INSTALLATION & OPERATIONS MANUAL

AdvancedIQ STAND ALONE NITROGEN GENERATOR

AG-6500/11000 | AG-18500/22500

Products for use under U.S. Patents 8,720,591, 9,144,700 and 9,186,533

Table of Contents

General

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Safety Guidelines

The manual contains safety information that is important to know and understand. The information is provided for the safety of the installers, operators and users of the nitrogen generation systems, as well as the nitrogen generation equipment.

The Installation and Operations Manual that is supplied with each nitrogen generation system must be read thoroughly and be completely understood prior to installing and operating nitrogen generation system. All appropriate safety standards for the handling of gases as determined by local, state or national laws and regulations are to be followed at all times.

General Safety Information

IMPORTANT: Read all of the safety information in the manual prior to operating the equipment. Use of the equipment in a manner not specified within the manual could impair the protection provided by the nitrogen generation system and could result in an unintended release of pressure which could cause serious injury or damage. Only qualified personnel can perform commissioning, inspection, testing and maintenance of the nitrogen generation equipment.

When handling, installing, or operating the nitrogen generation equipment, the personnel must employ safe engineering practices and observe all related local, state and national regulations, health, and safety procedures, and legal requirements for safety.

Ensure the nitrogen generation equipment is depressurized and electrically isolated, before performing any maintenance or troubleshooting instructions specified in this manual.

The warnings covered in this manual are the most known potential hazards, but by definition cannot be all-inclusive. If the user employs an operating procedure, item of equipment, or method of working that is not specifically recommended by Engineered Corrosion Solutions, LLC, the user must ensure that the equipment will not be damaged or become hazardous to any persons or property.

Cautions and Warnings

CAUTION: Do not install the Nitrogen Generator or Air Compressor Package in an area where ammonia, sulfur dioxide, hydrogen sulfide, mercaptans, chlorides, chlorine, oxides of nitrogen, acid fumes, solvent vent vapors, and ozone vapors or similar contaminates exist. The equipment can be damaged by ammonia and other vapors shortening membrane life.

WARNING: Do not operate the Nitrogen Generation System if damaged during shipment, handling or use. Damage could result in injury or property damage.

WARNING: Operation of the nitrogen membrane above the rated design pressure could be hazardous. Do not connect the nitrogen generation equipment to compressed air sources that can exceed the maximum rated pressure without installing pressure controls and safety relief devices in the compressed air supply line.

WARNING: Specific procedures must be developed for maintenance and servicing of the equipment where the nitrogen membrane is located. Appropriate labels must be continuously displayed in all areas where personnel might be exposed to a nitrogen atmosphere under normal and abnormal conditions.

WARNING: Nitrogen is nontoxic and largely inert. Rapid release of nitrogen gas into an enclosed space displaces the oxygen and can cause an asphyxiation hazard.

Maintenance and Troubleshooting Warnings

1. Nitrogen Generator includes 120-240 VAC, 50-60 Hz voltage inside cabinet. Exercise caution and do not touch any wiring connections when power is applied to the unit.
2. Nitrogen Generator has hot surfaces inside cabinet when nitrogen generator is operating and after nitrogen generator has turned off. Exercise caution when working on nitrogen generator while operating and after nitrogen generator has shut off. (***Wear Hand Protection where needed***)

Lifting and Troubleshooting Instructions

Nitrogen Generators weigh in excess of 100 lbs (45 kg). When lifting and/or carrying a nitrogen generator, proper lifting a carrying techniques must be considered.

1. Keep a wide base of support. Feet should be shoulder-width apart with one knee slightly in front of the other.
2. Squat down bending at hips and knees. If needed, one knee on the floor and other knee in front, bent at a right angle.
3. Keep good posture. Look straight ahead with back straight, chest out, and shoulders back.
4. Slowly lift by straightening your hips and knees (not your back). Keep your back straight, and don't twist as you lift.
5. Hold the load as close to body as possible.
6. Use feet to change direction. Small steps.
7. Lead with hips as changing direction. Keep shoulders in line with hips as you move.
8. Set load down carefully, squatting with the knees and hips only.

SYSTEM and PRODUCT INFORMATION

Dry Pipe Nitrogen Inerting (DPNI)

Dry Pipe Nitrogen Inerting technology was developed by Engineered Corrosion Solutions, LLC, (ECS) and is used to control oxygen corrosion in dry pipe and/or preaction fire sprinkler systems. DPNI is executed by employing a "fill and purge" differential pressure cycle (breathing) within the sprinkler pipe network. The "fill and purge" pressure cycle consists of venting the system pressure by 3-5 psi (.2-.3 bar), followed by replacing the vented pressure back into the system. This breathing process uses a nitrogen rich gas stream, typically 98% or greater, for a specific length of time (typically fourteen (14) days or less), until a nitrogen-rich, or inert, atmosphere exists within the sprinkler pipe network. By changing the atmosphere inside the pipe network to 98% or higher nitrogen content, the available oxygen content is reduced to a level that will not allow appreciable corrosion of the fire sprinkler pipe. With the level of oxygen corrosion reduced to near zero the effective life of the fire sprinkler system is greatly extended. Systems that implement a DPNI corrosion control strategy should never develop leaks when maintained properly.

Dry Pipe Nitrogen Inerting Equipment

Nitrogen Generator

The Advanced**IQ** Nitrogen Generator is an on-site nitrogen generation system is designed to facilitate the Dry Pipe Nitrogen Inerting (DPNI) for controlling oxygen corrosion in dry pipe and preaction fire sprinkler systems. The nitrogen generator can be used in cold storage/freezer to provide added benefit of ice plug mitigation. The human-machine interface (HMI) display screen allows for easy operation and complete control of the nitrogen generator as well as the ability to communicate with the nitrogen generator from anywhere in the world. Access to nitrogen generator operation, maintenance, diagnostics and stored historical data is easily obtained through the HMI screen on the nitrogen generator or remotely through the internet. The nitrogen generator includes an external bypass valve, in conjunction with a separate air compressor, for maintenance or "fast fill" needs to meet the NFPA 13 30-minute fill requirement. The Nitrogen Generator facilitates "fill and purge" breathing in the fire sprinkler system and has been paired with a Standard Vent (PAV-D), SMART Vent (PSV-D/DE) or Avanced**IQ** Vent (PAV-DQ) installed on the fire sprinkler riser.

Nitrogen Generator Features

The nitrogen generators with the ECS patented "fill and purge" breathing technology include the following features:

- Removal of corrosive oxygen from the entire sprinkler system in fourteen (14) days or less
- All equipment is installed in the sprinkler riser room for easier installation and servicing
- No refrigerated dryers or nitrogen storage tanks required
- Interactive LCD touchscreen display
- Bypass alarm indication with sleep mode
- Programmable audible alarm
- Optional remote monitoring and email alerts
- Nitrogen generation system monitoring
- Membrane separation technology with 20-year service life
- Programmable automatic drain function
- Minimal maintenance requirements

Oxygen Removal Vent

To completely remove the oxygen in a dry pipe and preaction fire sprinkler system, it is necessary to install a vent on the main riser of each fire sprinkler system. Vents allow for a system to breathe, which requires a 3-5 psig (.2-.3 bar) pressure range to facilitate removal of oxygen gas from the system. Supervisory nitrogen gas is supplied to the system until the air maintenance device reaches the high-end pressure. The vent slowly releases the gas mixture inside the sprinkler system through the restricted orifice until the system reaches the low-end pressure at which point supervisory nitrogen is supplied to the system again. This process is repeated numerous times until the atmosphere inside the piping network reaches at least 98% nitrogen. The vent is crucial for expedient mixing of the gas and elimination of oxygen inside the system within the specified timeframe.

ECS offers three (3) DPNI vents: The PSV-D/(DE) SMART Vent, the PAV-D Standard Vent and the PAV-DQ Vent.

- The PSV-D/(DE) SMART Vent is an automated vent that when activated will automatically vent for the necessary amount of time to achieve the desired inert inner pipe atmosphere, and automatically close when the process is completed. This process is initiated by pressing the **Vent** button on the vent's control panel.
- The PAV-D Standard Vent requires an operator to open the vent's isolation valve when venting is desired, and after a specified time (typically fourteen (14) days or less) when the breathing process is completed, the isolation valve on the vent must be manually closed.
- The PAV-DQ Vent in conjunction with Advanced**IQ** Vent Controller (AVC) is an automated vent that when activated will open and vent for the necessary amount of time to achieve the desired inert inner pipe atmosphere, and close automatically when the process is completed.

Oxygen Removal Vent Features

The oxygen removal vents with the ECS patented "fill and purge" breathing technology include the following features:

- Removal of corrosive oxygen from the entire sprinkler system in fourteen (14) days or less
- All equipment is installed in the sprinkler riser room for easier installation and servicing
- No support hanger required
- Backpressure regulator preventing system depressurization from vent
- In-line filter to protect restricted venting orifice from contamination

Recommended Monitoring Equipment

In-Line Corrosion Detectors

The In-Line Corrosion Detector (ILD) is designed to provide an early warning of corrosion activity within the fire sprinkler system. The ILD features a double wall construction that incorporates a thin milled section of pipe (.035" (8.9mm)) surrounded by a full-thickness piece of pipe to detect and alert to the presence of corrosion activity. If corrosion occurs the milled section of the ILD will fail prior to the failure of any other section of the pipe wall. When the milled section fails it allows the system to pressurize the chamber outside the milled section of pipe which activates the attached pressure switch on the ILD. The pressure switch can be remotely monitored through a building monitoring system.

The ILD is placed at strategic locations within the fire sprinkler piping network where corrosion has the highest potential of occurring.

- Wet Systems: Locate the ILD in high point of the sprinkler system, typically at the air/water interface in a branch line, where air will be trapped as the system is filled with water.
- Dry Systems: Locate the ILD in a horizontal portion of the supply main piping where trapped water will accumulate.

SMART Gas Analyzer

The SMART Gas Analyzer (SGA-1) provides continuous real-time nitrogen/oxygen concentration levels within a dry pipe and preaction fire sprinkler system. The analyzer samples discharge gas from an adjacent Standard Vent (PAV-D/DQ) or SMART Vent (PSV-D/DE). It is equipped with programmable outputs for one of three different oxygen concentration levels (1%, 3%, and 5%), providing early warning to a user when the nitrogen concentration within the fire sprinkler system falls below the desired level. The SGA-1 is also equipped with an analog (0-5VDC, 0-10VDC, or 4-20mA) output and an RS-485 port for optional remote control and monitoring as well as displaying either oxygen or nitrogen concentration.

Handheld Gas Analyzer

The handheld gas analyzer (PHGA-1) allows for quick, convenient reading of nitrogen gas purity levels. The gas analyzer can be connected to any of the sample ports on the ECS devices such as the nitrogen generator or a vent. Additional sampling ports can be ordered and placed at any point on the systems where gas purity monitoring is desired.

AdvancedIQ Vent Controller (AVC)

The Advanced**IQ** Vent Controller (AVC) provides automatic oxygen venting, monitoring of nitrogen/oxygen concentration levels and monitoring of the sprinkler system pressure within each dry pipe/preaction fire sprinkler system. As a fire sprinkler system is filled with a continuous supply of nitrogen gas from the nitrogen generator system, the vent, installed on the sprinkler system riser, allow oxygen-rich gas to be vented from the fire sprinkler system.

The AVC samples the discharge gas from each vent connected to the controller. Over a fourteen (14) day period, the vent will dilute the oxygen concentration in the entire fire sprinkler system to less than 2% oxygen. The gas flows out of the restricted orifice on the vent through pressure-rated tubing to provide slow, controlled flow to the Advanced**IQ** Controller. Once the desired system gas composition is reached, the controller will automatically close and stop the venting process thereby preventing continuous venting. The AVC is equipped with a programmable logic controller (PLC) and a human-machine interface (HMI) with an LCD display to control the venting process and continuously monitor the nitrogen purity levels in the sprinkler systems.

AdvancedIQ Vent Controller Features

The Advanced**IQ** Vent Controller, in conjunction with oxygen removal vents along with the ECS patented “fill and purge” breathing technology, includes the following features:

- All equipment is installed in the sprinkler riser room for easier installation and servicing
- Individual pressure & purity monitoring for up to six (6) sprinkler systems
- Datalogging & historical trends for each sprinkler system
- Leak rate checks for each sprinkler system
- Internet connectivity and remote monitoring capability
- Removeable datalog (flash drive)
- Form-C dry contact supervisory

TECHNICAL SPECIFICATIONS

Nitrogen Generators

Dimensions – AG-6500/11000	24.5"(622mm) W x 52.5"(1,334mm) H x 8.5"(216mm) D
Dimensions – AG-18500/22500	24.5"(622mm) W x 76"(1,930mm) H x 12.5"(318mm) D
Dimensions with Bypass Assembly - AG-6500/11000	32.5"(826mm) W x 52.5"(1,334mm) H x 8.5"(216mm) D
Dimensions with Bypass Assembly - AG-18500/22500	32"(813mm) W x 76"(1,930mm) H x 12.5"(318mm) D
Weight - AG-6500/11000	152 lbs (69kg)
Weight - AG-18500/22500	300 lbs (136kg)
Location	Dry Indoor Use
Altitude	Up to 6,560 ft (2,000m)
Temperature Range	40°F - 105°F (5°C - 40°C)
Pollution Degree	2
Nitrogen Generator Cabinet Power Supply	120-240 VAC, 50-60 Hz, 1 ph
Power Consumption	1 Amp
Overvoltage Category	II
AG-6500 Nitrogen Gas Output (COMP-7.5)	4.0 SCFM/240 SCFH (113.3 L/min)
AG-6500 Largest Single Zone Capacity @ 40 psig (2.8 bar)	2,025 gallons (7,666 Liters)
AG-6500 Largest Single Zone Capacity @ 20 psig (1.4 bar)	4,050 gallons (15,331 Liters)
AG-6500 Largest Cumulative System Capacity	6,500 gallons (24,605 Liters)
AG-11000 Nitrogen Gas Output (COMP-7.5)	4.0 SCFM/240 SCFH (113.3 L/min)
AG-11000 Largest Single Zone Capacity @ 40 psig (2.8 bar)	2,025 gallons (7,666 Liters)
AG-11000 Largest Single Zone Capacity @ 20 psig (1.4 bar)	4,050 gallons (15,331 Liters)
AG-11000 Largest Cumulative System Capacity	11,000 gallons (41,640 Liters)
AG-18500 Nitrogen Gas Output (COMP-7.5)	7.1 SCFM/425 SCFH (200.6 L/min)
AG-18500 Largest Single Zone Capacity @ 40 psig (2.8 bar)	2,025 gallons (7,666 Liters)
AG-18500 Largest Single Zone Capacity @ 20 psig (1.4 bar)	4,050 gallons (15,331 Liters)
AG-18500 Largest Cumulative System Capacity	18,500 gallons (70,030 Liters)
AG-22500 Nitrogen Gas Output (COMP-10)	9.2 SCFM/550 SCFH (259.6 L/min)
AG-22500 Largest Single Zone Capacity @ 40 psig (2.8 bar)	2,900 gallons (10,978 Liters)
AG-22500 Largest Single Zone Capacity @ 20 psig (1.4 bar)	5,800 gallons (21,955 Liters)
AG-22500 Largest Cumulative System Capacity	22,500 gallons (85,172 Liters)
Air Inlet Connection	½" NPT Female
Nitrogen/Air Bypass Output Connection	½" NPT Female
Drain Connection	¼" NPT Female
Filter Replacement Part Number	FKSA-FS

Nitrogen Quality

N_2 Purity at Discharge: 98% (maximum of 2.0% oxygen)
N_2 Pressure at Discharge: Min: 15 psig (1 bar); Max: feed air pressure minus 15 psig (1 bar)
N_2 Water Dew Point: Less than -70°F (-57°C)

Nitrogen Generator Approvals

FM Approved - Standard 1035
UL Listed - 508A Industrial Control Panel
UL-508A Listed to Canadian Standards
CE Certification

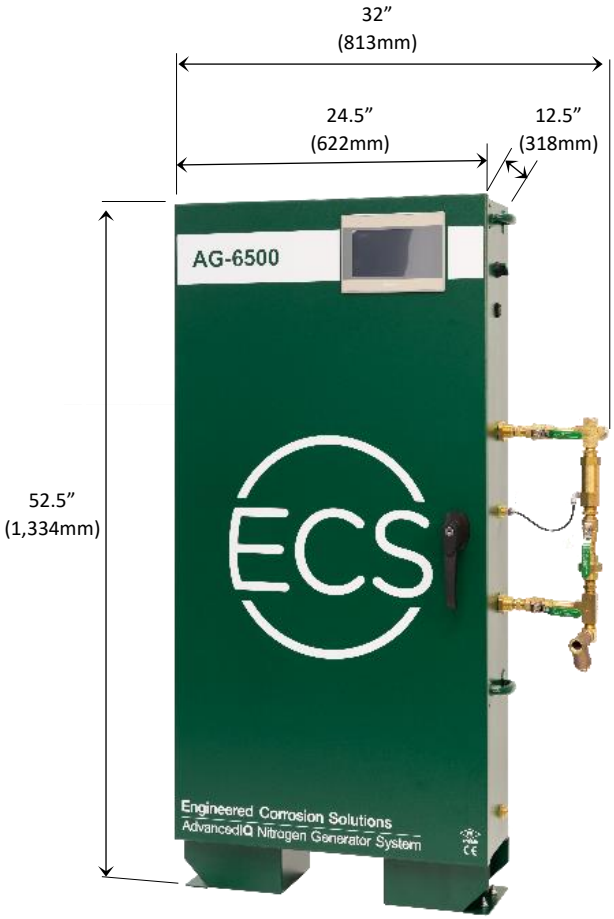
Air Compressors

COMP-5-2 Dimensions (Duplex/Horizontal)	84.2"(2,140mm) (L) x 34.6"(878mm) (W) x 48.2"(1,224mm) (H)
COMP-7.5 Dimensions (Simplex/Vertical)	23.6"(1,097mm) (L) x 38.1"(968mm) (W) x 70.1"(1,781mm) (H)
COMP-7.5-2 Dimensions (Duplex/Horizontal)	84.2"(2,140mm) (L) x 34.6"(878mm) (W) x 48.2"(1,224mm) (H)
COMP-10 Dimensions (Simplex/Vertical)	30"(762mm) (L) x 43.2"(1,097mm) (W) x 76.6"(1,946mm) (D)
COMP-10-2 Dimensions (Duplex/Horizontal)	87.5"(2,222mm) (L) x 35.8"(910mm) (W) x 51.5"(1,308mm) (D)
COMP-5-2 Weight (Duplex/Horizontal)	1,265 lbs (574kg)
COMP-7.5 Weight (Simplex/Vertical)	573 lbs (260kg)
COMP-7.5-2 Weight (Duplex/Horizontal)	1,265 lbs (574kg)
COMP-10 Weight (Simplex/Vertical)	800 lbs (362kg)
COMP-10-2 Weight (Duplex/Horizontal)	1,545 lbs (701kg)
COMP-5-2 Power Supply, Two (2) Supplies	460VAC/3 ph/60Hz – 7.6 Amps / 208VAC/3 ph/60Hz – 17.5 Amps (6.3kW)
COMP-7.5 Power Supply	460VAC/3 ph/60Hz - 11 Amps / 208VAC/3 ph/60Hz - 25.3 Amps (8.8kW)
COMP-7.5-2 Power Supply, Two (2) Supplies	460VAC/3 ph/60Hz - 11 Amps / 208VAC/3 ph/60Hz - 25.3 Amps (8.8kW)
COMP-10 Power Supply	460VAC/3 ph/60Hz - 14 Amps / 208VAC/3 ph/60Hz – 32.2 Amps (11.2kW)
COMP-10-2 Power Supply, Two (2) Supplies	460VAC/3 ph/60Hz - 14 Amps / 208VAC/3 ph/60Hz – 32.2 Amps (11.2kW)
COMP-5-2 Air Compressor Output	33 SCFM/2,016 SCFH (951.4 L/min)
COMP-7.5 Air Compressor Output	24 SCFM/1,458 SCFH (688.1 L/min)
COMP-7.5-2 Air Compressor Output	48 SCFM/2,916 SCFH (1,376.2 L/min)
COMP-10 Air Compressor Output	35 SCFM/2,100 SCFH (991.1 L/min)
COMP-10-2 Air Compressor Output	70 SCFM/4,200 SCFH (1,982.2 L/min)
COMP-5 Air Tank Output Connection	½" NPT Female
COMP-7.5 Air Tank Output Connection	½" NPT Female
COMP-10 Air Tank Output Connection	1" NPT Female
Auto-Drain Connection	¼" NPT Female
Auto-Drain Power Supply	120VAC/1 ph/60Hz - Connect to unswitched Power Supply
Temperature Range	40°F - 105°F (5°C - 40°C)

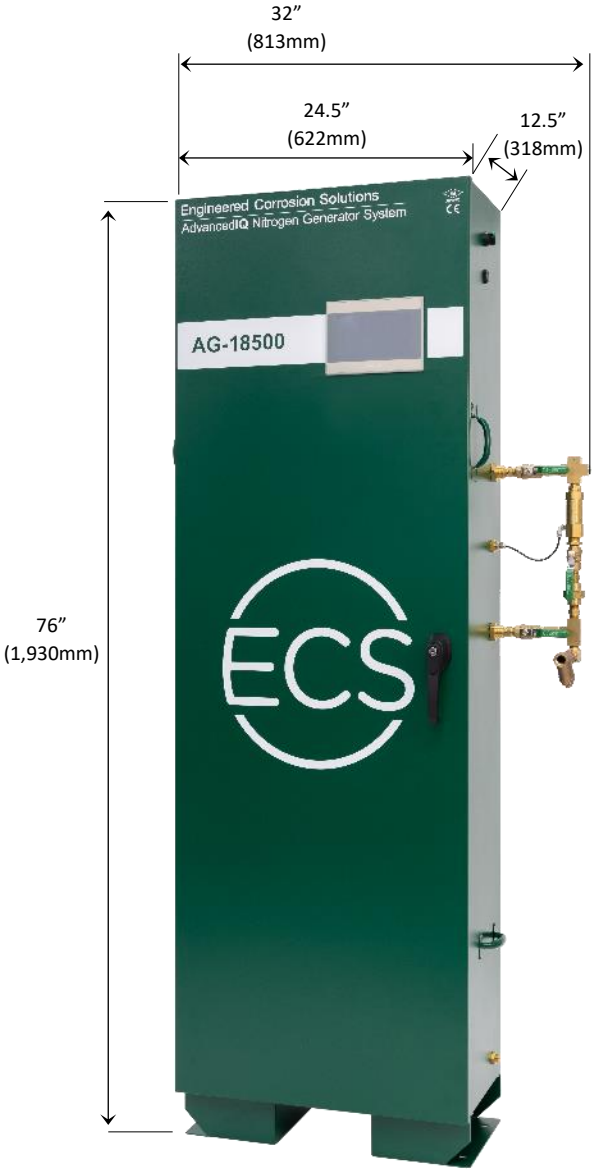
WARRANTY REQUIREMENTS: **To ensure warranty of the air compressor by Ingersoll Rand, must adhere to the following:**

1. **Use only Ingersoll Rand approved oil** (supplied)
2. **Install vibration pads under air compressor feet** (supplied)
3. **Install braided hose directly to isolation valve on air receiver tank** (supplied)

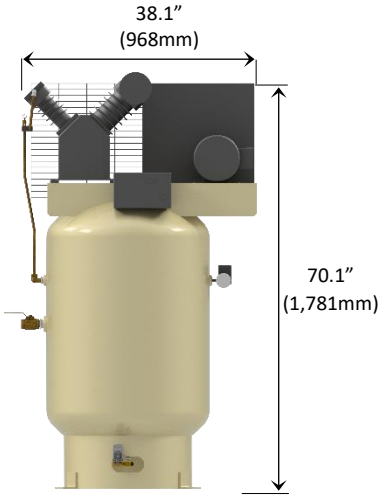
Nitrogen Generator Dimensions
AG-6500 and AG-11000

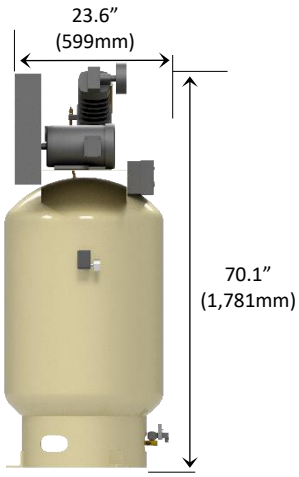


Nitrogen Generator Dimensions
AG-18500 and AG-22500

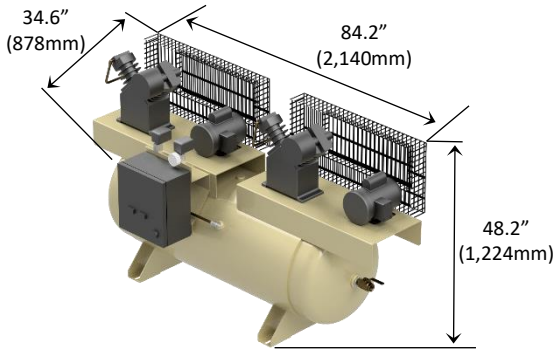


Air Compressor Dimensions

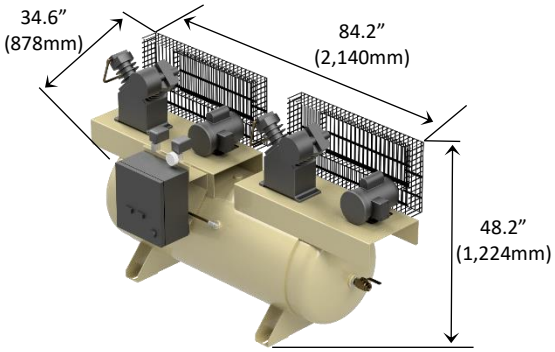




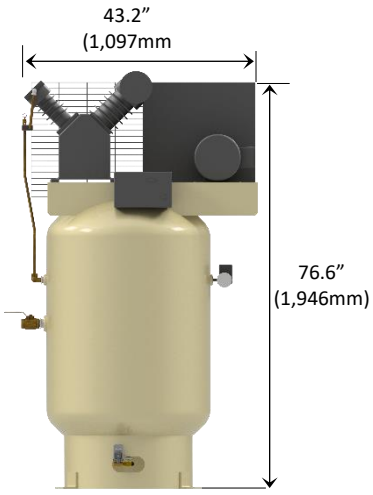
COMP-7.5 Simplex Air Compressor

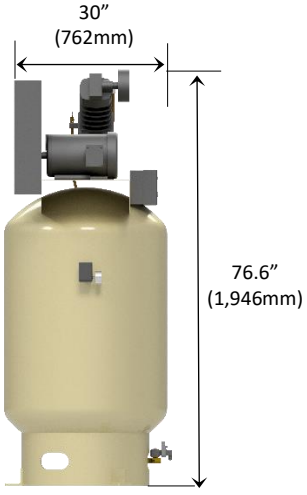


COMP-5-2 Duplex Air Compressor

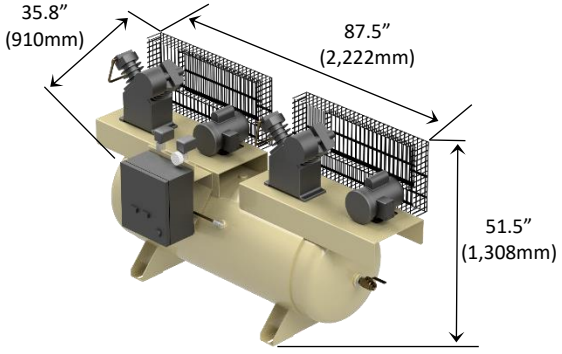


COMP-7.5-2 Duplex Air Compressor





COMP-10 Simplex Air Compressor



COMP-10-2 Duplex Air Compressor

OPERATIONAL INFORMATION

System Operating Pressures

When multiple dry pipe and preaction fire sprinkler systems are connected to one nitrogen generator, the **fire sprinkler systems must operate at the same supervisory gas pressure**.

In applications where multiple dry pipe and preaction fire sprinkler systems are connected to one (1) nitrogen generator and there is more than one (1) supervisory gas pressure an ECS Nitrogen Interface Controller (NIC-1) must be included in the project.

System Operating Pressure Adjustments

The nitrogen generator operating pressure settings in conjunction with the pressure setting of the fire sprinkler system's air maintenance device(s) are established and set during the commissioning process.

1. The operating pressure settings of the fire sprinkler air maintenance device(s) or the nitrogen generator must not be readjusted after the system has been commissioned.
2. Any adjustments to the operating pressure settings of the fire sprinkler air maintenance device(s) or the nitrogen generator will have an adverse effect on the nitrogen inerting process and could damage the nitrogen generation equipment.
3. **Any changes to the fire sprinkler air maintenance device(s) or nitrogen generator operating pressure settings must be authorized by and performed under the direction of ECS.**

Sprinkler System Gauge Accuracy

The accuracy of the gauges used in fire sprinkler systems can affect the operating pressure of the fire sprinkler system as well as determining the required 3-5 psig (.2-.3 bar) pressure range needed to properly remove the oxygen from a fire sprinkler system. NFPA 25 indicates that gauges in excess of ±3% must be replaced or recalibrated. FM Global allows the gauges used in fire sprinkler systems to be accurate within ±2% over the center third of its scale and ±3% over the remaining two thirds of its scale. This can become paramount when operating a low-pressure valve sprinkler system with an operating pressure of 15-20 psig (1-1.4 bar).

Example: NFPA 25: A 200 psi (14 bar) gauge with ±3% accuracy equates to ±6 psi (.4 bar) variance in the actual pressure reading of the gauge. Therefore, a sprinkler system indicating a 40 psig (2.8 bar) operating pressure can actually be operating between 34 psig (2.3 bar) and 46 psig (3.2 bar).

FM Global: A 200 psi (14 bar) gauge with ±2% accuracy in the center third of the gauge equates to ±4 psi (.3 bar) variance in the actual pressure reading of the gauge; and ±3% accuracy in the upper and lower third of the gauge equates to ±6 psi (.4 bar) variance in the actual pressure reading of the gauge.

1. A 200 psi (14 bar) gauge on a sprinkler system indicating a 100 psig (6.9 bar) (center third of the gauge) operating pressure can actually be operating between 96 psig (6.6 bar) and 104 psig (7.2 bar).
2. A 200 psi (14 bar) gauge on a sprinkler system indicating a 20 psig (1.4 bar) (lower third of the gauge) operating pressure can actually be operating between 14 psig (.9 bar) and 26 psig (1.8 bar).

A sprinkler system using a low-pressure valve with a 200 psi (14 bar) gauge indicating a 15 psig (1 bar) operating pressure can actually be operating between 9 psig (.6 bar) and 21 psig (1.4 bar); which could be close to the low-air alarm/trip pressure of the sprinkler system.

To ensure proper operation of the sprinkler system and the nitrogen generator, calibrate the sprinkler system operating pressure to the turn-on and turn-off pressure of the nitrogen generator using the Air Maintenance Device Pressure Adjustment Procedure (section 6.f.) in the Maintenance Section of this manual.

The procedure aligns the sprinkler system operating pressure to the turn-on pressure of the nitrogen generator; reducing the potential of the nitrogen generator turn-on pressure to be set near the low-air alarm/trip pressure of the sprinkler system.

Sprinkler System Air Maintenance Device

Dry pipe and preaction fire sprinkler systems are to be configured to use a single air maintenance device (AMD) for each dry pipe or preaction fire sprinkler system in accordance with NFPA 13.

1. Applications where multiple fire sprinkler systems are served with a single AMD have been known to cause nitrogen generators to short cycle due to the air restriction that the AMD imposes on the nitrogen supply line. Short cycling of the nitrogen generator can cause damage to the system components and may affect the manufacturer's warranty.

AMD operation is directly affected by the inlet pressure to the AMD. To ensure the AMD operates properly with the nitrogen generator, use the Air Maintenance Device Pressure Adjustment Procedure (section 6.f.) in the Maintenance Section of this manual.

Fire Sprinkler System Leak Rates

The leak rate of a dry pipe or preaction fire sprinkler system will have a direct effect on the nitrogen generator run frequency or on/off cycles. The maximum allowable leak rate in a fire sprinkler system as defined by NFPA-13 is 1.5 psig (.1 bar) within a twenty-four (24) hour period. The design specifications of ECS nitrogen generators is based on 6.0 psig (.4 bar) leak rate within a twenty-four (24) hour period. Sprinkler systems with a leak rate in excess of 6.0 psig (.4 bar) within a twenty-four (24) hour period will cause the nitrogen generator run frequency to increase resulting in a greater wear on system components and a potential reduction in the service life of the nitrogen generator. Sprinkler systems with a leak rate greater than 6.0 psig (.4 bar) within a twenty-four (24) hour period must be repaired to ensure the anticipated service life of the nitrogen generator is met.

NOTE: The run frequency of the nitrogen generator in this chart is based on nitrogen generator operation outside of the fourteen (14) day nitrogen inerting process with the vent closed.

Excessive cycle count could indicate an air compressor/nitrogen generator short cycling issue. Contact ECS immediately.

Sprinkler Leak Rate to ECS Nitrogen Generator Run Cycle Comparison							
Leak Rate psig (bar)/24 Hr	**Generator Cycle Time** Time between cycles Hrs	Cycles per Day	Cycles per Week	**Leak Rate** psig (bar)/24 Hr	**Generator Cycle Time** Time between cycles Hrs	Cycles per Day	Cycles per Week
1.5 (.10) *	80	< 1	3	15.0 (1.0)	8	3	21
2.0 (.14)	60	< 1	3	15.5 (1.1)	7.7	4	22
2.5 (.17)	48	< 1	4	16.0 (1.1)	7.5	4	23
3.0 (.20)	40	< 1	5	16.5 (1.2)	7.3	4	23
3.5 (.24)	34.3	< 1	5	17.0 (1.2)	7.1	4	24
4.0 (.28)	30	< 1	6	17.5 (1.2)	6.9	4	25
4.5 (.31)	26.7	< 1	7	18.0 (1.2)	6.7	4	25
5.0 (.35)	24	1	7	18.5 (1.3)	6.6	4	26
5.5 (.38)	21.8	2	8	19.0 (1.3)	6.3	4	27
6.0 (.41) ***	20	2	9	19.5 (1.3)	6.2	4	27
6.5 (.45)	18.5	2	9	20 (1.4)	6	4	28
7.0 (.48)	17.1	2	10	21 (1.4)	5.7	5	30
7.5 (.52)	16	2	11	22 (1.5)	5.5	5	31
8.0 (.55)	15	2	12	23 (1.6)	5.2	5	33
8.5 (.59)	14.1	2	12	24 (1.7)	5	5	34
9.0 (.62)	13.3	2	13	25 (1.7)	4.8	5	35
9.5 (.66)	12.6	2	14	26 (1.8)	4.6	6	37
10.0 (.69)	12	2	14	27 (1.9)	4.5	6	38
10.5 (.72)	11.4	3	15	28 (1.9)	4.3	6	39
11.0 (.76)	10.9	3	16	29 (2.0)	4.2	6	40
11.5 (.79)	10.4	3	17	30 (2.1)	4	6	42
12.0 (.83)	10	3	17	31 (2.1)	3.9	7	43
12.5 (.86)	9.6	3	18	32 (2.2)	3.8	7	45
13.0 (.90)	9.2	3	19	33 (2.3)	3.7	7	46
13.5 (.93)	8.9	3	19	34 (2.3)	3.6	7	47
14.0 (.97)	8.6	3	20	35 (2.4)	3.5	7	48
14.5 (1.0)	8.3	3	21	36 (2.5) **	3.4	8	50

*****NFPA-13 Allowable leak rate.

******NFPA-25 Allowable leak rate.

*******Allowable leak rate for ECS Nitrogen Generators. Higher leak rates may reduce the service life of the nitrogen generator.

Start Up and Operational Procedures

INSTALLATION

Installation Instructions

Installation of the ECS Advanced**IQ** Nitrogen Generator and air compressor requires ten (10) steps:

1. Mount the nitrogen generator cabinet in the appropriate location.
2. Mount the air compressor in the appropriate location.
3. Connect the dedicated power supply to the nitrogen generator cabinet.
4. Connect the dedicated power supply to the air compressor.
5. Plumb the air supply line between the air compressor and the nitrogen generator.
6. Plumb the nitrogen/air supply line to the dry pipe and/or preaction sprinkler risers being served.
7. Plumb the condensate drain line to floor drain or building exterior.
8. Connect air compressor running monitoring contacts to nitrogen generator (Recommended) .
9. Connect the nitrogen generator to the internet via ethernet cable connection, where applicable.
10. Connect nitrogen generator output signals to Building Management System or Building Alarm System, where applicable.

NOTE: Review and follow air compressor manufacturer's published instructions to ensure proper installation of the air compressor.

Wire Gauge Chart

1. Ensure an appropriately rated disconnect switch and circuit breaker (minimum 15 Amps and a Short Circuit Current Rating (SCCR) of 5 kVA) are installed in a suitable and accessible location in accordance with the applicable national and/or local codes (i.e., NFPA 70).
2. The circuit breaker and disconnect are to be easily identifiable as associated with the equipment.
3. Ensure the ground wire is properly connected to the ground terminal(s) of the equipment using appropriately sized ground wire.

Wire Gauge Chart							
Size	**Amperage**			**Diameter**		**Resistance**	
(AWG)	60°C (140°F)	75°C (167°F)	90°C (194°F)	(Inches)	(mm)	(Ohms / 1,000 ft)	(Ohms / km)
18				.0403	1.024	6.385	20.95
16				.0508	1.291	4.016	13.17
14	15	15	15	.0641	1.628	2.525	8.282
12	20	20	20	.0808	2.053	1.588	5.211
10	30	30	30	.1019	2.588	.9989	3.277
8	36	43	48	.1285	3.264	.6282	2.061

Step 1: Mount the nitrogen generator cabinet

The Nitrogen Generator is designed to be mounted directly to the floor and /or the wall at the appropriate location. Several factors should be considered in choosing the proper mounting location for the nitrogen generator:

1. Access to required power supply (dedicated circuit)
2. Access to building monitoring connections and internet connection (where applicable)
3. Access to sprinkler risers being supplied from nitrogen generator
4. Access to drain for the condensate discharge line
5. Clearance in front of the unit to open the cabinet door and for servicing the equipment
6. Cleanliness of the environment and air intake

The cabinet includes pre-punched holes in the feet for floor mounting and holes in the back panel for wall support using standard anchors.

NOTES:
1. The AG-6500/11000 cabinet does not include holes in the back panel for wall support.
2. The AG-18500/22500 cabinet includes holes in the back panel for wall support.
3. When floor mounting the generator cabinet, ensure the cabinet is firmly anchored to a flat/level surface.
4. When wall supporting the generator cabinet, ensure the cabinet is firmly anchored to a wall, the wall is structurally sound, and cable of supporting the generator cabinet.

Step 2: Mount the air compressor

The air compressor is designed to be mounted directly to the floor at the appropriate location. Several factors should be considered in choosing the proper mounting location for air compressor:

1. Access to required power supply (dedicated circuit)
2. Access to nitrogen generator
3. Access to drain for the condensate discharge line
4. Clearance around the air compressor for servicing the equipment
5. Cleanliness of the environment and air intake

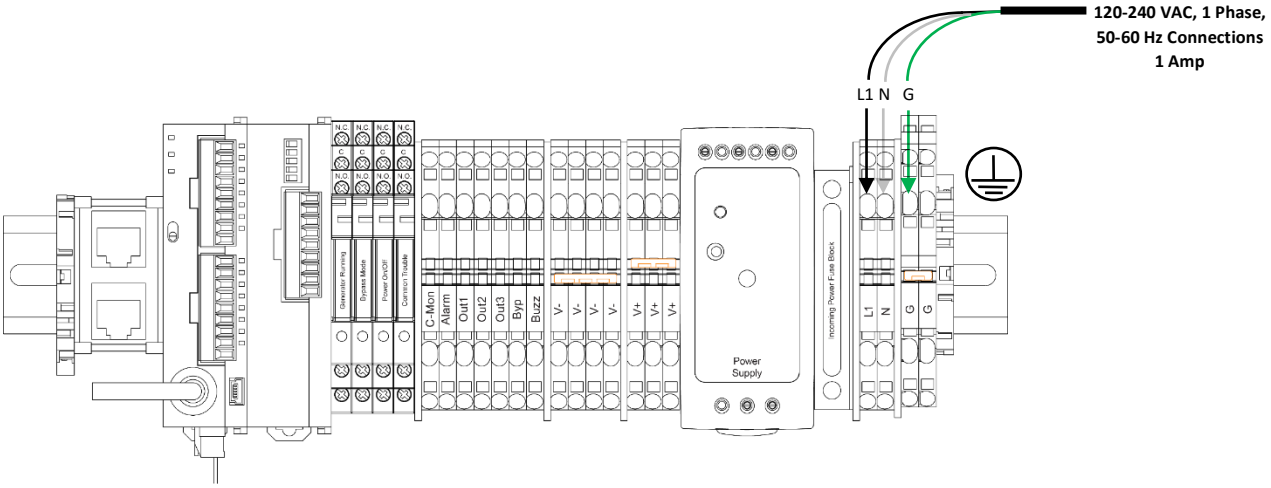
The air compressor includes pre-punched holes in the feet for floor mounting using standard anchors.

NOTES:
1. Ensure the air compressor is firmly anchored to a flat/level surface.
2. Install vibration pads between mounting feet of the air compressor and the floor.
3. Install braided hose directly-to the isolation valve on the air supply outlet of the air receiver tank.

Step 3: Connect the Nitrogen Generator Power Supply

The Nitrogen Generator requires a dedicated power supply to prevent interaction with other equipment. The incoming power supply line is connected to the terminal blocks inside the nitrogen generator cabinet. The terminal connections are labeled L1, N, and G.

Required nitrogen generator power supply: 120-240 VAC, 50-60 Hz, 1 phase dedicated circuit.



NOTE: Ensure an appropriately rated disconnect switch and circuit breaker (minimum 15 Amps and a Short Circuit Current Rating (SCCR) of 5 kVA) are installed in a suitable and accessible location in accordance with the applicable national and/or local codes (i.e., NFPA 70).

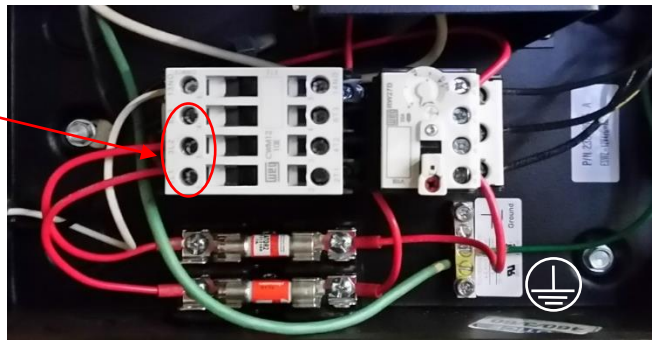
Step 4: Connect the Air Compressor Power Supply

The air compressor requires a dedicated power supply to prevent interaction with other equipment. Provide a means of power disconnect adjacent to the air compressor in accordance with manufacturer's published instructions and in accordance with the applicable national and/or local codes (i.e., NFPA 70). The incoming power supply line is connected to the terminal block inside the NEMA 4 power supply box on the air compressor.

NOTE: Confirm the available power source is compatible with the wiring configuration of the air compressor. Contact ECS if there is a discrepancy.

The auto-drain power supply: 120 VAC, 1 phase, 60 Hz unswitched power supply can be connected to same power supply as the nitrogen generator.

208 or 460 VAC, 3 Phase, 60 Hz Connections
Labeled L1, L2, L3



	208 VAC	460 VAC
COMP-5	17.5 Amps	7.6 Amps
COMP-7.5	25.3 Amps	11 Amps
COMP-10	32.2 Amps	14 Amps

Figure 2

NOTE: Ensure an appropriately rated disconnect switch and circuit breaker (minimum 15 Amps and a Short Circuit Current Rating (SCCR) of 5 kVA) are installed in a suitable and accessible location in accordance with the applicable national and/or local codes (i.e., NFPA 70).

Step 5: Plumb the Air Supply Line to Nitrogen Generator

Connect the air discharge plumbing from the air compressor to the air inlet of the nitrogen generator using a minimum ½" black steel, galvanized steel, or copper lines. The air compressor start-up kit includes a flex-hose connection to be installed between the air compressor and nitrogen generator to reduce vibration.

Step 6a: Plumb the Nitrogen/Air Supply Line - No Additional Air Compressor (Figure 3a)

The nitrogen/air discharge plumbing from the Nitrogen Generator must be connected directly to the dry pipe or preaction valve trim using a minimum ½" black steel, galvanized steel, or copper lines. The size of the nitrogen/air supply line must be based on both the length of pipe between the nitrogen generator and fire sprinkler systems and the total volume of fire sprinkler systems being supplied.

NOTE: The Nitrogen Generator requires an in-line Air Maintenance Device (AMD) that is equipped with an on-board field adjustable pressure regulator for each sprinkler system being served. Acceptable AMD models are the Reliable Model A, Tyco Model AMD-1 and Victaulic Series 757.

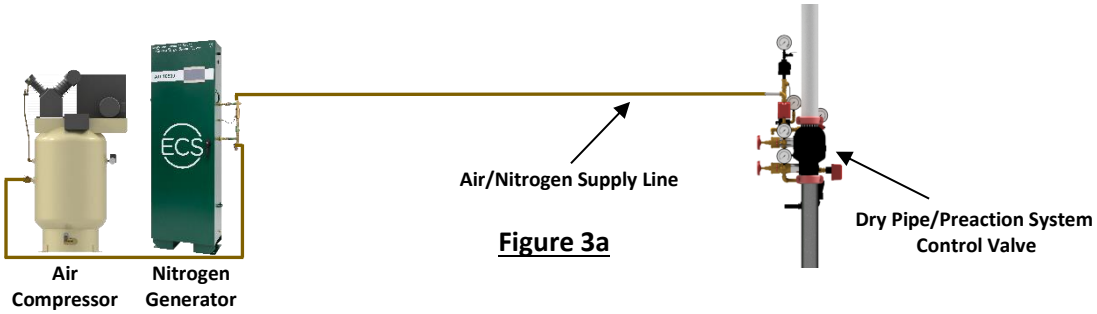


Figure 3a

Step 6b: Plumb the Nitrogen/Air Supply Line – With Separate Air Compressor (Figure 3b)

A separate air compressor can be used to meet the NFPA 13 30-minute fill requirement or as a back up to the nitrogen generator. In this application, the nitrogen/air discharge plumbing from the Nitrogen Generator and the separate air compressor are connected to the dry pipe or preaction valve trim with isolation valves in each supply line using a minimum ½" black steel, galvanized steel, or copper lines. The size of the nitrogen/air supply line must be based on both the length of pipe between the nitrogen generator and fire sprinkler systems and the total volume of fire sprinkler systems being supplied.

NOTE: The Nitrogen Generator requires an in-line Air Maintenance Device (AMD) that is equipped with an on-board field adjustable pressure regulator for each sprinkler system being served. Acceptable AMD models are the Reliable Model A, Tyco Model AMD-1 and Victaulic Series 757.

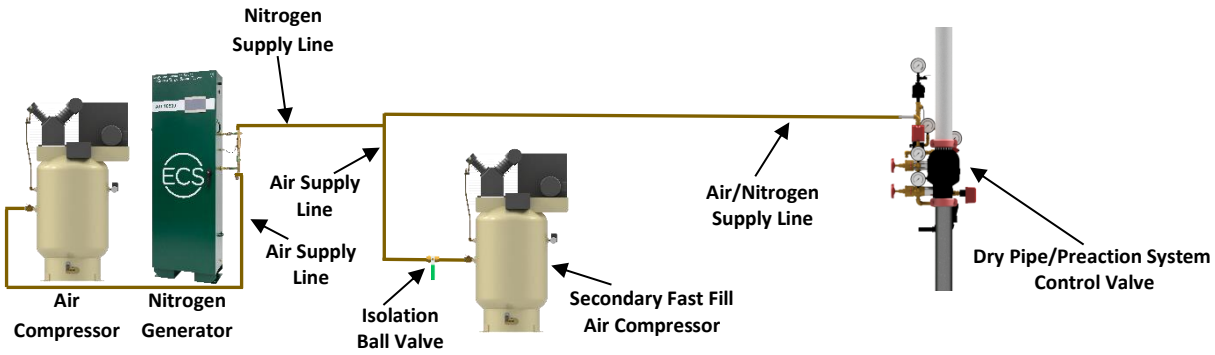


Figure 3b

Step 6c: Plumb the Nitrogen/Air Supply Line – With House/Plant Air Supply (Figure 3c)

A separate house/plant air supply can be used to meet the NFPA 13 30-minute fill requirement or as a back up to the nitrogen generator. In this application, the nitrogen/air discharge plumbing from the Nitrogen Generator and the separate hose/plant air supply are connected to the dry pipe or preaction valve trim with isolation valves in each supply line using a minimum ½" black steel, galvanized steel, or copper lines. The size of the nitrogen/air supply line must be based on both the length of pipe between the nitrogen generator and fire sprinkler systems and the total volume of fire sprinkler systems being supplied.

NOTE: The Nitrogen Generator requires an in-line Air Maintenance Device (AMD) that is equipped with an on-board field adjustable pressure regulator for each sprinkler system being served. Acceptable AMD models are the Reliable Model A, Tyco Model AMD-1 and Victaulic Series 757.

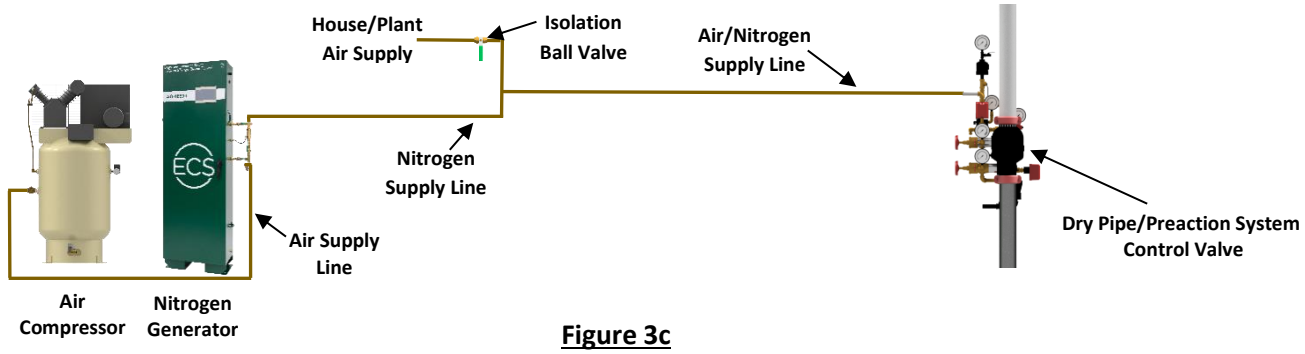
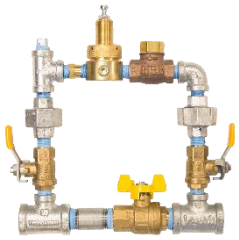


Figure 3c

Approved Air Maintenance Device (AMD)



Reliable - Model A

Tyco - Model AMD-1

Victaulic - Series 757

Step 7: Plumb the Condensate Drain Line

The Nitrogen Generator will occasionally discharge a small amount of condensate water from the coalescing filters inside the cabinet. It is recommended that the ¼" drain connection be plumbed to a floor drain or building exterior. When plumbing to a drain is not feasible, an evaporative collection chamber can be used.

The Nitrogen Generator includes an automatic draining function of the condensate water from the coalescing filters inside the cabinet. The autodrain function is programmed from the factory to momentarily drain upon initial start of a nitrogen generation cycle, momentarily drain upon each hour of runtime of a nitrogen generation cycle, and momentarily drain at the completion of a nitrogen generation cycle. (See section 6.b., HMI User Interface Information in the Maintenance Section for Nitrogen Generator Autodrain Settings Screen if adjustments are needed to the autodrain function).

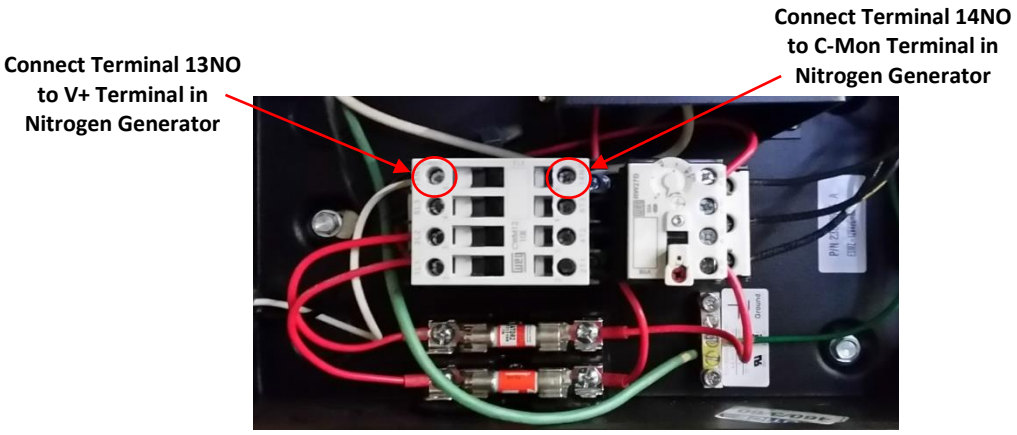
The air compressor will discharge a small amount of condensate water periodically from the air receiver tank auto-drain. The condensate water discharge time and frequency are based on the settings of the auto-drain. The auto-drain requires 120 VAC, 60 Hz, 1 phase unswitched power supply and can be connected to the same power supply as the nitrogen generator. Ensure the auto-drain is connected and the power supply is active.

Recommend: Set the discharge frequency (OFF Time) to twenty (20) minutes and the discharge time (ON Time) to ten (10) seconds. Adjust as necessary.

It is recommended that the ¼" drain connection be plumbed to a floor drain or building exterior. When plumbing to a drain is not feasible an evaporative collection chamber can be used.

Step 8: Connect the Air Compressor Running Monitor Contacts

The nitrogen generator and air compressor are designed to run for up to two (2) hours at a time when filling all the systems with 3-5 psig (.2-.3 bar) of high-purity nitrogen. To ensure the air compressor does not operate in excess of the anticipated run-time of the nitrogen generator and air compressor, the air compressor running can be monitored through the nitrogen generator. All wiring must be in accordance with manufacturer's published instructions and in accordance with the applicable national and/or local codes (i.e., NFPA 70).



Step 9: Connect Nitrogen Generator to the Internet (where applicable)

The nitrogen generator cabinet has ethernet cable connection to connect the nitrogen generator to the internet through a local area network (LAN). Connect the ethernet cable from the LAN to the ethernet connector in the nitrogen generator.

Step 10: Connect Nitrogen Generator Output Signals (where applicable)

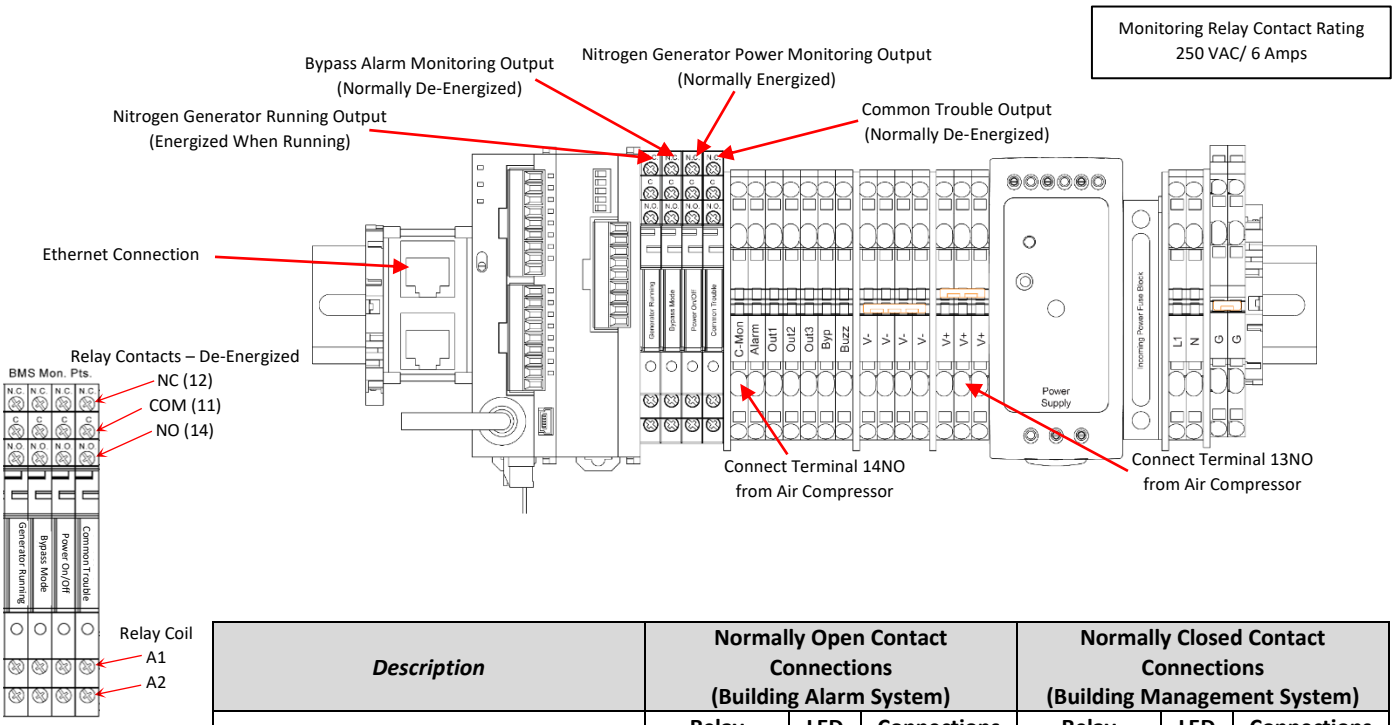
The nitrogen generator cabinet has two (2) system signals and four (4) outputs that can be monitored by the facility's Building Management System or Building Alarm System.

Two (2) system signals:

1. Bypass Alarm: The nitrogen generator operating in the bypass mode which is activated when the bypass valve is in the "fast fill" position to fill the fire sprinkler system and the air supplied directly from the air compressor has reached a pressure of 20 psig (1.4 bar).
    a. Indication on HMI Display
2. Common Trouble Audible Alarm: The nitrogen generator is equipped with a common trouble audible signal which is programmable to activated upon a predetermined trouble.
    a. Audible signal
    b. Contact ECS for specific procedures to reconfigure common trouble signal

Four (4) system output signals for monitoring through a building monitoring system, if desired:

1. Nitrogen Generator Running Mode: Form-C Contacts (Energized When Running, LED On)
2. Bypass Mode Alarm: Form-C Contacts (Normally De-Energized, LED Off)
3. Nitrogen Generator Loss of Power: Form-C Contacts (Normally Energized, LED On)
4. Common Trouble: Form-C Contacts (Normally De-Energized, LED Off)
    a. *Short Cycling:* Runs more than ten (10) times per hour
    b. *Excessive Runtime:* Continuous running for more than Four (4) hours
    c. Low Supply Line Pressure
    d. *Bypass Mode:* In Bypass for more than one (1) hour
    e. Filters Need Replacement



Description	**Normally Open Contact Connections (Building Alarm System)**			**Normally Closed Contact Connections (Building Management System)**		
	Relay	**LED**	**Connections**	**Relay**	**LED**	**Connections**
Nitrogen Generator Running Output (Running)	Energized	On	11 & 14	Energized	On	11 & 12
Bypass Alarm Monitoring Output	De-Energized	Off	11 & 14	De-Energized	Off	11 & 12
Nitrogen Generator Power Monitoring Output	Energized	On	11 & 12	Energized	On	11 & 14
Common Trouble Monitoring Output	De-Energized	Off	11 & 14	De-Energized	Off	11 & 12

COMMISSIONING and START UP PROCEDURE

Only qualified personnel should commission the new equipment into service once it is installed. **Once the nitrogen generator has been configured, there should be no reason to adjust them.**

Pre-Commissioning Information

Prior to setting the cut-in (turn-on) and cut-out (turn-off) pressures of the nitrogen generator, identify the following sprinkler system pressures:

1. Sprinkler system operating pressure/Air Maintenance Device (AMD) pressure.

   NOTE: When the nitrogen generator is connected to multiple dry pipe and preaction systems, the **fire sprinkler systems must operate at the same supervisory gas pressure**.

2. Sprinkler system low air alarm pressure.

Once the sprinkler system pressures have been identified, determine the cut-in (turn-on) and cut-out (turn-off) pressures of the nitrogen generator.

1. **Important:** The nitrogen generator cut-in (turn-on) pressure is to be 3-5 psig (.2-.3 bar) **below** the sprinkler system operating/AMD pressure.
2. **Important**: The nitrogen generator cut-in (turn-on) pressure needs to be 3-5 psig (.2-.3 bar) **above** the sprinkler system low air alarm pressure.
3. The nitrogen generator cut-out (turn-off) pressure is preset from the factory at 85 psig (5.9 bar) which should be adequate for most applications. Should a higher cut-out (turn-off) pressure be needed, adjust the cut-out (turn-off) pressure using the cut-out (turn-off) pressure adjustment procedure.

Commissioning Nitrogen Generator

The nitrogen generator commissioning must be completed for the nitrogen generator to operate. See Commissioning Section for procedure.

Start Up Procedure

To start up the generator or to put back in service, follow these steps:

NOTE: For component locations, see section 6.j., in the Maintenance Section for Generator Configuration Diagrams.

1. Verify that the air compressor is functioning properly.
2. Verify that the automatic drain on the compressor is functioning properly.
3. Verify the air maintenance devices (AMDs) have been set to the system operating or “high end” breathing pressure.
   a. Ensure AMD is calibrated to operate with nitrogen generator pressures using the Air Maintenance Device Pressure Adjustment Procedure (section 6.e.) in the Maintenance Section of this manual.
4. **Important:** Verify the nitrogen generator turn-on pressure is 3-5 psig (.2-.3 bar) psig **below** the AMD set pressure/sprinkler system supervisory gas operating pressure.
5. **Important:** Verify the nitrogen generator turn-on pressure is 3-5 psig (.2-.3 bar) psig **above** the sprinkler system low air alarm set pressure.
6. Verify the nitrogen generator is in the nitrogen generation mode with the air inlet isolation ball valve and the nitrogen outlet isolation ball valve in the open position; and the air bypass isolation ball valve in the closed position.

NOTE: The only time the nitrogen generator should need to be in the "air bypass" position is for the NFPA 13 30-minute system fill time requirement.

7. Turn the cabinet power switch ON (if not already on). The generator will prompt to complete the commissioning process through the HMI. See section 5.a., in the Commissioning Section for procedure.

System Filling Procedure

The sprinkler system(s) is (are) filled using the air from the air compressor connected to the nitrogen generator to meet the NFPA 13 30-minute fill requirement.

1. Close the nitrogen generator's air inlet isolation ball valve and the nitrogen outlet isolation ball valve.
2. Open the nitrogen generator's air bypass isolation ball valve.

   NOTE: Bypass indication on HMI screen will be displayed.

3. Open the fast fill valve and close the regulated valve of the appropriate air maintenance device (AMD) necessary to fill the sprinkler system(s).
4. Close the fast fill and regulated AMD valves on any system not being filled.
5. Air compressor will start running.
6. Once the sprinkler system(s) obtain the desired pressure:
   a. Open the nitrogen generator's air inlet isolation ball valve and the nitrogen outlet isolation valve.
   b. Close the nitrogen generator's air bypass isolation ball valve.

      NOTE: Bypass Alarm indication on HMI screen will be extinguished.

   c. Close the appropriate AMD fast fill valve and open the AMD regulated valve.
   d. Open AMD regulated valves that were previously closed on any systems not being filled.
7. Initiate the fourteen (14) day nitrogen inerting process (See Nitrogen Inerting Process in this section).
8. Once the nitrogen inerting process is completed, the nitrogen generator will continue to automatically operate when any of the associated sprinkler systems require nitrogen.

Nitrogen Inerting Process

1. Standard Vents
   a. Open the ball valve on the Standard Vent to initiate the fourteen (14) day nitrogen inerting process.
   b. Close the ball valve on the Standard Vent at the completion of the fourteen (14) day nitrogen inerting process.
2. SMART Vents
   a. Press the **Vent** button on the SMART Vent Controller which energizes the solenoid on the SMART Vent to initiate the fourteen (14) day nitrogen inerting process.
   b. At the completion of the fourteen (14) day nitrogen inerting process the SMART Vent Controller will automatically close the vent by de-energizing the solenoid.

3. Advanced**IQ** Vents
    a. Press the **Vent System** button on the Advanced**IQ** Vent Controller which initiates the fourteen (14) day nitrogen inerting process.
    b. At the completion of the fourteen (14) day nitrogen inerting process or when the nitrogen purity has obtained 98%, the Advanced**IQ** Vent Controller will automatically cease the nitrogen inerting process.

NORMAL OPERATION

Once in service, the nitrogen generator requires no additional intervention to function properly. Generator settings should not be altered without consulting ECS and the unit should not be powered down for any reason other than maintenance. To take the generator out of service for maintenance, follow these steps:

1. Close the air maintenance device (AMD) regulated and fast fill valve on the appropriate fire sprinkler system.
2. Power off generator cabinet.
3. Depressurize the nitrogen generator cabinet and/or air compressor before performing any work on either the nitrogen generator or the air compressor.

FIRE SPRINKLER SYSTEM MAINTENANCE PROCEDURE

In the event the fire sprinkler system requires maintenance or repair, the following procedure ensures the nitrogen inerting process will continue to function properly.

1. Close the air maintenance device (AMD) regulated and fast fill valve on the appropriate fire sprinkler system.
2. Depressurize the fire sprinkler system.
3. Complete the maintenance or repair work on the fire sprinkler system.
4. Refill the sprinkler system with air in compliance with the NFPA 13 30-minute fill requirement.
5. Open the appropriate fire sprinkler system AMD to pressurize the appropriate fire sprinkler system (See System Filling Procedure in this section).

Sequence of Operation

Once in service, the nitrogen generator requires no additional intervention to function properly. Nitrogen generator settings should not be altered without consulting ECS and the unit should not be powered down or bypassed for any reason other than a service or maintenance procedure as detailed in the Maintenance Section. The nitrogen generator operates in two (2) modes: Nitrogen Inerting Mode and Supervisory Gas Mode.

Nitrogen Inerting Mode

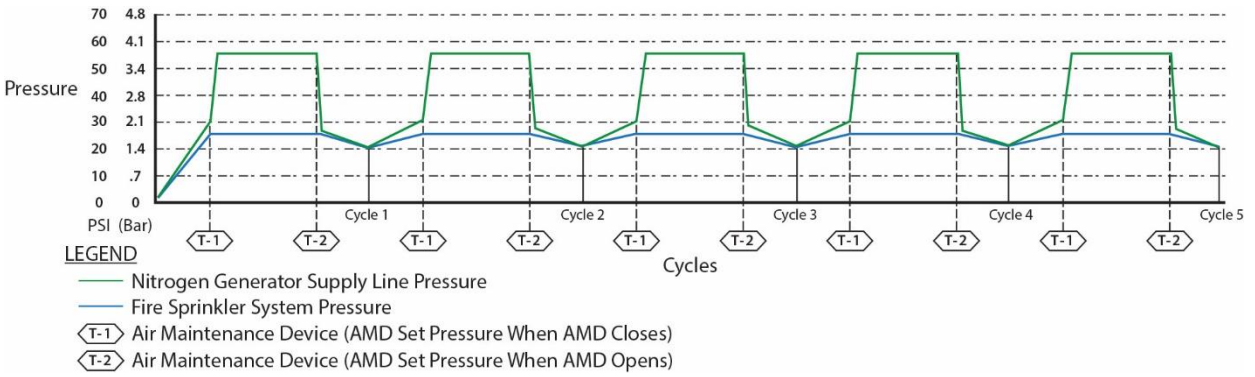
The application of supervisory nitrogen gas to a dry pipe or preaction fire sprinkler system using the ECS Dry Pipe Nitrogen Inerting (DPNI) protocol which is fundamentally different than the traditional application of compressed air as a supervisory gas. Because the DPNI protocol uses a process called "fill and purge breathing" it requires small (3-5 psig (.2-.3 bar)) supervisory pressure fluctuations in the fire sprinkler system(s) to remove oxygen before it can cause corrosion.

1. The nitrogen generator and compressor will cycle on to increase the pressure in all fire sprinkler systems connected to the nitrogen generator.
2. Once the high-end pressure of the breathing cycle is reached the air compressor and nitrogen generator will turn off and the fire sprinkler system(s) are allowed to depressurize gradually through the oxygen removal vent(s).
3. Once the low-end pressure of the breathing cycle is reached, the air compressor and nitrogen generator automatically turn on to repeat the process.
4. The high-end/turn-off pressure is determined by the pressure setting of the fire sprinkler system(s) air maintenance device (AMD) and the low-end/turn-on pressure is determined by the nitrogen generator's integral pressure transducer.
5. The air compressor and nitrogen generator are simultaneously cycling the pressure in all fire sprinkler system(s) by 3-5 psig (.2-.3 bar) during each cycle. This will result in longer run times of the air compressor and nitrogen generator than a traditional air compressor configured to supply supervisory gas.
6. The DPNI "fill and purge breathing" protocol described above is performed for a fourteen (14) day period, during this time the system pressure will fluctuate between the high-end and low-end breathing pressures.
7. Once the fourteen (14) day inerting period is complete and the ball valve on the Standard Vent is closed, the SMART Vent is automatically closed, or the Advanced**IQ** Vent is automatically closed; and the run frequency of the air compressor and nitrogen generator is reduced.

It is important to remember that closing the vents will not affect the runtime of the air compressor and nitrogen generator. It will only affect the frequency that the air compressor and nitrogen generator will run. The nitrogen generator and air compressor are designed to run for up to two (2) hours at a time when filling all the systems with 3-5 psig (.2-.3 bar) of high purity nitrogen.

If air compressor and nitrogen generator runtimes are greater than four (4) hours, contact ECS immediately.

ECS Nitrogen Generator Pressure Cycling for Dry Pipe and Preaction Fire Sprinkler Systems

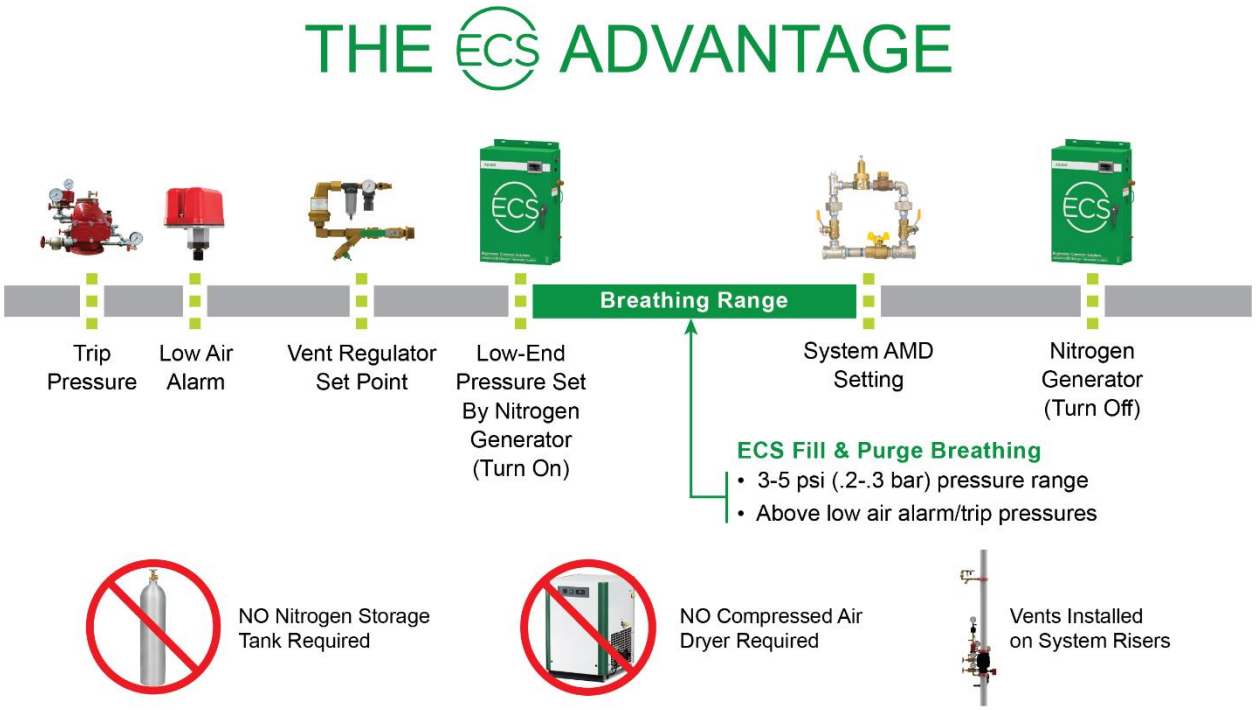


OPERATING NOTES:

1. The nitrogen generator produces nitrogen increasing the pressure in the nitrogen supply line which increases the pressure in the fire sprinkler system.
2. When the pressure in the fire sprinkler system reaches the pressure setting of the AMD, the AMD closes (no longer needing supervisory gas).
3. The nitrogen generator continues to produce nitrogen increasing the pressure in the nitrogen supply line until the cut-out pressure is reached and the nitrogen generator shuts off.
4. When the pressure in the fire sprinkler system decreases (inerting process or normal operation) below the pressure of the AMD, the AMD opens (needing supervisory gas).
5. The pressure in the nitrogen supply line equalizes with the pressure in the fire sprinkler system.
6. When the pressure in the nitrogen supply line and the fire sprinkler system decreases to the cut-in pressure of the nitrogen generator, the nitrogen generator turns on.
7. The nitrogen generator produces nitrogen increasing the pressure in the nitrogen supply line and the fire sprinkler system, repeating the nitrogen filling cycle.
8. The nitrogen inerting "fill & purge" process requires a 3-5 psig (.2-.3 bar) range between the cut-in pressure of the nitrogen generator and the pressure of the AMD to nitrogen inert the fire sprinkler system within fourteen (14) days.

GRAPH NOTE:

The pressures reflected in the graph are representative of the operating pressures in a typical dry pipe or preaction fire sprinkler system. Actual operating pressures may vary.



Supervisory Gas Mode

Once the DPNI "fill and purge breathing" protocol is complete the nitrogen generator will automatically operate in the Supervisory Gas Mode. Whenever a fire sprinkler system needs supervisory gas the nitrogen generator and compressor will automatically operate.

1. The vents no longer operate to depressurize the systems.
2. When the sprinkler systems reach the low-end pressure, the nitrogen generator and compressor will automatically turn on to increase the pressure in all fire sprinkler systems connected to the nitrogen generator.
3. Once the high-end pressure of the breathing cycle is reached the air compressor and nitrogen generator will automatically turn off.
4. It is important to remember that closing the vents will not affect the *runtime* of the air compressor and nitrogen generator it will only affect the *frequency* of the runtime of the air compressor and nitrogen generator. The nitrogen generator and air compressor are designed to run for up to two (2) hours at a time when filling all the systems with 3-5 psig (.2-.3 bar) of high purity nitrogen.

If air compressor and nitrogen generator runtimes are greater than four (4) hours, contact ECS immediately.

Restart of the Nitrogen Inerting Process

Whenever the fire sprinkler system(s) are serviced and refilled with air, the ECS DPNI protocol using the "fill and purge breathing" process must be reinitialized.

1. Standard Vent:
    a. Open the vent isolation ball valve to begin the venting process.
    b. The isolation ball valve on the vent(s) will need to be closed after fourteen (14) days to stop the Nitrogen Inerting Mode and begin the Supervisory Gas Mode.
2. SMART Vent:
    a. Press the **Vent** button on the SMART Vent control box which energizes the solenoid on the SMART Vent to begin the venting process.
    b. The SMART Vent(s) will automatically close at the end of the fourteen (14) day inerting period and the nitrogen generator and compressor will automatically transition from the Nitrogen Inerting Mode to the Supervisory Gas Mode.
3. Advanced**IQ** Vent
    a. Press the **Vent System** button on the Advanced**IQ** Vent controller which initializes the venting process.
    b. The Advanced**IQ** Vent(s) will automatically close at the end of the fourteen (14) day inerting period and the nitrogen generator and compressor will automatically transition from the Nitrogen Inerting Mode to the Supervisory Gas Mode.

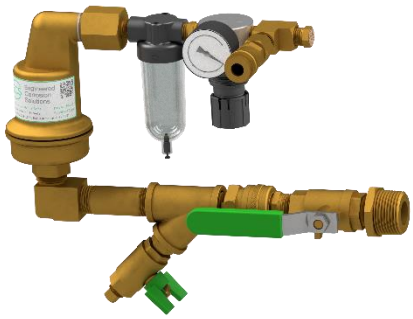
System Power Loss

In the event of a system power loss, all programmed information in the nitrogen generator is stored in the nitrogen generator and the nitrogen generator will automatically restart once system power is restored.

1. Where Standard Vents are installed, the system will automatically return to Nitrogen Inerting Mode or Supervisory Gas Mode, depending on which mode the nitrogen generator was in when the power loss occurred.
    a. If Standard Vent ball valve is open (Nitrogen Inerting Mode), then the ball valve needs to be manually closed upon completion of the fourteen (14) day DPNI process. The air compressor and nitrogen generator will automatically transition to the Gas Supervisory Mode.
2. Where SMART vents are installed, the system will automatically return to the Supervisory Gas Mode. When the system power loss is during the fourteen (14) day DPNI process, the DPNI process will need to be reinitialized.
    a. Press the **Vent** button on the SMART vent control box which energizes the solenoid on the SMART vent.
    b. The nitrogen generator and compressor will automatically cycle on operating in the nitrogen inerting mode.
    c. Upon completion of the fourteen (14) day DPNI process, the vents automatically close and the air compressor and nitrogen generator will automatically transition to the Gas Supervisory Mode.
3. Where Advanced**IQ** vents are installed, the Advanced**IQ** Vent Controller will automatically return to the sequence prior to the loss of power.

Auxiliary Equipment

OXYGEN REMOVAL VENT: STANDARD VENT PAV-D/DQ



For use under U.S. Patents
8,720,591, 9,144,700, 9,186,533 and 9,610466 B2

Specifications

Stock Number:	PAV-D/DQ
Service Pressure:	Up to 175 PSIG (12 Bar)
System Connection:	1” NPT Male
Temperature Range:	40°F to 120°F (4.5°C to 49°C)
Dimensions:	13.5” (W) X 7.5” (H) X 4.25” (D) (343mm (W) X 191mm (H) X 108mm (D))

Support Hanger Not Required

General Description

The ECS Standard Vent (PAV-D/DQ) provides oxygen venting in dry pipe and preaction fire sprinkler systems. As a fire sprinkler system is filled with a continuous supply of nitrogen gas from the nitrogen generator system, the PAV-D/DQ allows oxygen rich gas to be vented from the fire sprinkler system. Over a short period of time the vent will almost completely remove oxygen from the fire sprinkler system (less than 2% oxygen). The vent is equipped with a levered float valve that prevents water from passing through the restricted venting orifice when water enters the fire sprinkler system. The in-line filter protects the restricted venting orifice from contaminants from the sprinkler system. A backpressure regulator is included to prevent total system depressurization from the vent assembly during the venting process. The restricted venting orifice allows oxygen to be vented from the fire sprinkler system at a controlled rate to achieve a minimum of 98% nitrogen concentration. A special push fitting is provided to receive 5/32” tubing when the vent is used in conjunction with the SMART Gas Analyzer or the Advanced**IQ** Vent Controller.

Installation Instructions

1. The vent is equipped with a ball valve to be connected to the fire sprinkler riser. The contractor must install a 1” outlet (welded or mechanical) to connect the vent assembly to the sprinkler system on the system side of the main control valve. The ball valve must remain in the closed position until the nitrogen generator system has been commissioned.

   NOTE: The vent assembly does not require a support hanger.

2. Install the vent assembly in a level position. Recommended mounting height is 5’-10’ (2-3m) above the finished floor, but a minimum of 2’ (.6m) above the dry pipe or preaction control valve.

   NOTE: Piping to the vent assembly cannot be installed in a configuration that would trap water and prevent drainage to the sprinkler system; a water trap impedes the ability of the vent assembly to vent oxygen from the fire sprinkler system.

3. Inspection of the vent assembly should be performed after installation and hydrostatic testing of the fire sprinkler system. Inspection should be performed periodically thereafter in accordance with the applicable national codes, NFPA codes and standards, and/or the authority having jurisdiction.

NOTE: Inspection must include the condition of the in-line filter and checking for blockage in the Y-Strainer and the restricted venting orifice.

Operating Instructions

1. Verify the vent assembly has been equipped with a restricted venting orifice downstream of the backpressure regulator.

   NOTE: If the vent assembly is not equipped with a restricted venting orifice, one will be provided by ECS during system commissioning. The restricted venting orifice must be installed before proceeding with the steps below.

2. Determine the low air alarm pressure and the turn-on pressure of the nitrogen generator.
3. Choose a pressure setting for the backpressure regulator that is above the low air alarm pressure but below the turn-on pressure of the nitrogen generator.
4. Pull the knob out from the regulator to adjust pressure setting. Turn the knob clockwise to raise the pressure, counterclockwise to lower the pressure.
5. Close the ball valve and allow device to depressurize through restricted venting orifice to pressure setting. Make adjustment to pressure setting using the knob, then open ball valve to pressurize device and close ball valve again to check pressure setting. Repeat process until desired pressure setting is achieved.

   NOTE: This process can only be performed when fire sprinkler system is at normal operating pressure.

6. Push knob back into regulator until it clicks into place.
7. Once the nitrogen generator system has been commissioned, open the isolation ball valve on the vent assembly.

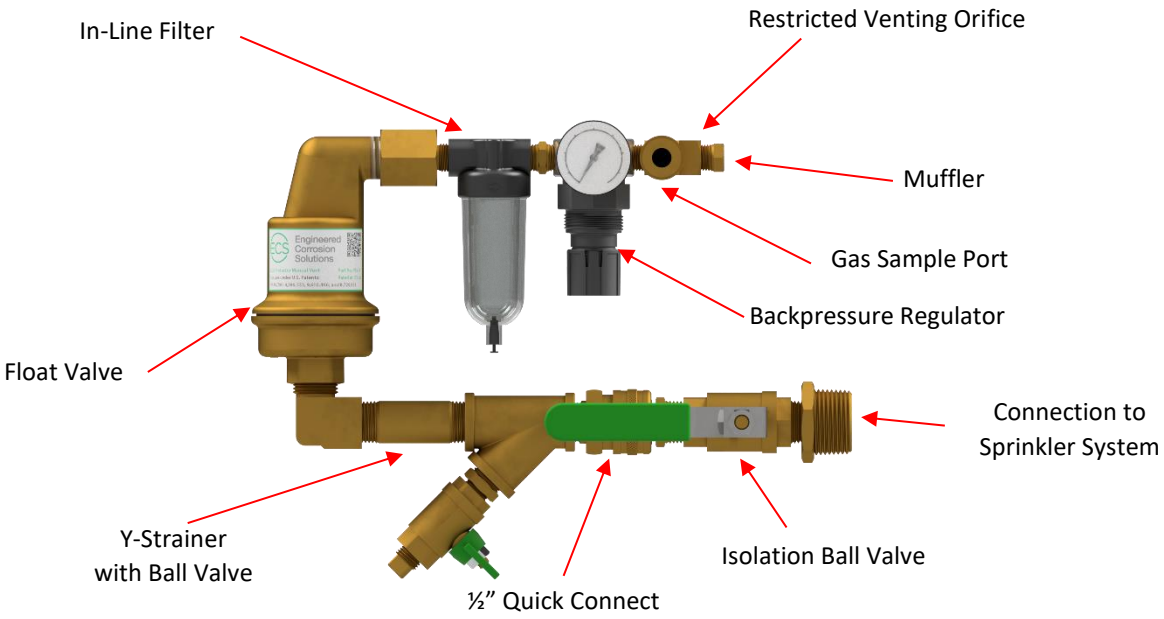
8a. Standard Vent Operation:

   a. The vent is now open and actively venting oxygen from the fire sprinkler system. It should remain open for approximately fourteen (14) days or less, until the system nitrogen concentration reaches 98% or greater.
   b. Close the isolation ball valve. Failure to close the isolation ball valve after fourteen (14) days or less, once fire sprinkler system nitrogen concentration reaches 98% will result in additional oxygen corrosion damage to the system and unnecessary run time of the air compressor and nitrogen generator.
   c. Use a Handheld Gas Analyzer to verify the gas concentration inside the fire sprinkler system.

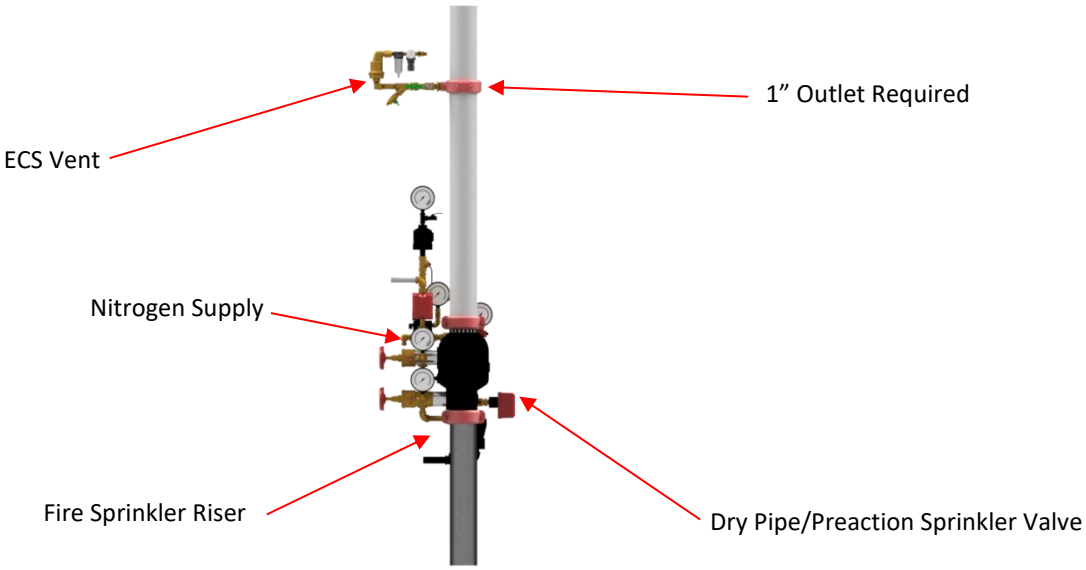
8b. The Advanced**IQ** Vent is now open and actively purging oxygen from the fire sprinkler system. It will remain open for approximately fourteen (14) days. The Advanced**IQ** Controller (AVC) will automatically stop the venting process.

9. If the sprinkler system actuates or another event introduces oxygen to the sprinkler system the isolation ball valve must be opened again for a period of fourteen (14) days to vent oxygen from the system.

ECS Standard Vent Assembly



ECS Vent Installation Schematic



OXYGEN REMOVAL VENT: SMART VENT PSV-D/DE

For use under U.S. Patents
8,720,591, 9,144,700, 9,186,533 and 9,610,466

Specifications

Stock Number:	PSV-D (PSV-DE)
Service Pressure:	Up to 175 PSIG (12 Bar)
System Connection:	1" NPT Male
Temperature Range:	40°F to 120°F (4.5°C to 49°C)
Dimensions:	
Vent Assembly:	13.5" (W) X 7.5" (H) X 4.25" (D) (343mm (W) X 191mm (H) X 108mm (D))
Control Box:	8" (W) X 10" (H) X 6" (D) (203mm (W) X 254mm (H) X 152mm (D))

Support Hanger Not Required

General Description

The ECS SMART Vent provides oxygen venting in dry pipe and preaction fire sprinkler systems. As a fire sprinkler system is filled with a continuous supply of nitrogen gas from the nitrogen generator system, the PSV-D/DE allows oxygen rich gas to be vented from the fire sprinkler system. Over a short period of time the vent will almost completely remove oxygen from the fire sprinkler system (less than 2% oxygen). The vent is equipped with a levered float valve that prevents water from passing through the restricted venting orifice when water enters the fire sprinkler system. The in-line filter protects the restricted venting orifice from contaminants from the sprinkler system. A backpressure regulator is included to prevent total system depressurization from the vent assembly during the venting process. The restricted venting orifice allows oxygen to be vented from the fire sprinkler system at a controlled rate to achieve a minimum of 98% nitrogen concentration. A special push fitting is provided to receive 5/32" tubing when the vent is used in conjunction with the SMART Gas Analyzer.

The SMART Vent is equipped with an electronic solenoid valve that must be wired to the electric control box (conductors not included). The control box will automatically close the vent once the desired nitrogen concentration has been reached. The control box is equipped with an on/off switch and a vent button to provide a means to restart of the venting process should oxygen be reintroduced into the fire sprinkler system.

Installation Instructions

1. The SMART Vent includes two (2) separate components. The first component is the vent assembly equipped with a ball valve to be connected to the fire sprinkler riser. The contractor must install a 1" outlet (welded or mechanical) to connect the vent assembly to the sprinkler system on the system side of the main control valve. The isolation ball valve must remain in the closed position until the nitrogen generator system has been commissioned.

   NOTE: The vent assembly does not require a support hanger.

2. Install the vent assembly in a level position. Recommended mounting height is 5'-10' (2-3m) above the finished floor, but a minimum of 2' (.6m) above the dry pipe or preaction control valve.

   NOTE: Piping to the vent assembly cannot be installed in a configuration that would trap water and prevent drainage to the sprinkler system; a water trap impedes the ability of the vent assembly to vent oxygen from the fire sprinkler system.

3. The second component of the SMART Vent is the electric control box. The control box must be installed on a wall or vertical surface adjacent to the vent assembly installation location.
4. Provide conductors from 120 VAC, 60 Hz (200-240 VAC, 50 Hz) power supply to designated terminals in the electric control box in accordance with the applicable national and/or local codes (i.e., NFPA 70). The device draws less than 2 amps. Contractor must drill hole in the control box to provide access for the 120 VAC, 60 Hz (200-240 VAC, 50 Hz) power supply conductors.
5. Provide conductors to connect the 120 VAC, 60 Hz (24 VDC) coil leads of the electronic solenoid valve on the vent assembly to the designated terminals in the electric control box in accordance with applicable national and/or local codes (i.e., NFPA 70). Contractor must drill hole on side or top of the control box to provide access.
6. The green power switch on the electric control box must remain in the OFF position until the nitrogen generator has been commissioned.
7. Inspection of the vent assembly should be performed after installation and hydrostatic testing of the fire sprinkler system. The inspection should be performed periodically thereafter in accordance with the applicable national codes, NFPA codes and standards, and/or the authority having jurisdiction.

   NOTE: Inspection must include verifying the condition of the inline filter and checking for blockage in the Y-Strainer and the restricted venting orifice.

Operating Instructions

1. Verify the vent assembly has been equipped with a restricted venting orifice downstream of the backpressure regulator.

   NOTE: If the vent assembly is not equipped with a restricted venting orifice, one will be provided by ECS during system commissioning. The restricted venting orifice must be installed before proceeding with the steps below.

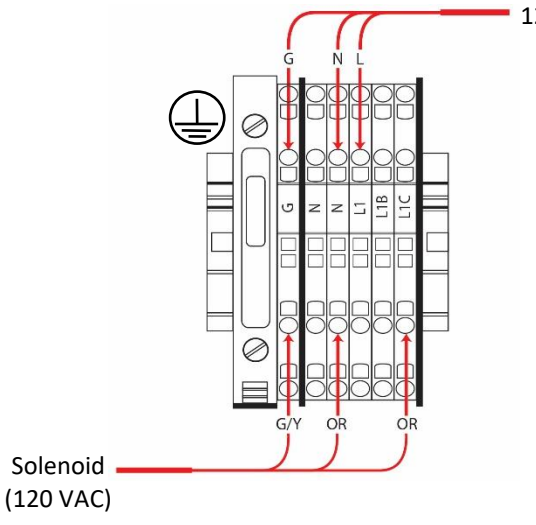
2. Determine the low air alarm pressure and turn-on pressure of the nitrogen generator.
3. Choose a pressure setting for the backpressure regulator that is above the low air alarm pressure but below the turn-on pressure of the nitrogen generator.

   NOTE: This process can only be performed when the solenoid on the vent is energized (power on and **Vent** button pressed), and fire sprinkler system is at normal operating pressure.

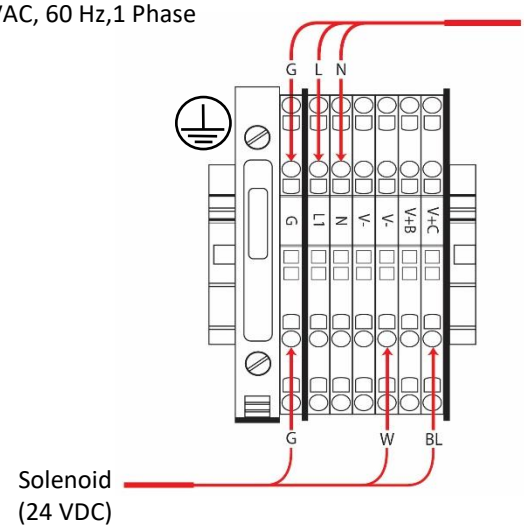
4. Pull the knob out from the regulator to adjust pressure setting. Turn the knob clockwise to raise the pressure, counterclockwise to lower the pressure.
5. Close the isolation ball valve and allow device to depressurize through restricted venting orifice to pressure setting. Make adjustment to pressure setting using the knob, then open the isolation ball valve to pressurize device and close the isolation ball valve again to check pressure setting. Repeat process until desired pressure setting is achieved.
6. Push knob back into regulator until it clicks into place.
7. Verify the timer settings inside the electric control box. The settings should be as follows: mode set to **E**, scale set to **20, 30, 40, 50, 60**, range set to **10h**, and timer knob set to **35**. If needed, a small flathead screwdriver can be used to make the timer setting adjustments.
8. Once the nitrogen generator system has been commissioned, open the isolation ball valve on the vent assembly, turn the green power switch on the electric control box to the ON position and push the **Vent** button. The button should now be illuminated.
9. The SMART Vent is now open and actively purging oxygen from the fire sprinkler system. It will remain open for approximately fourteen (14) days. The **Vent** button will turn off when the vent is closed.

10. If the sprinkler system actuates or another event introduces oxygen to the sprinkler system press the **Vent** button to restart the purging cycle.

ECS SMART Vent Control Box

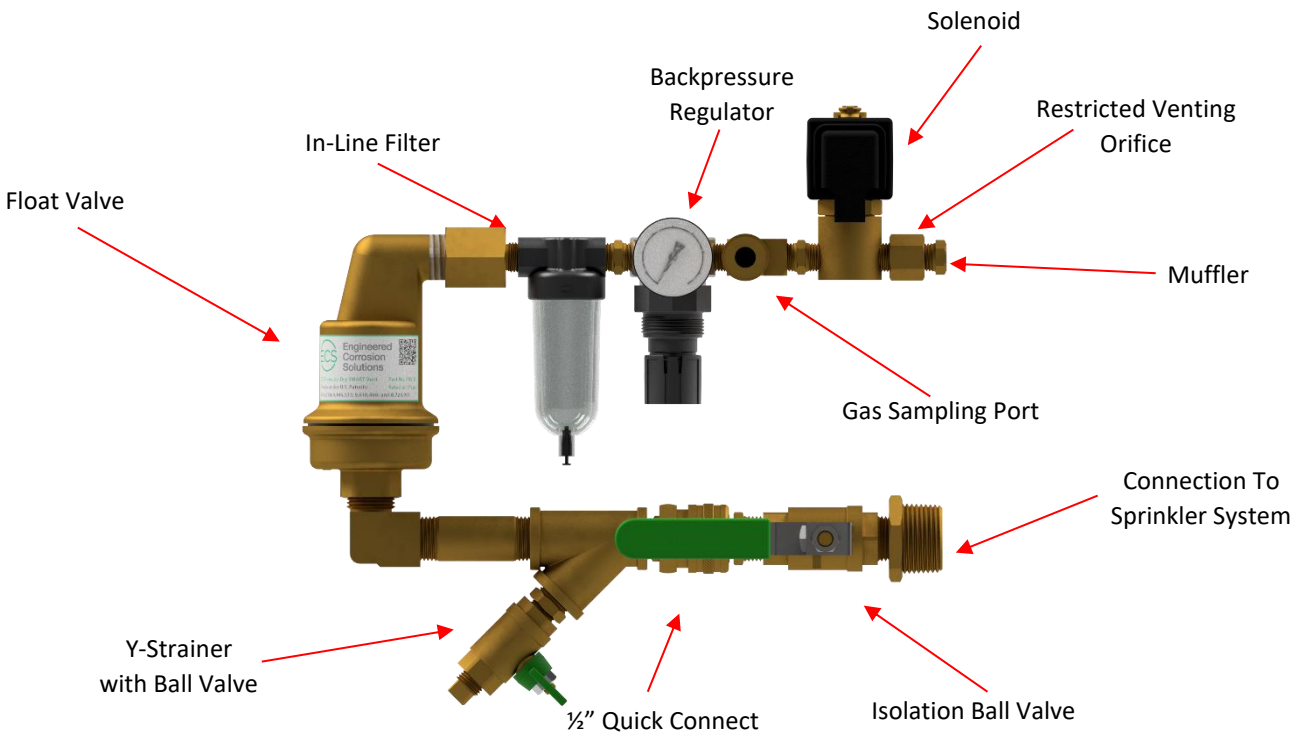


PSV-D Wiring Diagram

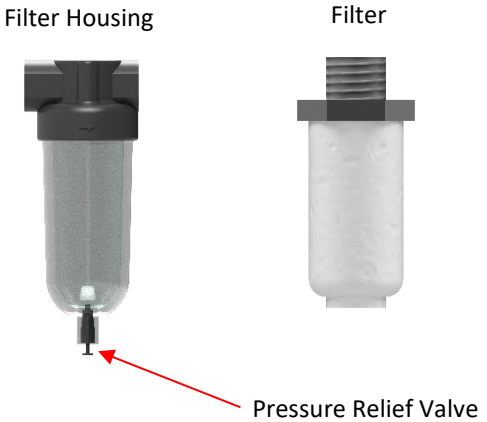


PSV-DE Wiring Diagram

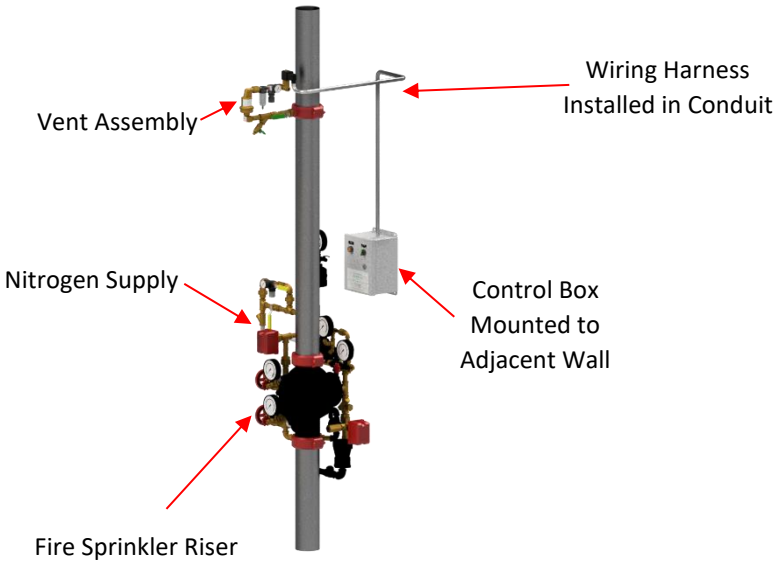
ECS SMART Vent Assembly



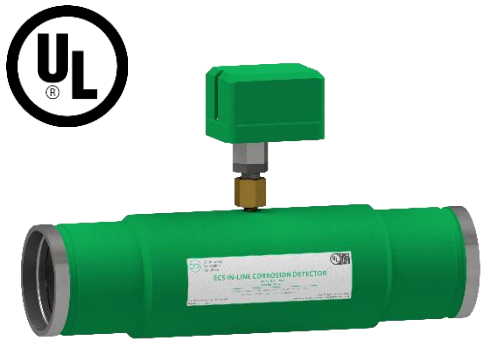
In-Line Filter Assembly



ECS SMART Vent Installation Schematic



MONITORING: IN-LINE CORROSION DETECTOR (ILD-X)



U.S PAT. No. 9,095736 and 9,839,802

Specifications

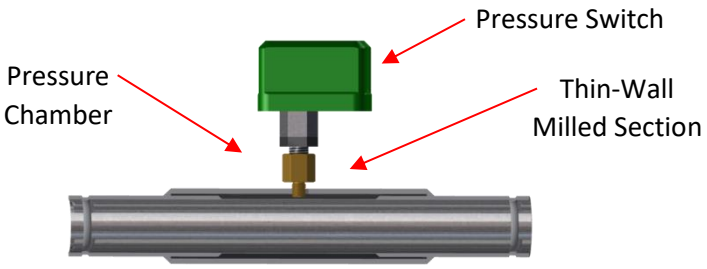
Stock Number:	ILD-X
Service Pressure:	175 psi
Temp. Rating:	-40°F to 120°F (-40°C to 49°C)
Elec. Connection:	dry contact
Pipe Size:	1.25” - 6”
Pipe Schedule:	Sch. 10 or Sch. 40
Pipe Material:	Black Steel or Galvanized

How to Order ILD-__ __ _____

Size	Pipe Material	Pipe Schedule
1.25” - 6”	G - Galvanized B - Black Steel	10 - Schedule 10 40 - Schedule 40

General Description

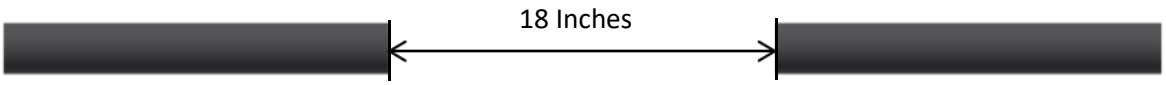
The ECS In-Line Corrosion Detector is designed to provide an early warning indication of internal corrosion activity in water-based fire sprinkler systems. The device is designed to be installed where corrosion is most likely to occur: the air/water interface. A cross-section of the device shows the two key attributes that allow for early detection of corrosion: an externally milled section of the pipe that creates a thin-wall section and a pressure chamber created by an external sleeve welded over the pipe. The thin-wall section of the device will fail before other system piping to provide an early warning indication. The In-Line Corrosion Detector is equipped with a pressure switch to monitor the pressure chamber. The In-Line Corrosion Detector can be remotely monitored through a buildings monitoring system.



Installation Instructions

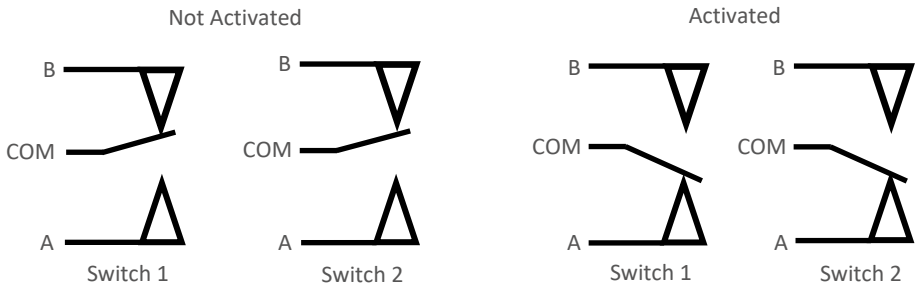
The In-Line Corrosion Detector is manufactured as a spool of piping with roll grooved ends for easy insertion into the fire sprinkler piping using standard mechanical couplings (supplied by others). All models of the In-Line Corrosion Detectors are eighteen (18) inches in length. The variety of pipe schedules and metal are listed in the table under ordering information.

1. Contact an ECS Engineer to determine a location within the sprinkler system where corrosion is likely to occur. In wet pipe systems locate on a high point at the air/water interface; in dry pipe and preaction systems locate on a horizontal portion of the mains in an area with trapped water.
2. At the chosen location in the fire sprinkler piping remove an eighteen (18) inch pipe section from the fire sprinkler system.



3. Roll groove the remaining ends of the fire sprinkler system piping to receive a standard mechanical coupling.
4. Install the In-Line Corrosion Detector of matching pipe material, diameter and schedule into the section space that has been created with the removal of the eighteen (18) inch pipe section. Orient the In-Line Corrosion Detector so that the pressure switch is accessible for maintenance. Tighten the mechanical couplings as per the manufacturer's specifications.
5. **(Optional)** Connect the wiring from the monitoring system to the pressure switch (dry contact) in accordance with the manufacturer's wiring instructions. Activation of the In-Line Corrosion Detector should be identified as a supervisory signal.

Model EPS10-2 Pressure Switch Electrical Connections



Response to Device Activation

Activation of the pressure switch indicates that the thin wall section of the device has failed and the pressure chamber is exposed to system pressure. Contact ECS for instructions regarding replacement and testing of the failed In-Line Corrosion Detector.

Monitoring: SMART Gas Analyzer (SGA-1)

For use under U.S. Patent 9,144,700 and 9,186,533

Specifications

Stock Number:	SGA-1
Sensor Type:	Zirconium Dioxide
Electrical Connection:	120-240VAC, 50-60 Hz/.5A 24VDC/2A
Signal Output:	0-5VDC linear output 4-20mA linear output
Output Display:	$\%O_2$ or $\%N_2$
Resolution:	1dp (nn.n%)
Accuracy:	1%
Sample Connection:	5/32" nylon tubing quick connect
Dimensions:	8" (W) X 10" (H) X 6" (D) (203mm (W) X 254mm (H) X 152mm (D))

General Description

The ECS SMART Gas Analyzer (SGA-1) provides a continuous real-time monitoring of nitrogen/oxygen concentration levels within a dry pipe and preaction fire sprinkler system. The analyzer samples discharge gas from an adjacent Standard Vent (PAV-D/DQ) or SMART Vent (PSV-D/PSV-DE). The gas flows out of a restricted orifice on the vent through pressure-rated tubing to provide slow, controlled flow to the analyzer. One (1) SGA-1 analyzer is recommended with each Nitrogen Generation System.

The SGA-1 has many different functions. It is equipped with a programmable contact closure for one of three different oxygen concentration levels (1%, 3%, and 5%), which will provide early warning to a user when the nitrogen concentration within the fire sprinkler system falls below the desired level. The SGA-1 is equipped with an analog (0-5VDC, 0-10VDC, or 4-20mA) output and an RS-485 port for optional remote control and monitoring. The SGA-1 can display either oxygen or nitrogen concentration.

The SGA-1 is equipped to protect itself from damage, and let the user know if the sensor is in poor health. Five minutes after the sensor is powered on, it begins a self-diagnostic protocol. If at this time the oxygen level is below .3%, the alarm relay will energize, and the sensor will automatically shut itself down. It will reboot automatically after twenty-four (24) hours and resume reading gas concentration levels. Pumping at extremely low oxygen levels can eventually cause damage to the sensor. If the sensor detects rapid deviation in oxygen concentration it will signal an error and energize the alarm relay without shutting down.

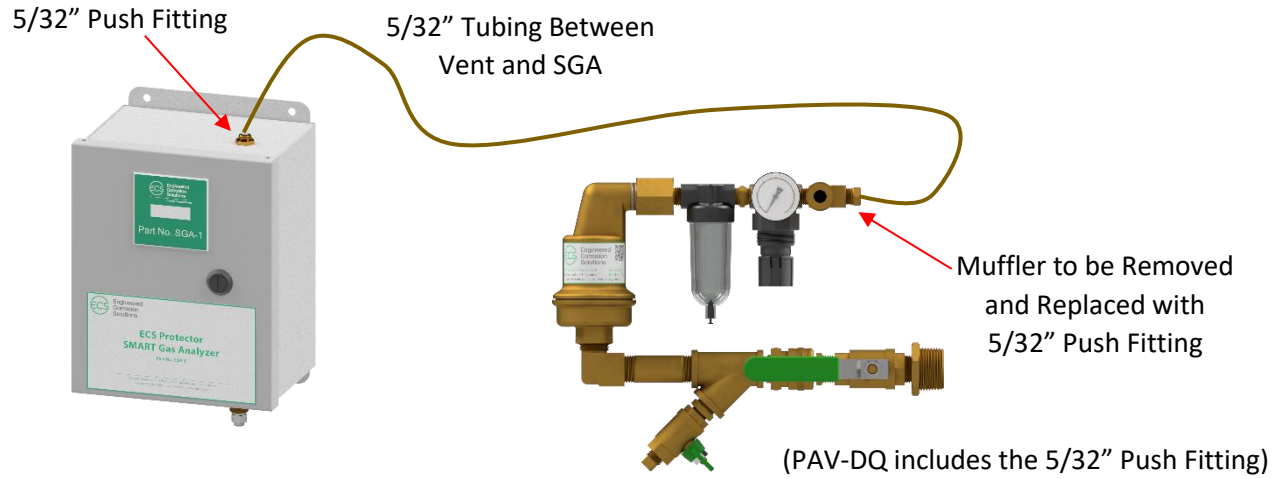
Installation Notes

1. When connecting the SGA-1 Gas Analyzer to a fire sprinkler system using the PAV-D/DQ Vent, a dedicated PAV-D/DQ Vent is required to provide a continuous gas stream to analyze. The muffler in the PAV-D must be removed and replaced with a 5/32" push-connect fitting. The PAV-DQ includes the 5/32" push-connect fitting.
2. When connecting the SGA-1 Gas Analyzer to a fire sprinkler system using the PSV-D/DE SMART Vent, the quick disconnect sampling port in the PSV-D/DE must be removed and replaced with a 5/32" push-connect fitting.

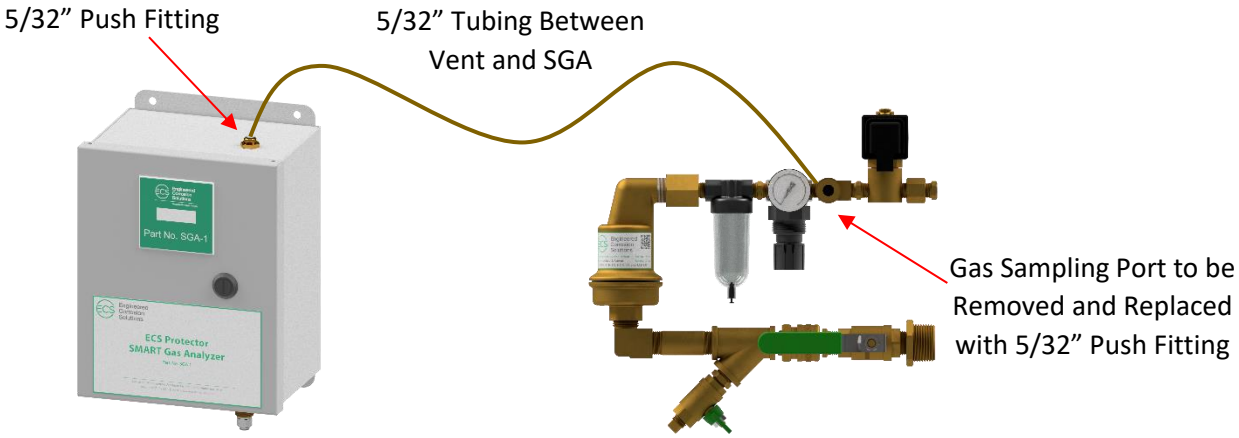
Installation Instructions

1. Mount the SMART Gas Analyzer on a wall adjacent to the PAV-D/DQ Vent or the PSV-D/DE SMART Vent (not included).
2. Once mounted, connect the 5/32" tubing to the push-connect fitting on the top of the SGA-1.
3. Connect the opposite end of the tubing to the push-connect fitting on the outlet of the PAV-D/DQ or PSV-D/DE Vent.

SMART Gas Analyzer with Dedicated PAV-D/DQ Standard Vent Assembly



SMART Gas Analyzer with PSV-D/DE SMART Vent Assembly



4. With the incoming power off, connect the incoming 120-240VAC, 50-60 Hz power supply to block **J6**.
5. Select the appropriate gas concentration level to be displayed on the SGA-1 using Dip 1 of Switch 1. Nitrogen (N_2) or Oxygen (O_2).

   NOTE: N_2 is recommended

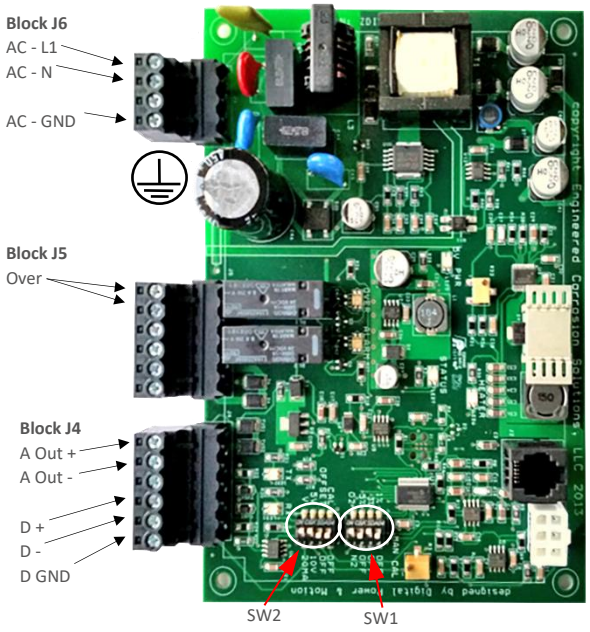
6. When monitoring and a (N.O.) contact closure required, connect to the **Over** contacts on block **J5** (J5-1 & J5-2).
   a. If a LOW Nitrogen (N_2)/HIGH Oxygen (O_2) percentage alarm is desired, select the corresponding oxygen concentration level using dip 2, 3 or 4 of Switch 1 to energize the **Over** relay output.
   b. Dip 2 of Switch 1 (5%) is recommended.
7. When monitoring and an analog output is required, connect positive lead to AOUT+ (J4-1) and negative lead to AOUT– (J4-2).
   a. 4-20mA Output - Turn on Dip 1 of Switch 2 to 4-20mA.
   b. 0-5VDC or 0-10VDC Output:
      i. Turn on Dip 1 of Switch 2 to **V**
      ii. Use Dip 2 of Switch 2 to select 5V (for 0-5VDC) or 10V (for 0-10VDC)
8. If RS-485 remote control/monitoring is desired, connect RS-485 leads to D+ (J4-4), D- (J4-5) and DGND (J4-6).

Alarm Bypass While Nitrogen Inerting Feature

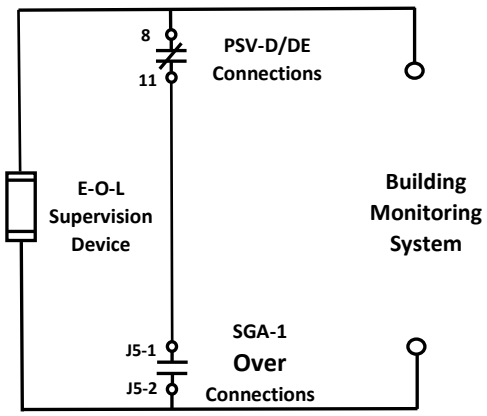
The **Over** contacts can be bypassed from transmitting a low nitrogen signal to the building monitoring system during the fourteen (14) day nitrogen inerting process when the SGA-1 is used in conjunction with the PSV-D/DE SMART Vent.

1. Connect the spare normally closed (N.C.) contacts (Terminals 8 and 11) in the PSV-D/DE SMART Vent Controller with the normally open (N.O.) contacts of the SGA-1 (Terminals J5-1 and J5-2).
2. Connect the output of the SGA-1 and PSV-D/DE to the building monitoring system.
3. Connect the building monitoring system's end-of-line supervision device (if needed).

PC Board Wiring Diagram



Inerting Bypass Wiring Diagram



Operating Instructions

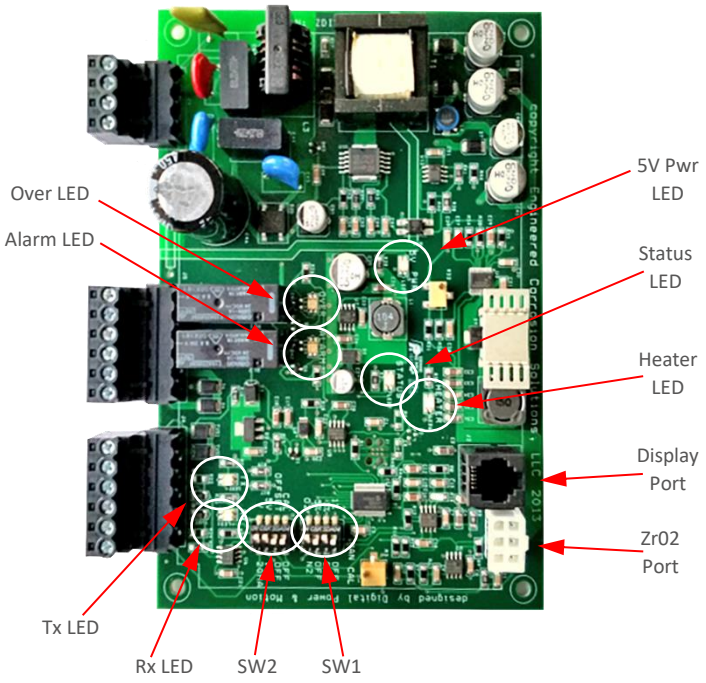
1. Once unit is verified to be wired correctly, power unit on. The status LED light will repeatedly flash green two times quickly for two (2) minutes. The sensor heater is warming up during this period.
2. After the two-minute warm-up period, the sensor and status LED light will flash green one time repeatedly indicating normal operation. At this time, the display will show the current average concentration of the feed gas.

Calibration

NOTE: Please contact ECS before any calibration adjustment

1. Allow SMART Gas Analyzer to sample fresh compressed air for a minimum of ten (10) minutes.
2. Switch N_2/O_2 switch (SW 1-1) to **O_2** position.
3. If digital display not reading approximately 20.9%, switch **CAL** switch (SW 2-4) to CAL position.
4. Allow SMART Gas Analyzer to remain in **Calibration Mode** and sample the gas for a minimum of ten (10) minutes to allow SMART Gas Analyzer to recalibrate.
5. Switch **CAL** switch (SW 2-4) to **Off** position.
6. Verify digital display is reading approximately 20.9%.
7. Switch N_2/O_2 switch (SW 1-1) to **N_2** position.

PC Board - LED Locations



LED Identification Chart

Status LED Color	Flash Code	Condition
Red	1	ERROR: Low Oxygen Level (less than .3%)
Red	2	ERROR: Assymetry (greater than 5%)
Green	1	Normal Operation
Green	2	Heater Warming Up
Green	3	Averaging Calibration Value
Green	4	Set Calibration Value If Needed

Commissioning

COMMISSIONING PROCEDURE

Safety Warning

Only qualified personnel should commission the new equipment into service once it is installed. Prior to any system commissioning on the nitrogen generator, ensure that the nitrogen generator is isolated from all system risers. Failure to do so can result in system damage and/or personal injury.

Commissioning Video

A commissioning video to assist with the commissioning process of this equipment is available. Access to the commissioning video can be obtained through the QR code on the back page of this document or by contacting ECS.

Commissioning Nitrogen Generator

The nitrogen generator commissioning is accomplished through the Human-Machine Interface (HMI) screen. The HMI screen provides the access for setup, monitoring and control functions of the nitrogen generator. See section 6.b. HMI User Interface Information in the Maintenance Section for HMI User Interface Screen information.

1. The HMI Home Screen includes a banner that requires the nitrogen generator to be commissioned prior to operation. To commission, press the commissioning note banner.
2. Check the nitrogen generator's nitrogen production and nitrogen purity, see section 6.d. in the Maintenance Section for Nitrogen Production Flow Rate Check and Nitrogen Purity Level Check Procedures.
    a. Isolate the nitrogen generator from the sprinkler system(s).
    b. Verify nitrogen generator is in the Nitrogen Production Mode.
    c. Open the flow meter ball valve to initiate nitrogen production.
    d. Check nitrogen production and nitrogen purity.
3. Enter the nitrogen production and nitrogen purity in the HMI Screen.
4. Check and adjust the time and date, as needed.
5. Enter sprinkler system operating pressures and nitrogen generator cut-in and cut-out pressures in HMI screen.
    a. Set the Sprinkler System Operating Pressure.
        i. Set PSI/Bar button to the appropriate position, if needed (Factory set for PSI).
            1) Press the display.
        ii. Enter the sprinkler system operating pressure.
            1) Press the pressure display, which displays a keypad.
            2) Enter the appropriate pressure, then press keypad **Enter** key.
    b. Set the nitrogen generator Cut-In (Turn-On) Pressure.
        i. Press the pressure display, which displays a keypad.
        ii. Enter the appropriate pressure, then press keypad **Enter** key.
    c. Set AMD In Use: Yes or No.
        i. Stand Alone nitrogen generators must be configured for AMD In Use.
        ii. Press the **Yes** button.
    d. Set the nitrogen generator Cut-Out (Turn-Off) Pressure.
        i. Press the pressure display, which displays a keypad.
        ii. Enter the appropriate pressure, then press keypad **Enter** key.

e. Set the sprinkler system Low Air Alarm Pressure.
    i. Press the pressure display, which displays a keypad.
    ii. Enter the appropriate pressure, then press keypad **Enter** key.
6. Enter the installation location information into the HMI Screen (recommended but not required).
    a. Press the appropriate display, which displays a keyboard.
    b. Enter the appropriate information, then press keypad **Enter** key.
7. Enter the Owner Contact information (recommended but not required).
    a. Press the appropriate display, which displays a keyboard.
    b. Enter the appropriate information, then press keypad **Enter** key.
8. Press the **Finish** Button.
9. Enter the Service Contractor Contact information in the Information Settings Screen (recommended but not required).
    a. Press the appropriate display, which displays a keyboard.
    b. Enter the appropriate information, then press keypad **Enter** key.

Sprinkler System Air Maintenance Device Pressure

The proper operation of the nitrogen generator and the dry pipe nitrogen inerting (DPNI) process is dependent on the sprinkler system's air maintenance device (AMD) pressure setting. Sprinkler system AMD pressure settings less than 3 psig (.2 bar) above the nitrogen generator cut-in (turn-on) pressure or greater than 5 psig (.3 bar) above the nitrogen generator cut-in (turn-on) pressure will have an adverse effect on the service life of the nitrogen generator.

Verify the AMD pressure setting using the Air Maintenance Device Pressure Adjustment Procedure (section 6.f.) in the Maintenance Section of this manual.

Nitrogen Generator Pressure Settings

Prior to setting the cut-in (turn-on) and cut-out (turn-off) pressures of the nitrogen generator, identify the following sprinkler system pressures:

1. Sprinkler system operating pressure/Air Maintenance Device (AMD) pressure.

    NOTE: When the nitrogen generator is connected to multiple dry pipe and preaction systems, the **fire sprinkler systems must operate at the same supervisory gas pressure**.

2. Sprinkler system low air alarm pressure.

Once the sprinkler system pressures have been identified, determine the cut-in (turn-on) and cut-out (turn-off) pressures of the nitrogen generator.

1. The nitrogen generator cut-in (turn-on) pressure is to be 3-5 psig (.2-.3 bar) **below** the sprinkler system operating/AMD pressure.
2. The nitrogen generator cut-in (turn-on) pressure needs to be 3-5 psig (.2-.3 bar) **above** the sprinkler system low air alarm pressure.
3. The nitrogen generator cut-out (turn-off) pressure is preset from the factory at 85 psig (5.9 bar) which should be adequate for most applications. Should a higher cut-out (turn-off) pressure be needed, adjust the cut-out (turn-off) pressure using the cut-out (turn-off) pressure adjustment procedure.

Nitrogen Generator Pressure Adjustments

The nitrogen generator cut-in (turn-on) and cut-out (turn-off) pressure settings are established and set as part of the commissioning process of the nitrogen generator and do not need to be readjusted unless the fire sprinkler system parameters change. Any adjustments to the nitrogen generator cut-in (turn-on) and cut-out (turn-off) pressure settings will affect the Standard Vent (PAV-D/DQ) or SMART Vent (PSV-D/DE) backpressure regulator settings, which will require readjusting the backpressure regulators to coincide with the changes to the nitrogen generator cut-in (turn-on) and cut-out (turn-off) pressure settings.

NOTE: Any changes to the nitrogen generator cut-in (turn-on) and cut-out (turn-off) pressure settings or the vent backpressure regulator settings must be authorized by and under the direction of ECS.

1. Nitrogen generator pressure adjustments are accomplished through the HMI display.
2. Adjust the nitrogen generator cut-in (turn-on) pressure. (See section 6.g., in the Maintenance Section for Nitrogen Generator Pressure Adjustment Procedure).
3. Adjust the nitrogen generator cut-out (turn-off) pressure, if needed. (See section 6.g., in the Maintenance Section for Nitrogen Generator Pressure Adjustment Procedure).

Nitrogen Generator Leak Monitor Alarm

The nitrogen generator and air compressor are designed to run for up to two (2) hours at a time when filling all the systems with 3-5 psig (.2-.3 bar) of high purity nitrogen. If air compressor and nitrogen generator runtimes are greater than four (4) hours, the nitrogen generator HMI displays a leak monitor alarm, activates an audible alarm and activates the common trouble output contacts.

Nitrogen Generator Start Up and System Check Instructions

Once the nitrogen generator has been programmed through the HMI, the nitrogen generator can be started to verify nitrogen production and nitrogen purity.

1. Verify the nitrogen generator is in the Nitrogen Generation Mode.
2. Verify the “fast fill” valves of all appropriate air maintenance devices (AMD)s are closed.
3. Close the regulated valve of all appropriate AMDs.
4. Turn on the nitrogen generator (if nitrogen generator is not already on).
5. Close nitrogen outlet valve on nitrogen generator.
6. Open the nitrogen production flow meter isolation ball valve to automatically start the nitrogen generator to generate nitrogen.
7. Allow the nitrogen generator to operate in the nitrogen production mode for approximately five (5) minutes to allow the nitrogen generator to obtain optimum operating temperature.

   NOTE: Air compressor must remain running continuously during the nitrogen generation cycle. If the air compressor cycles during the nitrogen generation cycle or an excessive amount of air is being exhausted from the excess air regulator muffler, the excess air regulator in the nitrogen generator may require adjustment. (See section 6.c., in the Maintenance Section for Excess Air Adjustment Procedure.)

8. Connect the Handheld Gas Analyzer to the quick connect gas sampling port in the nitrogen generator to verify the nitrogen purity is 98%.

   NOTE: Prior to connecting the Handheld Gas Analyzer to the nitrogen generator, calibrate the Handheld Gas Analyzer using the calibration procedures. (See section 6.d., in the Maintenance Section for Nitrogen Purity Check Procedure.)

9. The nitrogen purity was verified to be producing 98% nitrogen purity prior to equipment shipment from ECS. Should the purity not be 98%, contact ECS prior to making changes to the nitrogen purity.
    a. If the nitrogen purity is above 98%, decrease the nitrogen purity by turning the Nitrogen Flow Control Valve counterclockwise in ⅛ turn increments (See section 6.j., in the Maintenance Section for Generator Configuration Diagram).
    b. If the nitrogen purity is below 98%, increase the nitrogen purity by turning the Nitrogen Flow Control Valve clockwise in ⅛ turn increments (See section 6.j., in the Maintenance Section for Generator Configuration Diagram).

    IMPORTANT NOTE: Nitrogen purity and nitrogen production rate are inversely proportional in the nitrogen generator. **As the nitrogen purity increases (above 98%) the nitrogen production rate decreases (lower SCFH) and as the nitrogen purity decreases (below 98%) the nitrogen production rate increases (higher SCFH).** Lower nitrogen production rates will increase system fill times resulting longer run times of the nitrogen generator.

10. Verify and document the nitrogen production rate as indicated on the flow meter in the nitrogen generator (See section 6.d., in the Maintenance Section for Nitrogen Production Flow Rate Procedure).
11. Close the nitrogen production flow meter isolation ball valve, allow the pressure to increase to the nitrogen generator's cut-out pressure and the nitrogen generator to shut off.
12. Once nitrogen generator has shutoff, monitor the pressure on the HMI display to ensure the pressure indicated remains constant and does not decrease.
    a. If pressure decreases, a leak within the nitrogen cabinet or in the nitrogen supply line exists, leak check all piping and fittings within the nitrogen generator and repair leaks as necessary.
13. Open the nitrogen generator's nitrogen outlet isolation ball valve and confirm the nitrogen supply line to the AMDs does not contain any leaks, repair leaks as necessary.
14. Open the regulated valve of all appropriate AMDs and confirm the Fast Fill valves of all appropriate AMDs are closed.
15. The nitrogen generator is ready to protect the fire sprinkler system(s).

    NOTE: Once the nitrogen generator is operational and if the nitrogen generator experiences short cycling issues, the short cycling is typically a result of an erratically operating air maintenance device. (See section 6.e., in the Maintenance Section for Nitrogen Generator Short Cycling Prevention Procedure.)

Oxygen Removal Vent Setup and Pressure Regulator Adjustment Instructions

Once the nitrogen generator has been commissioned, the oxygen removal vents can be commissioned.

1. Install the appropriate restricted venting orifice in the oxygen removal vent by removing the vent muffler downstream of the backpressure regulator, installing the restricted venting orifice and re-installing the vent muffler.
    a. The restricted venting orifice size is determined by the sprinkler system capacity (gallons).
    b. Consult with ECS to ensure the appropriate restricted venting orifice is installed in the appropriate oxygen removal vent.
2. Based on the nitrogen generator turn-on pressure and the sprinkler system low alarm pressure, adjust the pressure setting for the backpressure regulator.
    a. Choose a pressure setting for the backpressure regulator that is **above** the low air alarm pressure and **below** the turn-on pressure of the nitrogen generator.
    b. PAV-D/DQ Standard Vents:

i. Pull the knob out from the regulator to adjust pressure setting. Turn the knob clockwise to raise the pressure, counterclockwise to lower the pressure.
ii. Close the isolation ball valve and allow device to depressurize through the restricted venting orifice to pressure setting. Make adjustment to pressure setting using the knob, then open the isolation ball valve to pressurize device and close the isolation ball valve again to check pressure setting. Repeat process until desired pressure setting is achieved.

NOTE: This process can only be performed when fire sprinkler system is at normal operating pressure.

iii. Push knob back into regulator until it clicks into place.
iv. Once the nitrogen generator system has been commissioned, open the isolation ball valve on the vent assembly. The Standard Vent is now open and actively venting oxygen from the fire sprinkler system.
v. The isolation ball valve should remain open for approximately fourteen (14) days or until the system nitrogen concentration reaches 98% or greater.

NOTE: Use a Handheld Gas Analyzer to verify the gas concentration inside the fire sprinkler system.

vi. At the conclusion of the fourteen (14) day DPNI process, close the isolation ball valve.

NOTE: Failure to close the isolation ball valve after fourteen (14) days or once fire sprinkler system nitrogen concentration reaches 98% will result in additional oxygen corrosion damage to the system and unnecessary run time of the air compressor and nitrogen generator.

vii. If the sprinkler system actuates or another event introduces oxygen to the sprinkler system, the isolation ball valve must be opened again for a period of fourteen (14) days to vent oxygen from the system.

c. SMART Vents:
i. Verify the timer settings inside the electric control box. The settings should be as follows:
1) Mode set to **E**
2) Scale set to **20, 30, 40, 50, 60**
3) Range set to **10h**
4) Timer knob set to **35**
5) If needed, a small flathead screwdriver can be used to adjust the timer settings.

NOTE: The green power switch on the electric control box must be in the ON position and the **Vent** button pressed with both the green power switch and the **Vent** button illuminated to adjust the vent pressure regulator.

ii. Pull the knob out from the regulator to adjust pressure setting. Turn the knob clockwise to raise the pressure, counterclockwise to lower the pressure.
iii. Close the isolation ball valve and allow device to depressurize through restricted venting orifice to pressure setting. Make adjustment to pressure setting using the knob, then open the isolation ball valve to pressurize device and close the isolation ball valve again to check pressure setting. Repeat process until desired pressure setting is achieved.

NOTE: This process can only be performed when fire sprinkler system is at normal operating pressure.

iv. Push knob back into regulator until it clicks into place.
v. Once the nitrogen generator system has been commissioned, open the isolation ball valve on the vent assembly, turn the green power switch on the electric control box to the ON position and push the **Vent** button. The button should now be illuminated.
vi. The SMART Vent is now open and actively venting oxygen from the fire sprinkler system. It will remain open for approximately fourteen (14) days.
vii. At the conclusion of the fourteen (14) day DPNI process, the **Vent** button will extinguish and the vent will automatically close.
viii. If the sprinkler system actuates or another event introduces oxygen to the sprinkler system press the **Vent** button to automatically restart the oxygen venting cycle.

Low Pressure Valves

When connecting a nitrogen generator to a low-pressure valve, additional considerations need to be evaluated. Due to the inherent operating pressures (i.e., 20 psi (1.4 bar) or below), the operational tolerances are tighter which reduces the pressure range for the "fill and purge" pressure cycling to operate.

1. Typical trip pressure for low-pressure valve is 7 psi (.5 bar).
2. Typical low air alarm pressure for low pressure valve is 10 psi (.7 bar).
3. Typical operating pressure for a low-pressure valve is 13 psi (.9 bar) minimum and 18 psi (1.2 bar) maximum.

Based on this information, the "fill and purge" breathing cycle needs to be reduced to a 3 psi (.2 bar) breathing range and determine the vent orifice size based on a 3 psi (.2 bar) breathing range.

1. Adjust the sprinkler system air maintenance device (AMD) to 18 psig (1.2 bar).
2. Set the nitrogen generator cut-in (turn-on) pressure to 15 psig (1 bar).

Check the operation and interaction between the nitrogen generator and the sprinkler system AMD.

NOTE: ALL pressures are measured from the Sprinkler System Air Gauge, unless otherwise indicated.

1. Check the turn-on function.
    a. Reduce sprinkler system pressure to 15 psig (1 bar) to check the turn-on function.
    b. If nitrogen generator automatically turns on, the nitrogen generator and sprinkler system air gauge are in alignment.
    c. If nitrogen generator does not automatically turn on, the nitrogen generator and sprinkler system air gauge are NOT in alignment.
        i. Verify pressure indicated on nitrogen generator HMI.

            Example: Nitrogen generator HMI indicates 16 psig (1.1 bar) and the sprinkler system air gauge indicates 15 psig (1 bar), 1 psig (.1 bar) difference between nitrogen generator HMI and sprinkler system air gauge.

        ii. Change the nitrogen generator cut-in (turn-on) pressure to align with pressure indicated on nitrogen generator HMI.

            Example: Change cut-in (turn-on) pressure form 15 psig (1 bar) to 16 psig (1.1 bar).

        iii. The nitrogen generator and sprinkler system air gauge are in alignment.

2. Check the turn-off function.
    a. Verify or lower the sprinkler system pressure is below the sprinkler system operating pressure (Example: 18 psig (1.2 bar)).
    b. If nitrogen generator is not running, manually turn on nitrogen generator and allow sprinkler system to refill and generator shut off.
    c. If sprinkler system pressure has returned to the sprinkler system operating pressure (Example: 18 psig (1.2 bar)), the turn-off function is operating properly.
    d. If sprinkler system pressure is not returned to the sprinkler system operating pressure (Example: 18 psig (1.2 bar)), use the Air Maintenance Device Pressure Adjustment Procedure (section 6.f.) in the Maintenance Section of this manual.
3. Repeat process to confirm nitrogen generator is automatically turning on and turning off as well the sprinkler system air gauge is operating between the nitrogen generator turn-on pressure (Example: 15 psig (1 bar)) and sprinkler system operating pressure (Example: 18 psig (1.2 bar)).

COMMISSIONING CHECKLIST

Fire Sprinkler System - General

Verify and document the quantity of fire sprinkler systems connected to the nitrogen generator:

Yes ☐ Qty. _____

Verify and document the capacity of each fire sprinkler systems connected to the nitrogen generator (gallons or sq. ft.): Yes ☐

Sys. #1 _____	Sys. #9 _____	Sys. #17 _____
Sys. #2 _____	Sys. #10 _____	Sys. #18 _____
Sys. #3 _____	Sys. #11 _____	Sys. #19 _____
Sys. #4 _____	Sys. #12 _____	Sys. #20 _____
Sys. #5 _____	Sys. #13 _____	Sys. #21 _____
Sys. #6 _____	Sys. #14 _____	Sys. #22 _____
Sys. #7 _____	Sys. #15_____	Sys. #23 _____
Sys. #8 _____	Sys. #16_____	Sys. #24 _____

Verify and document the make and model of air maintenance device(s): _____

Verify and document the pressure settings of the air maintenance device(s): _____

Verify and document the Systems(s) High Air Alarm Pressure: _____

Verify and document the Systems(s) Low Air Alarm Pressure: _____

Verify and document the Systems(s) Trip Pressure: _____

Verify and document the make and model of accelerator: _____

Air Compressor - Existing

Verify and document the location of the air compressor: _____

Verify and document the manufacturer of the air compressor: _____

Verify and document the model number of the air compressor: _____

Verify and document the serial number of the air compressor: _____

Verify and document the air compressor on/off pressure settings: _____

Verify and document if an air compressor exists and whether the existing air compressor(s) to remain: ☐ Yes ☐ No

If existing Yes: ☐ Primary ☐ Backup ☐ Meet NFPA 13 30-Minute Fill Requirement

Verify and document whether the fire sprinkler system(s) are supplied by house air: ☐ Yes ☐ No

If Yes, what pressure: _____

Air Compressor - New

Verify and document the location of the air compressor: _____

Verify and document the manufacturer of the air compressor: _____

Verify and document the model number of the air compressor: _____

Verify and document the serial number of the air compressor: _____

Verify and document the air compressor on/off pressure settings: _____

Verify and document the air compressor power supply voltage: _____

Verify and document whether the air compressor(s) is/are installed correctly: ☐ Yes ☐ No

If No, explain: _____

Verify and document whether the air compressor(s) is/are wired correctly: ☐ Yes ☐ No

If No, explain: _____

Verify and document whether the air compressor(s) rotation is correct: ☐ Yes ☐ No

NOTE: If rotation incorrect on 3-phase motor, reverse any two of the three incoming power wires to reverse the rotation

Verify and document if air compressor receiver tank auto-drain(s) is/are powered: ☐ Yes ☐ No

Verify and document the auto-drain(s) is configured for on time of ten (10) seconds and off time frequency is twenty (20) minutes (maximum):

☐ Yes ☐ No

Verify and document whether the auto-drain is/are plumbed to a drain: ☐ Yes ☐ No

Nitrogen Generator Equipment

Verify and document the location of the nitrogen generator(s): _____

Verify and document the quantity of the nitrogen generator(s): _____

Verify and document the model number of the nitrogen generator(s): _____

Verify and document the serial number of the nitrogen generator(s): _____

Verify and document whether the nitrogen generator(s) is/are installed correctly: ☐ Yes ☐ No

If No, explain: _____

Verify and document whether the nitrogen generator(s) is/are wired correctly: ☐ Yes ☐ No

If No, explain: _____

Programming of Nitrogen Generator's Pressure Settings

Turn On/Off Power Switch to the **On** position

Verify and document the cut-in or turn-on pressure of the nitrogen generator is **3-5 psig (.2-.3 bar) <u>below</u>** operating pressure of the fire sprinkler systems' air maintenance device(s): ☐ Yes ☐ No

If No, change the cut-in or turn-on pressure of the nitrogen generator to be **3-5 psig (.2-.3 bar) <u>below</u>** operating pressure of the fire sprinkler systems' air maintenance device(s) using the Nitrogen Generator Pressure Adjustment Procedure (section 6.g.) in the Maintenance Section.

Verify and document that the cut-in or turn-on pressure of the nitrogen generator is **<u>above</u> the low air alarm** pressure of the fire sprinkler system(s): ☐ Yes ☐ No

Verify and document the cut-in or turn-on pressure of the nitrogen generator: _____

Verify and document the cut-out or turn-off pressure of the nitrogen generator is above operating pressure of the fire sprinkler systems' air maintenance device(s): ☐ Yes ☐ No

If No, change the cut-out or turn-off pressure of the nitrogen generator to be above operating pressure of the fire sprinkler systems' air maintenance device(s) and below 85 psig (5.9 bar) using the Nitrogen Generator Pressure Adjustment Procedure (section 6.g.) in the Maintenance Section.

Verify and document the cut-out or turn-off pressure of the nitrogen generator: _____

Verify and document that the bypass/nitrogen generation valve is operating properly: ☐ Yes ☐ No

Verify and document the nitrogen back pressure regulator is set to 80 psig (5.5 bar): ☐ Yes ☐ No

Change if needed. Document regulator setting: _____

Open the isolation ball valve to the internal flow meter.

Connect the handheld gas analyzer (PHGA-1) to the gas sampling port of the nitrogen generator.

Allow the nitrogen generator to operate in nitrogen production mode for approximately five (5) minutes to ensure proper operating temperature of the nitrogen generator prior to adjusting nitrogen purity or measuring nitrogen production rate.

NOTE: The nitrogen generator will obtain optimum operating temperature faster if the nitrogen generator cabinet door is closed.

Adjust to Flow Control Valve in the nitrogen generator to obtain a nitrogen output purity level of 98%.

NOTE: Nitrogen purity and nitrogen production rate are inversely proportional in the nitrogen generator. As nitrogen purity increases, production decreases. Increase nitrogen purity by turning Flow Control Valve clockwise and decrease nitrogen purity by turning Flow Control Valve counterclockwise.

Verify and document the nitrogen output purity concentration: _____

Verify and document the nitrogen production rate as indicated on the flow meter: _____

Compare documented nitrogen output purity concentration and nitrogen production rate levels with the Shop Test Report provided in the nitrogen generator.

1. Readjust nitrogen output purity level using Flow Control Valve, as necessary, to obtain nitrogen output purity levels and nitrogen production rate comparable to the Shop Test Report, if discrepancies are significant.
2. If unable to obtain comparable nitrogen output purity levels and nitrogen production rate, contact ECS.

Close the isolation ball valve to the internal flow meter.

Disconnect the handheld gas analyzer (PHGA-1) from the gas sampling port of the nitrogen generator.

Leak check all plumbing throughout the nitrogen generator, include the air supply from the air compressor and the nitrogen supply to the fire sprinkler systems, repair any leaks found.

Verify and document that the no leaks exist in the nitrogen generator, air compressor supply line and fire sprinkler supply line: ☐ Yes ☐ No

Verify and document bypass/nitrogen generation ball valve in the nitrogen generator is in the nitrogen generation position: ☐ Yes ☐ No

Oxygen Removal Vents: PAV-D/DQ and PSV-D/DE

Verify and document the appropriate orifices for each venting device are available: ☐ Yes ☐ No

NOTE: Ensure the appropriate orifice is installed in the appropriate vent for each fire sprinkler system. The restricted venting orifice size is determined by the sprinkler system capacity (gallons). The restricted venting orifice ensures the oxygen removal process is completed in all fire sprinkler systems within the same approximate timeframe and within typically fourteen (14) days.

PAV-D/DQ Standard Vent

Verify and document the model and serial number of each oxygen removal vent installed: ☐ Yes ☐ No

Determine the pressure setting of the backpressure regulator of oxygen removal vent.

1. The backpressure regulator setting must be **below** the cut-in or turn-on pressure of the nitrogen generator and **above** the low air alarm pressure of the fire sprinkler system.

Verify and document the appropriate orifice in the oxygen removal vent: ☐ Yes ☐ No

Install the appropriate orifice in the oxygen removal vent.

Adjust the backpressure regulator setting on the oxygen removal vent:

1. Open and close the isolation ball valve on the oxygen removal vent to determine the pressure setting of the backpressure regulator.
2. Pull the knob out from the regulator to adjust pressure setting. Turn the knob clockwise to raise the pressure, counterclockwise to lower the pressure.
3. Repeat process until desired pressure setting is achieved.

   NOTE: This process can only be performed when fire sprinkler system is at normal operating pressure.

4. Once the desired pressure has been obtained on the backpressure regulator, push the knob on the regulator until it clicks into place.

Verify and document the backpressure regulator set point: _____

Verify and document isolation ball valve left in open position: ☐ Yes ☐ No

PSV-D/DE SMART Vent

Verify and document model and serial number of each oxygen removal vent installed: ☐ Yes ☐ No

Verify and document serial number of each oxygen removal vent control box installed: ☐ Yes ☐ No

Verify and document that the control box is properly installed: ☐ Yes ☐ No

If No, explain: _____

Verify and document wiring between the control box and the vent is properly installed: ☐ Yes ☐ No

If No, explain: _____

Verify the control box timer is programmed properly:

1. Mode is set to **E** ☐ Yes ☐ No
2. Scale is set to **20, 30, 40, 50, 60** ☐ Yes ☐ No
3. Range is set to **10h** ☐ Yes ☐ No
4. Dial is set to **35** ☐ Yes ☐ No

Turn on the control box. Verify and document control box is operating properly: ☐ Yes ☐ No

If No, explain: _____

Determine the pressure setting of the backpressure regulator of oxygen removal vent.

1. The backpressure regulator setting must be **below** the cut-in or turn-on pressure of the nitrogen generator and **above** the low air alarm pressure of the fire sprinkler system.

Verify and document the appropriate orifice in the oxygen removal vent: ☐ Yes ☐ No

Install the appropriate orifice in the oxygen removal vent.

Adjust the backpressure regulator setting on the oxygen removal vent:

1. Turn on the power switch to the control box and press the **Vent** button.
2. Open and close the isolation ball valve on the oxygen removal vent to determine the pressure setting of the backpressure regulator.
3. Pull the knob out from the regulator to adjust pressure setting. Turn the knob clockwise to raise the pressure, counterclockwise to lower the pressure.
4. Repeat process until desired pressure setting is achieved.

   NOTE: This process can only be performed when fire sprinkler system is at normal operating pressure.

5. Once the desired pressure has been obtained on the backpressure regulator, push the knob on the regulator until it clicks into place.

Verify and document the backpressure regulator set point: _____

Verify and document isolation ball valve left in open position: ☐ Yes ☐ No

Maintenance

Safety Warning

Only qualified personnel can perform inspection, testing and maintenance of the nitrogen generation equipment. Prior to any system maintenance on the nitrogen generation system, ensure that the nitrogen generator is isolated from the compressed air supply and all system risers. Ensure that the nitrogen generation system and the associated piping that is to be manipulated is completely depressurized prior to performing any maintenance. Failure to do so can result in system damage and/or personal injury.

Maintenance and Troubleshooting Warnings

1. Nitrogen Generator includes 120-240 VAC, 50-60 Hz voltage inside cabinet. Exercise caution and do not touch any wiring connections when power is applied to the unit.
2. Nitrogen Generator has hot surfaces inside cabinet when nitrogen generator is operating and after nitrogen generator has turned off. Exercise caution when working on nitrogen generator while operating and after nitrogen generator has shut off. **(*Wear Hand Protection where needed)***

ROUTINE CHECKS

The nitrogen generators require limited maintenance; however, it is advisable to routinely check the generator to ensure functionality. The following is a checklist and schedule for routine inspection.

Check	Occurrence
Verify all valves have smooth operation - clean and un-corroded	Quarterly
Verify all manual valves fully open and close	Quarterly
Verify compressor is turning on/off at low/high pressure	Quarterly
Verify correct nitrogen purity level out of cabinet sampling port	Quarterly
Verify pressure gauges are in working order	Quarterly
Change oil in air compressor (per manufacturer's recommendations)	Quarterly/500 hrs
Verify there are no noticeable leaks on unit	Quarterly
Check coalescing filters	Semi-annually
Check for loose connections in cabinet and control box	Semi-annually
Check air compressor filter, replace as necessary	Semi-annually
Check air receiver tank auto-drain strainer, clean as necessary	Annually
Replace coalescing filters	Annually
Verify Oxygen Removal Vent In-Line Filter and Y-Strainer are clean	Annually
Verify no air or water leaks in Oxygen Removal Vent	Annually

HMI USER INTERFACE INFORMATION

The nitrogen generator operation is accomplished through the Human-Machine Interface (HMI) screen. The HMI screen provides access for setup, monitoring and control functions of the nitrogen generator. All of the screens on the HMI are accessible from the Home Screen.

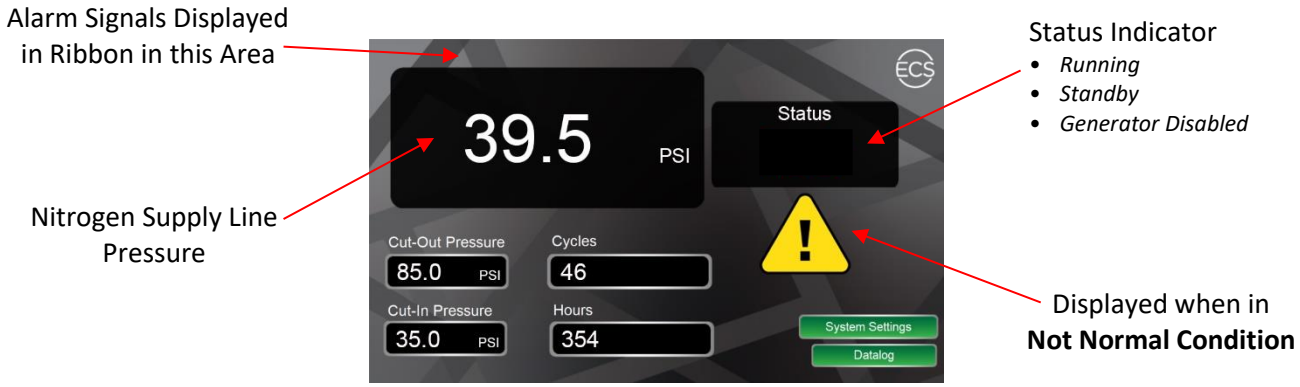
Home Screen

The Home Screen displays nitrogen supply line pressure, nitrogen generator cut-in and cut-out pressures, nitrogen generator status, nitrogen generator running hours and cycles. The Home Screen also provides access to System Settings Screen and Datalog Screen.

The Home Screen displays any alarm signals developed in the nitrogen generator across the top of the screen

NOTE: When the nitrogen generator status screen has three (3) different status:

1. *Running* - The nitrogen generator is running (producing nitrogen).
2. *Standby* - The nitrogen generator is not operating (not producing nitrogen).
3. *Generator Disabled* - The nitrogen generator is out of service.



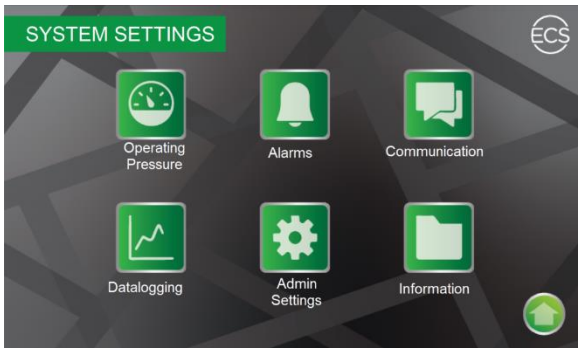
NOTE: Return to Home Screen

Return to Previous Screen

System Settings Screen

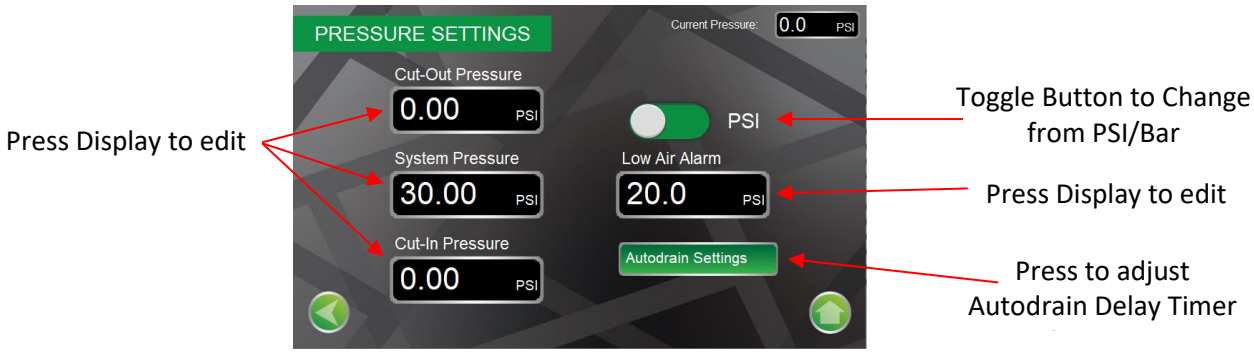
The System Settings Screen provides access to the Operating Pressure Screen, Alarms Screen, Communication Screen, Datalogging Screen, Admin Settings Screen and the Information Screen.

Press the appropriate button to set or to change the appropriate function



Operating Pressure Screen

The Operating Pressure Screen provides access to configure nitrogen generator to display pressure in **PSI** or **Bar**. The screen allows for setting nitrogen generator cut-in (turn-on) and cut-out (turn-off) pressures, sprinkler system operating pressure, and low air alarm pressures. The Operating Pressure Screen continuously displays the nitrogen supply line pressure.

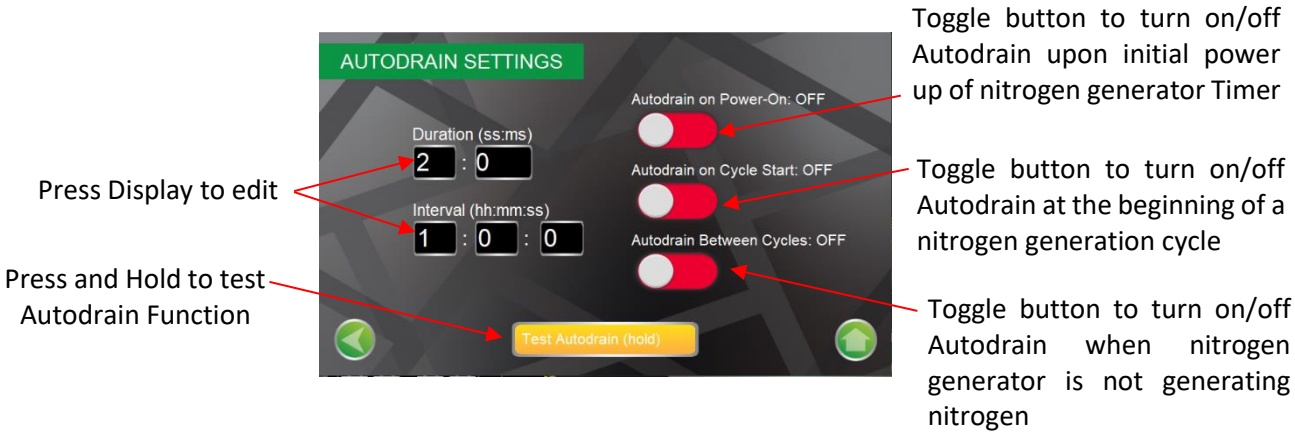


NOTE: If a pressure that is outside of the allowable operating pressures is entered, the HMI will prompt the user to enter a valid pressure.

	Cut-Out Pressure		Cut-In Pressure	
	With AMD	Without AMD		
Maximum	130 psi	System Pressure	10 psi Below System Pressure	Example System Pressure 30 psi Max - Cut-In Pressure 20 psi
Minimum	20 psi Above System Pressure	System Pressure	2 psi Below System Pressure	Example System Pressure 30 psi Min - Cut-In Pressure 28 psi

Autodrain Settings Screen

The autodrain function is programmed from the factory to momentarily drain (two (2) second duration) upon initial start of a nitrogen generation cycle, momentarily drain upon each hour (interval) of runtime of a nitrogen generation cycle, and momentarily drain at the completion of a nitrogen generation cycle. The in Settings Screen adjusts the interval and duration of the autodrain function, as well as the ability to turn on/off specific autodrain functions.



Alarm Settings Screen

The Alarm Settings Screen provides access to alarm settings on the nitrogen generator. Runtime Alarm (default 3.5 hours), Short-Cycle Alarm (default 10 cycles), Short-Cycle Alarm Time (default 1 hour). The alarm screen allows access to reset the short-cycle alarm signal, turn on/off the Filter Alerts function, turn on/off the Low Air Alarm. The Filter Alerts function signals when filter replacement is needed.

Press Display to edit

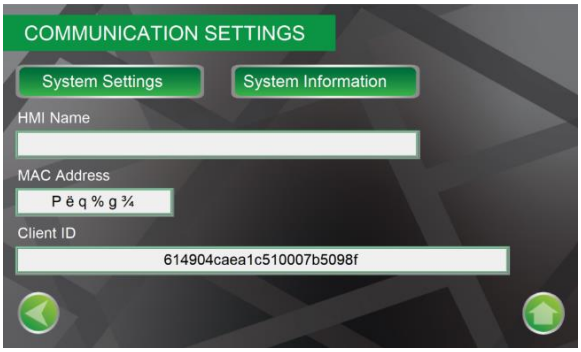
Press to Reset Short-Cycle Alarm Signal

Toggle Button to Turn On/Off Filter Alerts

Toggle Button to Turn On/Off Supply Line Low Air Alarm Signal

Communications Settings Screen

The Communications Settings Screen provides access to configure the remote communications to the nitrogen generator.

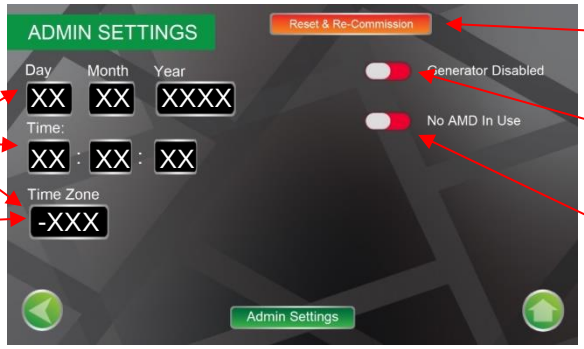


Contact ECS for specific procedure when communicating with the nitrogen generator remotely through the internet.

Admin Settings Screen

The Admin Settings Screen provides access to clock and calendar settings, identify whether the nitrogen generator is used with or without Air Maintenance Device (AMD) and selecting whether the nitrogen generator is disabled (Factory setting for shipping and prior to configuration) or enabled position (normal operation).

NOTE: If the nitrogen generator needs to be recommissioned, **Reset & Re-Commission** button can be pressed which will reset the nitrogen generator to the default settings.



Press Button to Reset Generator to Default Settings and Re-Commission

Press Display to edit

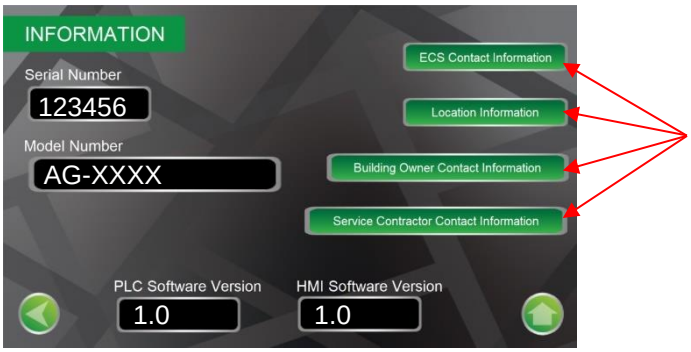
Toggle Button to Disable/Enable Nitrogen Generator

Time in minutes between current time and Greenwich Mean Time (GMT)
When Connected to the Internet

Toggle Button to AMD/No AMD In Use With Nitrogen Generator

Information Screen

The Information Screen displays the nitrogen generator's model number, serial number, PLC and HMI software version numbers. The Information Screen provides access to include the ECS Contact Information, Site Location Information, Building Owner's Contact Information, and Service Contractor Contact Information.

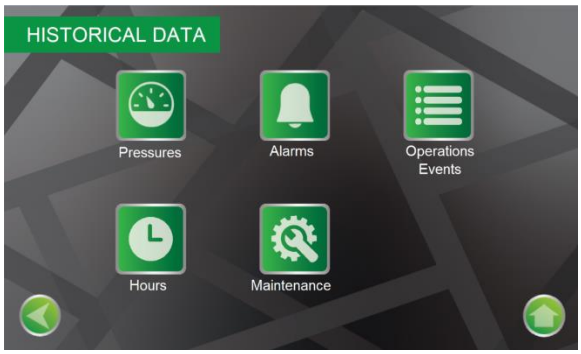


Press Display to edit

Datalog/Historical Data Screen

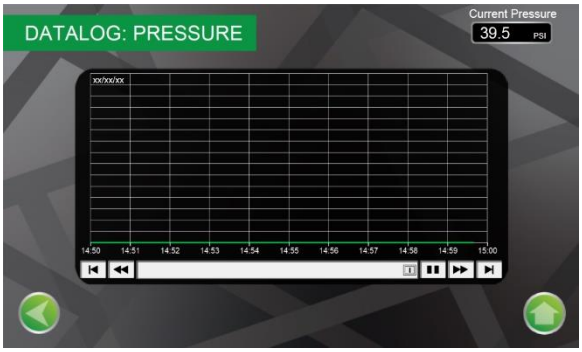
The Datalog/Historical Data Screen provides access to Historical Data stored in the HMI. The Datalog/Historical Screen allows access to Pressures Screen, Alarms Screen, Operations Events Screen, Hours Screen and Maintenance Screen.

Press the appropriate button to review the appropriate historical data information



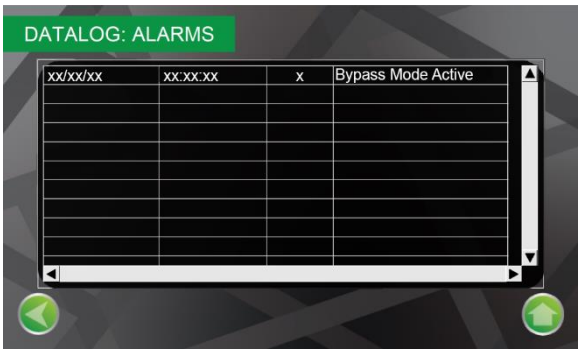
Pressures Screen

The Pressures Screen continuously logs and graphically displays the nitrogen supply line pressure.



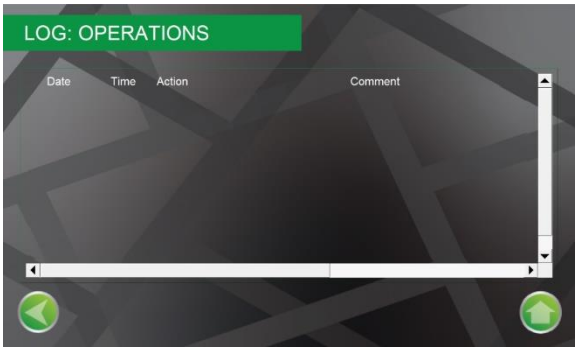
Alarms Screen

The Alarms Screen continuously logs and displays any alarms (low air, short cycling, extended run time and bypass mode) in the HMI.



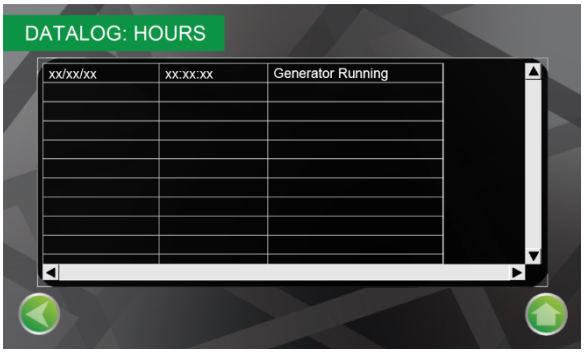
Log Operations Screen

The Log Operations Screen continuously logs and displays any changes to the programmed information stored in the HMI.



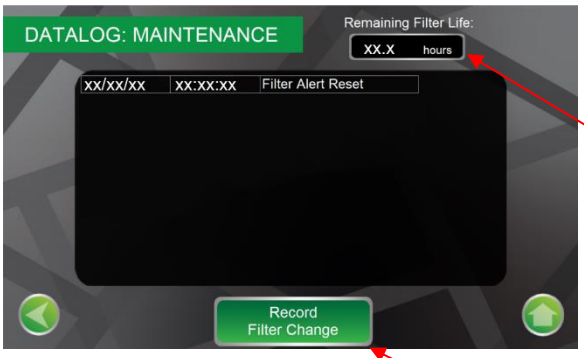
Hours Screen

The Hours Screen continuously logs and displays when the nitrogen generator is running (making nitrogen) and stops running (ceases to making nitrogen).



Maintenance Screen

The Maintenance Screen continuously tracks and records annual filter changes in the nitrogen generator. After replacing filters, press and hold “Record Filter Change” button for five (5) seconds which records the time and date of the filter change and resets the Filter Alert timer. The Maintenance Screen displays the anticipated remaining life of the filters in hours of use.



Displays Anticipated
Remaining Filter Life
Hours of Use

Press and Hold for five (5)
Seconds to Log Filter Change

NITROGEN GENERATOR EXCESS AIR ADJUSTMENT PROCEDURE

Air compressors used to meet the NFPA 13 30-minute fill requirement typically have a higher production rate than the maximum feed rate of the nitrogen generator separation membrane. When using the same air compressor to meet the NFPA 30-minute fill requirement and nitrogen production, the compressed air rate to the separation membrane must be held below the air compressor cut-out (turn-off) pressure to eliminate short cycling of the air compressor during the nitrogen production cycle. To prevent air compressor cycling, an excess air bleed-off assembly is included in the nitrogen generator. The excess air bleed-off assembly regulator is adjusted so that the air compressor operating pressure, when running in the nitrogen production mode, is below the cut-out (turn-off) pressure of the air compressor allowing the air compressor to operate continuously throughout the nitrogen production cycle.

1. If the air compressor’s air receiver tank pressure gauge and the excess air bleed-off regulator gauge, when operating, are more than 10-15 psig (.7-1 bar) below the cut-out (turn-off) pressure of the air compressor during nitrogen production cycle, decrease excess air bleed-off regulator (turn regulator clockwise). This raises the relief pressure of the regulator by exhausting less air thereby increasing the air compressor operating pressure resulting in increased nitrogen production.
2. If the air compressor is cycling during the nitrogen production cycle, increase excess air bleed-off regulator (turn regulator counterclockwise) until the pressure gauge on the regulator is approximately 10-15 psig (.7-1 bar) below the cut-out (turn-off) pressure of the air compressor. This lowers the relief pressure of the regulator by exhausting more air thereby decreasing the air compressor operating pressure, resulting in sustained operation below the air compressor cut-out (turn-off) pressure thus eliminating the air compressor short cycling.

NITROGEN PURITY AND FLOW RATE PROCEDURES

Nitrogen Purity Level Check Procedure

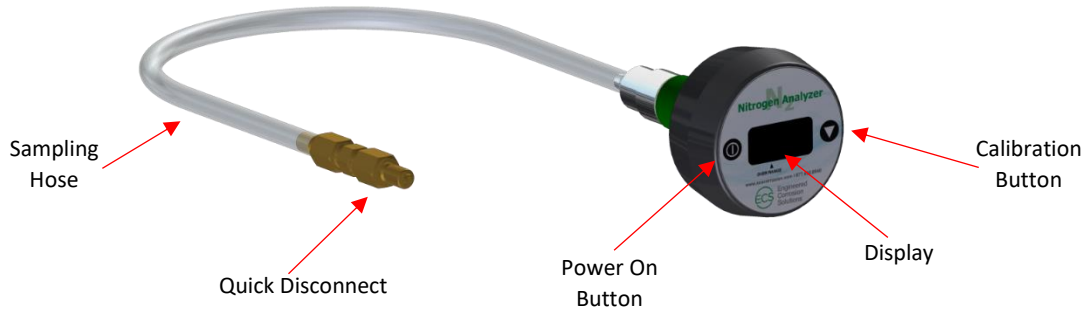
Nitrogen purity level in the fire sprinkler system can be checked by inserting the Handheld Gas Analyzer (PHGA-1) into the nitrogen sampling port in the nitrogen generator cabinet or the gas sampling port on the PAV-D/DQ and PSV-D/DE Vents.

1. Power On the PHGA-1 by pressing the power on button.
2. Calibrate the PHGA-1 by pressing and holding the calibration button for three (3) seconds until **CAL** is displayed.

   NOTE: To calibrate analyzer, unscrew sampling hose from analyzer and move back and forth until reading is displayed.

   a. PHGA-1 must be recalibrated if nitrogen percentage displayed is above 80.1% or below 78.1% when reading normal atmosphere, not connected to the nitrogen generator cabinet/vent.
   b. Recommended to recalibrate analyzer daily when in use.
3. Once the PHGA-1 is calibrated, insert the quick disconnect of the sampling hose into the sampling port in the nitrogen generator cabinet/vent.

   NOTE: Nitrogen generator must be operating (running) and in Nitrogen Production Mode to sample nitrogen in cabinet.
   Vent must be open to sprinkler system pressure to sample nitrogen in sprinkler system.
4. Allow one (1) minute for the PHGA-1 to stabilize, verify and document reading on PHGA-1 (nitrogen level should be approximately 98%). If nitrogen level from generator is below 96%, contact ECS.



Handheld Gas Analyzer - Factors Influencing Accurate Readings

1. Elevation changes will affect the accuracy of the nitrogen purity readings. The deviation of the nitrogen purity can be approximately 1% per 250 feet of elevation.
   a. Calibration of the instrument should be performed when elevation at which the product used changes more than 500 feet.
2. Temperature effects the accuracy of the nitrogen purity readings. The gas analyzer will hold calibration and correctly read nitrogen purity ±3% when thermal equilibrium within the operating temperature range. The device must be thermally stable when calibrated and allowed to thermally stabilize after experiencing temperature changes before readings are accurate.
   a. For best results, perform the calibration procedure at a temperature close to the temperature where analysis will occur.
   b. Allow adequate time for the sensor to equilibrate to a new ambient temperature.

CAUTION: **CAL Err St** may result from a sensor that has not reached thermal equilibrium.

Nitrogen Production Flow Rate Check Procedure

The production rate of the nitrogen generator can be verified using the production flow meter in the nitrogen generator cabinet (see section 6.j., for the Generator Configuration Diagrams).

1. With the nitrogen generator powered and in the nitrogen production mode:
   a. Open the nitrogen production flow meter isolation ball valve to automatically start the nitrogen generator.
   b. Close the regulated and fast fill valves on the air maintenance device (AMD) to the fire sprinkler system(s).
   c. Read and document the nitrogen production flow rate on the nitrogen production flow meter.
      i. Flow rate indicated is in standard cubic feet per hour (SCFH).
      ii. The production rate is measured using the center of the silver ball in the flow meter.
   d. Open the regulated valve on the AMD to the fire sprinkler system(s).
   e. Close the flow meter isolation ball valve.
   f. Compare the nitrogen production flow rate with the nitrogen production values listed in the following chart.

Nitrogen Generator Flow Rates

Nitrogen Generator	Production Rate – SCFH (L/min)	
	Bypass Mode	Nitrogen Generation Mode
AG-675 Wall Mount w/ Integral Air Compressor	150 (70.8)	20 (9.4)
AG-950 Wall Mount w/ Integral Air Compressor	198 (93.5)	27 (12.7)
AG-2000 Wall Mount w/ Integral Air Compressor	576 (271.8)	40 (18.9)
AG-3500 Wall Mount w/ Integral Air Compressor	576 (271.8)	90 (42.5)
AG-6500 Stand Alone w/ 7.5 hp Air Compressor	1,458 (681.1)	240 (113.3)
AG-11000 Stand Alone w/ 7.5 hp Air Compressor	1,458 (681.1)	240 (113.3)
AG-18500 Stand Alone w/ 7.5 hp Air Compressor	1,458 (681.1)	425 (200.6)
AG-22500 Stand Alone w/ 10 hp Air Compressor	2,100 (991.1)	550 (259.6)

NOTES: If production flow rate is lower than flow rates in the production chart, check pressure regulator of the excess bleed off assembly.

If production flow rate identified and documented varies more than 10% of the flow rates in the production chart, contact ECS.

NITROGEN GENERATOR SHORT CYCLING PREVENTION PROCEDURE

In situations where the nitrogen generator experiences short cycling, the short cycling is typically the result of an erratically operating air maintenance device (AMD). Installations where the AMD doesn't close properly or partially closes, the nitrogen supply line pressure increases to the cut-out (turn-off) pressure of the nitrogen generator before the sprinkler systems being supplied are at the proper operating pressure. Because one or more of the supplied systems did not reach the proper operating pressure when the nitrogen generator shuts off. The nitrogen supply line depressurizes through the AMD into the sprinkler system(s). This depressurization allows the supply line pressure to fall below the cut-in (turn-on) pressure of the nitrogen generator resulting in the nitrogen generator turning on. The process of filling the nitrogen supply line is repeated.

NOTES:

1. Exacerbated by a small or short nitrogen supply line between the nitrogen generator and sprinkler system.
2. Nitrogen Generator Short Cycling Prevention Device (*AG-18500 and AG-22500 only*) regulator should be fully closed unless used.
3. Nitrogen Generator Short Cycling Prevention Device (*AG-18500 and AG-22500 only*) is typically not needed in most applications. Adjust as necessary, when needed.

Procedure:

1. Increase set point of AMD to prevent premature shut-off of AMD regulator.
2. If set point modifications do not prevent short-cycling, repair (clean out) or replace the erratically operating AMD.

Procedure Option for AG-18500 and AG-22500 Only

If AMD repair/replacement unsuccessful, the AG-18500 and AG-22500 nitrogen generators include a short cycling prevention assembly. The short cycling prevention assembly allows a controlled leak after the sprinkler system's AMD closes to reduce the pressurizing of the supply line to the cut-out pressure of the nitrogen generator which reduces the potential of the nitrogen generator short cycling.

1. If needed, the short cycle prevention regulator is to be adjusted to open at 10 psig (.7 bar) above the sprinkler system operating /AMD set pressure.
   a. Normal Operation: Regulator should be closed completely
   b. Short Cycle Prevention: Adjust regulator to open 10 psig (.7 bar) above the sprinkler system operating /AMD set pressure.
      1) Turn regulator clockwise to increase pressure.
      2) Turn regulator counterclockwise to decrease pressure.

NOTE: The short cycle prevention assembly is not a substitute for repairing an erratically operating AMD. The short cycle prevention assembly reduces short cycling of the nitrogen generator by increasing the time to pressurize the nitrogen supply line.

AIR MAINTENANCE DEVICE PRESSURE ADJUSTMENT PROCEDURE

The sprinkler system air maintenance device (AMD) operating pressures are determined by the sprinkler system valve, system water pressure and water delivery time requirements as defined by NFPA 13. The AMD operating pressures should not need to be readjusted unless one of the above fire sprinkler system parameters change.

The following procedure has been developed to compensate for:

1. *Tolerances of the gauges used on fire sprinkler systems*
2. *Inlet pressure fluctuations to the AMD resulting in pressure fluctuations of the AMD.*
3. *Interaction between AMDs when multiple sprinkler systems are connected to a single nitrogen generator.*

NOTES:

1. When the nitrogen generator is connected to multiple dry pipe and preaction systems, the **fire sprinkler systems must operate at the same supervisory gas pressure**.
2. Any changes to the AMD pressure settings must be correlated with the nitrogen generator cut-in (turn-on) and cut-out (turn-off) pressure settings, and be authorized by and under the direction of ECS.

3. Accuracy of pressure gauges typically used in the fire sprinkler industry can vary as much as 8-12 psi (.55-.83 bar) (See Operational Information (section 1.d.) for Sprinkler System Gauge Accuracy).

Determine the operating pressure for all AMDs connected to a single nitrogen generator. The operating pressure must be the same for all AMDs.

NOTE: AMDs operating at different operating pressures will have an adverse effect on the operation and can reduce the service life of the nitrogen generator.

Initial Setting of AMDs *(Revised numbering)*

1. Close the valves to all accelerators on the sprinkler systems (if installed).
2. **Systems not being checked -** Close all the AMD valves.
3. **System being checked -** Verify the AMD fast fill (bypass) valve is open and the inlet/outlet (regulated) valves are closed.
4. Use the flow meter ball valve to relieve gas from nitrogen/air supply line to sprinkler system's AMD allowing the nitrogen generator to cycle on.
5. Set nitrogen generator to bypass (air only mode) and fast fill sprinkler system with air to 3-5 psig (.2-.3 bar) **below** operating pressure.
6. Change nitrogen generator to nitrogen mode, open the AMD inlet/outlet (regulated) valves, close AMD fast fill (bypass) valve and complete filling of sprinkler system.
7. When sprinkler system air pressure gauge reaches desired system operating pressure:
    a. Slowly decrease AMD regulator pressure (turn counterclockwise) until pressure indicated on HMI transitions from steady pressure to climbing pressure, the AMD regulator should be properly set.
8. Verify AMD operating with nitrogen generator using AMD Operation with nitrogen generator verification procedure.
9. Repeat 4 thru 8 for each additional AMD connected to the nitrogen generator.

AMD Operation with Nitrogen Generator - Verification

1. **Systems not being checked:** Close all the AMD valves.
2. **System being checked:** Verify the AMD fast fill (bypass) valve is closed and the inlet/outlet (regulated) valves are open.
3. Set the cut-in (turn-on) pressure of the nitrogen generator to 3-5 psig (.2-.3 bar) **below** the AMD set pressure (See section 6.g., in the Maintenance Section for the Nitrogen Generator Pressure Adjustment Procedure).
4. Slowly drain 3-5 psi (.2-.3 bar) of pressure out of the sprinkler system.
5. Use the flow meter ball valve to relieve gas from nitrogen/air supply line to sprinkler system AMDs allowing the nitrogen generator to turn on.
6. Allow the sprinkler system to fill with nitrogen while monitoring the pressure on the HMI LCD display in the nitrogen generator.
    a. As pressure increases in sprinkler system and on the HMI LCD display (through the AMD), the pressure increase will be gradual.
    b. When the sprinkler system operating pressure reaches the AMD set pressure and the AMD closes:
        i. The pressure on the sprinkler system air gauge will stop rising.
        ii. The pressure on the pressure HMI LCD display will increase at a rapid pace until the nitrogen generator turns off (cut-out pressure).

7. Compare the pressure indicated on the HMI LCD display at the transition (gradual increase to rapid increase) with the pressure indicated on the system air pressure gauges.

   NOTE: The pressure indicated on the HMI LCD display at the transition of gradual to rapid increase will be the pressure at which the AMD pressure regulation device is currently set.

   a. If the pressure indicated on the HMI LCD display at the transition (gradual increase to rapid increase) is the sprinkler system's target pressure, proceed to **9.**
   b. If the pressure indicated on the sprinkler system's air pressure gauge at the transition (gradual increase to rapid increase) is **LESS THAN** the sprinkler system's target pressure, proceed to **8a.**
   c. If the pressure indicated on the sprinkler system's air pressure gauge at the transition (gradual increase to rapid increase) is **MORE THAN** the sprinkler system's target pressure, proceed to **8b.**
8. Pressure settings.
   a. If the pressure on the sprinkler system's air pressure gauge is **LESS THAN** the target operating pressure, increase the pressure setting of the AMD by ¼ of a turn increment (cw) (increment can be different at discretion of operator) and return to **5.**
   b. If the pressure on the sprinkler system's air pressure gauge is **MORE THAN** the target operating pressure, decrease the pressure setting of the AMD by ¼ of a turn increment (ccw) (increment can be different at discretion of operator) and return to **4.**
9. Repeat 5, 6 and 7 to verify that the operating pressure readings are consistent.
   a. If the pressure reading is as expected, mark the location of the indicator on the sprinkler system air pressure gauge of the system being tested (and on the AMD pressure gauge if applicable).
10. Additional sprinkler systems.
   a. **Other sprinkler systems not tested:** If there is another system supplied by the nitrogen generator, proceed to that system and return to **2.**
   b. **No other sprinkler systems to test:** If there are no other systems supplied by the nitrogen generator to be tested, proceed to **11.**
11. Test operation of nitrogen generator with all sprinkler systems operating.
   a. Confirm AMD fast fill (bypass) valve(s) are closed and the regulated valve(s) are open on all the system AMD(s).
   b. Slowly drain 1-2 psi (.07-.14 bar) of pressure out of one (1) of the sprinkler systems.
   c. Use the flow meter ball valve to relieve gas from nitrogen/air supply line to sprinkler system AMDs allowing the nitrogen generator to turn on.
   d. Allow nitrogen generator to fill the sprinkler system(s) and turn-off.
   e. Compare sprinkler system pressures on all systems are the same as the target operating pressure.
   f. If system pressures are NOT the same as the target operating pressure, repeat **8,** as necessary.
   g. If system pressures are the same as the target operating pressure, proceed to **12.**
12. Determine the nitrogen generator cut-in (turn-on) pressure by subtracting 5 psig (.3 bar) from the target system operating pressure determined at the beginning of this procedure.
   a. If subtracting 5 psig (.3 bar) from the target operating pressure results in a cut-in (turn-on) pressure that is within 3 psig (.2 bar) of the low air alarm, subtract 3 psig (.2 bar) from the target operating pressure.

b. If subtracting 3 psig (.2 bar) from the target operating pressure results in a pressure that is within 3 psig (.2 bar) of the low air alarm, contact ECS for direction.

13. Program the cut-in (turn-on) pressure into the HMI LCD display in the nitrogen generator (See section 6.g., in the Maintenance Section for the Nitrogen Generator Pressure Adjustment Procedure).
14. Slowly depressurize the sprinkler system(s) individually to the cut-in (turn-on) pressure where the generator turns on and verify:
    a. The pressure setting on the AMD and sprinkler system air pressure gauge when the nitrogen generator turns on.
    b. That a low air alarm is not received on any fire sprinkler system supplied by the nitrogen generator prior to the nitrogen generator turning on.
    c. The nitrogen generator fills the sprinkler system(s) to the appropriate operating pressure and then turns off.
15. Confirm all AMD fast fill (bypass) valve(s) are closed and the regulated valve(s) are open on all the system AMD(s).
16. Open all valves to the accelerators on the sprinkler systems (if installed).

NITROGEN GENERATOR PRESSURE ADJUSTMENT PROCEDURE

The nitrogen generator cut-in (turn-on) and cut-out (turn-off) pressure settings are established and set during the commissioning process of the nitrogen generator and do not need to be readjusted unless the fire sprinkler system parameters change. Any adjustments to the nitrogen generator cut-in (turn-on) and cut-out (turn-off) pressure settings will affect the Standard Vent (PAV-D/DQ) or SMART Vent (PSV-D/DE) backpressure regulator settings, which will require readjusting the backpressure regulators to coincide with the changes to the nitrogen generator cut-in (turn-on) and cut-out (turn-off) pressure settings. (See section 6.j., in the Maintenance Section for the Generator Configuration Diagram for the HMI Location).

NOTE: Any changes to the nitrogen generator cut-in and cut-out pressure settings or the vent backpressure regulator settings are to be authorized by and under the direction of ECS.

Cut-In (Turn-On) Pressure Adjustment

1. Press the **System Settings** button on the Home screen.
2. Press the **Pressure Settings** button on the System Settings screen.
3. Press the **Cut-In Pressure** window, a keypad will be displayed.
4. Enter the appropriate pressure, then press **Enter** button on the keypad.
5. Press the **Back Arrow** button to return to the System Settings screen.
6. Press the **Back Arrow** button to return to the Home screen.

Cut-Out (Turn-Off) Pressure Adjustment

1. Press the **System Settings** button on the Home screen.
2. Press the **Pressure Settings** button on the System Settings screen.
3. Press the **Cut-In Pressure** window, a keypad will be displayed.
4. Enter the appropriate pressure, then press **Enter** button on the keypad.
5. Press the **Back Arrow** button to return to the System Settings screen.
6. Press the **Back Arrow** button to return to the Home screen.

FILTER REPLACEMENT

The nitrogen generators contain three (3) separate cartridge filters and a water separator. **It is recommended that each filter be replaced at a minimum as part of an annual preventative maintenance program.** ECS offers a replacement filter kit for each model. When maintained properly the nitrogen separation membrane will have an expected service life of twenty (20) years.

ECS Recommends that <u>all</u> cartridge filters (Filters 1, 3 & 4) in the nitrogen generator be replaced when replacing the filters.

Filter Replacement Kit Installation Instructions

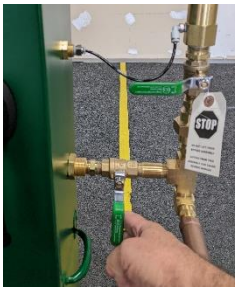
Filter Kit: FKSA-FS
(Filter Replacement Kit for AG-6500/11000/18500/22500 Nitrogen Generator Cabinet)

Part Description	Location w/o Autodrain	Location with Autodrain	Qty.
5-Micron Coalescing Filter	Right Filter Housing	Center-Right Housing	1
Water Separator	Center-Right Housing	Right Filter Housing	1
1-Micron Coalescing Filter	Center-Left Filter Housing	Center-Left Filter Housing	1
.01-Micron Coalescing Filter	Left Filter Housing	Left Filter Housing	1

NOTE: Before beginning the filter replacement process, **ensure all internal components are cool to the touch**. Components can be very hot after long run cycles and can present risk of injury.

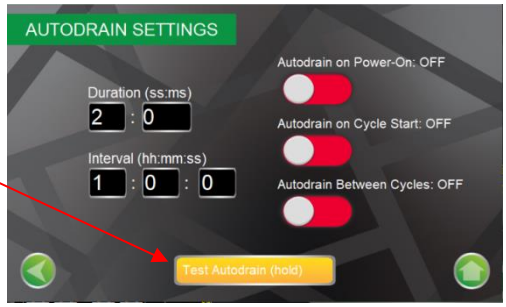
Replacement Guide:

1. Isolate nitrogen generator by closing inlet and outlet valves.

2. Drain air pressure from unit by pressing and holding the Test Autodrain button on the Autodrain Settings Screen on the HMI.

Press and Hold to Depressurize Filter Assembly.



3. Remove filter housing of 5-Micron Coalescing Filter Housing by pulling down on blue housing lock and turning filter housing counterclockwise.

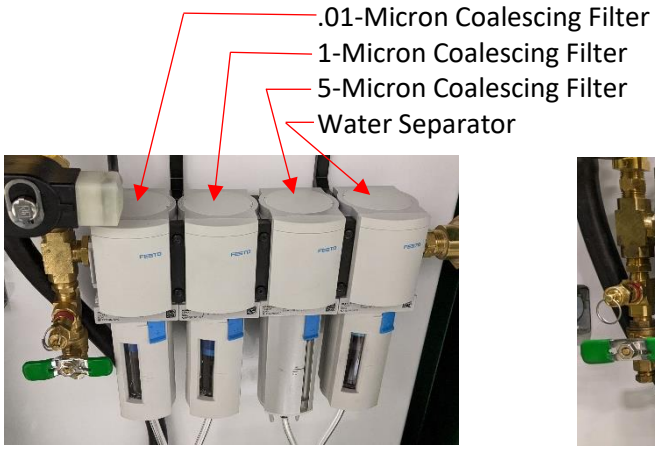
4. Remove black plastic filter plate underneath filter by turning counterclockwise. Remove old Coalescing Filter from the filter housing.

5. Replace with new 5-Micron Coalescing Filter, re-install black filter plate, re-install filter housing turning filter housing clockwise until blue housing lock latches.

6. Repeat this process for 1-Micron and .01-Micron filters adjacent to water separator, using the kit contents table as a guide to match the filters with the correct housings. Be very careful to do this process **<u>one filter at a time</u>** to ensure the filters do not get mixed in the process.

NOTE: The 1-Micron and .01-Micron Filters do not include black plastic filter plate and screw directly into the top of the housing.

Filters with Autodrain



Filters without Autodrain

7. Inspect Water Separator and clean as necessary.
8. Once all filter cartridges have been replaced, water separator has been cleaned, verify all filter housings are re-installed properly.
9. **Slowly** open inlet and outlet valves.

Once the filters have been replaced, log the filter replacement in the HMI by pressing and holding the "Record Filter Change" button for five (5) seconds on the Maintenance screen in the Datalog/Historical Data Section.

For further filter replacement orders, contact an ECS representative at 314-432-1377 or info@ecscorrosion.com.

Air Compressor Maintenance

Air compressors connected to the nitrogen generator must be maintained in accordance with the manufacturer's recommendations, which includes changing the oil filters on a regular basis.

OXYGEN REMOVAL VENT MAINTENANCE

ECS Oxygen Removal Vent - PAV-D/DQ & PSV-D/DE

Maintenance Instructions

1. PAV-D/DQ Vent: The Standard Vents must be inspected annually at minimum. While isolation ball valve is in the open position, check for air/water leaks and ensure the pressure gauge is displaying normal system pressure.
2. PSV-D/DE Vent: The SMART Vents must be inspected annually at minimum. While isolation ball valve is in the open position and the **Vent** button is illuminated, check for air/water leaks and ensure the pressure gauge is displaying normal system pressure.
3. PAV-D/DQ & PSV-D/DE Vents: While isolation ball valve is in the closed position the inspection must include the condition of the in-line filter to protect against blockage of the restricted venting orifice. Depressurize the in-line filter housing by pressing the pressure relief valve on the bottom of the housing. Twist the filter housing counterclockwise until it can be removed to expose the filter element.
4. PAV-D/DQ & PSV-D/DE Vents: The filter element in the in-line filter should be replaced if a visual inspection reveals a significant collection of debris.

In-Line Filter Replacement Instructions

1. Close the isolation ball valve.
2. Depressurize the housing by pressing the pressure relief valve on the bottom of the in-line filter housing.
3. Remove the lower section of the in-line filter housing by turning the filter housing counterclockwise.

   NOTE: A rubber o-ring/seal is located between the upper and lower sections of the filter housing.

4. Remove the old filter by turning the filter counterclockwise.
5. Replace with new filter. The filter is secured to the housing by turning the filter clockwise.

   NOTE: Ensure the filter is secured only finger/hand tight.

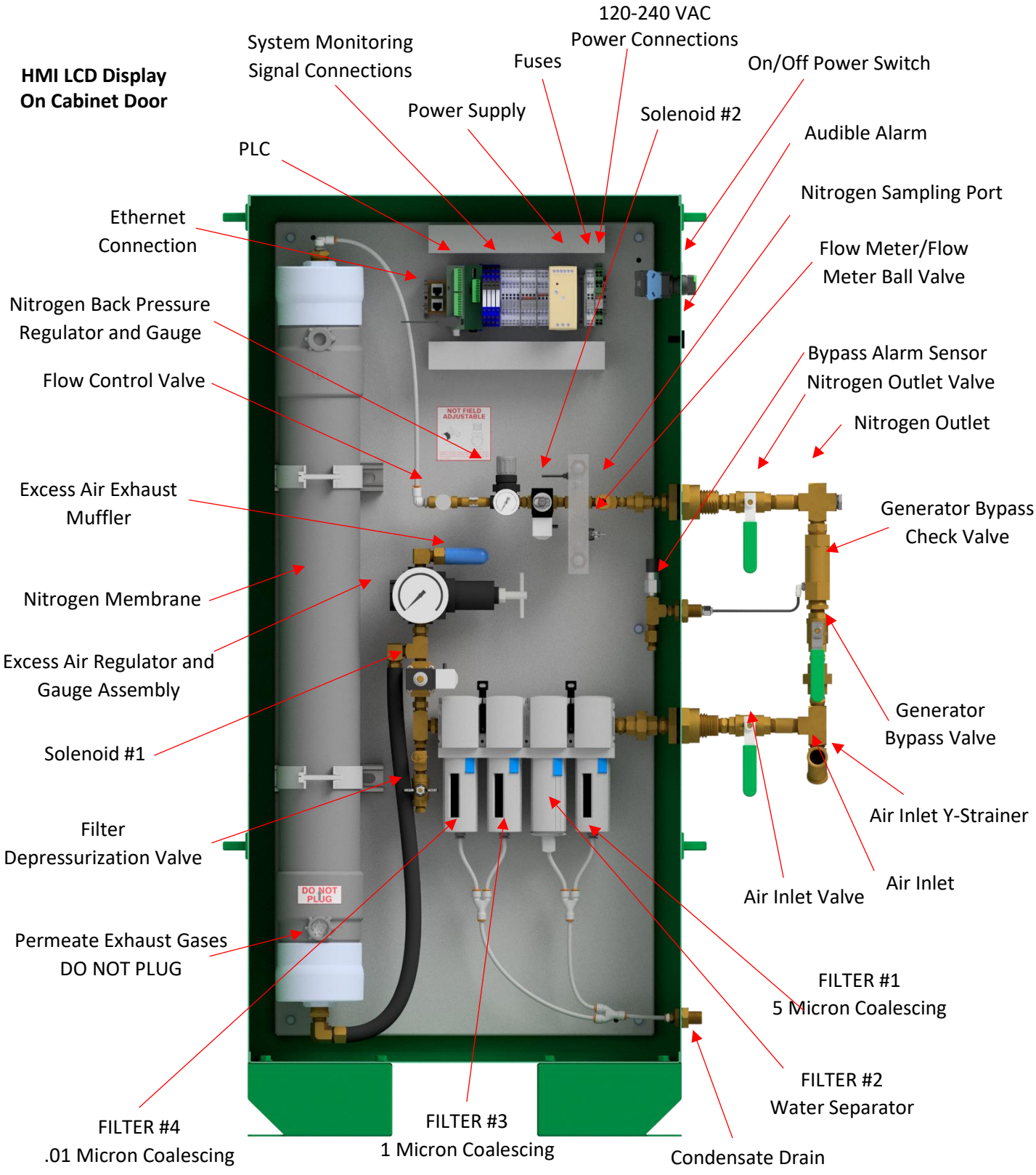
6. Install the rubber o-ring/seal on the lower section of the filter housing.
7. Re-install the filter housing by turning the filter housing clockwise.

   NOTE: Ensure the filter housing is secured only finger/hand tight.

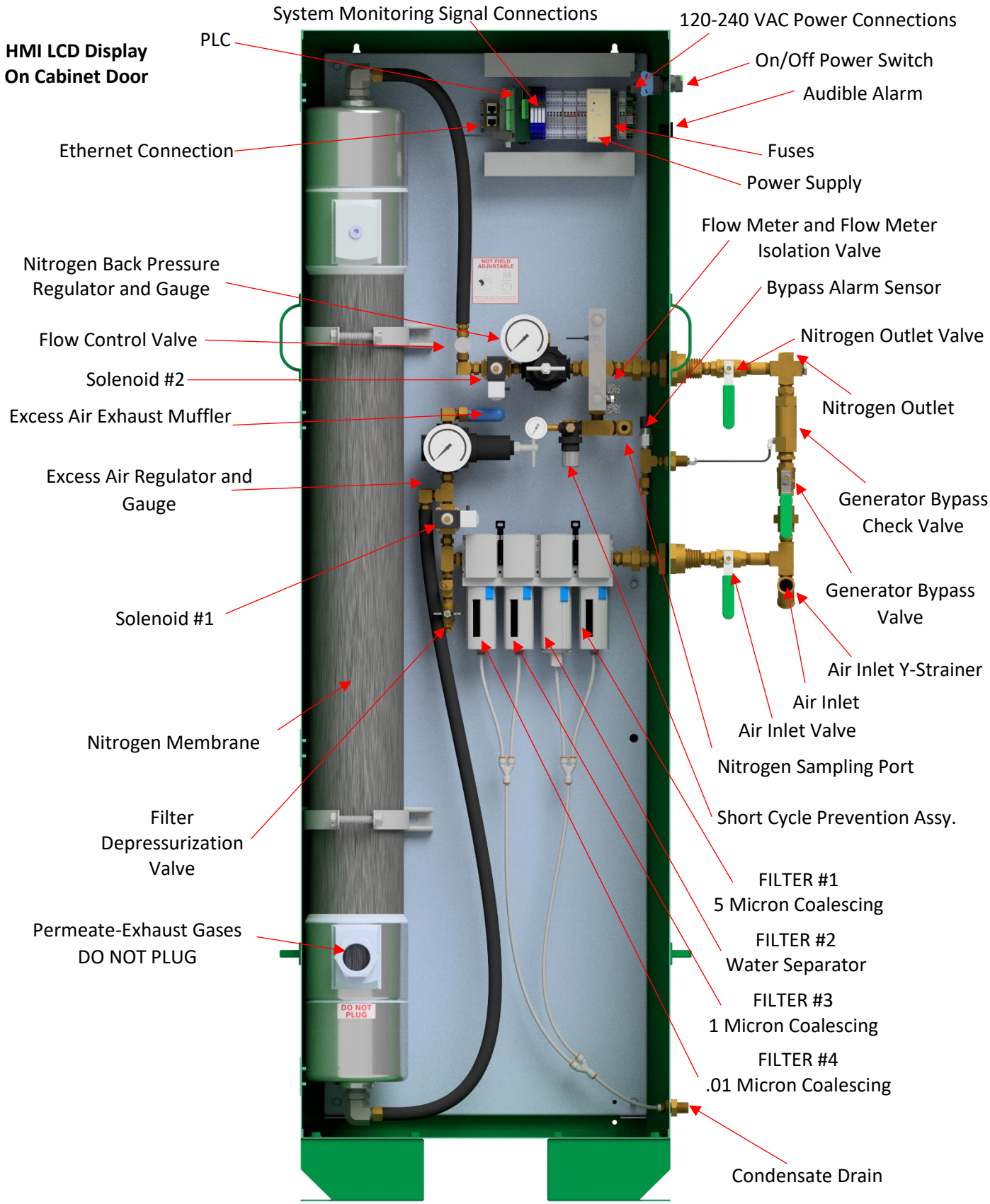
8. Open the isolation ball valve.

GENERATOR CONFIGURATION DIAGRAMS

AG-6500 and AG-11000 Nitrogen Generator Configuration



AG-18500 and AG22500 Nitrogen Generator Configuration



TROUBLESHOOTING

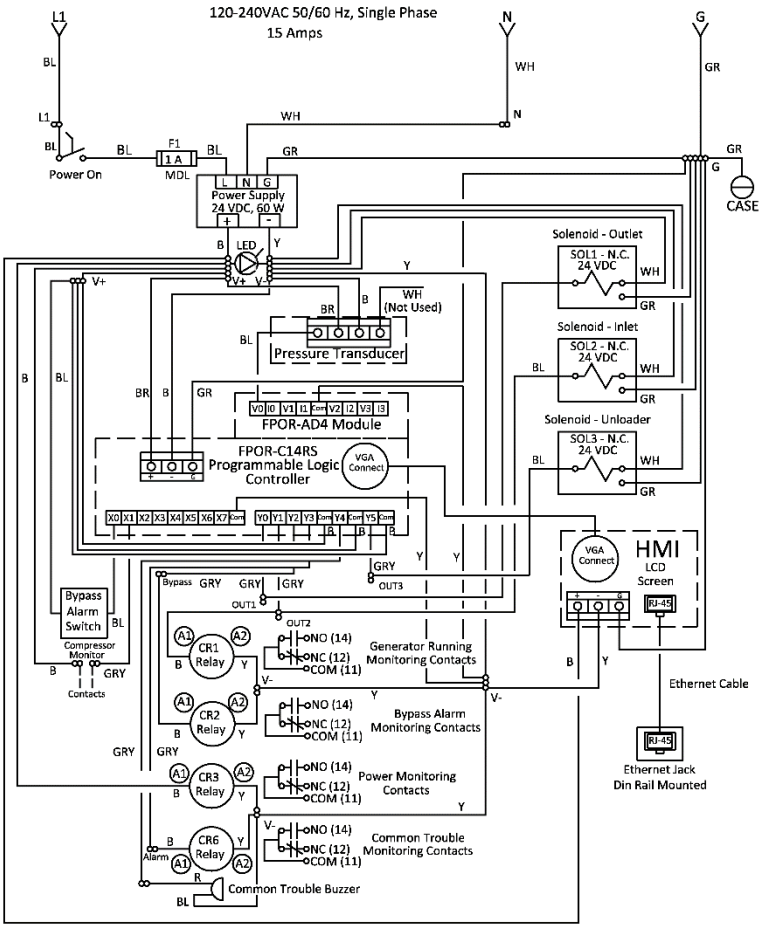
Safety Warning

Only qualified personnel can perform inspection, testing and maintenance of the nitrogen generation equipment. Prior to any system troubleshooting on the nitrogen generation system, ensure that the nitrogen generator is isolated from the compressed air supply and all system risers. Be aware of pressurized system components as some of the troubleshooting procedures require system components to be pressurized. Failure to do so can result in system damage and/or personal injury.

SYMPTOM	PROBLEM	RESOLUTION
Nitrogen generator not running.	No lights or indicators on generator.	Check incoming power and fuses in nitrogen generator.
Nitrogen generator not running.	Generator lights and indicators on.	The nitrogen generator may be in the depressurizing phase of the breathing cycle. When sprinkler system reaches the generator cut-in pressure, the nitrogen generator will automatically turn on. (normal operation).
		Check status of solenoids in generator. • Solenoids should be energized (LED on) when running Check system pressure: • If system pressure above cut-in pressure of generator, reduce system pressure below cut-in pressure and check generator operation. • If system pressure below cut-in pressure of generator, check power to air compressor.
Nitrogen not flowing in sprinkler system.	Verify nitrogen generator is not in bypass mode.	Place nitrogen generator in nitrogen generation mode.
	While the nitrogen generator running, use a gas analyzer to measure the nitrogen output quality. (See Commissioning and Maintenance Sections).	If the nitrogen reading is below 97%, contact ECS.
	While the nitrogen generator running, measure generator production flow rate through flow meter. (See Commissioning and Maintenance Sections).	Compare generator production rate to system commissioning documentation and/or factory test report. If significantly lower, contact ECS.
Nitrogen generator is short cycling.	Pressure on generator HMI display decreases after generator shuts off with sprinkler system air maintenance device (AMD) open.	Close inlet to sprinkler system AMD, if pressure continues to decrease, check for leaks in generator cabinet and supply line.
	With AMD closed, the pressure on generator HMI display remains constant after generator shuts off.	• AMD partially opening allowing minimal nitrogen flow to sprinkler system results in generator short cycling. Adjust, repair or replace AMD as necessary. • Verify the AMD pressure is 3-5 psig (.2-.3 bar) above nitrogen generator cut-in pressure. Adjust as necessary.
Air compressor is short cycling.	Air compressor short cycles with the nitrogen generator in the standby mode.	• Check supply line from air compressor to nitrogen generator for leaks. • Check filter floats in filter housings not sealing properly.
	Nitrogen generator remains on while air compressor short cycles.	• Verify the excess air regulator pressure is set 5-10 psig (.3-.7) below air compressor cutout pressure. Adjust as necessary. Air compressor should continue to operate until nitrogen generator shuts off. (See Commissioning and Maintenance Sections). • Verify production flow rate and nitrogen purity levels.
Nitrogen generator running continuously or running more than four (4) hours	Generator in nitrogen generation mode with AMD open and unable to pressurize sprinkler system.	Close AMD. • If system supply line pressurizes, check sprinkler system for leaks or inoperable AMD (AMD not automatically closing). • If system supply line does not pressurize, check nitrogen generator and system supply line for leaks.

WIRING DIAGRAMS

AG-6500/11000/18500/22500 Nitrogen Generator



Wiring Notes:

AC Wiring - 14 AWG. After Fuse
DC Wiring - Blue+ Yellow- (16 AWG.)
Ground - Green
Use Copper Conductors Only
Field Wiring Ttemperature Rating: 60° C (140° F)
Use Terminal Blocks As Required
Required Field Wiring Terminal Tightening Torque 14 In. Lbs.
120-240 VAC/15 Amp Circuit Breaker Minimum Provided By Installer
As Means Of Branch Circuit Protection
Bond Doors

Wiring Color Legend:

BL	BLack
WH	White
GR	Green
B	Blue
R	Red
Y	Yellow
GR/Y	Green/Yellow
BR	Brown
GRY	Grey

Monitoring Notes:

1 Optional Nitrogen Generator Running Monitoring Output.
(Contacts Shown Energized When Nitrogen Generator is Running)
2 Optional Bypass Alarm Monitoring Output.
(Contacts Shown Energized In Bypass (Air Only) Mode)
3 Optional Power Monitoring Output.
(Contacts Shown Energized)
4 Optional Common Trouble Monitoring Output.
(Contacts Shown De-Energized)

Alarm Indicator Operation

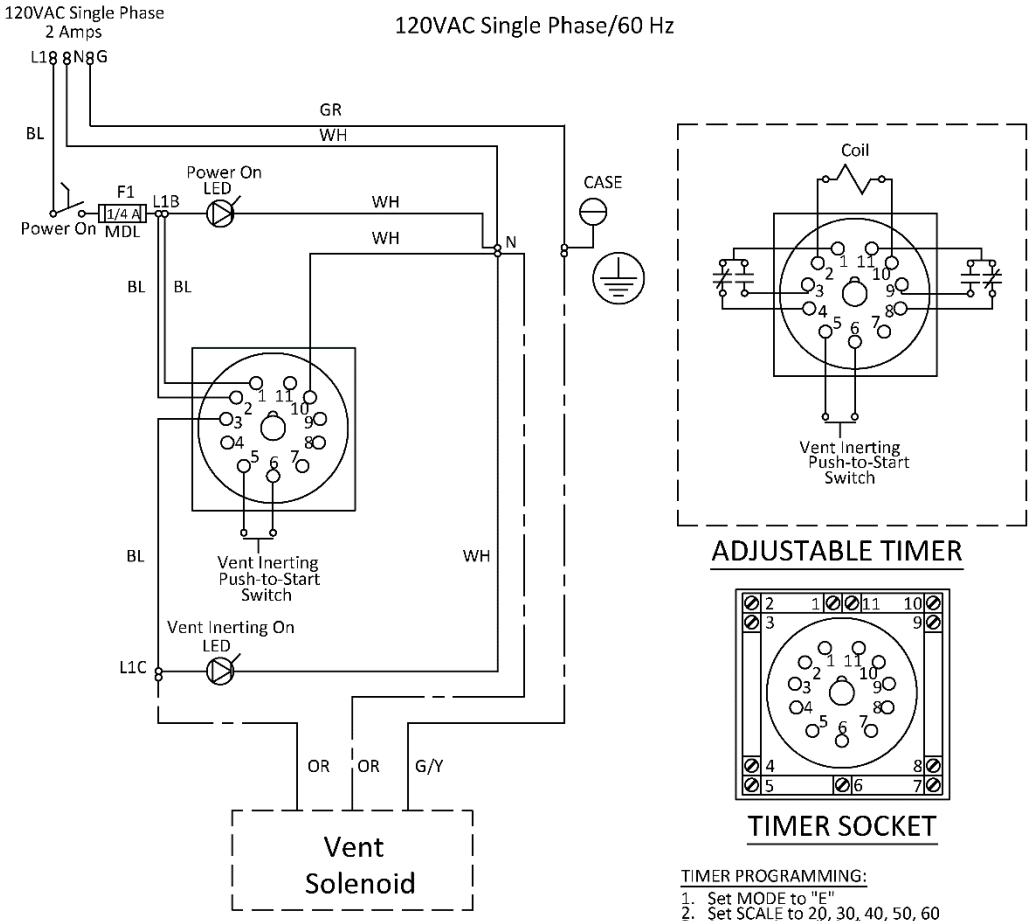
Flashing Indicator on HMI Screen - Nitrogen Generator In Bypass
Air Only Mode
Buzzer Activated - System Common Trouble

Air Compressor Monitoring Option

Connect air compressor normally open (N.O.) contacts (Terminals 13NO & 14NO) in air compressor control box to Nitrogen Generator (Terminals C-MON B1 & V+ B2).

Rev. 8.0

PSV-D
SMART Vent
120VAC Single Phase/60 Hz



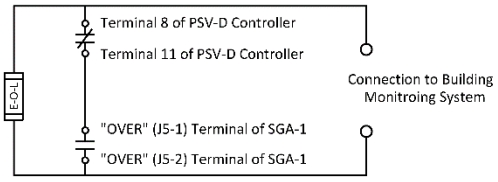
ADJUSTABLE TIMER

TIMER SOCKET

TIMER PROGRAMMING:
1. Set MODE to "E"
2. Set SCALE to 20, 30, 40, 50, 60
3. Set RANGE to "10H"
4. Rotate Knob to "35"

NOTES:
Timer Coil Rated at 24VDC, 1.7 W
LED'S Rated at 24VDC
Solenoid on PSV-D Rated at 24VDC, 9.5 W
On/Off Power Switch LED Rated at 24VDC
On/Off Power Switch Rated at 600VAC

NOTE - When PSV-D is Used Inconjunction With SGA-1
1. Connect Terminals 8 & 11 to Output Signal of SMART Gas Analyzer (SGA-1) to Bypass the Low Purity Alarm Signal During the 14-Day Nitrogen Inerting Process. (See Inerting Bypass Wiring Diagram)



INERTING BYPASS SIGNAL WIRING DIAGRAM

Wiring Notes:

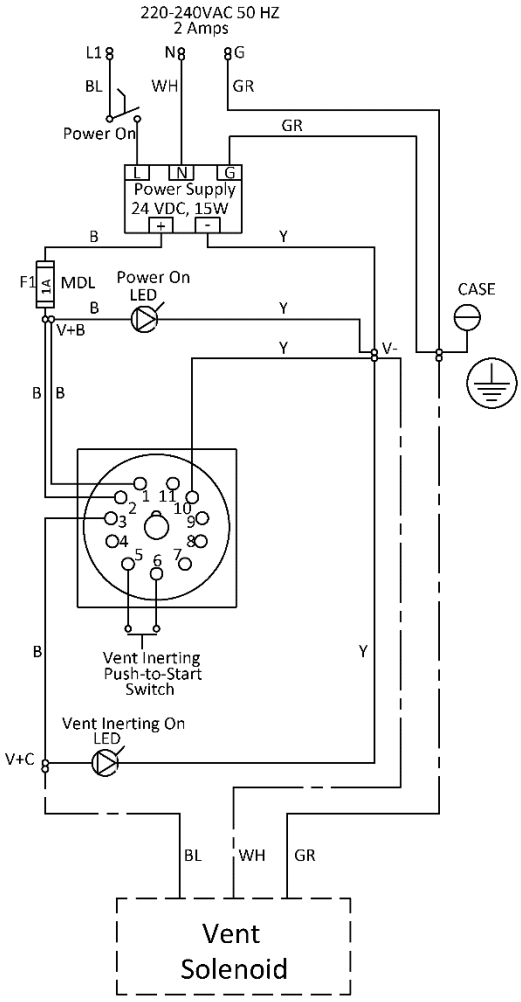
AC Wiring - 14 AWG. After Fuse
DC Wiring - Blue+ Yellow- (16 AWG.)
Ground - Green
Use Copper Conductors Only
Field Wiring Temperature Rating: 60° C (140° F)
Use Terminal Blocks As Required
Required Field Wiring Terminal Tightening Torque 14 In. Lbs.
120 VAC/15 Amp Circuit Breaker To Be Provided By Installer As Means Of Branch Circuit Protection
Bond Doors

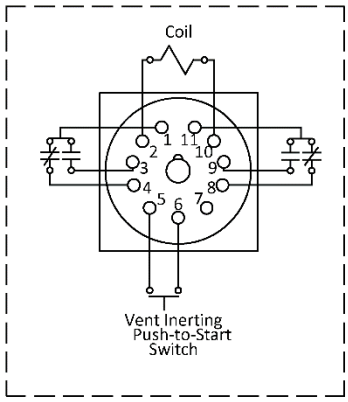
Wiring Color Legend:

BL	BLack	R	Red
WH	White	Y	Yellow
GR	Green	GR/Y	Green/Yellow
OR	Orange	BR	Brown
B	Blue	GRY	Grey

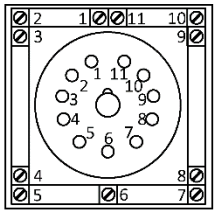
Rev. 1.0

PSV-DE
SMART Vent
220-240VAC Single Phase/50 Hz





ADJUSTABLE TIMER



TIMER SOCKET

TIMER PROGRAMMING:

1. Set MODE to "E"
2. Set SCALE to 20, 30, 40, 50, 60
3. Set RANGE to "10H"
4. Rotate Knob to "35"

Wiring Notes:

AC Wiring - 14 AWG. After Fuse
DC Wiring - Blue+ Yellow- (16 AWG.)
Ground - Green
Use Copper Conductors Only
Field Wiring Temperature Rating: 60° C (140° F)
Use Terminal Blocks As Required
Required Field Wiring Terminal Tightening Torque 14 In. Lbs.
220-240VAC/15 Amp Circuit Breaker To Be Provided By Installer
As Means Of Branch Circuit Protection
Bond Doors

Wiring Color Legend:

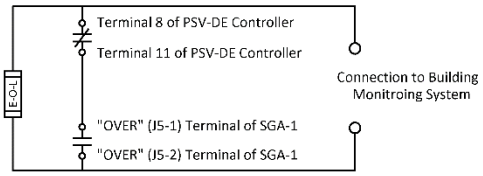
BL	BLack	R	Red
WH	White	Y	Yellow
GR	Green	GR/Y	Green/Yellow
OR	Orange	BR	Brown
B	Blue	GRY	Grey

NOTES:

Timer Coil Rated at 24VDC, 1.7 W
LED'S Rated at 24VDC
Solenoid on PSV-DE Rated at 24VDC, 9.5 W
On/Off Power Switch LED Rated at 24VDC
On/Off Power Switch Rated at 600VAC

NOTE - When PSV-DE is Used Inconjunction With SGA-1

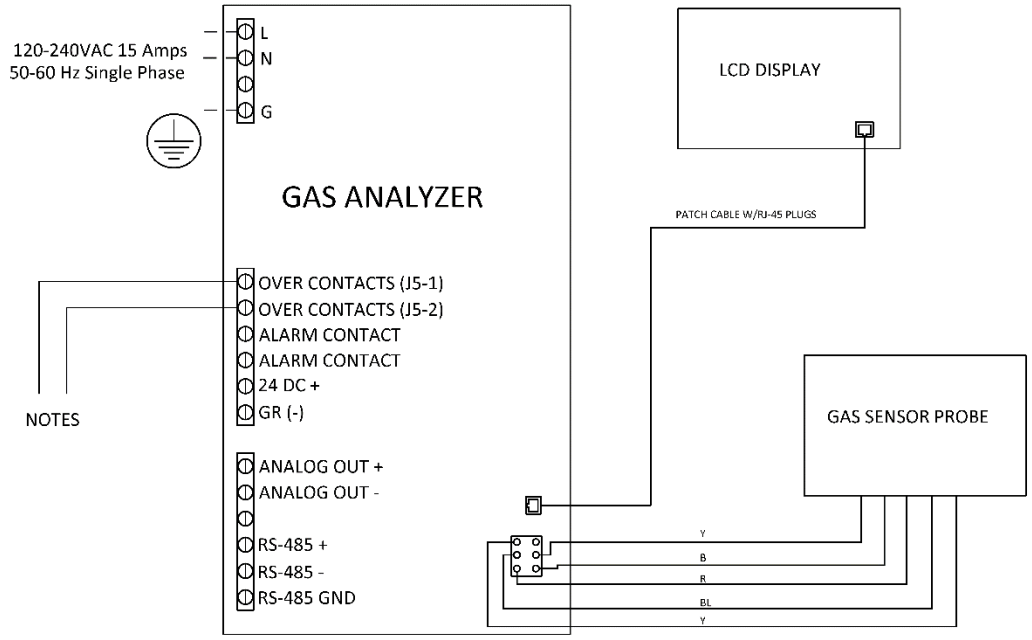
1. Connect Terminals 8 & 11 to Output Signal of SMART Gas Analyzer (SGA-1) to Bypass the Low Purity Alarm Signal During the 14-Day Nitrogen Inerting Process. (See Inerting Bypass Wiring Diagram)



INERTING BYPASS SIGNAL WIRING DIAGRAM

Rev. 1.0

SMART Gas Analyzer - SGA-1



Wiring Notes:

AC Wiring - 14 AWG. After Fuse
DC Wiring - Blue+ White/Blue Tracer - 16 AWG.
Ground - Green
Use Copper Conductors Only
Field Wiring Temperature Rating: 60° C (140° F)
Use Terminal Blocks As Required
Required Field Wiring Terminal Tightening Torque 14 In. Lbs.
120-240 VAC/15 Amp Circuit Breaker To Be Provided By Installer
As Means Of Branch Circuit Protection
Bond Doors

Wiring Color Legend:

BL	BLack
WH	White
GR	Green
B	Blue
R	Red
W/B	White/Blue
GR/Y	Green/Yellow
BR	Brown
GRY	Grey

Incoming Power Source Note:

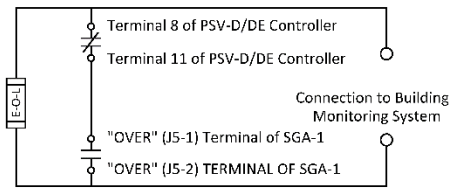
Operates at 120-240 VAC 50-60 HZ

NOTES:

1. "OVER" Contacts Provide a Contact Closure When the Nitrogen Purity Falls Below 95% or the Oxygen Purity Increases abovw 5%

2. When PSV-D/DE is Used Inconjunction With SGA-1 Contacts in the PSV-D/DE Can Be Used to Bypass the Output Of SGA-1 During the 14-Day Nitrogen Inerting Period.

   Connect Terminals 8 & 11 of PSV-D/DE to "Over" Contacts of SMART Gas Analyzer (SGA-1) to Bypass the Low Purity Alarm Signal During the 14-Day Nitrogen Inerting Process.



INERTING BYPASS SIGNAL WIRING DIAGRAM

Rev. 1.0

INSPECTION, TESTING AND MAINTENANCE REPORT

Customer		Date	
Address		Inspector	
City		Customer No.	
State		Contract No.	
ZIP		Inspection No.	

Only qualified personnel can perform inspection, testing and maintenance of the nitrogen generation equipment. Prior to any system maintenance on the nitrogen generation system, ensure that the nitrogen generator is isolated from the compressed air supply and all system risers. Ensure that the nitrogen generation system and the associated piping that is to be manipulated is completely depressurized prior to performing any maintenance. Failure to do so can result in system damage and/or personal injury.

Sprinkler System Information				psig (bar)	N/A	Verified
Qty of Systems		AMD Set Pressure				
AMD Manufacturer		Low Air Alarm Pressure				
AMD Model No.		System Trip Pressure				
Nitrogen Generator Air Compressor Information			Cut-In psig (bar)	Cut-Out psig (bar)	N/A	Verified
Manufacturer						
Model No.						
Serial No.						
Existing/Backup Air Compressor Information			Cut-In psig (bar)	Cut-Out psig (bar)	N/A	Verified
Manufacturer						
Model No.						
Serial No						
Nitrogen Generator Information			Cut-In psig (bar)	Cut-Out psig (bar)	N/A	Verified
Manufacturer						
Model No.						
Serial No.						
Air Compressor – Quarterly Maintenance				Hrs.	N/A	Verified
Verify run time (hours) on air compressor (use nitrogen generator hour meter)						
Verify compressor is turning on/off at low/high pressure						
Verify pressure gauges are in working order (replace as necessary)						
Verify all manual valves fully open and close (repair/replace as necessary)						
Verify all manual valves operate smooth-clean and un-corroded (repair/replace as necessary)						
Check air compressor filter(s) (clean or replace as necessary)						
Check electrical connections in control box and pressure switch (repair as necessary)						
Check air compressor and supply piping for leaks (repair as necessary)						
Air Compressor – Splash Lubricated						
Check drive belt and drive belt tension (repair/replace as necessary)						
Replace crankcase oil (3 months or 500 hours whichever comes first)						
Air Compressor – Oil-Less						
Rebuild compressor cylinders (5,000 hours)						

Nitrogen Generator – Quarterly Maintenance	Hrs.	Count:	N/A	Verified
Verify run time (hours) on nitrogen generator – Hour Meter				
Verify cycle count on nitrogen generator – Cycle Counter				
Verify nitrogen generator is turning on/off at low/high pressure				
Verify pressure gauges are in working order (replace as necessary)				
Verify all manual valves fully open and close (repair/replace as necessary)				
Verify all manual valves operate smooth-clean and un-corroded (repair/replace as necessary)				
Check coalescing filter gauge(s) (replace filters as necessary)	Indication:			
Check electrical connections in cabinet, control box and pressure switch (repair as necessary)				
Verify correct nitrogen purity level out of cabinet sampling port	N_2 Purity:			
Verify nitrogen production level through cabinet flow meter	SCFH:			
Check nitrogen generator and supply piping for leaks (repair as necessary)				
Nitrogen Generator – Annual Maintenance	Hrs.	Count:	N/A	Verified
Verify run time (hours) on nitrogen generator – Hour Meter				
Verify cycle count on nitrogen generator – Cycle Counter				
Verify nitrogen generator is turning on/off at low/high pressure				
Verify pressure gauges are in working order (replace as necessary)				
Verify all manual valves fully open and close (repair/replace as necessary)				
Verify all manual valves operate smooth-clean and un-corroded (repair/replace as necessary)				
Replace coalescing filters				
Check electrical connections in cabinet, control box and pressure switch (repair as necessary)				
Verify correct nitrogen purity level out of cabinet sampling port	N_2 Purity:			
Verify nitrogen production level through cabinet flow meter	SCFH:			
Check nitrogen generator and supply piping for leaks (repair as necessary)				

Oxygen Removal Vents – Annual Maintenance			N/A	Verified
Inspect Y-Strainer for dirt and debris (clean as necessary)				
Insect vent filter dirt and debris (clean/replace as necessary)				
Verify pressure regulator and gauges are in working order (replace as necessary)				
Verify the pressure regulator closes at the determined set pressure (repair/replace as necessary				
Verify all manual valves fully open and close (repair or replace as necessary)				
Verify all manual valves operate smooth-clean and un-corroded (repair/replace as necessary)				
Check electrical connections in control cabinet and solenoid (SMART Vent) (repair as necessary)				
Verify correct nitrogen purity level out of vent sampling port	N_2 Purity:			
Check vent and piping for leaks (repair as necessary)				
Corrosion Monitoring – Quarterly Maintenance			N/A	Verified
Verify corrosion detector has not activated (replace probe/detector as necessary)				
Verify remote test station batteries operational (replace as necessary)				
Verify all manual valves fully open and close (repair/replace as necessary)				
Verify all manual valves operate smooth-clean and un-corroded (repair/replace as necessary)				
Check electrical connections on corrosion detector pressure switch and monitoring equipment				
Check device and piping for leaks (repair as necessary)				
Permanent Gas Analyzer – Quarterly Maintenance			N/A	Verified
Verify correct nitrogen purity level displayed on Gas Analyzer	N_2 Purity:			
Check electrical connections in control cabinet (repair as necessary)				
Check nitrogen sampling tubing for leaks (repair as necessary)				

Miscellaneous

ORDER FORM

PART #	REPLACEMENT CORROSION PRODUCTS	QUANTITY
AdvancedIQ – Wall Mount Nitrogen Generator System (AG-675/950/2000/3500)		
FKWM-FS	Filter Maintenance Kit, Wall Mount - Annual	
AdvancedIQ – Stand Alone Nitrogen Generator System (AG-6500/11000/18500/22500)		
FKSA-FS	Filter Maintenance Kit, Stand Alone - Annual	
Oxygen Removal Vents (PAV-D/DQ and PSV-D/DE)		
PV-DRF	Oxygen Removal Vent Filter	
Inspector - Corrosion Monitoring Station		
OSC-1	One (1) Coupon/Probe Replacement Kit	
Handheld Gas Analyzer		
PHGA-1	Portable Handheld Gas Analyzer	
Inline Corrosion Detector		
ILD-X	Inline Corrosion Detector	Pipe sch. - Pipe size -

For additional information about ECS products and services, please visit our website at **www.ecscorrosion.com**

SYSTEM SUMMARY

Existing Air Compressor			Cut-In psig (bar)	Cut-Out psig (bar)	Gen. Backup	30-Min. Fill
Manufacturer	Model Number	Serial Number				

New Air Compressor			Cut-In psig (bar)	Cut-Out psig (bar)
Manufacturer	Model Number	Serial Number		

Air Maintenance Device (AMD)		Pressure psig (bar)		**Sprinkler System**	Pressure psig (bar)
Manufacturer	Model Number				
				Trip Pressure	
				Low Air Alarm	
				High Alarm	

Nitrogen Generator		Cut-In psig (bar)	Cut-Out psig (bar)
Model Number	Serial Number		

Oxygen Removal Vent	Vent	Control Panel	Orifice
Model Number	Serial Number	Serial Number	
Vent Pressure Regulator – psig (bar)			

WARRANTY INFORMATION

The essential purpose of any sale or contract for sale of any of the products marketed or distributed by Engineered Corrosion Solutions, LLC, including Engineered Corrosion Solutions (ECS) and other brands of products, is the furnishing of that product. It is expressly understood that in furnishing said product, ECS does not agree to insure the Purchaser against any losses the Purchaser may incur, even if resulting from the malfunction of said product.

ECS warrants that the products shall be free from defects of manufacture, labeling and packaging for a period of one (1) year from the invoice date to the original purchaser, provided that the defective product(s) are returned to ECS for inspection. Upon a determination by ECS that a product is not covered under warranty, ECS shall, at its exclusive option, replace or repair said defective product or parts thereof at its own expense except that Purchaser shall pay all shipping, insurance and similar charges incurred in connection with the replacement of the defective product or parts thereof. The Warranty is void in the case of abuse, misuse, abnormal usage, faulty installation or repair by unauthorized persons or disassembled beyond the manufacturer's instructions, or if for any other reason ECS determines that said product is not operating properly as a result or causes other than defective manufacture, labeling or packaging.

THE AFORESAID WARRANTY IS EXPRESSLY MADE IN LIEU OF ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED, IT BEING UNDERSTOOD THAT ALL SUCH OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE ARE HEREBY EXPRESSLY EXCLUDED. IN NO EVENT SHALL ECS BE LIABLE TO PURCHASER FOR ANY DIRECT, COLLATERAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH PURCHASER'S USE OF ANY OF THE PRODUCTS SOLD OR DISTRIBUTED BY ECS, OR FOR ANY OTHER CAUSE WHATSOEVER RELATING TO THE SAID PRODUCTS. NEITHER ECS NOR ITS REPRESENTATIVES SHALL BE LIABLE TO THE PURCHASER OR ANYONE ELSE FOR ANY LIABILITY, CLAIM, LOSS, DAMAGE OR EXPENSE OF ANY KIND, OR DIRECT COLLATERAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES RELATIVE TO OR ARISING FROM OR CAUSED DIRECTLY OR INDIRECTLY BY SAID PRODUCTS OR THE USE THEREOF OR ANY DEFICIENCY, DEFECT OR INADEQUACY OF THE SAID PRODUCTS. IT IS EXPRESSLY AGREED THAT PURCHASER'S EXCLUSIVE REMEDY FOR ANY CAUSE OF ACTION RELATING TO THE PURCHASE AND/OR USE OF ANY OF THE PRODUCTS SOLD OR DISTRIBUTED FROM ECS SHALL BE FOR DAMAGES, AND ECS LIABILITY FOR ANY AND ALL LOSSES OR DAMAGES RESULTING FROM ANY CAUSE WHATSOEVER, INCLUDING NEGLIGENCE, OR OTHER FAULT, SHALL IN NO EVENT EXCEED THE PURCHASE PRICE OF THE PRODUCT IN RESPECT TO WHICH THE CLAIM IS MADE, OR AT THE ELECTION OF ECS THE RESTORATION OR REPLACEMENT OR REPAIR OF SUCH PRODUCT.

Engineered Corrosion Solutions, LLC.

11336 Lackland Road, St. Louis, MO

PH: 314-432-1377

www.ecscorrosion.com

Engineered Corrosion Solutions

Complete Corrosion Control.

ECS Website QR Code

ECS Commissioning Video QR Code

CONTACT US

- Contact ECS for 24/7 engineering and technical support **(314) 432-1377**
- Office business hours: Monday thru Friday, 8 AM - 5 PM (central time zone)
- Technical information available online or email info@ecscorrosion.com
- Website: www.ecscorrosion.com