

Furnish and install an engineered, nitrogen-based sprinkler corrosion inhibiting system for replacing the air in the preaction sprinkler system piping with 98% dry nitrogen at the required supervisory pressure. The system shall be supplied by UNITED Fire Systems, Kenilworth New Jersey, 908-688-0300 and referred to as NITROGEN-PAC M Series.

1. COMPONENTS. The system shall consist of the following components:

1.1 General. All components shall be sourced from one manufacturer and shall be designed to work together as a system. Components shall be properly sized for use together to deliver the proper volume of fast-fill air and 98% nitrogen to the preaction and / or dry-pipe sprinkler system(s) to be protected. A system sizing calculation from the manufacturer shall demonstrate that proper component choices have been made.

1.2 Compressor / Tank Assembly. The Compressor / Tank Assembly shall be a single unit equipped with a high-pressure cast-iron splash lubricated compressor, electric motor, magnetic starter, vertical or horizontal mount ASME code compliant pressure vessel, pressure switch, auto-drain, outlet ball valve, and adjustable filter / regulator. The filter / regulator shall be capable of being adjusted to and maintaining the required system pressure under normal demand conditions. The unit shall be floor-mounted. The motor shall use 3-phase AC power. Single-phase AC power shall not be acceptable. The voltage shall be 460 VAC if available; otherwise 230 VAC. The use of 208 VAC power shall be avoided. The compressor / tank assembly shall be UNITED Fire Systems M Series Model CTA or approved equal.

1.3 Refrigerated Dryer. A Refrigerated Dryer (RD) shall be supplied to remove condensation moisture from the air supplied by the Compressor / Tank Assembly. The unit shall produce air with a +40 degree Fahrenheit dew point at the maximum SCFM operating mode of the Compressor / Tank Assembly as determined by the system sizing calculation. The unit shall be based on motor-driven evaporative cooling, with moisture removed through a separator and automatic condensate drain. A heat exchanger shall re-warm the cooled, dry air. The refrigerant shall be R-134A or other zero-ozone-depletion refrigerant. The refrigerated dryer shall be a UNITED Fire Systems M Series Model RD or approved equal.

1.4 Nitrogen Generator Module. The system Nitrogen Generator Module shall produce minimum 98% nitrogen using membrane separator technology. The module shall be sized to produce sufficient 98% purity nitrogen generation rate in SCFM to maintain 98% nitrogen within the sprinkler system piping. The module shall be equipped with a two-stage (particulate and coalescing) filtration system that protects the nitrogen separator membrane to facilitate long service life. The module shall be equipped with bypass valves, metering valves, two (2) pressure gauges, drain valves and all required hardware and ports for testing and maintenance. All hardware shall be enclosed in a heavy-gauge sheet metal enclosure with hinged locking door. The nitrogen generator module shall be a UNITED Fire Systems Model NGM or approved equal.

1.5 Nitrogen Receiver. The system shall be equipped with a nitrogen receiver with a minimum capacity of 30 gallons. The actual size of the receiver shall be determined by a system sizing calculation. The nitrogen receiver shall be ASME code compliant, and shall be equipped with a pressure gage, bypass valve, and a manual drain valve. The nitrogen receiver shall be a UNITED Fire Systems Model NR or approved equal.

1.6 Purge Vent Assembly. The sprinkler system piping shall be equipped with at least one purge vent assembly. The purge vent assembly shall be equipped with a manually-operated isolation ball valve, strainer, float valve, restriction orifice, and nitrogen purity analyzer port. The purge vent assembly shall permit purging of the sprinkler system piping per manufacturer recommendations, and monitoring of the nitrogen purity within the piping. At least one (1) purge vent assembly shall be provided per sprinkler system riser. The purge vent assembly shall be a UNITED Fire Systems Model PVA-1 or approved equal.

1.7 N2 Purity Analyzer. The system shall be supplied with a hand-held battery-operated N2 purity analyzer. The analyzer shall have a digital display, showing the nitrogen purity in percent to one decimal place, or 1/10 of 1 percent. Flexible tubing shall connect the body of the analyzer to a female quick-connect fitting, compatible with the male quick-connect fittings located at the nitrogen generator module and each purge vent assembly. Proper performance of the nitrogen generation system shall be established with readings taken with the analyzer. The N2 Purity Analyzer shall be a UNITED Fire Systems Model NA-1, or approved equal.

1.8 Nitrogen / Air Maintenance Device. Each sprinkler riser shall be equipped with a nitrogen / air maintenance device, to properly regulate the nitrogen and air pressure to suit the valve installed in the riser. The device shall be equipped with an adjustable regulator, adjusted at system commissioning to the pressure required by the preaction sprinkler valve. The device shall also be equipped with bypass valving for fast-fill in 30 minutes or less as required by NFPA 13. The Nitrogen / Air Maintenance device shall be a UNITED Fire Systems Model AMD-1, or approved equal.

2. SYSTEM SIZING.

2.1 The project submittal shall include the sprinkler system size (in gallons) and calculations from the equipment manufacturer to substantiate component size selection. The system sizing calculations shall take into account the volume of all piping networks, the largest single piping network, the system piping allowable leakage rate permitted by NFPA 13, and the purging sequence that establishes and maintains 98% nitrogen throughout the piping network.

2.2 The compressor / tank assembly shall be sized to have sufficient capacity (in SCFM) to provide sufficient nitrogen generation rate to maintain minimum 98% nitrogen concentration throughout the sprinkler piping network. In addition, the device shall be sized to comply with the maximum 30 minute fast-fill with air requirement (from NFPA 13) into the largest sprinkler riser connected to the system.

2.3 The refrigerated dryer shall be sized to have sufficient capacity (in SCFM) to dry the required amount of air provided by the compressor / tank assembly.

2.4 The nitrogen generator module shall be sized to provide the volume and pressure of 98% purity nitrogen that fills and purges the sprinkler piping network connected to the system.

2.5 The nitrogen receiver shall be sized (in gallons) to store 98% pure nitrogen required to compensate for nitrogen demand spikes, such as system testing, as well as to reduce excessive cycling of the system compressor.

3. SUBMITTALS. The following items shall be submitted for approval by the Engineer for acceptance before installation.

3.1 Manufacturer data sheets of each component, showing dimensions, mounting details, weights, voltage and current requirements, and manufacturer part number.

3.2 The system sizing calculations required in Section 2 of this specification.

3.3 Normal pressure values (in PSIG) to be expected on all system pressure gages.

3.4 Shop drawings of the intended installation, showing component location, installation details, component interconnections, and system normal adjustment values.

4. COMMISSIONING. The system shall be commissioned by a representative from the manufacturer, or a representative from the installing contractor trained by the representative. The Engineer, at his / her option, may observe the commissioning process. The process shall include at least the following steps.

4.1 Verify that all aspects of the installation have been completed, including mechanical interconnection and electrical power installation.

4.2 The regulator on the compressor / tank assembly shall be adjusted to indicate the normal value from the shop drawing on the pressure gage.

4.3 The entire nitrogen system shall be checked with air from the compressor / tank assembly for leaks. All leaks shall be corrected by the contractor before proceeding.

4.4 The regulators on each nitrogen / air maintenance device shall be adjusted to indicate the normal value from the shop drawing on the pressure gages.

4.5 Fast-fill of each sprinkler piping network shall be performed with air from the compressor / tank assembly, with the refrigerated dryer running, and the nitrogen generator and nitrogen receiver bypassed. Each network shall fill in 30 minutes or less. Each piping network shall be examined for excessive leakage. If any network fails to fill in 30 minutes, or excessive leakage is found, the leaks shall be corrected by the contractor before proceeding.

4.6 Air pressure shall be applied to the nitrogen generator module. After the manufacturer's recommended run-in period, the N2 purity analyzer shall be used to check the nitrogen purity being produced at the module. If needed, the nitrogen generator module shall be adjusted, under the supervision of the manufacturer, to produce 98% nitrogen at the generator.

4.7 All valves shall be restored to normal (not fast-fill or bypass) status.

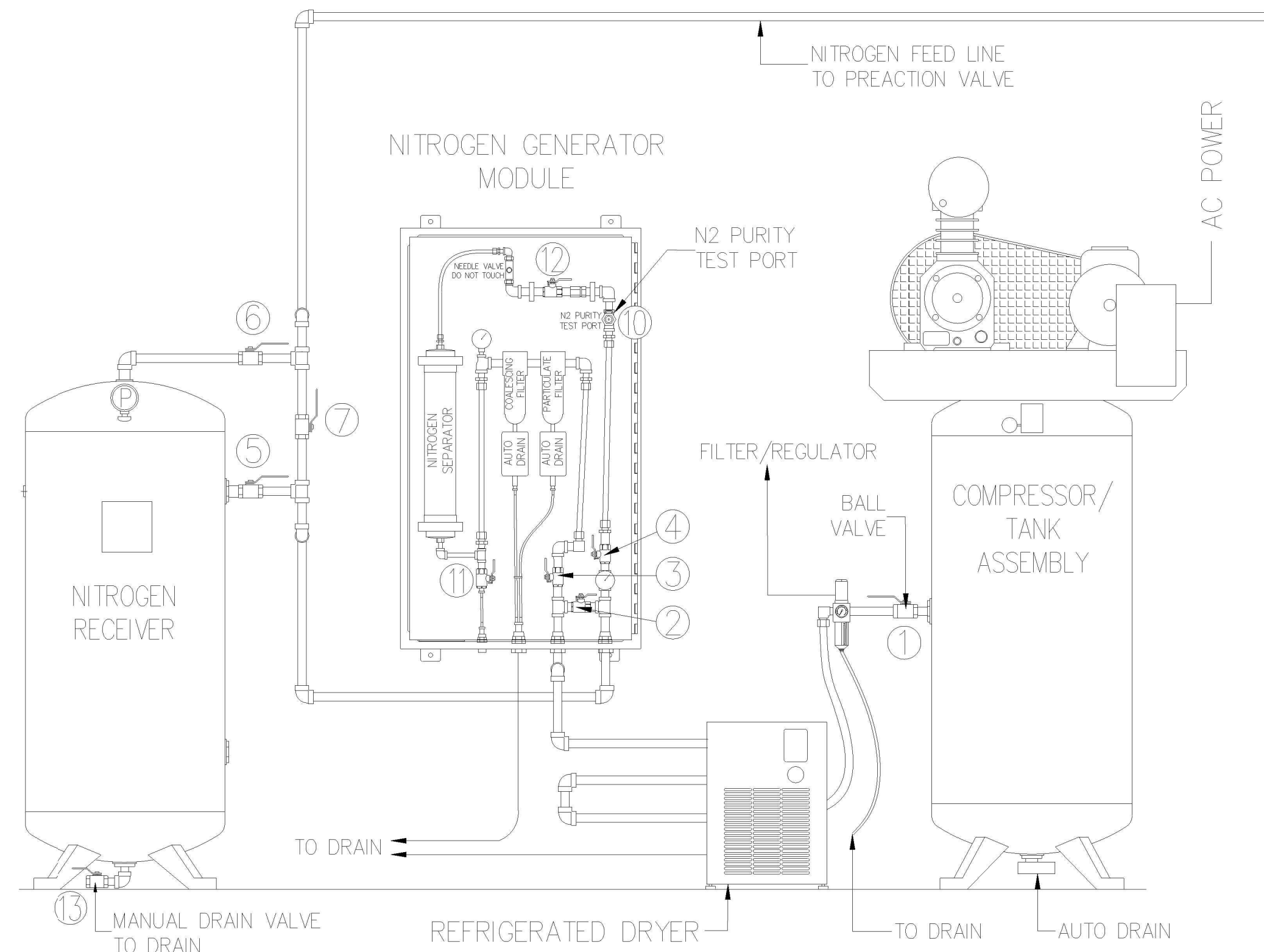
4.8 The valves on each purge vent assembly shall be opened to purge each sprinkler piping network in a pre-determined sequence.

4.9 The values shown on each pressure gage shall be recorded, including:
 • Gage indicating pressure in compressor tank,
 • Gage indicating regulated pressure on filter / regulator on compressor / tank assembly outlet,
 • Two (2) gages in nitrogen generator module (upstream and downstream of separator membrane),
 • Gage indicating pressure in nitrogen receiver,
 • Gage(s) indicating pressure at each nitrogen / air maintenance device.

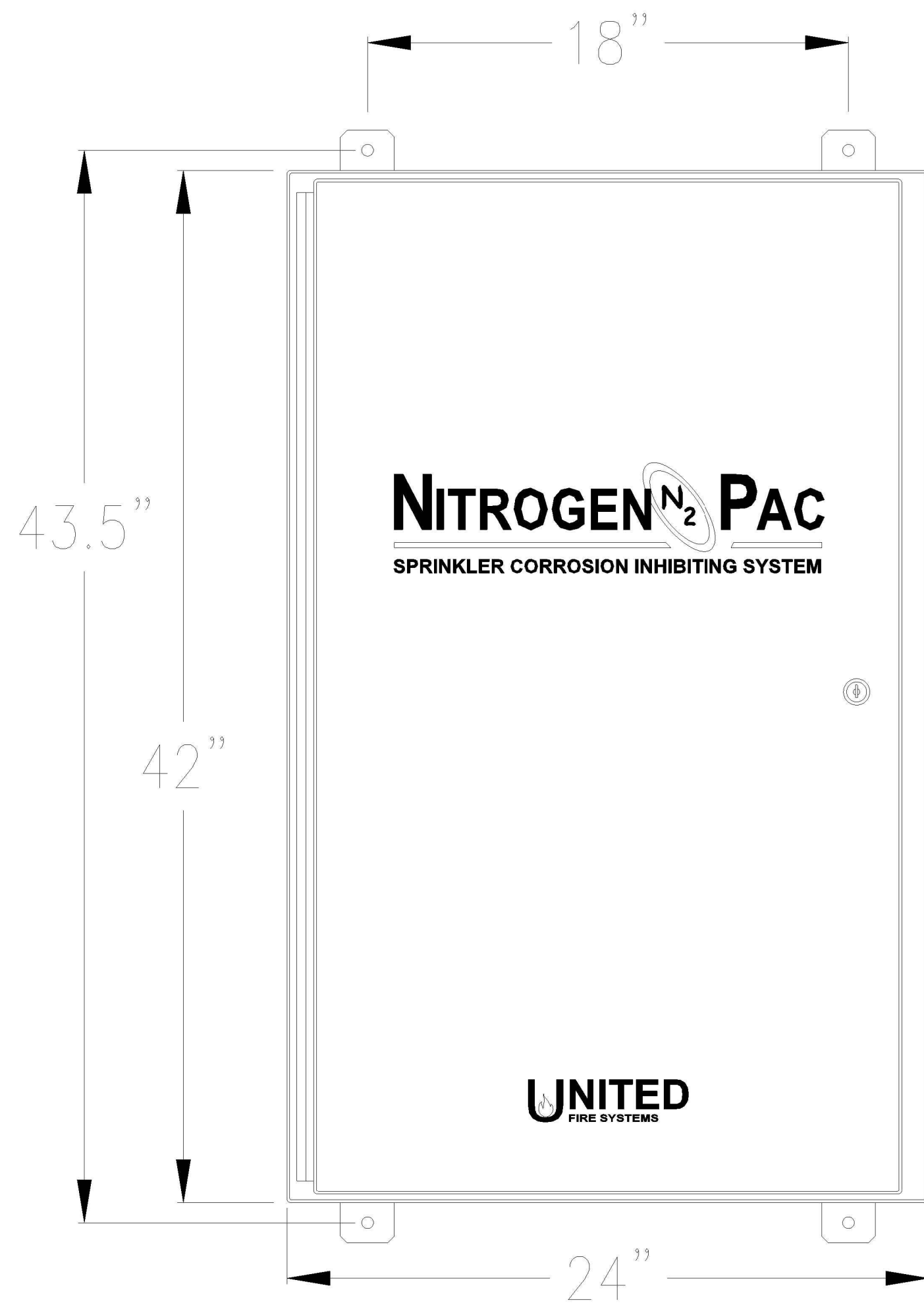
4.10 The N2 purity analyzer shall be used to verify that sprinkler piping network(s) with open purge valve assemblies are beginning to register a rise in nitrogen purity.

4.11 The contractor shall return at regular, agreed-to intervals to continue the purging process until all sprinkler piping networks register at least 98% nitrogen purity at all purge vent assemblies.

4.12 A final commissioning report shall be submitted, including as-built shop drawings, gage readings as indicated in this specification, and written verification of 98% or more nitrogen purity at each purge valve assembly.



NITROGEN-PAC M SERIES
GENERAL INSTALLATION ARRANGEMENT



NITROGEN GENERATOR MODULE INSTALLATION
NOTE: DEPTH OF MODULE IS APPROX. 8-1/2" WITH DOOR CLOSED.

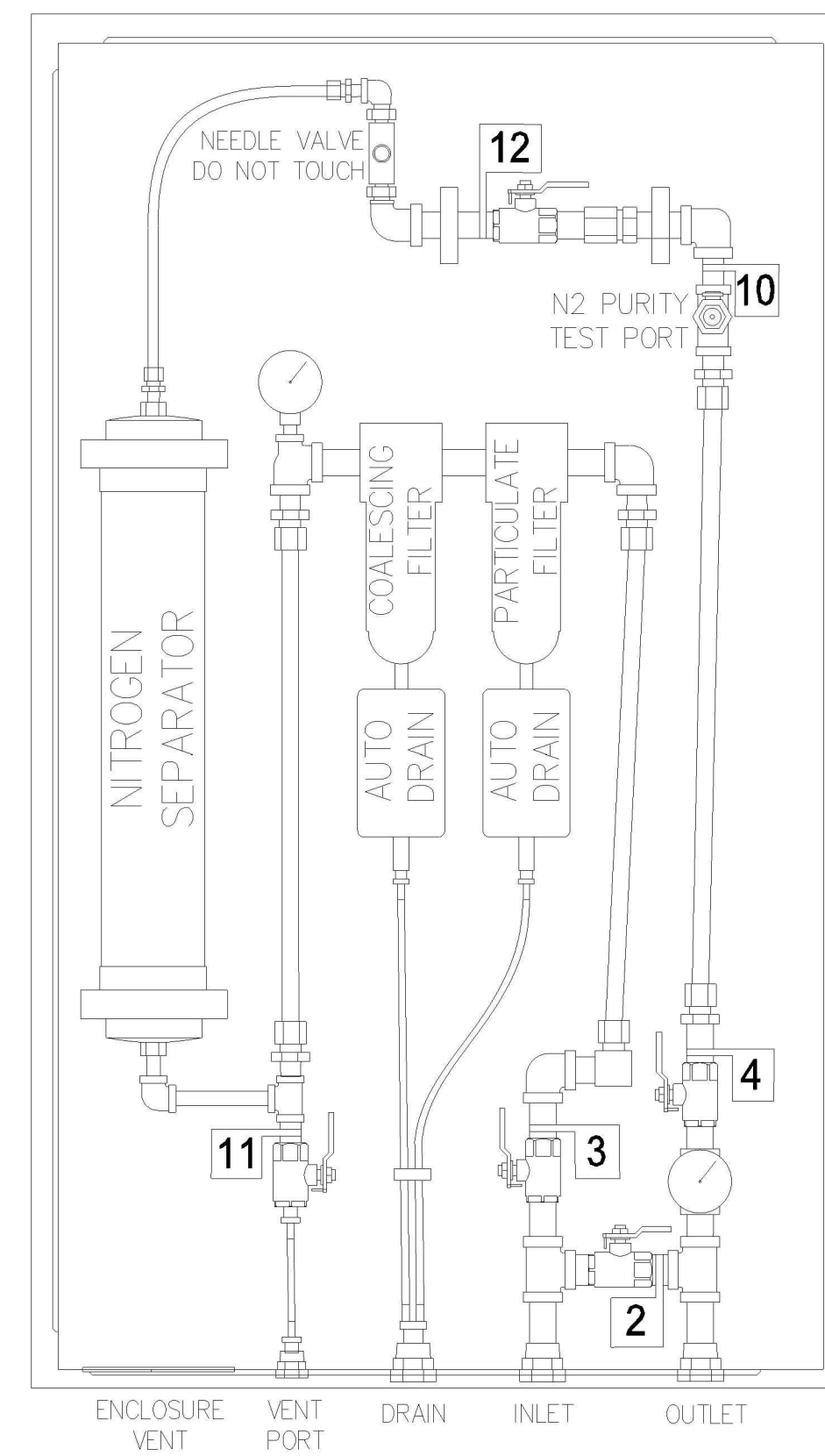
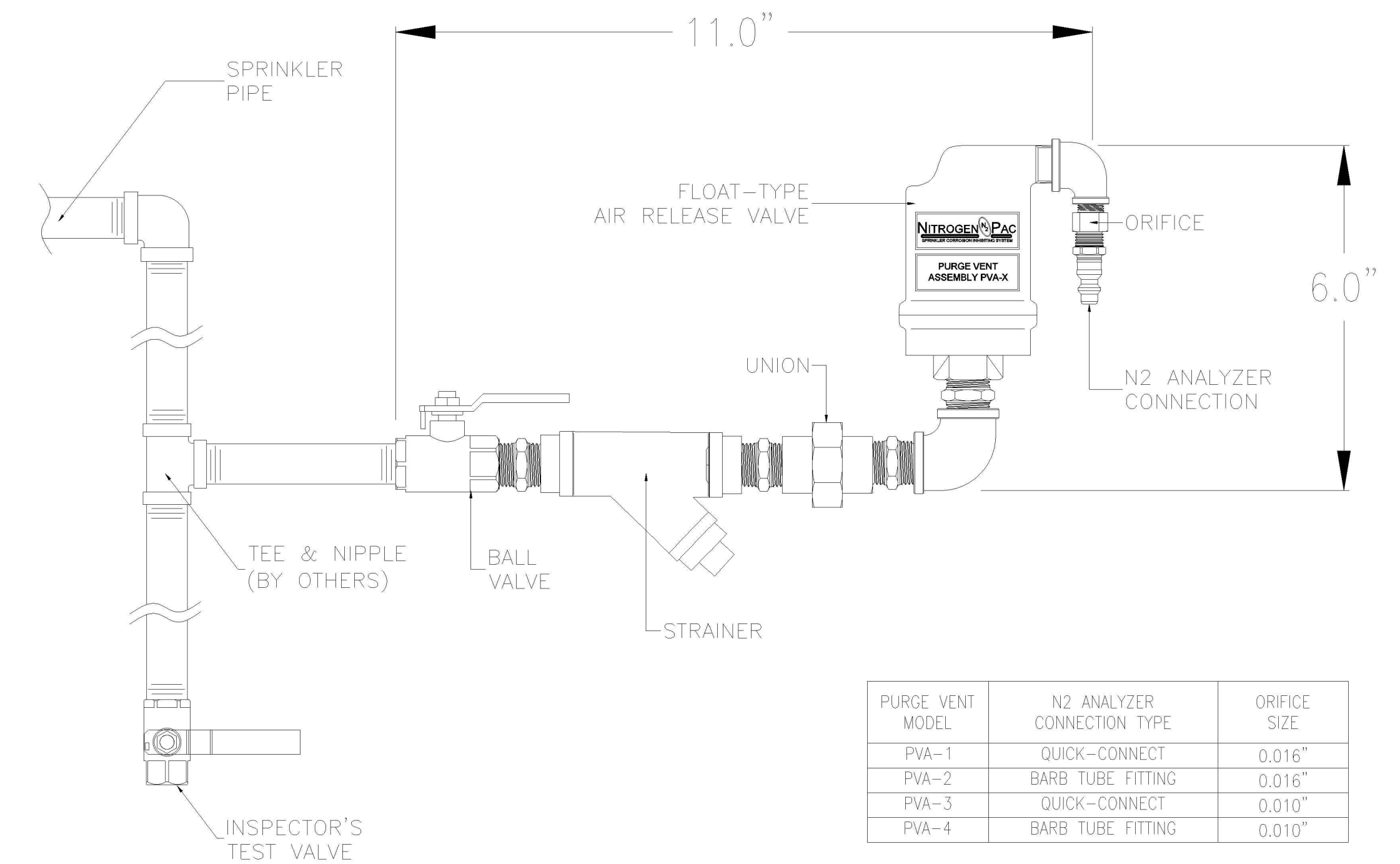


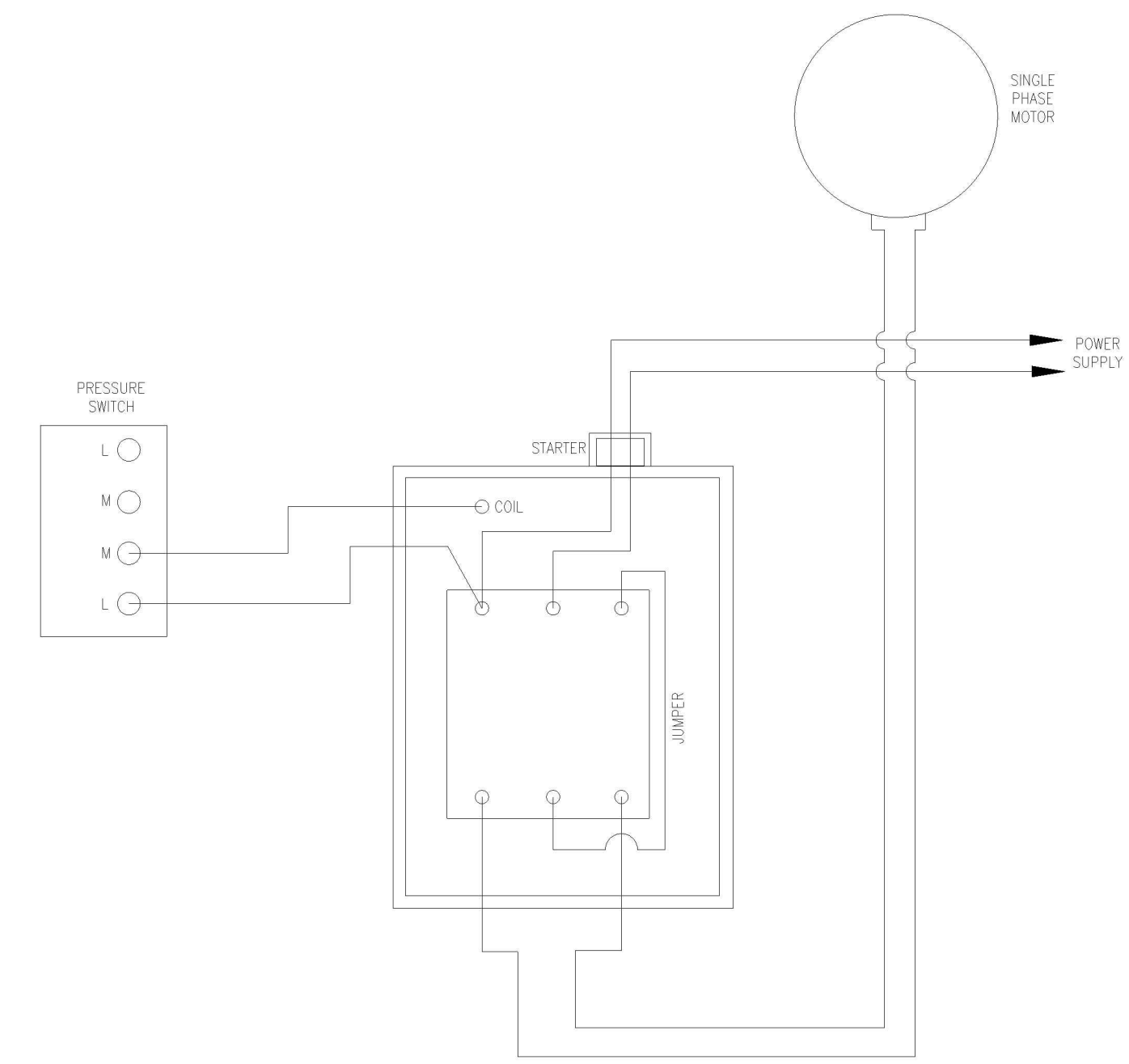
DIAGRAM OF INTERIOR - NITROGEN GENERATOR MODULE
NOTE: NUMBERS ARE VALVE DESIGNATIONS

VALVE NUMBER	COMPONENT CONTAINING VALVE	VALVE PURPOSE
1	COMPRESSOR / TANK ASSEMBLY	SHUTOFF
2	NITROGEN GENERATOR MODULE	BYPASS
3	NITROGEN GENERATOR MODULE	INLET
4	NITROGEN GENERATOR MODULE	OUTLET
5	NITROGEN RECEIVER	INLET
6	NITROGEN RECEIVER	OUTLET
7	NITROGEN RECEIVER	BYPASS
10	NITROGEN GENERATOR MODULE	N2 PURITY TEST PORT
11	NITROGEN GENERATOR MODULE	VENT
12	NITROGEN GENERATOR MODULE	SHUTOFF
13	NITROGEN RECEIVER	MANUAL DRAIN

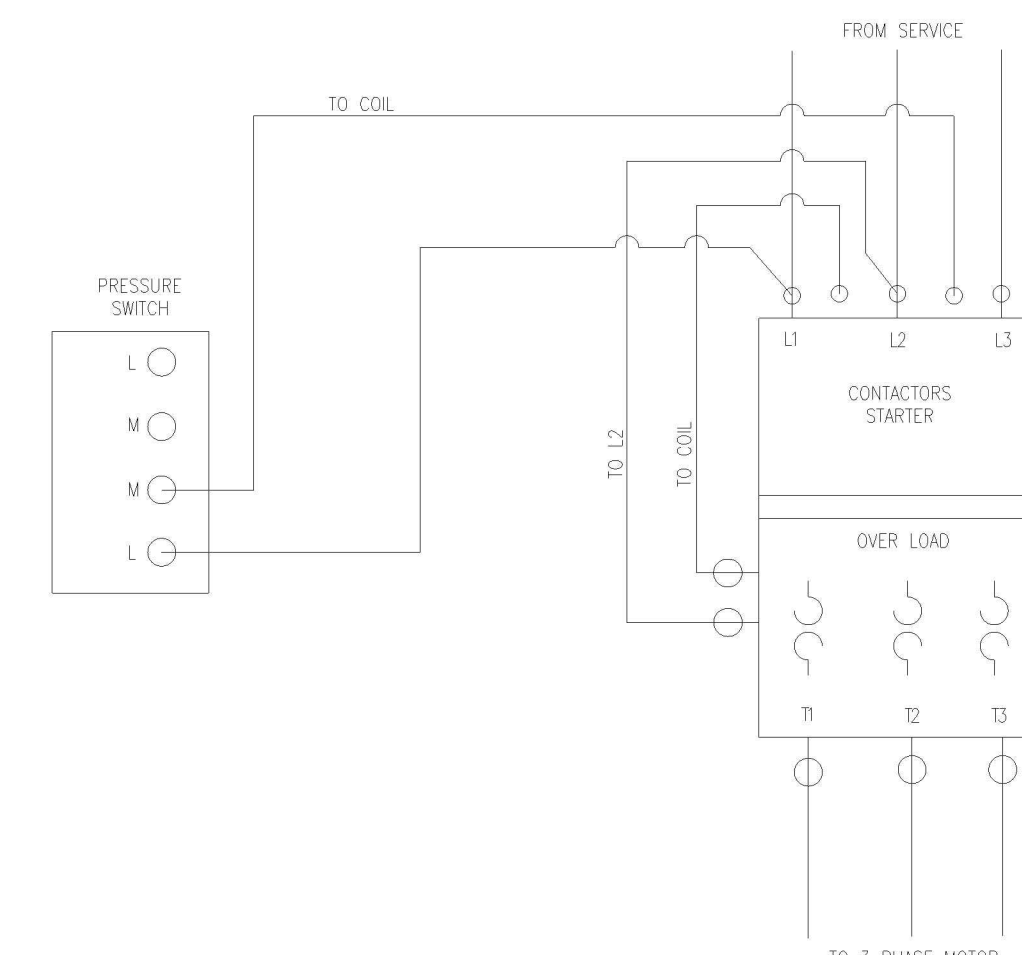


PURGE VENT ASSEMBLY - MODEL PVA-X
DIMENSIONS AND INSTALLATION

PURGE VENT MODEL	N2 ANALYZER CONNECTION TYPE	ORIFICE SIZE
PVA-1	QUICK-CONNECT	0.016"
PVA-2	BARB TUBE FITTING	0.016"
PVA-3	QUICK-CONNECT	0.010"
PVA-4	BARB TUBE FITTING	0.010"



WIRING DIAGRAM - COMPRESSOR / TANK ASSEMBLIES SINGLE PHASE



WIRING DIAGRAM - COMPRESSOR / TANK ASSEMBLIES THREE PHASE

REV	DATE	DESCRIPTION
1.01	15 SEP 2015	RELEASED
1.02	28 OCT 2015	REVISED LINE WEIGHT
2.00	01 MAR 2016	UPDATED DESIGN, REVISED ILLUSTRATIONS
2.01	21 APR 2016	REVISED PVA MODEL & ILLUSTRATION

UNITED FIRE SYSTEMS
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JOB TITLE
 SPECIFICATION & DETAILS
 NITROGEN-PAC M SERIES
 SPRINKLER CORROSION INHIBITING SYSTEM
 UNITED FIRE SYSTEMS

SCALE
AS NOTED

DRAWN BY
JG

DESIGNED BY
JG

CHECKED BY
SUS

SYSTEM TYPE
NITROGEN-PAC

DATE
15 SEP 2015

UFS-330

SHEET
1 OF 1