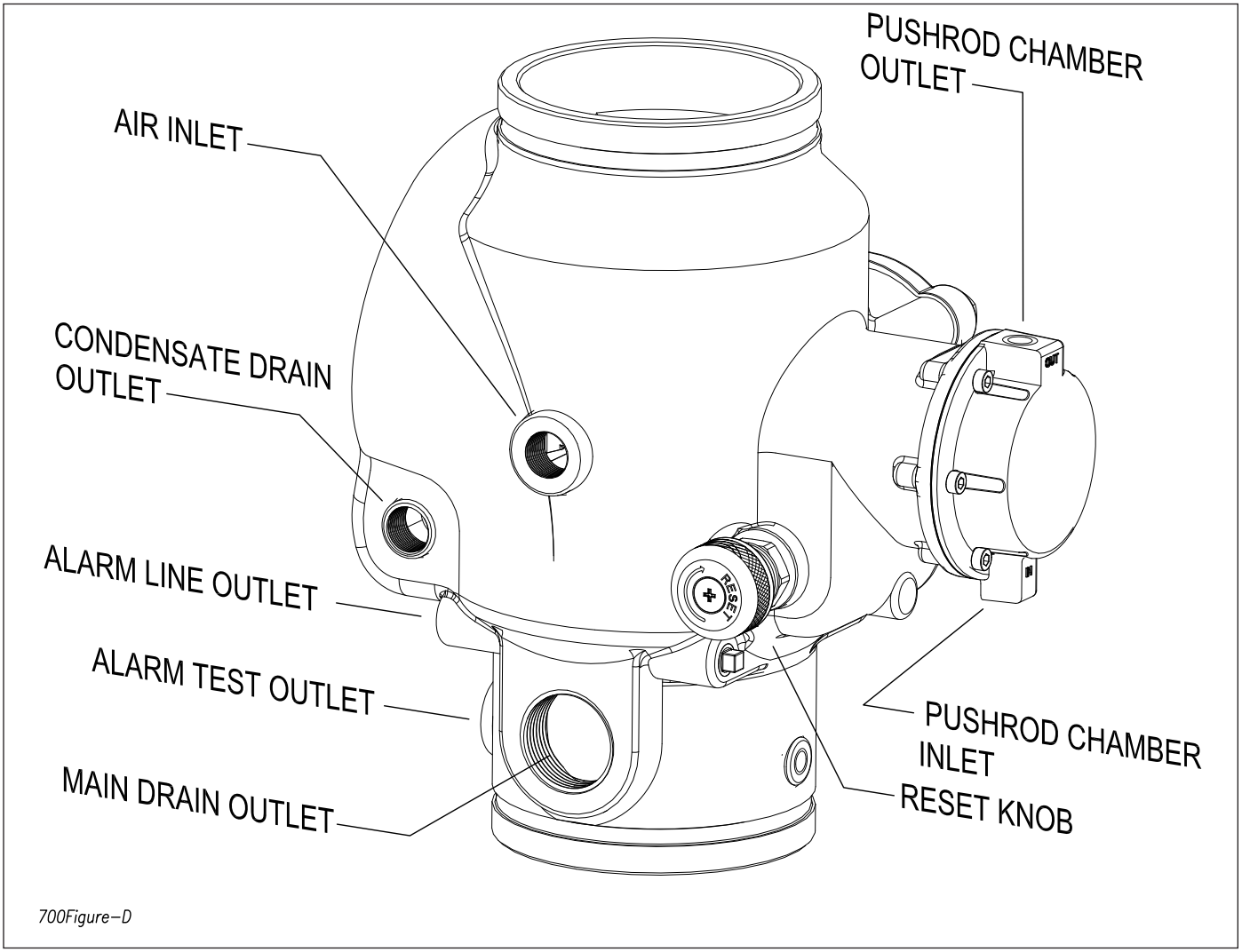

Figure D:
DDX VALVE REAR VIEW

The Model DDX Deluge Valve has an intermediate chamber built into the seat assembly which eliminates the need for an additional system side check valve when the Model DDX Deluge Valve is used to control preaction or low pressure dry systems that contain pressurized air or nitrogen. The intermediate chamber also removes the need for secondary main drain valves to facilitate draining of the fire protection system piping.

The Model DDX Deluge Valve is available in six sizes: 2" (50mm), 2½" (65mm), 3" (80mm), 4" (100mm), 6" (150mm), and 8" (200mm). All six sizes are available with a cast ductile iron body with grooved inlet and outlet connections. The 4" (100mm) and 6" (150mm) sizes are also available with flanged inlet and flanged outlet connections, or flanged inlet and grooved outlet connections. The 8" (200mm) size is also available with flanged inlet and flanged outlet connections. Flange options include class 150 & class 300. All working components of the valve are field replaceable without removing the valve from the riser. The Model DDX Deluge Valve is rated at 250 psi (17.2 bar), 4" & 6" are rated to 300 psi (20.7 bar) working pressure, factory tested at 500 psi (34.5 bar), and is listed and approved by various agencies worldwide.

2.2 Releasing Devices

A releasing device serves to vent hydraulic pressure from the main system control valve push-rod chamber allowing the Model DDX Deluge Valve to open and flow water into the fire protection system. They can be classified as either manual or automatic, and can be used in various combinations to achieve the desired level of operational safety.

2.2.1 Sprinklers

Any closed automatic fire sprinkler can be used as a thermal detector whenever hydraulic (wet pilot) or pneumatic (dry pilot) activation of the primary control valve is desired. Although a large variety of sprinkler temperature ratings exist, ratings between 135°F (57°C) and 212°F (100°C) are most common for use in wet or dry pilot lines. Reliable Automatic Sprinkler Company Bulletins 013, 110, 014 & 131 illustrate suitable standard spray sprinklers for use as pilot line detectors. The Model G sprinklers (Bulletin 110) may be coated with wax or lead for corrosion resistance.

Quick response sprinklers installed in wet or dry pilot lines may be desirable as a means for hastening operation of a thermal detection system. Sprinkler models GFR and F1FR sprinklers are described in Reliable Automatic Sprinkler Company Bulletins 131 and 014, respectively. Quick Response sprinklers, however, cannot be wax or lead coated for corrosion-resistance.

Figure 23

Sprinklers used as thermal detectors must be spaced according to NFPA 13 sprinkler spacing requirements. Generally speaking, sprinklers on the pilot lines must be spaced the same as the sprinkler spacing required for the hazard to be protected. For additional pilot line information, refer to Reliable Automatic Sprinkler Company bulletins for deluge systems (516 through 519) and single interlock preaction systems (749), paying special attention to maximum elevation and length limitations for wet pilot lines. NFPA 13 Standard for the Installation of Sprinkler Systems and NFPA 15 Water Spray Fixed Systems for Fire Protection provide additional information on the use of automatic fire sprinklers on pilot lines for system actuation.

2.2.2 Pilot Line Detectors

Similar to automatic fire sprinklers, pilot line detectors such as the Reliable F1-FTR Pilot Line Detector can be used for systems utilizing hydraulic (wet pilot) or pneumatic (dry pilot) actuation. The FTR incorporates a 2.5 mm glass bulb with a Model F1 sprinkler frame, and is identified as a Fixed Temperature Release (FTR) to differentiate it from standard sprinklers. The FTR is made of die cast brass and is available in various finishes. During fire conditions the heat sensitive liquid in the bulb expands, the bulb shatters and releases the cap and spring assembly. This vents the hydraulic or pneumatic pressure in the pilot line, and in turn the pushrod chamber. The water pressure from the pushrod chamber discharges to a drain, allowing the Model DDX Deluge Valve to open and fill the system piping.

The F1-FTR can be installed at greater spacing than regular sprinklers used on a pilot line. Refer to Reliable Automatic Sprinkler Company Bulletin 180 for specific listing and installation limits. Similar to a glass bulb sprinkler, the F1-FTR must be installed in accordance with NFPA-13 installation specifications to prevent possible damage to FTR. Before installing the F1-FTR the appropriate temperature rating must be determined. The temperature rating should be lower than the temperature rating of system sprinklers or nozzles.

Figure 24

The F1-FTR can be installed in any position; however, in locations where the pilot line system is exposed to freezing conditions install them in the upright position only. Wet pilot lines must be installed where there is adequate heat to avoid possible freezing. An F1-FTR that may be subject to mechanical damage must be protected by the appropriate sprinkler guard (see Reliable Automatic Sprinkler Company Bulletin 208) for the F1 Model.

Approvals and technical data for the Reliable Automatic Sprinkler Company Model F1-FTR Pilot Line Detector can be found on Bulletin 180.

2.2.3 Solenoid Valve

A normally closed electric solenoid valve is a primary control valve releasing device when located on the discharge outlet of the hydraulically pressurized push rod chamber of the Model DDX Deluge Valve. The solenoid valve separates water pressure in the pushrod chamber from atmospheric air pressure in a drain line. When sufficient electrical current is provided to energize the solenoid valve coil (from a listed releasing panel), the solenoid valve opens and discharges water pressure from the pushrod chamber to a drain. Since the pressure cannot be replenished through the inlet restricted orifice as rapidly as it is discharging, the push rod chamber pressure falls instantaneously and the Model DDX Deluge Valve opens. Refer to Reliable Automatic Sprinkler Company Bulletin 718 for more detailed information on the solenoid valve specifications.

Figure 25

2.2.4 Dry Pilot Actuator

A dry pilot actuator uses the same differential principle as a conventional dry pipe valve wherein low pneumatic pressure holds the device closed against considerably higher water pressure. The actuator is connected to the Model DDX Deluge Valve pushrod chamber outlet port. When a dry pilot line detector activates, a manual station is opened, or (in the case of the low pressure dry system), system pressure is lost, water pressure on the underside of the dry pilot actuator overcomes the reduced air or nitrogen pressure on the top side of the actuator. The actuator opens allowing the push rod chamber pressure to discharge through the actuator to a drain outlet. Since the pushrod chamber pressure cannot be replenished through the inlet restricted orifice as rapidly as it is discharging, the push rod chamber pressure falls instantaneously and the Model DDX Deluge Valve opens.

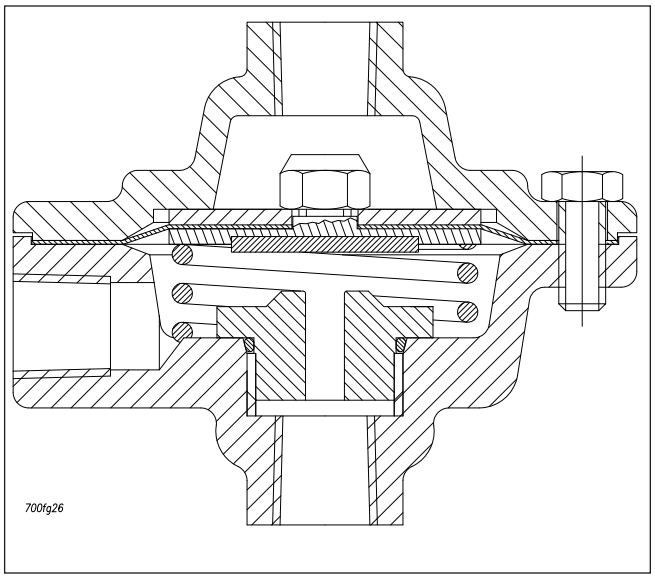

Figure 26

Technical information for the LP actuator is found on the Reliable Automatic Sprinkler Company bulletin for each system where it is utilized.

2.2.5 Manual Release

A manual release or pull station is a normally closed, quick opening valve which acts as a system releasing device when located in the piping of a wet or dry pilot line of sprinklers. It discharges hydraulic or pneumatic pressure from the pilot line, just as an automatic pilot line detector or sprinkler would do. The Model A pull station valve is enclosed in a labeled steel box that has a cover held closed by a breakable strut. Once opened, the cover will not stay closed unless the strut is replaced.

Refer to Reliable Automatic Sprinkler Company Bulletin 506 for detailed information on the Model A Manual Hydraulic Emergency Pull Box.

Figure 27

2.3 Pneumatic Pressure Supervision

With the exception of electric and wet pilot operated deluge systems and non-supervised single interlock preaction systems, all special systems use pneumatic pressure for either (or both) supervising the integrity of the system or as a trigger for system operation. Compressed air or nitrogen are the two most common gases used to supply pneumatic pressure.

2.3.1 Air Compressor Panel

Reliable Model B-SI and C-SI Air Compressor Panels provide self-contained supervisory air supply and pressure maintenance for single interlock preaction systems* with capacity up to 200 gallons. The air source of the Model B-SI is a 120 VAC, 1/16 HP Gast air compressor; the Model C-SI is equipped with a 220 VAC, 1/16 HP Gast air compressor. A System Sensor Model EPS10-2 pressure switch monitors the system air pressure. Approximately 7 psi (0.48 bar) of air pressure will keep the pressure switch contacts open and therefore the air compressor motor off. A drop of approximately 2 psi (0.14 bar) will switch the contact to closed position; the compressor will turn on to replace the air in the system (in case of a small leakage). If the pressure continues to drop, at a pressure of approximately 4 psi (0.28 bar) the low air signal will activate. An auxiliary relay provides dry contacts for remote signal of low air pressure and/or loss of power to the building fire alarm panel or other monitored location. The Model B-SI and Model C-SI Air Compressor Panels are designed with keyhole slots for ease of wall mounting. A quick-fill bypass connection outside the enclosure reduces setup time after installation, testing, or maintenance.

Refer to Reliable Automatic Sprinkler Company Bulletin 254 for more detailed information on the Model B-SI and C-SI Air Compressor Panels.

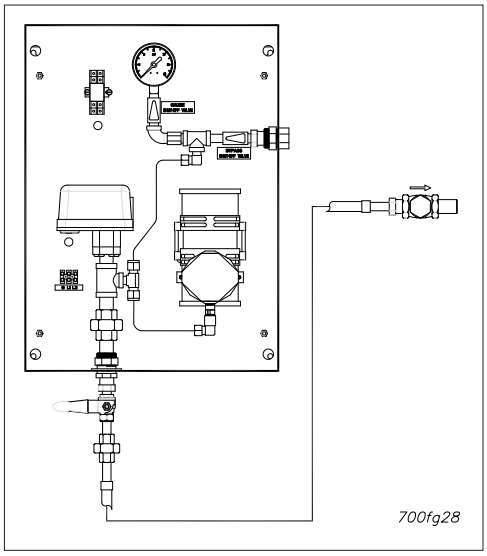

Figure 28
MODEL B-SI/C-SI AIR COMPRESSOR PANEL

**Note: The Reliable Dry Pilot Line Single Interlock Preaction System may require up to 26 PSI pneumatic pressure, therefore, the Model B-SI and C-SI are not to be used with this system. Air compressors or compressed nitrogen (see below) with appropriate pressure maintenance devices (section 2.4) must be used.*

2.3.2 Air Compressor

NFPA 13 requires that dry systems and double interlock preaction systems be pressurized to normal operating pressure within 30 minutes (60 minutes for freezers below 5°F). Properly sized dedicated air compressors or dependable plant air compressors are commonly used for this purpose. Although not required by NPFA 13 to be listed, consideration should be given to selecting a quality compressor to avoid maintenance issues and/or false activation of the system. Local electrical codes should also be consulted to determine if any additional requirements exist (e.g., UL listing). Compressors having capacities of less than 5.5 CFM at 10 PSI are not required to have an air receiver or air maintenance device; however, individual maintenance of pressure for each system is required when an automatic air supply is used to feed multiple systems. This necessitates the use of an air receiver (tank) with a listed pressure maintenance device on each system.

A tankless compressor without pressure switch or “bare” compressor can be used to supply a single dry system or single interlock preaction system. Bare compressors require an auxiliary means of motor control such as the Reliable Model B-1 Pressure Maintenance Device (see 2.4.2.). The factory supplied pressure switch on the Model B-1 directly monitors system pressure and starts/stops the compressor motor. System air pressure will fluctuate from high to low via the compressor start/stop controller. An A-2 Air Maintenance Device will cause compressor to short cycle. ***Note: The pressure switch on the Model B-1 Pressure Maintenance Device is not a low pressure supervisory switch.*** An air receiver (tank) is not required by NFPA 13 when the compressor has a capacity less than 5.5 CFM at 10 PSI.

Tank-mounted air compressors provide a convenient means of meeting the requirement for an air receiver when compressor capacity is 5.5 CFM at 10 PSI or greater, or when a tank is otherwise mandated. Tank mounted compressors are provided with a pressure switch that monitors the tank pressure and starts/stops the compressor motor at the desired settings. Air pressure from the tank is regulated (“bled”) into the system or systems through a listed pressure maintenance device such as the Reliable Model A-2 (see 2.4.1.). Tank-mounted systems, even when not required, can help prevent short-cycling and thereby extend the life of air compressors, and can also be helpful in preventing ice build-up in freezer systems. When supplying multiple systems, the compressor must be selected to pressurize the largest system within the time frame required by NFPA 13.

Reliable recommends that a tank mounted compressor along with a listed air maintenance device be used on all systems. This is particularly important with double interlock preaction systems where loss of pneumatic pressure is used as one of the releasing conditions. Tank mounted compressors also provide a reserve supply of pressurized air in the event of power outages.

Figure 29

Figure 30

Figure 31

2.3.3 Compressed Nitrogen

Cylinders of compressed nitrogen can provide a clean, dependable, and most importantly, dry source of pneumatic pressure in special systems. High pressure nitrogen cylinders can typically be rented from a local source, with rental fees varying by supplier and bottle size. By replacing oxygen in the system piping with nitrogen, the chemical process that results in corrosion is severely mitigated, thereby extending the life-span of steel piping. Nitrogen is also effective in preventing the formation of ice on the inside of piping for freezer systems. The Reliable Model A-2 Pressure Maintenance Device (2.4.1.), the NS-Pak (2.4.3.), and the Nitrogen Regulating Device (2.4.4.) serve to regulate and supervise compressed nitrogen pneumatic supplies.

2.3.4 Nitrogen Generator

Pipe corrosion is a common problem within dry and preaction fire protection systems when supervised by traditional compressed air. Nitrogen Generation Systems can be used to provide corrosion inhibiting supervisory pressure to the system to mitigate problematic sprinkler pipe corrosion. Reliable offers these systems in partnership with South-Tek Systems, Wilmington NC.

South-Tek Systems designs and manufactures the N2-Blast® - Corrosion Inhibiting System specifically for dry and preaction fire protection systems. The N2-Blast produces 98%+ pure Nitrogen and introduces it to the dry or preaction system. In doing so, oxygen and moisture are displaced from the piping. The N2-Blast effectively inhibits electrochemical, galvanic and Microbiologically Influenced Corrosion (MIC), as well as freeze-ups and ice plugs.

The N-2 Blast generator incorporates a nitrogen storage tank, and the Reliable Model A-2 Pressure Maintenance Device (2.4.1) serves to regulate and supervise the compressed nitrogen pneumatic supply.

Figure 32

2.4 Pressure Maintenance Equipment

Automatic pressure maintenance devices are used to maintain the correct operating pressure in dry and preaction* systems, and in dry pilot lines used for releasing special systems. The devices described below eliminate the need for manual refilling of a system to overcome small leaks or variable pressures due to temperature changes.

**Single interlock preaction systems with 20 or less sprinklers are not required to be supervised with pneumatic pressure.*

2.4.1 Model A-2 Pressure Maintenance Device

The Reliable Model A-2 Device is designed for use where a clean and dependable source of compressed gas is available, such as an owners plant air supply, a tank mounted air compressor with a pressure control switch, or cylinders of compressed nitrogen gas. The regulator in the Model A-2 Device will reduce the pressure from an acceptable gas source (175 psi/12 bar maximum) to the pressure required for the system. The Model A-2 Device will maintain a constant pressure in the system, regardless of fluctuations in the supply source being used. The A-2 has a built in strainer that prevents foreign matter from entering the regulator and check valve which may interfere with their normal operation. Shut-off valves permit servicing of the strainer and regulator without impairing the sprinkler system, and a bypass valve permits rapid restoration of the required system pressure after service or operation. The bypass valve must be closed and shut-off valves open for proper automatic operation. Approvals and technical data for the Model A-2 Pressure Maintenance Devices can be found on Reliable Automatic Sprinkler Company Bulletin 254.

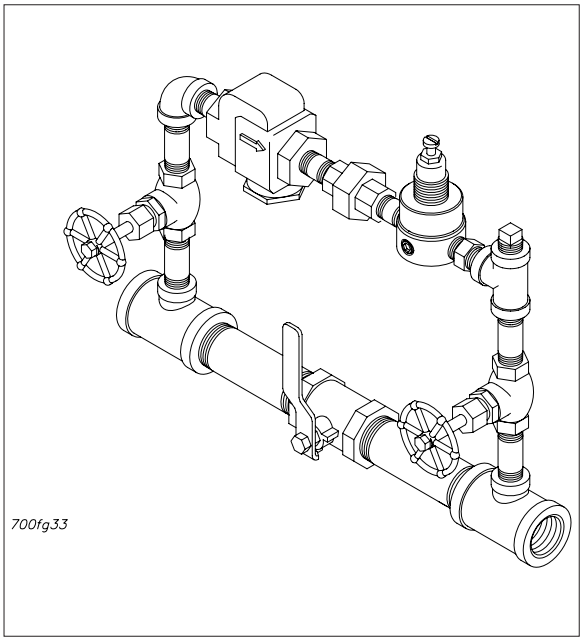

Figure 33
MODEL A-2

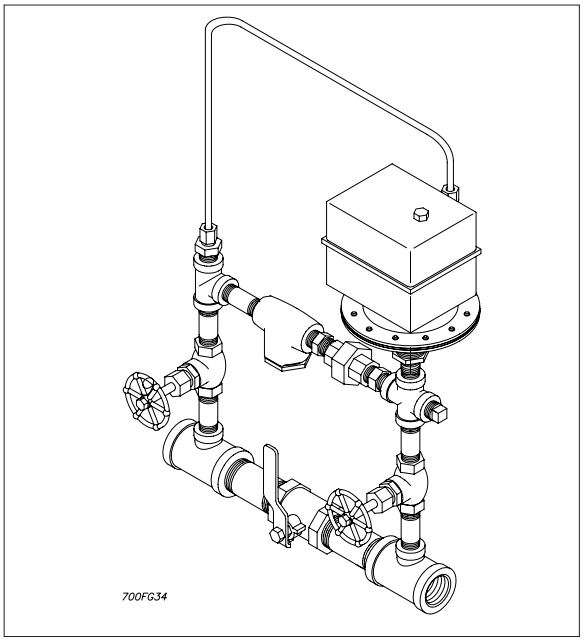

Figure 34
MODEL B-1

2.4.2 Model B-1 Air Maintenance Device

The Reliable Model B-1 Pressure Maintenance Device is designed for use in conjunction with a tankless air compressor that does not have a pressure control switch to maintain the correct pressure in the system. By wiring the compressor motor to the electrical pressure switch of the Model B-1 Device*, the on/off operation of the compressor is controlled directly by the pressure in the system. A significant decrease in air pressure closes the pressure switch contacts activating the compressor. The compressor runs until the air pressure is restored to the pre-adjusted setting of the pressure switch. When the pressure is satisfied, the switch contacts open and stop the compressor. The pressure switch on the B-1 is equipped with an unloader valve that automatically bleeds off the air pressure between the compressor outlet and the air maintenance device each time the pressure switch opens. This protects the compressor motor from starting under a load the next time it starts. Like the Model A-2 Device, the Model B-1 has a strainer for contamination control, a bypass valve for rapid fill, and shut off valves open for ease of repairs to the device.

**Note: The switch on the B-1 Air Maintenance Device is NOT a low pressure alarm switch. When using this device, a separate low air alarm switch is required.*

Approvals and technical data for the Model B-1 Pressure Maintenance Devices can be found on Reliable Automatic Sprinkler Company Bulletin 254.

2.4.3 Model NS-Pak

The Reliable Model NS-PaK is designed to supervise nitrogen pressure for individual preaction and dry pipe systems. The nitrogen supply is obtained from a high pressure nitrogen cylinder (or cylinders) which are sold or rented separately. The NS-PaK includes a single stage pressure regulator equipped with high pressure inlet and low pressure outlet gauges. As the nitrogen is gradually depleted and the pressure inside the cylinder drops, the low pressure regulated output remains stable. The cylinder pressure supervisory switch (System Sensor Model EPS40-2) is factory set to 90 PSI and monitors the regulated pressure coming out of the nitrogen cylinders. The pressure switch provides notification to the owner that the nitrogen cylinders are in need of replacement or refilling. The adjustable system pressure supervisory switch (System Sensor Model EPS10-2) is factory set to 13 PSI and monitors the system supply pressure.

Braided flexible hoses and adapters are provided for connection of the NS-Pak to the nitrogen regulator and the system. All components are conveniently cabinet mounted, and a quick by-pass segment is incorporated on the NS-PaK to reduce set up time. The Model NS-PaK Panel is designed with keyhole slots for ease of wall mounting.

Approvals and technical data for the Model NS-Pak Panel can be found on Reliable Automatic Sprinkler Company Bulletin 254.

2.4.4 Nitrogen Regulating Device

The Reliable Nitrogen Regulating Device is used to regulate pressure to individual or multiple preaction and dry systems using Reliable Model A-2 Pressure Maintenance Devices. The nitrogen supply is obtained from a high pressure nitrogen cylinder (or cylinders) which are sold or rented separately. The Nitrogen Regulating Device includes a single stage pressure regulator equipped with high pressure inlet and low pressure outlet gauges. As the nitrogen is gradually depleted and the pressure inside the cylinder drops, the low pressure regulated output remains stable. If desired, an optional adjustable pressure switch is available for monitoring the nitrogen pressure between the tank regulator and connection to the pressure maintenance device(s). The switch is installed between the Nitrogen Regulating Device outlet and the Model A-2 Pressure Maintenance Device, and signals the approaching depletion of the nitrogen supply. The Nitrogen Regulating Device is provided with a coiled ¼" copper tube and fittings for connection to the fire protection system pneumatic supply line.

Approvals and technical data for the Nitrogen Regulating Device can be found on Reliable Automatic Sprinkler Company Bulletin 254.

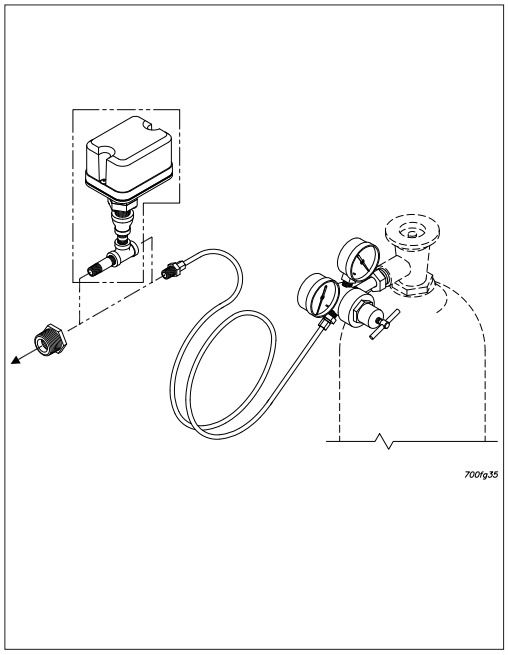

Figure 35
NS PAK

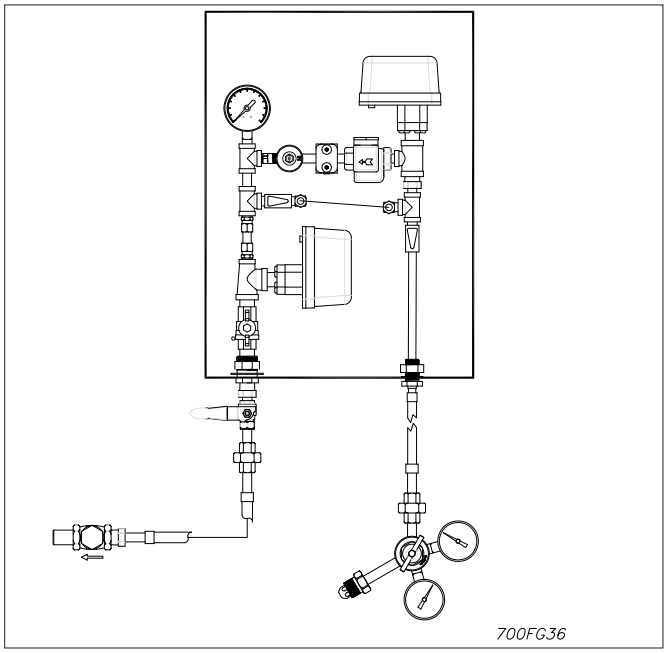

Figure 36
NITROGEN REGULATING DEVICE

2.5 Pneumatic Pressure Supervision

Pressure switches are used to monitor pneumatic pressure in dry pipe and special systems, and are necessary to provide low pressure notification in the event of sprinkler damage, leaks, or failure of the compressed gas system. In some systems, activation of the pressure switch may also serve as a condition required for opening the main system control valve.

2.5.1 Model EPS40 Pressure Switch

The System Sensor Model EPS40 switch is designed to detect a 10 psi (0.7bar) decrease (and in some cases, increase) from normal system pressure in automatic fire protection systems. They are typically used to supervise system pneumatic pressure in preaction and dry systems using 10 psi or higher pressure. These switches can be used to initiate electronic signals and/or control auxiliary fire equipment when a low pressure condition occurs. Although factory set, the adjustment wheel requires no special tools and can be used to adjust the nominal value of the "window" at which the switches activate.

Figure 37

The EPS40-1 Series features field adjustable pressure sensitivity between 10 and 100 psi (0.7 and 6.9 bar) and is used for low pressure supervision only. It is factory set to be used in a nominal 40 psi (2.8 bar) system with a switch transfer occurring at 30 psi (2 bar) on decreasing pressure. The EPS40-2 Series features field adjustable pressure sensitivity between 10 and 100 psi (0.7 and 6.9 bar) and is used for low and high pressure supervision. It is factory set to be used in a nominal 40 psi (2.8 bar) system with a switch transfer occurring at 30 psi (2 bar) on decreasing pressure and a second switch transfer occurring at 50 psi (3.5 bar) on rising pressure.

2.5.2 Model EPS10 Pressure Switch

The System Sensor Model EPS10 pressure switch is used for single interlock preaction systems and Reliable Type D Double Interlock Preaction Systems using pneumatic pressures between 7 psi (0.48) and 10 PSI (0.7 bar). The EPS10-1 Series (one SPDT switch) and EPS10-2 (two SPDT switches) feature field adjustable pressure sensitivity between 4 and 20 psi (0.3 and 1.4 bar) and are used for low pressure supervision. For Type D Double Interlock Preaction Systems, the EPS10 is also used for system activation when cross-zoned with the supplemental detection system. Switch transfer occurs upon the loss of approximately 3 psi (0.21 bar). Although factory set, the adjustment wheel requires no special tools and can be used to adjust the nominal value of the "window" at which the switches activate.

2.6 Quick-Opening Device

NFPA 13 requires that water be delivered to the inspector's test within 60 seconds of valve operation on double interlock preaction systems over 500 gallons and on dry pipe systems over 750 gallons. A quick-opening device or accelerator can be installed on the system to help achieve the water delivery time. Dry pipe systems that do not exceed 500 gallons capacity are not required to meet a specific water delivery time when provided with a quick-opening device.

2.6.1 Model B-1 Accelerator with Trim for Model DDX Deluge Valve

The Reliable Model B-1 Accelerator is a normally-closed valve that is highly sensitive to the rate of pneumatic pressure change in the system. The top chamber is filled to normal pressure with system air or nitrogen, and is designed to accommodate minor fluctuations in pressure. The device retains normal pressure in the top chamber when pressure drops as a direct result of one or more sprinklers opening. Upon this significant pressure decay, the top chamber exerts a downward force across the diaphragm assembly, forcing the valve to open and allowing system pressure to discharge to atmosphere. Operation of the accelerator speeds up the purging of pressure from the pneumatic side of the LP Actuator and opening of the Model DDX Deluge Valve. Simultaneously, pressure passes through the accelerator and closes the integral Accelo-Check preventing water and water-borne debris from entering the device. This increases reliability of the accelerator and reduces maintenance that otherwise would be required after each operation.

Approvals and technical data for the Reliable Model B-1 Accelerator can be found on Reliable Automatic Sprinkler Company Bulletin 323. Additional information can be also found on bulletins for those systems that can benefit from the addition of a quick-opening device.

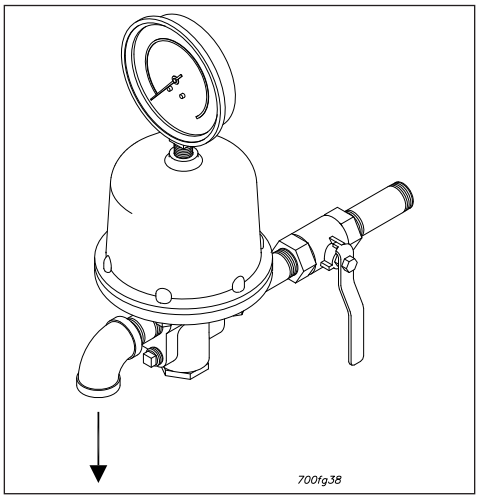

Figure 38
B-1 ACCELERATOR
WITH DDX TRIM

2.7 Alarm Devices

An essential element of any automatic fire protection system is the ability to provide audible and visual notification upon detection of a fire and/or release of the system. This section is intended to provide the user with the most common types of alarm devices; it is not intended to convey all the requirements of NFPA 72 or other applicable codes. Responsibility for the actual design of any fire alarm system rests with the engineer of record, certified layout technician, and/or the Authority Having Jurisdiction.

2.7.1 Model C Mechanical Alarm

The Model C Mechanical Alarm, also called a water motor gong, is a hydro-mechanical alarm usually mounted on an outside building wall and energized by water flowing through a primary system control valve. When the system control valve is operated, water flows from special porting through the ¾" strainer and ¾" piping that connects to the water motor alarm. In the motor, water passes through a nozzle directed against the Pelton wheel blades causing the Pelton wheel to rotate. The striker assembly is connected to the Pelton wheel by a drive shaft that also rotates causing the striker to impact against the gong, producing a continuous piercing alarm. After impinging against the Pelton wheel the water drains through an outlet in the motor body.

Figure 39

The alarm continues to sound as long as pressurized water is in the sprinkler system and will stop when the main water supply control valve is closed. The water motor alarm may be temporarily silenced by closing the alarm control valve located in the trim of the Model DDX Deluge Valve. Model C Mechanical Alarms are self resetting after each operation, eliminating the need of removing cover plates, etc. to reset internal mechanisms.

Approvals and technical data for the Reliable Model C Mechanical Alarm can be found on Reliable Automatic Sprinkler Company Bulletins 612 and 613.

2.7.2 EPS10 Pressure Switch

Pressure activated switches are used to control the operation of fire alarm devices, trouble annunciating devices, and electrical equipment (such as, computer systems and HVAC systems) when water flows from a primary control valve into a sprinkler system. The System Sensor Model EPS10 switch is designed for use in automatic sprinkler systems to indicate a discharge from a sprinkler (water flow alarm). The Model EPS10-1 has a single SPDT switch and the Model EPS10-2 has two SPDT switches. The pressure switch can be connected directly (or indirectly via an alarm panel) to an electric bell, horn, horn/strobe or other alarm. The EPS-10 Series features field adjustable pressure sensitivity to provide alarm response between 4 and 20 psi (0.3 and 1.4 bar) on rising pressure. It is factory set to respond at 4 (0.3) to 8 psi (0.3 – 0.55 bar) on rising pressure. The pressure adjustment wheel requires no special tools. Please reference System Sensor Data Sheet A05-0176 for further information on the EPS10 Series

2.7.3 Electric Bell

The high reliability and low power requirement of electric bells such as the System Sensor Model SSM (24 VDC) and SSV (120 VAC) Series makes them suitable for most fire alarm applications. These devices are typically rated for continuous operation and may be used in many different applications. Electric bells are available in various sizes and finishes, and can be used for indoor or outdoor applications. Electric bells can be operated directly from an alarm pressure switch such as the System Sensor Model EPS10 pressure switch, or indirectly via a listed alarm panel. Please reference System Sensor Data Sheet A05-260 for further information on electric bells.

Figure 40

3. ORDERING GUIDE

The following form is provided for your use in ordering Special Systems built around the Reliable Automatic Sprinkler Company DDX valve. (Please note that this form is not applicable for 1½" Model H systems and/or PrePak systems.) If additional information is needed, or should you need assistance in filling out the form prior to contacting your regional sales office, please contact the Technical Services Department at 1-800-557-2726, or by email at technicalservices@reliablesprinkler.com.

SPECIAL SYSTEM ORDERING GUIDE

This sheet is provided to assist in the ordering of DDX special systems as described in The Reliable Automatic Sprinkler Company Bulletin 700

GENERAL INFORMATION							
PERSON COMPLETING THIS FORM:							
REPRESENTING (COMPANY):							
PHONE NUMBER:							
EMAIL ADDRESS:							
PROJECT NAME (OPTIONAL):							
STEP ONE: VALVE SIZE	◯ 2"	◯ 2.5"	◯ 3"	◯ 4"	◯ 6"	◯ 8"	
STEP TWO: END CONFIGURATION	☐ Grooved x Grooved (All Sizes)						
	☐ Flanged x Grooved (4" & 6" Sizes Only)						
	☐ Flanged x Flanged (4", 6", & 8" Sizes)						
STEP THREE: BODY MATERIAL	☐ Ductile Iron (All Sizes)						**BULLETIN NO:**
	☐ Stainless Steel (4", 6", & 8" Sizes; Deluge Only)						
STEP FOUR: SYSTEM TYPE	☐ Deluge with Wet Pilot Line Trim						518 & 519 (Ductile) 516 & 517 (St. Steel)
	☐ Deluge with Dry Pilot Line Trim						
	☐ Deluge with Electrical Actuation Trim						
	☐ Single Interlock Preaction with Wet Pilot Line Trim						749
	☐ Single Interlock Preaction with Dry Pilot Line Trim						
	☐ Single Interlock Preaction with Electrical Actuation Trim						
	☐ Double Interlock Preaction Type D						750
	☐ Double Interlock Preaction Type F						751
	☐ Double Interlock Preaction Type PL						752
	☐ Low Pressure Dry System Type EX						358 & 359
STEP FIVE: ASSEMBLAGE	☐ Fully Assembled with Supervised Control Valve						
	☐ Fully Assembled without Control Valve						
	☐ Segmentally Assembled						
	☐ Individual Parts						
STEP SIX: ACCESSORIES	☐ EPS10-2 Pressure Switch (Provided with some systems)						System Sensor
	☐ EPS40-2 Pressure Switch (Provided with some systems)						System Sensor
	☐ Model C Mechanical Alarm						612 & 613
	☐ Tank-Mounted Air Compressor (Specify size & voltage)						Gast Mfg
	☐ Model A2 PMD (Provided with some systems)						254
	☐ B-SI 120 VAC Air Compressor Panel (Single Interlock)						254
	☐ C-SI 220 VAC Air Compressor Panel (Single Interlock)						254
	☐ Model B1 Accelerator						323
	☐ Model NS Pak						254
	☐ Nitrogen Regulating Device						254
	☐ Electric Bell (Specify Voltage)						System Sensor
	☐ PFC4410 Release Control Panel						Potter Electric
	☐ Batteries (Standard or FM 90 Hour)						Potter Electric

Reliable...For Complete Protection

Reliable offers a wide selection of sprinkler components. Following are some of the many precision-made Reliable products that guard life and property from fire around the clock.

- Automatic sprinklers
- Flush automatic sprinklers
- Recessed automatic sprinklers
- Concealed automatic sprinklers
- Adjustable automatic sprinklers
- Dry automatic sprinklers
- Intermediate level sprinklers
- Open sprinklers
- Spray nozzles
- Alarm valves
- Retarding chambers
- Dry pipe valves
- Accelerators for dry pipe valves
- Mechanical sprinkler alarms
- Electrical sprinkler alarm switches
- Water flow detectors
- Deluge valves
- Detector check valves
- Check valves
- Electrical system
- Sprinkler emergency cabinets
- Sprinkler wrenches
- Sprinkler escutcheons and guards
- Inspectors test connections
- Sight drains
- Ball drips and drum drips
- Control valve seals
- Air maintenance devices
- Air compressors
- Pressure gauges
- Identification signs
- Fire department connection

The equipment presented in this bulletin is to be installed in accordance with the latest published Standards of the National Fire Protection Association, Factory Mutual Research Corporation, or other similar organizations and also with the provisions of governmental codes or ordinances whenever applicable.

Products manufactured and distributed by Reliable have been protecting life and property for over 90 years, and are installed and serviced by the most highly qualified and reputable sprinkler contractors located throughout the United States, Canada and foreign countries.

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