The NJEX 8400 N-400 Series Natural Gas Odorization System

Instruction & Operating Manual

YZ SYSTEMS®

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How to Use this Manual

The NJEX 8400 Operations Manual is a step-by-step guide containing the procedures needed to work with the 8400 System. The NJEX System Series of odorizers implement the most advanced technology available in the industry. It is recommended that the technicians working with the NJEX Odorization Systems study the manual prior to initiating work on the system for the first time.

Getting Help

This manual provides solutions to typical questions about the NJEX system. If the answer cannot be found within this manual, contact YZ Systems at:

T: 1.281.362.6500
T: 1.800.653.9435 (800.NJEX.HELP)
F: 1.281.362.6513
E: techsupport@yzhq.com

When calling, have this manual close at hand. Whether calling or writing, please include the following information:

- The serial number and model number of the NJEX N-400 System. The serial and model numbers are located on the nameplate located on the exterior of the front door of the enclosure.
- A description of the problem and, if applicable, the actions of the technical personnel when the problem occurred.
- A listing of any messages that may have appeared in the LCD on the N-400 controller, please include:

    1. The exact wording of all alarm(s).
    2. The version number of the controller firmware.
    3. The version number of the Sentry software used.

Warranty

Please visit our web site www.yzsystems.com for a complete copy of our warranty contained in our Terms and Agreement document.

System Certifications

The NJEX N-400 System holds one of the following approvals and must be installed, grounded, wired, and I.S. Barrier Protected in accordance with all applicable electrical codes:

In addition to local electrical codes for which the system is installed, the systems must also comply with the *Wiring Control Documents* located in the appendix of this manual. For both hazardous location listings, ***the N-400 Wiring Control Document 1E-0440***, in Appendix B must be followed for any connections to the N-400 controller. See the ***System Level Control Documents 1E-0441, in Appendix C*** for requirements for connecting incoming power per the hazardous location listing.

North America, Class and Division Hazardous & Ordinary Location Certification*

Class 1, Division 1, Groups C and D

Class 1, Zone 1, AEx 60079-46 Group IIB Gb

EX 60079-46 IIB Gb

Heated System: T3

Non-Heated System: T4

-20°C ≤ Ta ≤ + 60°C

UL 60079-0:2019 Ed.7+R:19Jul2024

UL 508A:2018 Ed.3+R:26Jun2025

NFPA 79:2023 Ed.2024

CSA C22.2#60079-0:2019 Ed.4

CSA C22.2#286:2023 Ed.3

CSA C22.2#60079-46:2019 Ed.1

UL 60079-46:2022 Ed.1

CSA C22.2#301:2023 Ed.2

ATEX, IECEx Zone Hazardous Location

IECEx ETL 26.0019X

Ex 60079-46 IIB Gb

ETL26ATEX0695X

II 2G Ex 60079-46 IIB Gb

Heated System: T3

Non-Heated System: T4

-20°C ≤ Ta ≤ + 60°C

CE 2812

EN IEC 60079-0:2018

EN IEC 60079-14

IEC 60079-0:2017, Edition:7.0

IEC 60079-14:2024, Edition 6.0

IEC TS 60079-46:2017, Edition 1.0

Specific Conditions of Use:

1. The equipment contains non-metallic enclosure and process parts. To avoid the risk of electrostatic sparking, the non-metallic surfaces should only be cleaned with damp cloth. Painted surface of the equipment may store electrostatic charge and become a source of ignition in applications with low relative humidity.
2. For units supplied with External Power Supply (EPO) the factory installed seal ships un-poured, seal shall be poured during installation with methods and material as per 1E-0443.

Power Requirements

North American and IECEx/ATEX Installations

NOTE: Below includes instructions for how to supply power to the NJEX N-400 system, but in addition to local electrical codes for which the system is installed, the systems must also comply with the Wiring Control Documents located in the Appendix B of this manual. For both hazardous location listings, t*he N-400 Wiring Control Document 1E-0440*, in Appendix B must be followed for any connections to the N-400 controller. *See the System Level Control Document 1E-0441* in Appendix C for requirements for connecting incoming power per the hazardous location listing.

The NJEX N-400 series runs primarily from an intrinsically safe power supplied through an isolated barrier. The I.S. power may be supplied in two ways:

1. **Customer Supplied I.S. Power** in which the end user supplies intrinsically safe power through a barrier that meets the entity parameters outlined below.
2. **Factory Supplied 120/240VAC External Power Supply** an explosion proof enclosure is mounted to the cabinet and the end user supplies 120/240VAC input power and the EPO converts this into an intrinsically safe output.

The external intrinsically safe power supply is the main power source for NJEX N-400 system. If the external supply is lost, a Lithium Thionyl Chloride, non-rechargeable lithium backup battery is supplied with the unit to provide temporary backup power. The backup battery is to last an estimated 2 weeks of life. The life of the battery pack is dependent on ambient temperature, stroke rate, and battery health.

⚠ **WARNING: USE ONLY YZ E3-2006 INTRINSICALLY SAFE BATTERY PACK WHEN REPLACING THE NJEX N-400 SYSTEM BACKUP BATTERY. SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.**

Standard System Power Connections

Customer Supplied I.S. Power

If your unit is not supplied with an EPO and the end user installation site is providing power, the system requires an intrinsically safe power input. Power should be supplied through an isolated barrier with output characteristics of 15V Minimum at 150mA and minimum current limit of 350mA, with entity parameters not to exceed those listed below. Contact YZ customer service for a list of barriers that meet these requirements.

Please note that the wiring for the NJEX N-400 series system should meet the requirements outlined in the ***N-400 Wiring Control Document in Appendix B***. All wiring should adhere to local laws and regulations for which the unit is installed in. Required field connections to place the 8400 into operation are as follows:

Intrinsically Safe Barrier Requirements

Maximum Input Entity Parameters	Ui =	23.6V
	Ii =	830mA
	Pi =	3.24W

If supplying intrinsically safe power to the NJEX N-400 system, two wires should be routed through the grommet provided in the cabinet and into the power limiter enclosure cable gland. The positive and negative terminals will be labeled.

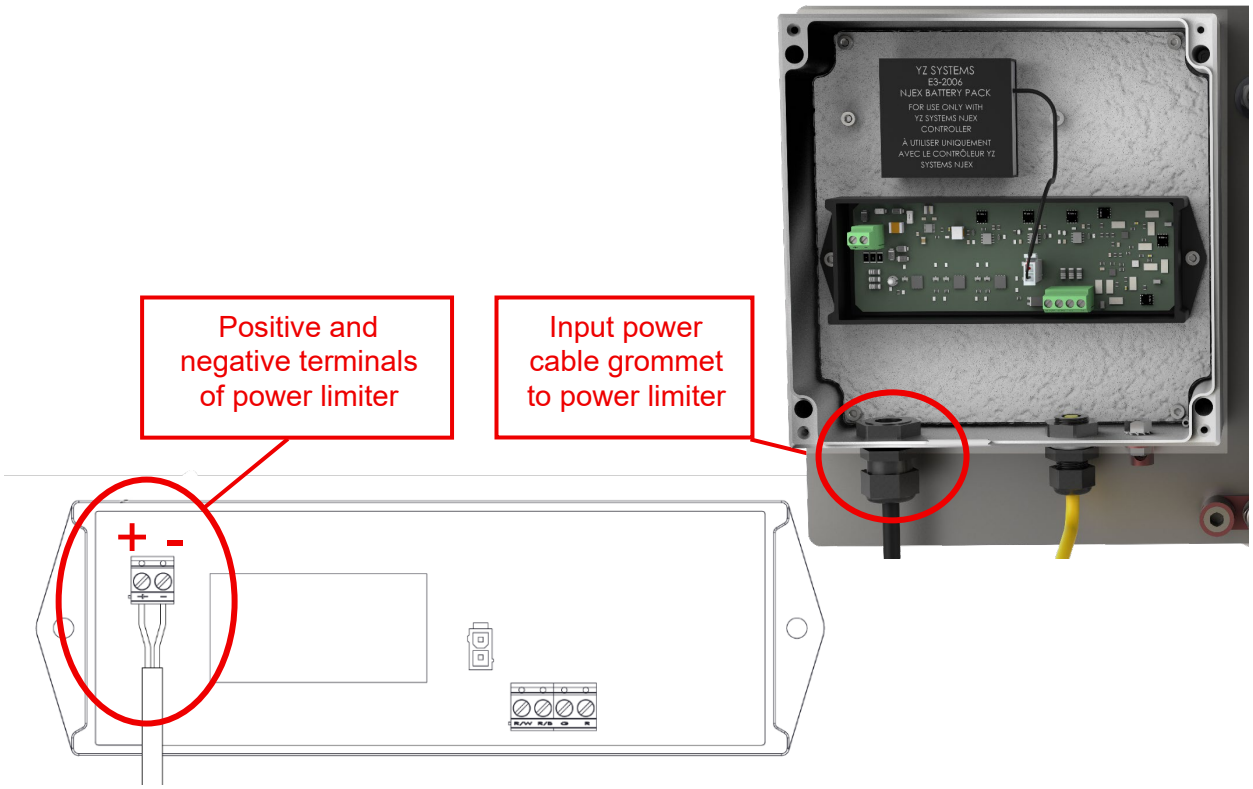

Figure 1 Power Limiter Input Power

EPO 120/240VAC External Power Option

Please note that the wiring of the EPO assembly shall meet the requirements in the **EPO Wiring Installation drawing 1E-0438 in Appendix E** and the **EPO Mechanical Installation drawing 1E-0443 in Appendix D.** All wiring should adhere to local laws and regulations for which the unit is installed in. Required field connections to place the 8400 into operation as follows:

Power Requirements:
120/240VAC, 50/60Hz
4.15W Max (F3-0034 & F3-0034Z Single)
8.30W Max (F3-0035 & F3-0035Z Dual)

1. If your unit is supplied with a 120/240VAC EPO (External Power Option), a 120/240VAC three wired connection is required for the EPO. The EPO will be mounted on the rear of the NJEX cabinet.
2. Conductors are supplied exiting the explosion-proof pack-off gland (A). Incoming power should be connected to these conductors through a termination junction box (not provided).
3. The recommended wire gauge for the incoming 120/240VAC power connection is 16AWG.
4. The factory supplied three 120/240VAC input wires may be replaced if longer wires are needed to reach the termination junction box. Minimum wire gauge is 16AWG. Replace wires at the lever connectors inside the explosion proof box. Match the wire colors with the factory wiring that was replaced or refer to Table 1 for wire color designation.
    - A dual NJEX unit will have two power supplies and two barriers in the assembly. A single NJEX will have one power supply a barrier, therefore one of the level connectors will have an unused position.
    - The ground wire will have one unused position for both dual and single EPOs.
    - Once the wires are clamped in the lever connector, secure the connectors in the din rail mount provided. Ensure they are properly secured by pushing the connectors down and towards the back of the din rail mount

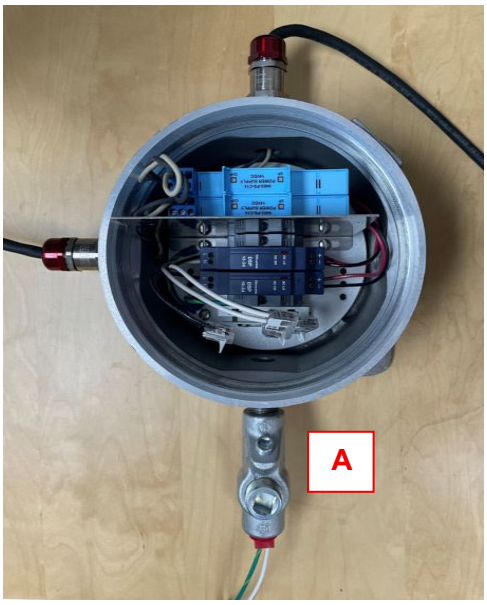

Figure 2 EPO Assembly

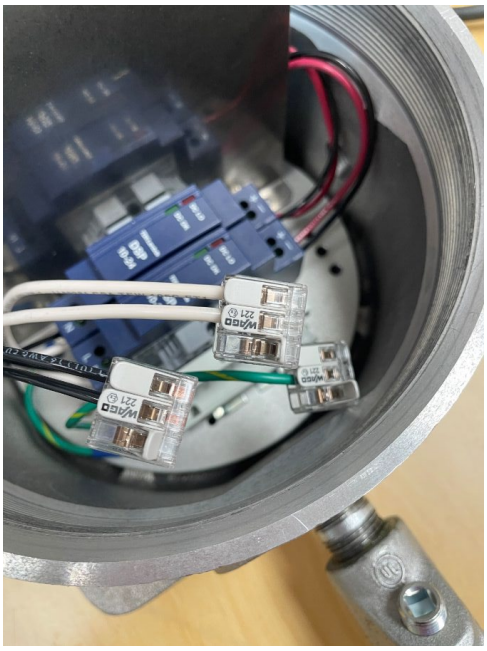

Figure 3 EPO Lever Connectors

Table 1: NJEX 120/240VAC EPO Wiring

EPO Model	Approval Scheme	Line (Hot)	Neutral	Ground
F3-0034 (Single) F3-0035 (Dual)	North America, CID1	Black	White	Green/Yellow
F3-0034Z (Single) F3-0035Z (Dual)	IECEx/ATEX Zone 1	Brown	Blue	Green/Yellow

NOTE: After connecting the incoming power to the EPO, the pack-off gland should be potted or encapsulated per the manufacturer's instructions. Encapsulation material is not provided with the NJEX system. See drawing 1E-0443 in the Appendix D of this manual for details.

Optional Heater Power Requirements

If your NJEX system has a heater, AC power must be provided to the heater separately from the system. A junction box will be provided with extra conductor length on the side of the cabinet. The end user can either use their own wire and connect in a junction box elsewhere or the extra conductor length may be removed and connection made at the terminal block provided.

Wiring should be connected via rigid conduit through the ½" NPT female connection on the junction box.

See the Appendix B of this manual for a N-400 wiring control document, the wiring diagram will be different depending on the certification the system holds. The heater requires 115/230VAC, 200W regardless of the certification.

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Figure 5 Heater Junction Box Location

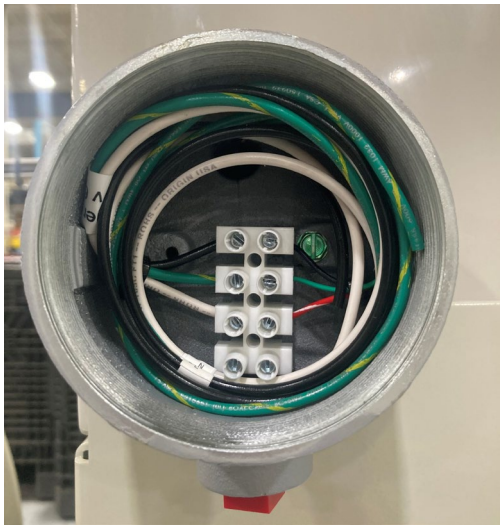


Figure 5 Inside Heater Junction Box

SAFETY NOTES – General System

- Always use extreme care when performing maintenance on an odorization system. Check to ensure the removal of liquid odorant and pressure from the portion of the system on which work will be performed prior to removing components or fittings.
- Inspect all tube fittings and valve packing semiannually to ensure that liquid odorant remains within the system.
- Systems must be installed per all applicable local electrical codes for which it is located.
- All mechanical and electrical work on NJEX Systems must be performed by trained professionals.
- Proper personal protection equipment (PPE) such as protective eyewear and gloves should be worn while installing or servicing this equipment.

⚠ WARNING: POTENTIAL STATIC CHARGING HAZARD - To avoid static buildup, use a damp cloth to clean all painted or other non-metallic surfaces.

⚠ WARNING: MATERIALS USED IN THE CONSTRUCTION OF GROUP II ENCLOSURES FOR EPL Ga EXCEEDS 10% IN TOTAL OF ALUMINUM, MAGNESIUM, TITANIUM AND ZIRCONIUM – Non-sparking tools must be used while servicing the NJEX System and N-400 controller to avoid an ignition hazard due to impact or friction.

⚠ WARNING: Power must be disconnected or locked out from the NJEX EPO Power Supply or option heater before performing any troubleshooting or repair to electrical components.

Theory of Operation

Operation of the 8400 centers around three primary components: the Model 8000 pump, the NJEX 8400 Verometer and the Model N-400 controller. During normal operation, the Model 8000 pump injects an exact quantity of odorant at a rate determined by the N-400 controller. The quantity of odorant injected per stroke is set using a spacer in the pump actuation assembly. The rate at which the pump is actuated is determined by the N-400 controller.

The NJEX 8400 Verometer serves as a temperature compensated meter which verifies the amount of odorant injected by the Model 8000 pump. The N-400 controller uses an input signal from the Verometer to determine the amount of odorant that has been injected, as well as the odorant level within the Verometer. Once the odorant level falls to a predetermined low level point, the N-400 controller actuates a solenoid valve which opens the fill valve, allowing the Verometer to be refilled. Once the Verometer is filled, the N-400 controller closes the fill valve.

The N-400 controller allows the 8400 system to operate in either a time-based mode or a proportional-to-flow mode. In the time-based mode of operation, the N-400 controller actuates the Model 8000 pump at a regular time interval preset by the operator.

In the proportional-to-flow mode of operation, the N-400 controller uses a customer provided gas flow rate input signal and several operator input values to calculate the time between strokes of the pump. These operator input values include the odorant injection rate (lbs/MMCF or mg/m3), pump displacement (cc/stroke), and the odorant density (lbs/gal or g/cc). The flow input signal is customer provided by either a flow computer or other flow monitoring devices. In this mode, the controller has the capability to distinguish between a low flow situation and a loss of flow input signal. For systems with analog inputs, if a loss of flow signal occurs, the controller automatically defaults back to a pre-selected percentage of the flow input.

The flow input signal is read by the N-400 controller once per second. These readings are averaged and the time duration until the next stroke is then calculated by the controller. The maximum time between strokes may be limited by a setting in the controller up to 99.99 minutes (when gas is flowing), regardless of the time calculated by the controller.

Two units may be configured for the N-400 Redundancy protocol. A 4 wire connection is required to connect two N-400 Controllers together, see the required signal connections in this manual for details. One unit will be configured as the primary unit and the secondary as backup. If the primary unit fails, the secondary unit will run. If the secondary unit also fails, both units will run as a fail safe as an attempt to odorize. After the primary unit fails but the alarm condition is cleared, the primary unit will automatically begin odorizing and stop the backup system. A unit will failover if in Redundancy by the following alarms: pump failure, running on battery, low battery, verometer loss of signal, verometer no fill, or verometer leak. See the alarm section of this manual for details on each alarm.

The NJEX N-400 series runs primarily from an intrinsically safe power supplied through an isolated barrier. In the case of power loss, a battery pack is provided for temporary backup power. While the unit is running off a battery pack, only one solenoid will operate a time to conserve energy. While filling the verometer, the fill solenoid may close to allow the pump solenoid to stroke but the solenoid fill will resume after and will affect fill time minimally. The time to stroke the pump is less than 1 second.

CAUTION: ***Excessive tubing lengths should be avoided. Installation of the NJEX Odorization system should be as close to the point of injection and Odorant Storage Tank as possible. Maximum tubing length should not exceed 15' (4.5 meters) with the tubing size maintained as indicated in this manual. If longer tubing lengths are required consult YZ Systems Technical Services at; 800.653.9435 or 1.281.362.6500.***

System Accessories

- **Odorant Injection Probe** - includes a 316 stainless steel probe, and isolation valve for location at the pipeline. When ordering, please specify pipeline connection required, 1/2" or 3/4".

- **Odorant Injection Probe with Sight Glass** - includes a 316 stainless steel probe, visual odorant sight indicator, and an isolation valve for location at the pipeline. When ordering, please specify pipeline connection required, 1/2" or 3/4".

- **50 psi, 1/4" stainless steel discharge tubing In-line Check Valve** - For placement in the odorant discharged tubing line immediately preceding the probe assembly. (P/N A3-0570).

- **1/4" stainless steel tubing Dielectric Isolator Union** - These should be installed in every tubing line that attaches the odorizer to the pipeline in any manner. For example, the supply gas and odorant discharge. (P/N A1-0182).

- **NJEX Scrubbers** - These filters are designed to scrub vented gas from the system. They are available by ordering P/N C4-0018, 15 gallon scrubber.

- **Back Pressure Regulator** - If the pipeline pressure is below 250psig (17.2 Bar), a back pressure regulator is required to be installed on the discharge tubing line prior to the isolator union charged to a minimum 300psig (20.7 Bar). (P/N 59207)

A complete line of odorization accessories ranging from pre-odorized gas scrubbers to injection probes is available through YZ. Please contact your local representative or YZ Systems toll free at 800.344.5399. For technical support, call 800.653.9435.

Notes

Section 1: System Installation

NJEX systems can be installed outdoors or indoors. The ambient temperature year-round must be within the system rated limits. If a system is installed outdoors in a location with higher ambient temperature and direct sunlight during warmer months, a shaded structure over the cabinet is recommended. If the system is installed outdoors in a colder climate close to the lower limits, a climate-controlled building or heater is recommended. NJEX systems must be installed per this manual and all local electrical regulations for which it is located.

Standard System Components

Standard primary components of the NJEX system include the following:

1. **System Enclosure:** Houses the Model 8000F pump, the NJEX 8400 Verometer, the odorant fill valve, the solenoid valve/pneumatic relay manifold, the odorant discharge manifold, the system control enclosure, power supply enclosure, and bulk odorant filter.
2. **System Control Enclosure:** Houses the N-400 controller
3. **Power Limiter Enclosure:** Houses the power limiter module and E3-2006 backup battery.
4. **Verometer Assembly:** precisely machined odorant tank with level sensor verifies the volume of odorant injected while compensating for odorant temperature.
5. **8000F Injection Pump:** Solenoid driven pneumatic pump injects odorant into the discharge.
6. **Actuation Gas Regulator:** Provides additional regulation of supply gas to actuate the pump.
7. **Bulk Odorant Filter:** Provides primary odorant filtration between the storage tank and the NJEX 8400. The Bulk Odorant Filter is pre-installed inside the System Enclosure attachment to the odorant source is via an odorant inlet manifold equipped with 1/4” FNPT connection located on the back of the System Enclosure.
8. **Service Tray:** should be installed in the bottom of the system enclosure, to capture any drops that may occur during servicing of the odorizer.

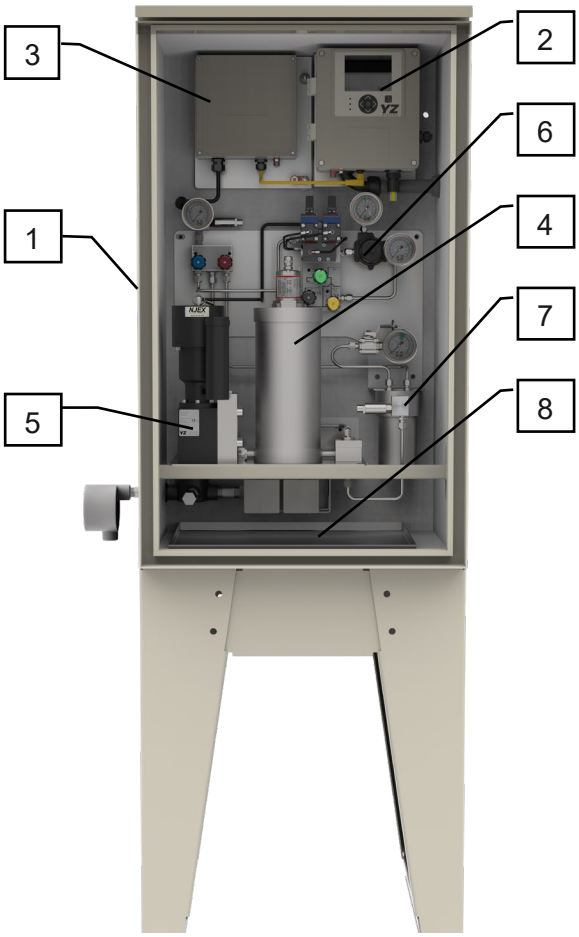


Figure 6 NJEX Cabinet subsystems

9. **Mechanical Cabinet Cable (Not Pictured**): Provides the connection between the system control enclosure and the electrical components in the mechanical section.

10. **Expansion Tank:** Provides a closed loop system for pressure fluctuations within the Verometer during the odorant fill/injection cycle.

11. **NJEX Gas Filter:** Installed between the actuation gas regulator and the actuation gas manifolds, this filter provides a 25 micron coalescent filtration to ensure a clean pneumatic supply.

12. **External Power Supply EPO (Optional):** 120/240VAC power supply to convert AC power to I.S. power in an explosion-proof housing.

Figure 7 Rear NJEX Cabinet

System Flow Schematic (P&ID)

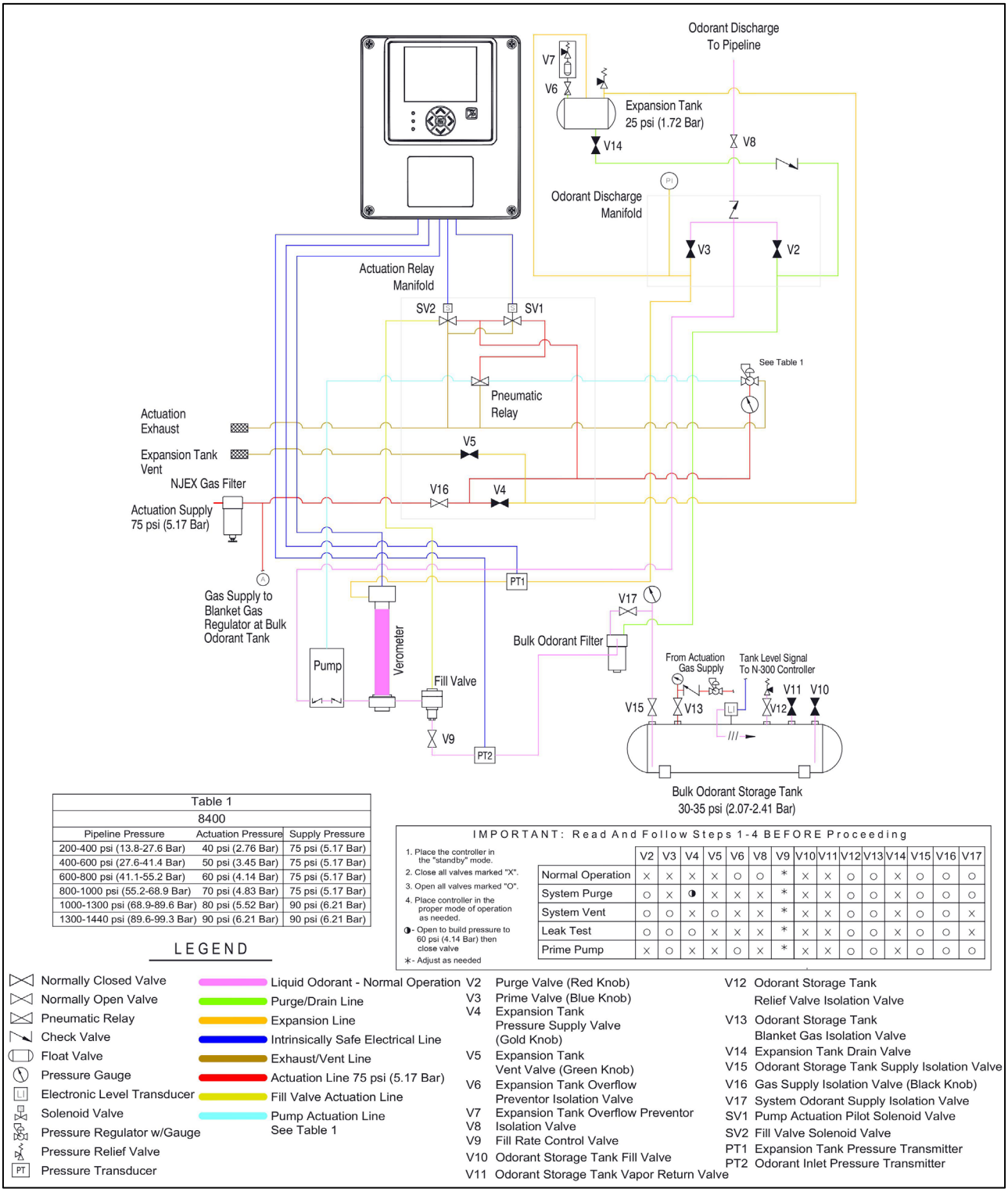


Table 1		
8400		
Pipeline Pressure	Actuation Pressure	Supply Pressure
200-400 psi (13.8-27.6 Bar)	40 psi (2.76 Bar)	75 psi (5.17 Bar)
400-600 psi (27.6-41.4 Bar)	50 psi (3.45 Bar)	75 psi (5.17 Bar)
600-800 psi (41.1-55.2 Bar)	60 psi (4.14 Bar)	75 psi (5.17 Bar)
800-1000 psi (55.2-68.9 Bar)	70 psi (4.83 Bar)	75 psi (5.17 Bar)
1000-1300 psi (68.9-89.6 Bar)	80 psi (5.52 Bar)	90 psi (6.21 Bar)
1300-1440 psi (89.6-99.3 Bar)	90 psi (6.21 Bar)	90 psi (6.21 Bar)

IMPORTANT: Read And Follow Steps 1-4 BEFORE Proceeding

1. Place the controller in the "standby" mode.
2. Close all valves marked "X".
3. Open all valves marked "O".
4. Place controller in the proper mode of operation as needed.

◑ - Open to build pressure to 60 psi (4.14 Bar) then close valve

✳ - Adjust as needed

	V2	V3	V4	V5	V6	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17
Normal Operation	X	X	X	X	O	O	*	X	X	O	O	X	O	O	O
System Purge	O	X	◑	X	X	X	*	X	X	O	O	X	O	O	O
System Vent	O	O	X	O	X	X	*	X	X	O	O	X	O	O	X
Leak Test	O	O	O	X	X	X	*	X	X	O	O	X	O	O	X
Prime Pump	X	O	X	X	O	X	*	X	X	O	O	X	O	O	O

LEGEND

- Normally Closed Valve
- Normally Open Valve
- Pneumatic Relay
- Check Valve
- Float Valve
- Pressure Gauge
- Electronic Level Transducer
- Solenoid Valve
- Pressure Regulator w/Gauge
- Pressure Relief Valve
- PT Pressure Transducer

- Liquid Odorant - Normal Operation
- Purge/Drain Line
- Expansion Line
- Intrinsically Safe Electrical Line
- Exhaust/Vent Line
- Actuation Line 75 psi (5.17 Bar)
- Fill Valve Actuation Line
- Pump Actuation Line
  See Table 1

V2 Purge Valve (Red Knob)
V3 Prime Valve (Blue Knob)
V4 Expansion Tank Pressure Supply Valve (Gold Knob)
V5 Expansion Tank Vent Valve (Green Knob)
V6 Expansion Tank Overflow Preventor Isolation Valve
V7 Expansion Tank Overflow Preventor
V8 Isolation Valve
V9 Fill Rate Control Valve
V10 Odorant Storage Tank Fill Valve
V11 Odorant Storage Tank Vapor Return Valve
V12 Odorant Storage Tank Relief Valve Isolation Valve
V13 Odorant Storage Tank Blanket Gas Isolation Valve
V14 Expansion Tank Drain Valve
V15 Odorant Storage Tank Supply Isolation Valve
V16 Gas Supply Isolation Valve (Black Knob)
V17 System Odorant Supply Isolation Valve
SV1 Pump Actuation Pilot Solenoid Valve
SV2 Fill Valve Solenoid Valve
PT1 Expansion Tank Pressure Transmitter
PT2 Odorant Inlet Pressure Transmitter

Standard System Mounting

Standalone Cabinet, no skid

Bolt down the system enclosure to a concrete slab using the four mounting holes (9/16”) provided in the bottom of each leg of the enclosure. Recommended bolt or stud size for mounting the enclosure is 1/2”. See Table 2 for mounting dimensions.

The cabinet should be properly grounded according to applicable codes and requirements.

NOTE: It is recommended to leave a 2-foot (0.6 meter) clearance around the NJEX cabinet to provide ample access when maintenance is required.

Table 3: NJEX Cabinet Mounting Dimensions			
	A	B	C
Single Cabinet	20-3/4”	20-1/4”	9”
Dual Cabinet	40-1/4”	39-1/2”	9”

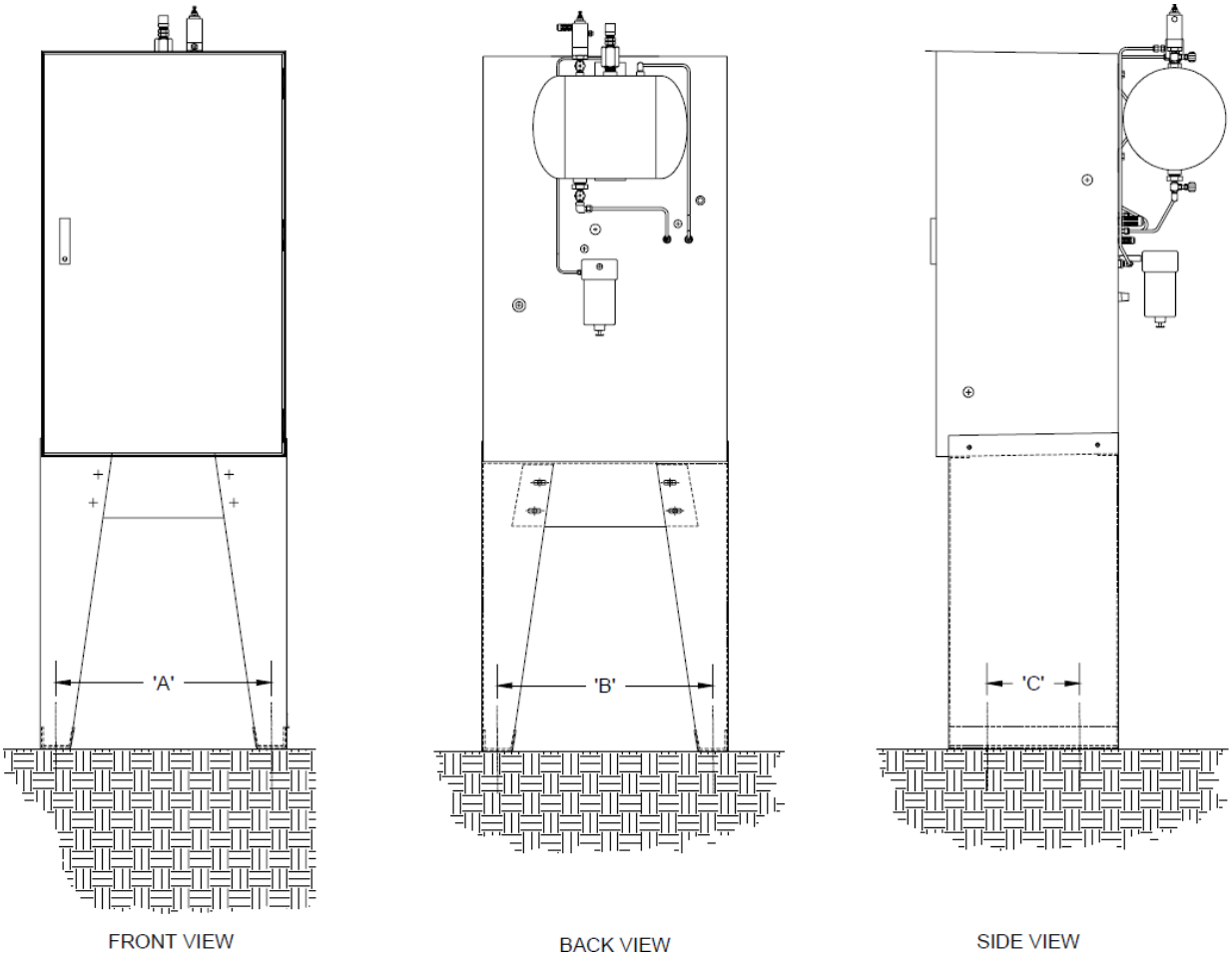


Figure 8 Standard System Mounting

Standard Skid System Mounting

1. Prepare a concrete slab that exceeds the NJEX skid length and width dimensions by at least 12”.
2. When moving the system into place follow these lifting guidelines:
    a. Lift containment skid systems using all four eyebolts on the corners of the skid.
    b. Lift rail skid systems from the bottom of the skid by forklift or other supportive device.
    c. Do not move a system with liquid in the odorant tank. Do not lift a system by the tank lugs, these lugs are designed only for the weight of the empty tank.
3. Bolt the system to the concrete slab using the 3/4” mounting holes provided in the skid. Recommended mounting bolt/stud sizes are either 11/16” or 5/8”.
4. The skid shall be properly grounded according to local codes and regulations.

CAUTION: Do not lift the system by the TANK LUGS. These lugs are designed only for the weight of the empty tank.
CAUTION: Do not move a system with liquid in the odorant tank. The tank must be emptied first.

Table 4: RAIL SKID SYSTEMS

Tank (Gallons)	Cabinet	BL (in)	BW (in)	L (in)	W (in)	Weight (lbs)
20	Either	47	47	49	49	450
60	Either	52	52	54	54	550
120	Single	96	26	98	28	750
	Double	96	47	98	49	800
250	Either	122	47	124	49	1150
500	Either	147	47	149	49	1600
1000	Either	220	47	222	49	2750
2000	Either	318	48 1/2	322	52 1/2	6600

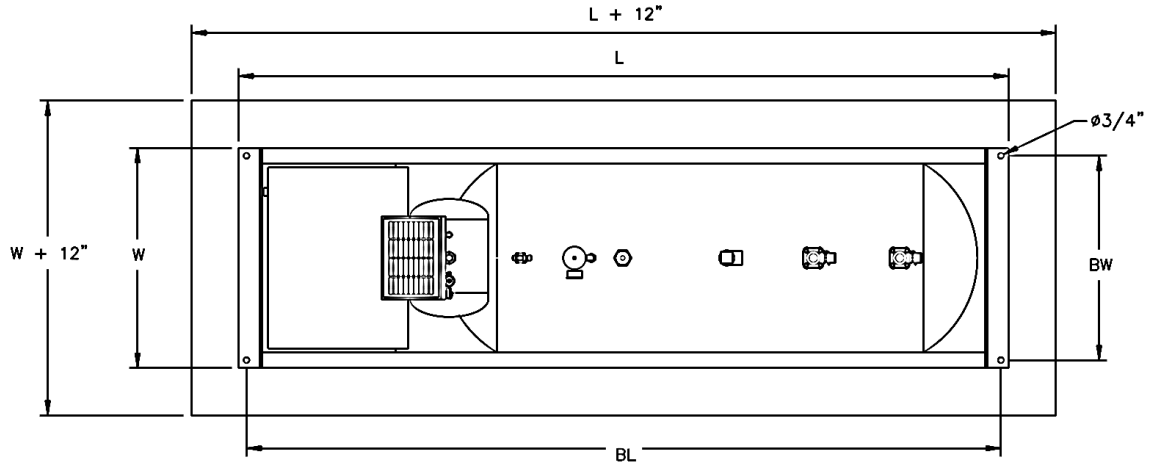


Figure 9 Standard Skid System Mounting

Table 5: CONTAINTMENT SKID SYSTEMS							
Tank (Gallons)	**Cabinet**	**BL (in)**	**BW (in)**	**O (in)**	**L (in)**	**W (in)**	**Weight (lbs)**
20	Single	50	32	8	66	36	800
	Double	31	58	7	45	62	850
60	Single	56	32	8	72	36	950
	Double	36	58	7	50	62	1000
120	Single	82	32	8	98	36	1200
	Double	82	54	8	98	58	1350
250	Either	108	58	8	124	62	1850
500	Either	116	58	8	154	62	3600
1000	Either	192	64	8	240	68	4250
2000	Either	252	69	14	318	73	7850

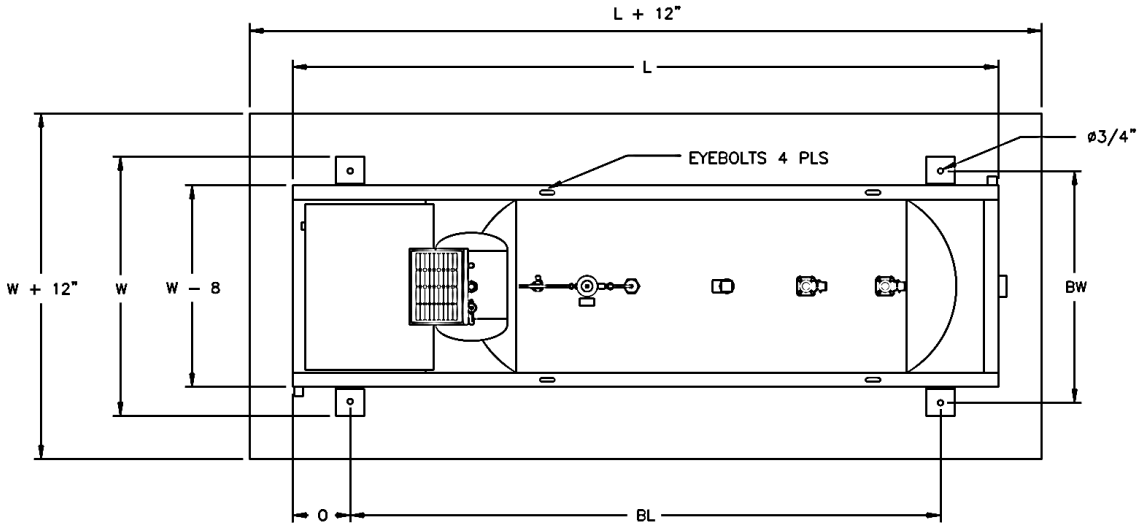


Figure 10 Standard Containtment Skid System Mounting

Standard Cabinet Connections

IMPORTANT: All connections to the N-400 Controller or Power Limiter Board (power or signal) must be intrinsically safe or supplied through an appropriate barrier. Connecting without a barrier will impair intrinsic safety. See drawing 1E-0440 in the Appendix B for all wiring requirements.

Power:

1. Follow the power requirements above in this manual to supply power to the NJEX cabinet.

Signal:

2. Connect the analog flow signal device to the termination block (TB8) located in the N-400 Controller OR the pulsed flow input to the termination block (TB2). Note the jumper placement (JP4) for each analog flow signal type and adjust if necessary. If using a pulsed flow input, the jumper position (JP4) is inconsequential. Refer to the *N-400 Wiring Control Document in Appendix B* and the Wiring Diagram reference label located inside the N-400 Controller Door or below in *Figure 11*.
3. If used, connect the optional Remote Inhibit Input signal to the termination block (TB2) (labeled inhibit input) located in the N-400 Controller. Refer to the *N-400 Wiring Control Document in Appendix B* and the Wiring Diagram reference label located inside the N-400 Controller Door or below in *Figure 11*.
4. If used, connect the RS-485 communication wiring as required to the termination block (TB16) located in the N-400 Controller. Refer to the *N-400 Wiring Control Document in Appendix B* and the Wiring Diagram reference label located inside the N-400 Controller Door or below in *Figure 11*.
5. For cabinet only systems, connect the tank level device to the termination block (TB11) located in the N-400 Controller. For skid mount systems, the tank level device will be factory wired to the N-400 Controller. In the instance of a dual cabinet skid mounted unit, the tank level will only be wired to one controller. Note the jumper placements (JP7 and JP9) for tank level signal type and adjust if necessary. Refer to the *N-400 Wiring Control Document in Appendix B* and the Wiring Diagram reference label located inside the N-400 Controller Door or below.

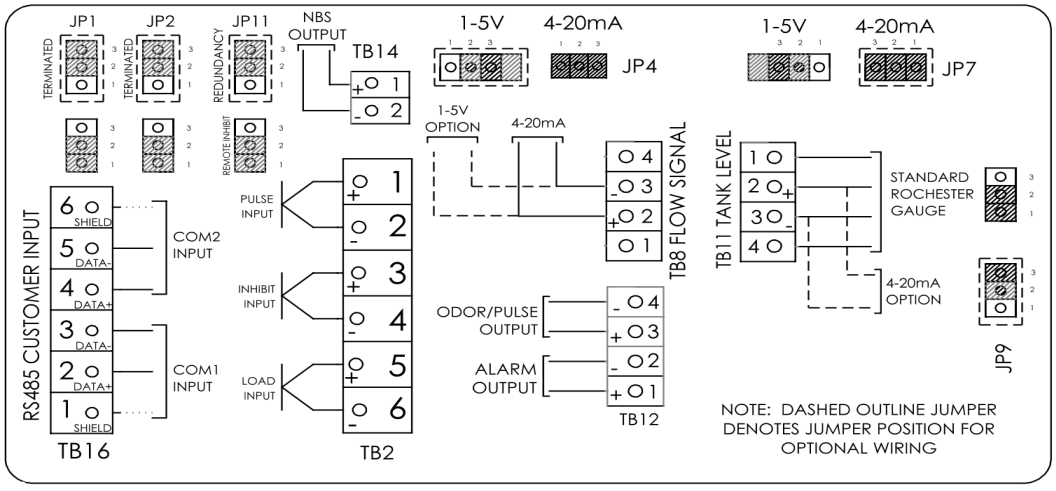


Figure 11 N-400 Controller Wiring Diagram Label

IMPORTANT: In a system with two cabinets wired for redundancy, the Remote Inhibit input is used to connect the primary and backup systems. Remote Inhibit will not be available for use. See Step 6 below for redundancy.

6. If wiring two cabinets for redundancy, connect the NBS output termination block (TB14) of the primary system to the Inhibit Input of the backup system (TB2 Pins 3 and 4) located in the N-400 Controller. Mirror the connection from the backup to the primary system by connecting the NBS output termination block (TB14) of the backup system to the Inhibit Input of the primary system (TB2 Pins 3 and 4). Refer to the *N-400 Wiring Control Document in Appendix B*, the Wiring Diagram reference label located inside the N-400 Controller Door or below in Figure 11, and the Redundancy Wiring Diagram in Figure 12 if needed.

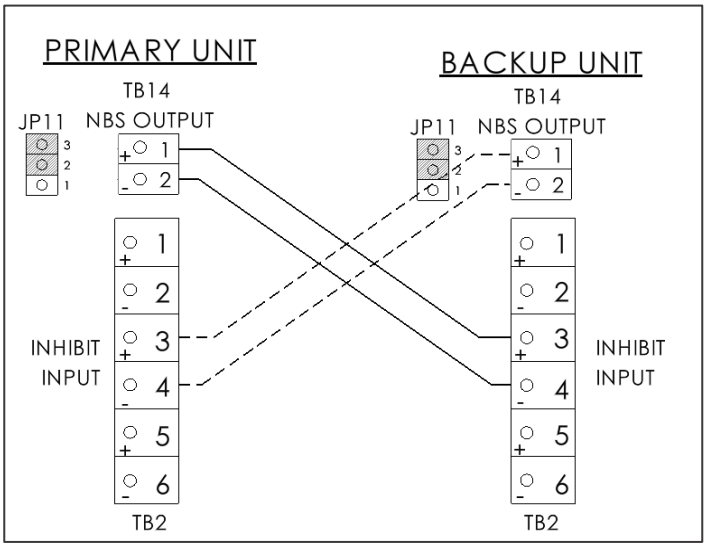


Figure 12 Redundancy Wiring

   a. On both the primary and backup systems, remove the shunt from jumper JP11 and reinstall it across pins 2 and 3. For standard remote inhibit operation without a backup system, JP11 should remain in the factory-default configuration, with the shunt installed across pins 1 and 2.The redundancy wiring should be run from one N-400 Controller to the other through the conduit provided with other intrinsically safe signals. The wiring is not completed at the factory.

7. Ensure the N-400 Controllers parameters are set to be “Primary” and “Backup” in the system settings in the N-400 Controller.

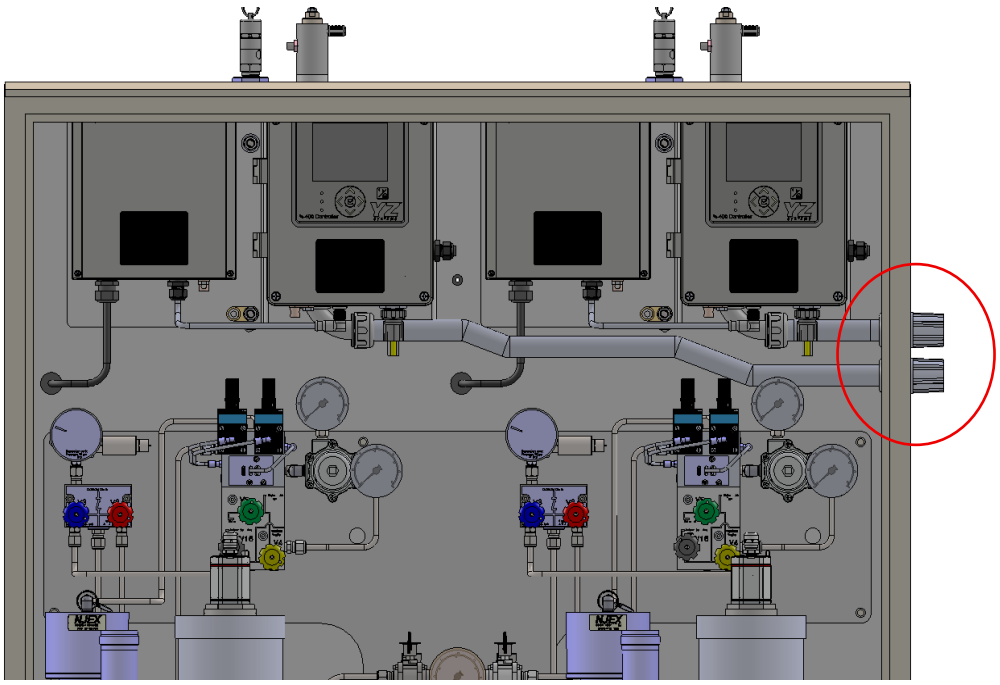


Figure 13 N-400 Controller Conduit

Standard System Tubing:

CAUTION: Excessive tubing lengths should be avoided. Installation of the NJEX Odorization system should be as close to the point of injection and Odorant Storage Tank as possible. Tubing length from the Odorant Storage Tank to the system should not exceed 15 feet (4.5 meters). Discharge tubing length should not exceed 250 feet (76 meters). The tubing size should be maintained as indicated in this manual. If longer tubing lengths are required, consult YZ Systems Technical Services at; 800.653.9435 or 1.281.362.6500.

CAUTION: Instrument air <u>cannot</u> be used as the supply gas source for NJEX installations. If natural gas is unavailable, bottled inert gas must be used.

8. Connect the odorant supply source to the odorant inlet manifold with the recommended 1/4" stainless steel tubing, *figure 14*. A tank isolation valve should be incorporated between the storage tank and this connection, figure 14.
9. Connect the regulated actuation gas source, of 75 psi (5.17 Bar) supplied by the NJEX system owner, to the NJEX gas filter inlet fitting using a dielectric union, *figure 14*.
    a. For Pipeline pressures less than 200 psi a single cut regulator (Fisher 67 YZ P/N A3-0042 or similar) adjustable to provide 75 psi to the inlet gas filter on the NJEX enclosure should be acceptable.
    b. Pipeline pressures above 200 psi need a dual cut regulation process:
        i. Install the primary regulator on the pipeline (Fisher 1301 YZ P/N A3-0274 or similar) and adjust it to provide 150 psi to the secondary regulator.
        ii. Install the secondary regulator at the inlet gas filter on the back of the NJEX enclosure (Fisher 67 YZ P/N A3-0042 or similar) and adjust it to provide 75 psig to the NJEX System should be acceptable.
        iii. 3/8" Stainless Steel tubing should be used between the two regulators.
    c. Dual Pump enclosures may require larger tubing between the regulators, and the secondary regulator may need to have a larger orifice (Fisher 64 or similar), if both pumps run simultaneously.

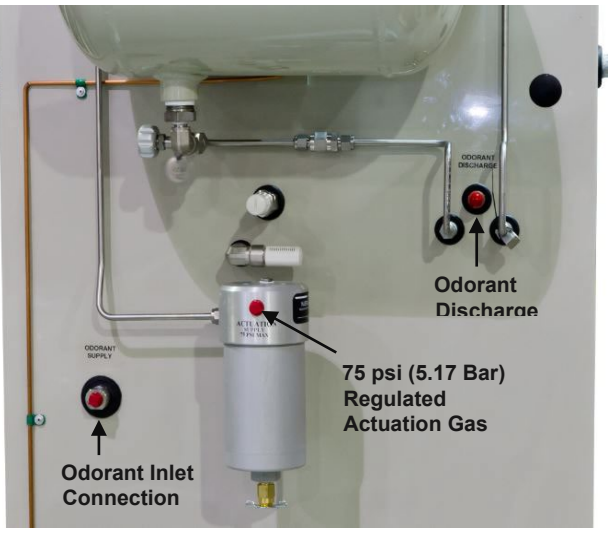


Figure 14 Rear Cabinet Connections

NOTE: In applications where the actuation gas supply has a high water content and/or a low hydrocarbon dew point, additional actuation gas filtration or heating of the 8400 system may be necessary. Bottled nitrogen can also be used during cold operating conditions to avoid condensation in the actuation gas supply line. Also, an actuation gas source pressure of 75 psi (5.17 Bar) should be adequate in most installations.

10. Connect the pipeline port of the odorant discharge manifold to the pipeline connection using a dielectric union and check valve.

Heater:

If the heater option is specific with this unit, see the power requirements above in this manual on power and wiring details.

Figure 15 Heater Connection

Standard Skid Connections

The NJEX Skid Mount Series of odorization systems is a total system approach to odorization. These systems are completely factory assembled, tested, and delivered requiring only three field connections to be fully operational. The NJEX Skid Mount Systems offer all the advantages of our standard 8400 Systems plus the added benefit of an onboard odorant storage tank.

The Skid Mount Systems come standard with an electronic level indicator factory connected to the N-400 controller. The controller has an alarm capability to indicate when the liquid level in the storage tank has fallen below a predetermined level set by the operator.

The Systems are available with 20, 60, 120, 250, 500 and 1000 gallon tank sizes. (Larger sizes are available up to 10,000 gallons by custom order).

Skid system primary components of the NJEX 8400 include the following:

Skid Mounted Tank a pre-assembled, and tested Structural steel skid with odorant tank, valve package, skid piping, and system enclosure.

NJEX System mounted to the tank, consisting of all components listed in the Standard System Components of this section

To install your skid and prepare for operation:

1. Follow the Standard System Mounting section above to properly install and anchor the skid.
2. Follow the Standard Cabinet Connections to connect flow signal and communications to the NJEX system
3. Follow the Standard System Tubing section above to connect tubing to the NJEX cabinet.

Figure 16 NJEX SkidMount System

Section 2: Filling the Bulk Odorant Tank

Filling the Tank for the First Time

CAUTION: Fill tank to a maximum level of 80% of the tank capacity.

IMPORTANT: If using an existing NJEX odorant tank, a ¼" NPT tee must be installed under the regulator to supply the blanket gas to the system. See the P&ID on page 16 for reference.

CAUTION: Odorant has a very strong odor, which if allowed to escape to the atmosphere, may cause problems in the local community. Take necessary precautions when filling an odorant storage tank to ensure that the local community is not disrupted during the filling process. Verify that the entire system has no pressure in it before beginning. Additionally, all personnel should wear protective clothing, and use equipment as recommended by the chemical manufacturer during this time. If you are uncertain about any aspect of the odorant itself, you should contact the manufacturer of your chemical prior to proceeding.

1. Verify correct position of valves before beginning.
   - Open: **V12,** and **V13***
   - Closed: **V10**, **V11**, and **V15**

   **Note Gas Supply to V13 should NOT be turned on during this procedure.*
2. Attach inert or natural gas supply to **V10**.
3. To purge the tank open valve **V10** to introduce inert or natural gas to the tank to begin displacing any ambient air from the empty tank. Continue until pressure on the gage located directly above **V13** is observed, then partially open **V11** to allow ambient air from the tank to begin flowing out. Allow this process to continue until all ambient air from the tank is purged, and only inert gas or natural gas is emitting from this valve, then close **V11** and **V10**. The time required to accomplish this task will vary with the tank size.
4. Vent purge gas by opening **V11** partially until tank pressure reaches just zero, then close **V11**.
5. Attach odorant supply to **V10**, open **V10**, and begin transferring odorant to the bulk tank.
6. Connect a line from **V11** to a flare or vapor recovery device, and open **V11**.

CAUTION: Fill tank to a maximum level of 80% of the tank capacity.

7. Close **V10** and **V11**, and remove odorant transfer equipment, and line to flare or vapor recovery device.
8. Continue through the remaining procedures in this manual.

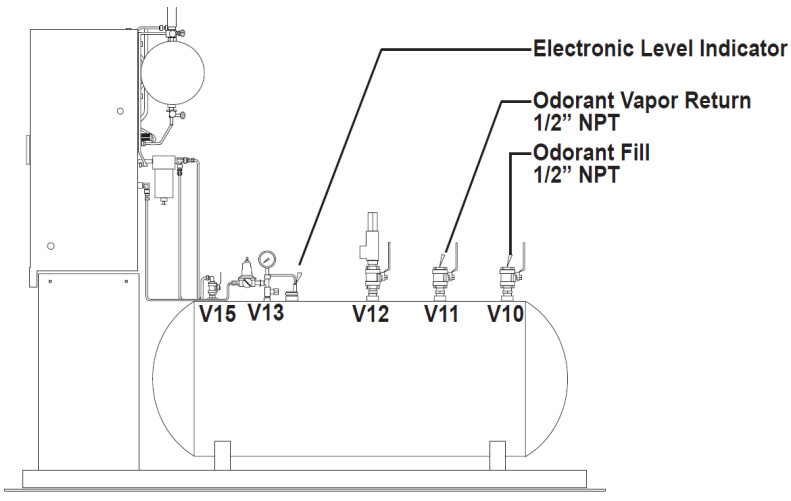


Figure 17 NJEX Valves

Refilling the Bulk Odorant Tank

CAUTION: Fill tank to a maximum level of 80% of the tank capacity.

IMPORTANT: If using an existing NJEX odorant tank, a ¼" NPT tee must be installed under the regulator to supply the blanket gas to the system. See the P&ID on page 16 for reference.

CAUTION: Odorant has a very strong odor, which if allowed to escape to the atmosphere, may cause problems in the local community. Take necessary precautions when filling an odorant storage tank to assure that the local community is not disrupted during the filling process. Verify that the entire system has no pressure in it before beginning. Additionally, all personnel should wear protective clothing, and use equipment as recommended by the chemical manufacturer during this time. If you are uncertain about any aspect of the odorant itself, you should contact the manufacturer of your chemical prior to proceeding.

1. Stop the NJEX system by pressing the Right Arrow Key or place in Standby by pressing the Down Arrow Key on the keypad on the N-400 controller.
2. Verify correct position of valves before beginning.
   - Open: **V12**
   - Closed: **V10**, **V11**, **V13**, **V15**
3. Connect a line from **V11** to a flare or vapor recovery device, and open **V11**.
4. Attach odorant supply to **V10**, open **V10**, and begin transferring odorant to the bulk tank.

CAUTION: Fill tank to a maximum level of 80% of the tank capacity.

5. Close **V10** and **V11** and remove odorant transfer equipment, and line to flare or vapor recovery device.
6. Open **V13** and **V15**.
7. Resume system operation by pressing the Right Arrow Key if stopped or the Down Arrow Key if in Standby on the keypad on the N-400 controller.

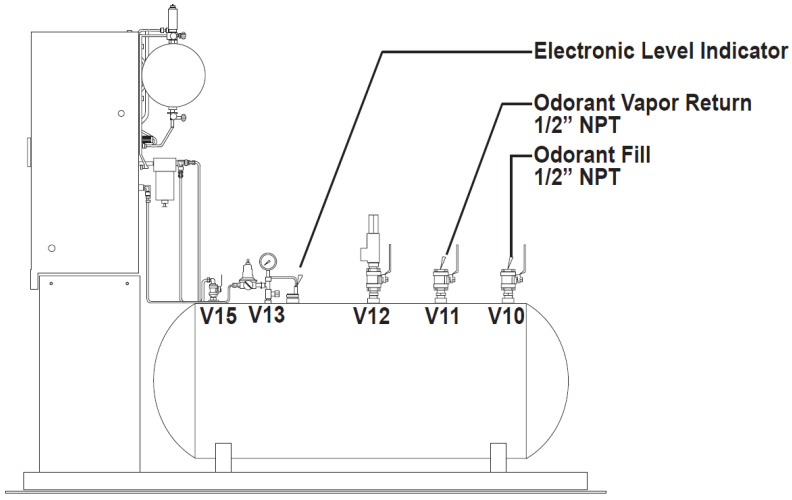


Figure 18 NJEX Valves

Section 3: System Control & Electronics

The NJEX N-400 series electronic system is composed of the N-400 Controller and the Power Limiter circuit board with lithium metal backup battery. Individual components of the system are shown below and are described in the following pages.

The NJEX system holds a system certification, but The N-400 Controller holds its own intrinsically safe approvals outlined in Figure 19. Any accessories must be installed, grounded, wired, and I.S. Barrier protected in accordance with all applicable electrical codes and the *N-400 Wiring Control Document in Appendix B*.

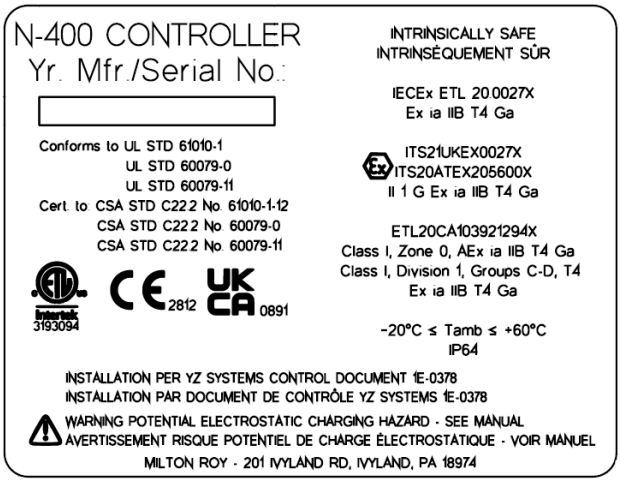


Figure 19 Controller label with intrinsically safe markings

Power is supplied to the power limiter board in the left enclosure located within the NJEX. The power limiter board limits power to the N-400 Controller and allows the unit to automatically switch to backup power if the main power source is lost. The N-400 Controller tracks the battery usage and will display the estimated battery life.

1. **N-400 Controller:** Consists of two printed circuit boards, an LCD display with membrane keypad, and an enclosure. Provides user interface and sends and receives operational signals.
2. **Power Limiter Circuit Board:** Receives and limits power to the N-400 Controller and allows the unit to automatically switch to backup battery upon loss of the main power source.
3. **Backup Battery Pack:** 14.4VDC Lithium primary backup battery to provide temporary power to the unit during a power loss.

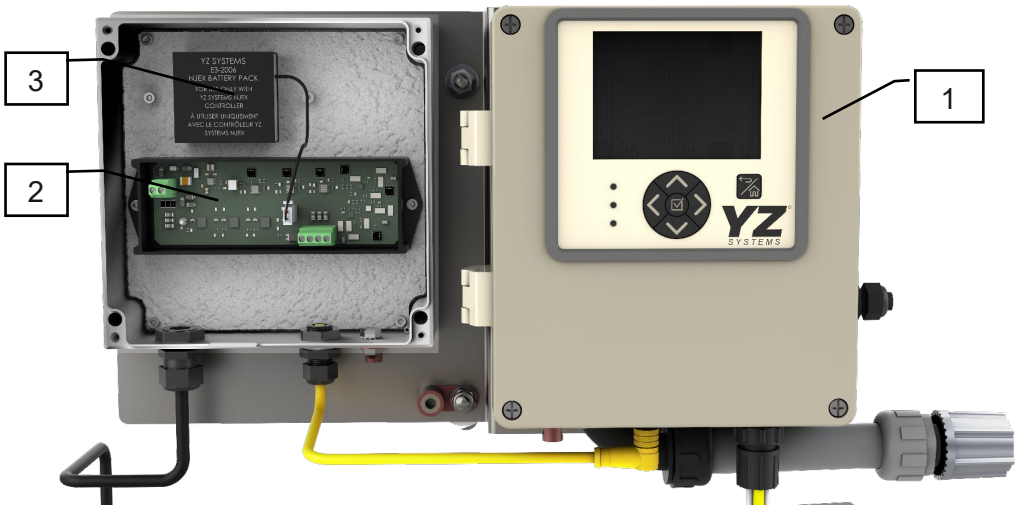


Figure 20 N-400 Control Electronics

Using the Keypad

The keypad has 6 keys to navigate through the menus.

Select Key	Up Arrow Key	Down Arrow Key	Left Arrow Key	Right Arrow Key	Home / Back Key
					

Arrow Keys

The arrow keys are used to navigate in their respective direction or to toggle through values in a menu.

At the home screen, the arrow keys have special functions:

- **UP:** Manually stroke Injection Pump
- **DOWN:** Standby/Pause
- **LEFT:** Manually Fill Verometer
- **RIGHT:** Start/Stop System

Select Key

The select key will be used to select items in the menu to enter submenus or apply changes to values. At the home screen, pressing the select key will open the main menu.

Home / Back Key

The home/back key is used in multiple ways.

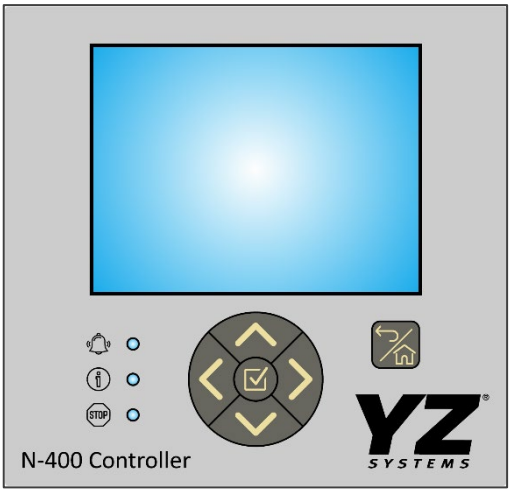


Figure 21 N-400 Controller Keypad

Pressing the back key will navigate back to the previous menu. Pressing and holding the home/ back key will bring the controller back to the home menu.

LED Communication Icons

Alarm Icon

The Alarm Icon LED will flash red in the instance of an active alarm.

Information Icon

The Information Icon LED will flash green for non-alarm indicators.

Stop Icon

The STOP Icon LED will flash yellow when stopped due to Remote Inhibit or when the system is in Standby.

Alarm Icon

Information Icon

Stop Icon

To Power Up the System

Open the N-400 Controller Enclosure and find the toggle switch S1, highlighted in red below. Turn on the main power switch by toggling the switch to up position. Navigate to the About menu and check to ensure the serial number and model type shown match the serial number and model type on the on the NJEX system label. Also check to ensure the verometer calibration number matches the verometer tag number located at the top of the verometer assembly.

IMPORTANT: If the serial number, model type, or the verometer tag number do not match the corresponding numbers in the N-400 controller consult the factory before proceeding further.

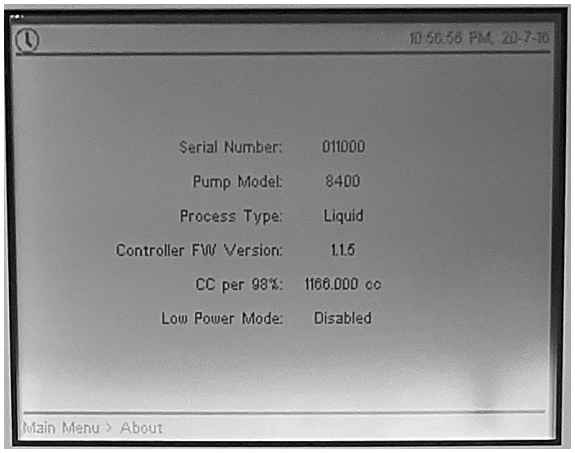


Figure 23 N-400 Information Screen

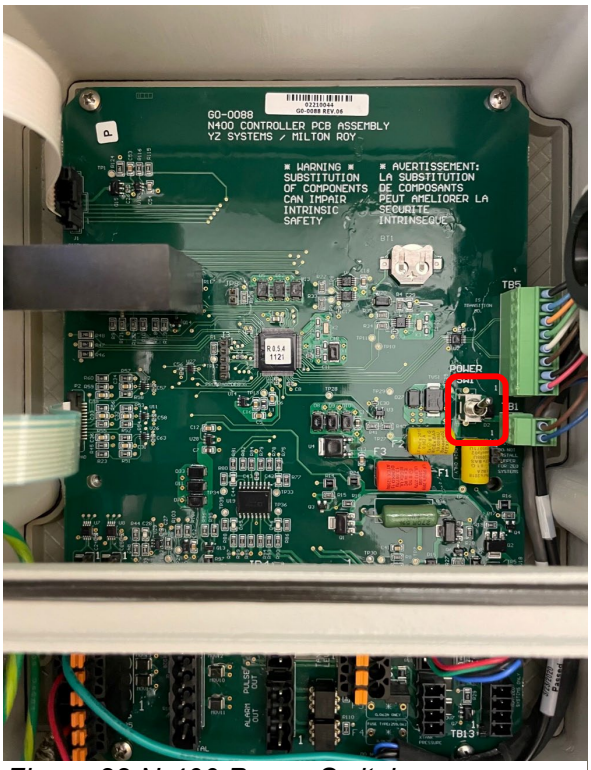


Figure 22 N-400 Power Switch

Communications Interface

There are two methods of communicating information out of the N-400 controller.

- **Method 1:** utilizes Modbus Communications protocol. Specifications to permit configuration can be found on *Appendix F: N400 Modbus Specifications.* Connections are via an RS-485 two-wire connection. In a safe, nonhazardous area, this may be connected to a RS-485 converter for interface with a SCADA system if required.

- **Method 2:** utilizes two output relays. One relay is for **Alarm Output** and provides single output communication to indicate some type of alarm has occurred. The alarm output connection is normally closed. The second output relay is for an **Odorant Output Pulse** relative to the mass of odorant injected by the system, refer to the *N-400 Wiring Control Document in Appendix B.*

Using the N-400 Home Screen

The N-400 Home Screen displays important information about your NJEX N-400 system and is used to start, stop, fill, test, or pause the unit. The home screen displays seven information sections with key information.

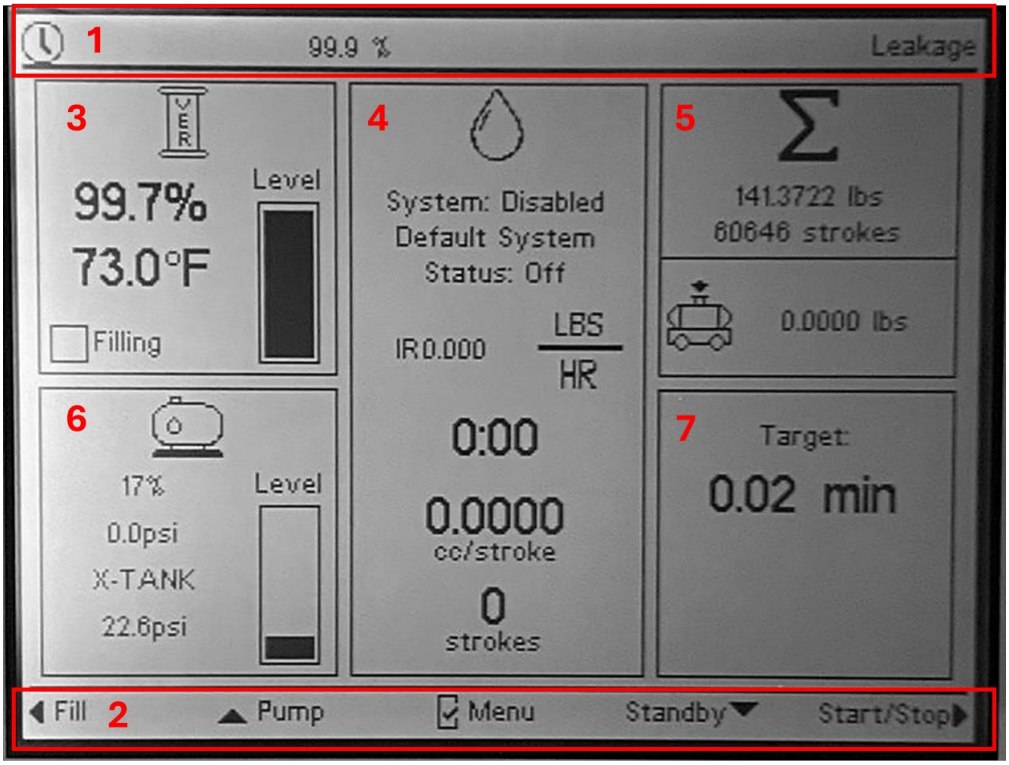


Figure 24 N-400 Home Screen Sections

Section 1 is the upper display bar which displays key setup and status information. The left side displays icons that are used as a quick reference guide for operation mode, memory module status, battery status, and communication status.

For operation mode, the controller will display one of the below two icons for Prop-To-Time or Prop-To-Flow operation. See Setting Operator Input Parameters below on how to adjust these parameters.

Additional icons that will be displayed are the Memory Module icon, which notifies the user that the MM-400 Memory Module is plugged in, properly recognized, and collecting data. This icon must be present if the memory module is present or data will not collect.

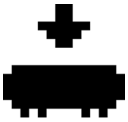
The Remote Inhibit icon will display if the unit is disabled due to a Remote Inhibit input while in the Default (NBS Output) System Redundancy mode. This icon will display if the unit is inhibited

either locally or via Modbus.

The Load Input icon is displayed when the system has a load input device wired and is active (liquid mode, load input only) or if a load is started in the liquid mode, flow detect mode.

The Modbus Communication icons will display where there is an active Modbus connection in either the COM1 or COM2 port respectively. The icons will flash as data is being transmitted.

The Battery Backup icon will display if the unit is running off the backup battery due to power loss from the main power source.

Table 6: NJEX N-400 Home Screen Upper Display Bar Icons							
Operational Mode Icon		Memory Module Present	Remote Inhibit Active	Load Input	Modbus Communication		Running on Backup Battery
Prop-To-Time	Prop-To-Flow (Pulse or Analog)				COM1	COM2	
							

The middle number in the upper status bar displays the estimated battery life of the replaceable lithium metal backup battery.

The upper right corner will display the time and date. The time and date can be set in the Time & Date menu. It is important to ensure the date and time is set to the correct values. The date and time are used to log data for system auditing.

In the instance of an alarm, the specific alarm will be displayed to notify the user in the upper right corner. See Figure 25 for an example. It will be accompanied by the red Alarm LED illuminating. If multiple alarms are present, they will alternate being displayed along with the time and date. See the Section 7, Troubleshooting section below on how to address alarms.

Figure 25 N-400 Upper Status Bar

Section 2 is the lower display bar which indicates how to start, stop, fill, pause (standby), or trigger a test pump stroke the NJEX N-400 system as well as which key will open the Main Menu. When at the start menu, the Left Arrow Key can be pressed to manually fill the verometer. This will be useful when initially installing the NJEX N-400 system or when performing maintenance that requires draining and refilling the system.

Additionally, at the Home Screen, the Right Arrow Key is used to start or stop the system. This is indicated in the lower right corner. The Up Arrow Key is used to stroke a test pump, useful when priming a unit. Each time the Up Arrow key is pushed, the pump should actuate and the N-400 display will count the stroke and adjust the totalizer in the upper right section of the N-400 Controller display.

The down Arrow key is used to pause the unit or put it into standby. Standby allows the operator to locally inhibit the operation of the N-400 controller. In the event of a no flow condition in the pipeline, the operator can switch the 8400 to a standby mode for extended periods of time or to temporarily suspend operation of the system for maintenance. When flow is initiated once more, or the maintenance has been completed, the 8400 can be switched from standby to operation.

Section 3 displays the verometer temperature and odorant level. The square next to filling will be filled in when a fill cycle is active.

Section 4 displays the main operation of your unit. The top section shows if your unit disabled or enabled and the redundancy status if using the NJEX N-400 redundancy mode. See the figures below for examples on how the running status will be displayed. The top row will display the system enabled or disabled status. The second row displays configuration state of either Default, Primary, or Backup and the state of the system as Good, Failed, or Off. The third row shows the status of the system and may display Running, Inhibit, Paused, Standby, FLO-Paused or Load stop.

First Row:

Enabled: Right arrow has been pressed, and unit will run if not inhibited.

Disabled: Right arrow has not been pressed; unit will not run.

Second Row:

Default: To be used if is a standalone NJEX unit or if end user controls their own backup protocol

Primary: N-400 redundancy primary unit

Backup: N-400 redundancy secondary unit

Off: Unit has not been enabled (right arrow has not been pressed)

Good: Redundancy only, unit has not failed due to an alarm. Will run if not inhibited.

Failed: Redundancy only, unit failed due to a failover alarm.

Third Row:

Off: Unit has not been enabled

Running: Unit actively odorizing

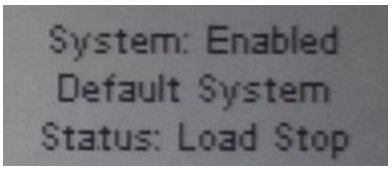
Standby: Standby button has been pressed or commanded via modbus. Ability to fill verometer or stroke pump is blocked.

Inhibit: Unit inhibited from remote inhibit (local or remote) or the backup redundancy unit paused due to primary running

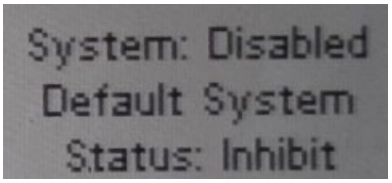
Standby Flow: Unit in standby due to low flow shutoff active or in a no flow condition

Load Stop: Liquid mode only, load has been stopped

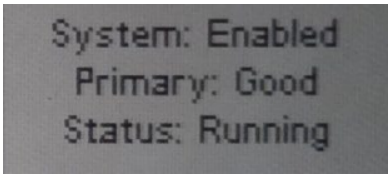
Example statuses and how they are read:



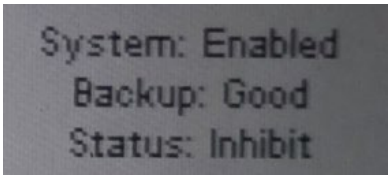
- Default system (not using redundancy protocol)
- unit enabled by pressing the right arrow
- Currently not pumping due to being in liquid mode and load not active
- Will pump once load signal is applied



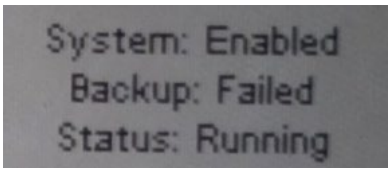
- Default system (not using redundancy protocol)
- Unit disabled, right arrow has not been pressed
- Unit inhibited by remote inhibit
- Unit will not pump if inhibit removed because it has not been enabled



- Primary system using redundancy protocol
- Unit is enabled
- Status is good, i.e. no active failover alarms
- Unit actively odorizing



- Backup system using redundancy protocol
- Unit enabled, i.e. will run if inhibit is removed
- Status good, i.e. no active failover alarms
- Unit inhibited due to primary unit running



- Backup system using redundancy protocol
- Unit enabled, i.e. will run if inhibit is removed
- Status failed, both primary and backup unit have active failover alarms
- Backup unit actively odorizing due to redundancy protocol

Section 4 also displays the target injection rate with the current active injection rate when the unit is running. At the bottom of this section, there is a countdown to the next stroke as well as the pump volume and number of strokes since the unit was turned on.

Section 5 is the Totalizer display. The totalizer shows the total odorant injected in the units that are selected under System Configuration. In liquid mode, the totalizer will also show the odorant mass injected and accumulated flow per load.

Section 6 displays the tank pressures for the NJEX unit. The two upper numbers are the bulk tank level and pressure values. The value at the bottom of this section is the expansion tank pressure denoted by X-TANK. If the NJEX unit is running off the battery backup, the pressure sensors will update every 17 seconds, and bulk tank level will be updated every 12 hours to reduce power consumption and lengthen battery life.

Section 7 has two display options. In the Proportional-To-Flow operational mode, the customer provided flow signal percentage of maximum flow is displayed. When in Proportional-To-Flow, the flow icon will indicate if the configured flow signal is Analog or Pulse. If the flow signal is analog, a wave signal icon signal will be displayed. If the flow signal is Pulse, a PWM signal icon is displayed. If Proportional-To-Time mode is selected, the stroke time will be displayed.

Using the N-400 Main Menu

From the Home Screen, press the Select Key to open the Main Menu. Using the navigation arrows, you can navigate to the selected submenus to modify or view system parameters.

Throughout the N-400 controller, additional parameters may exist but cannot be displayed on one screen. When applicable, a small black arrow will be displayed at the bottom or top of the screen indicating that more options are available. Use the navigation arrows to navigate in the direction of the arrow to display the options.

To open a submenu within the Main Menu, use the navigation arrows to highlight the selected menu and press the Select Key. To return to the previous menu, press the Home / Back Key. The line of text at the bottom of each screen will tell you where you are located within the menu.

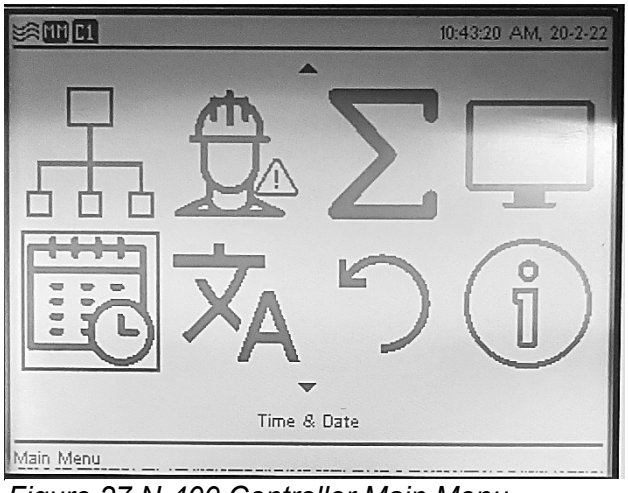


Figure 27 N-400 Controller Main Menu, Continued

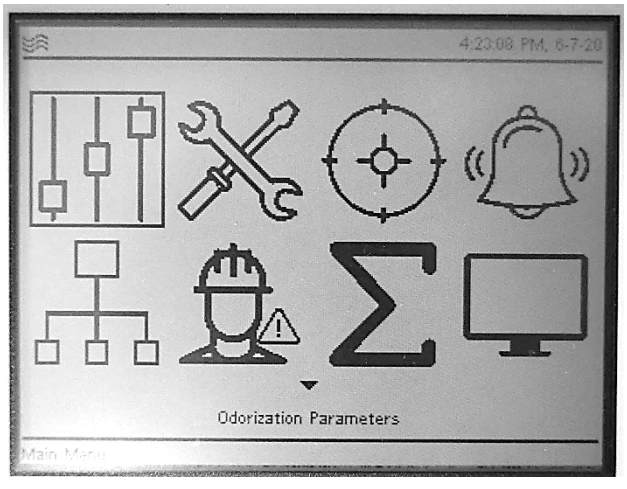


Figure 26 N-400 Controller Main Menu

Setting Operator Input Parameters

Before adjusting any parameters, ensure the system is stopped. The Home Screen will display *STATUS: Enabled OR Disabled* in the middle section of the screen. The ability to adjust input parameters is disabled when the system is Enabled or in Standby. To stop or start the system, press the Right Arrow Key while at the Home Screen. If the unit is enabled and you attempt to adjust the parameters, a screen will be displayed allowing you to disable the unit to adjust the parameters without returning to the Home Screen.

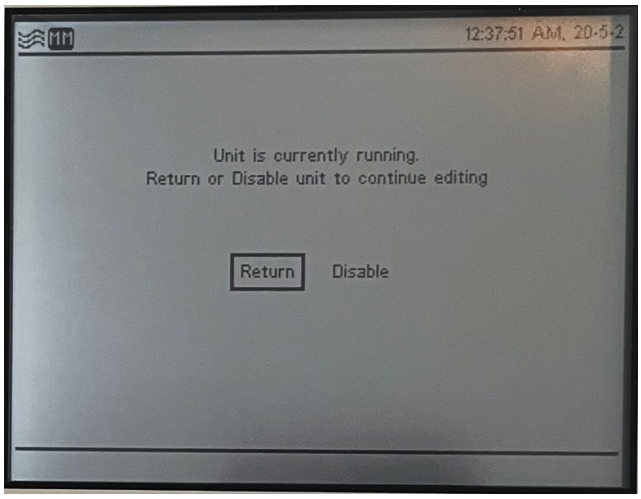


Figure 28 Unit Running Pop Up Screen

1 - Setting the System Configuration Parameters

To begin initializing a new system, the base System Configuration settings must be set. In the System Configuration menu, the user has the option of selecting the system units, if the system will resume automatically in the instance of a loss of power, and selecting the system redundancy options.

To set the System Configuration Parameters

1.1. From the home screen, press the Select Key to open the Main Menu.
1.2. Using the navigation arrows, navigate to the System Configuration Menu and press the Select Key.
1.3. Within this menu, navigate to the desired Units and press the select key to set the units. The parameter selected will be identified by the filled circle next to the parameter.
1.4. In the instance of a power loss while the system is running, the system can be set to resume automatically when power is restored. To allow the system to resume on power loss, use the navigation arrows to navigate to the “Resume on power loss” setting and

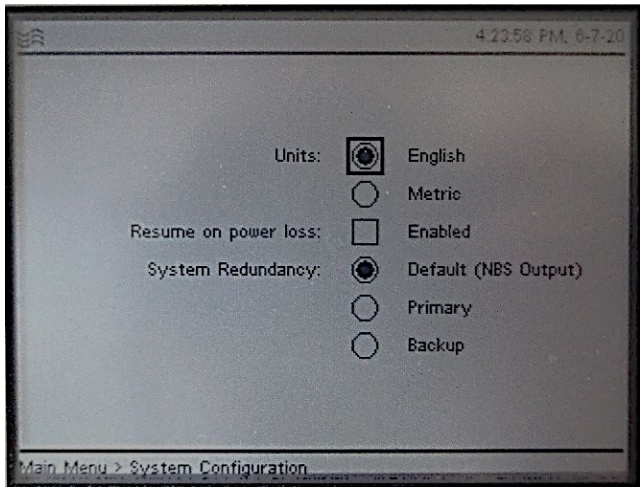


Figure 29 System Configuration Parameters, Gas Mode

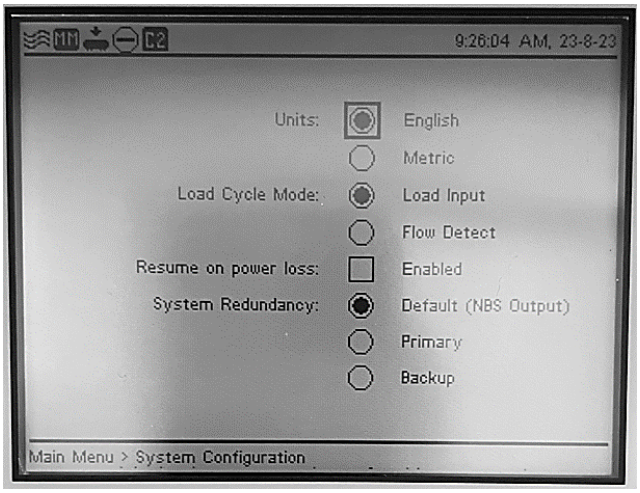


Figure 30 System Configuration Parameters, Liquid Mode

press the select key. If selected, the selection box will be checked next to Enabled. If this parameter is enabled and the NJEX system loses power while disabled, the system will resume in the disabled mode.

1.5. If the NJEX unit is part of a redundant system, navigate to System Redundancy options and select if the current unit is the Primary or Backup system. The set selection will be identified with a filled circle next to the selected option.

1.6. For liquid mode only, there is a Load Cycle Mode selection.

Load Input: Load input allows the user to set the operating parameters and when the unit is started, the status will read Load Stop until a load input signal is connected. When the load input is active, the unit will begin the batch. When the load signal is removed or the unit is stopped, the load is saved

Flow Detect: If a load input signal is not available, flow detect mode can be used to odorize batches. The N-400 Controller monitors the incoming flow signal and determines the batch starting when the flow signal increases to above 0% and then ends the batch when the signal falls to 0% again. The load may be started before the load begins, the load will start when flow is read. The load start and stop points may also be determined by the low flow shutoff. Instead of 0% flow signal determining the batch, the low flow shutoff may be turned on and adjusted to set the start and stop points.

2a - Setting the Odorization Parameters – Gas Mode

The N-400 controller can operate in two modes: Proportional-To-Flow or Proportional-To-Time. Proportional-To-Flow reads an input signal provided by the customer to determine the flow rate of the pipeline media and adjusts the amount of odorant injected at a rate to maintain the target injection rate. Proportional-To-Time mode injects odorant by setting a time per stroke value. Use the Odorization Parameters to set the target Injection Rate and odorant parameters.

Each operation mode and parameters are available in metric units.

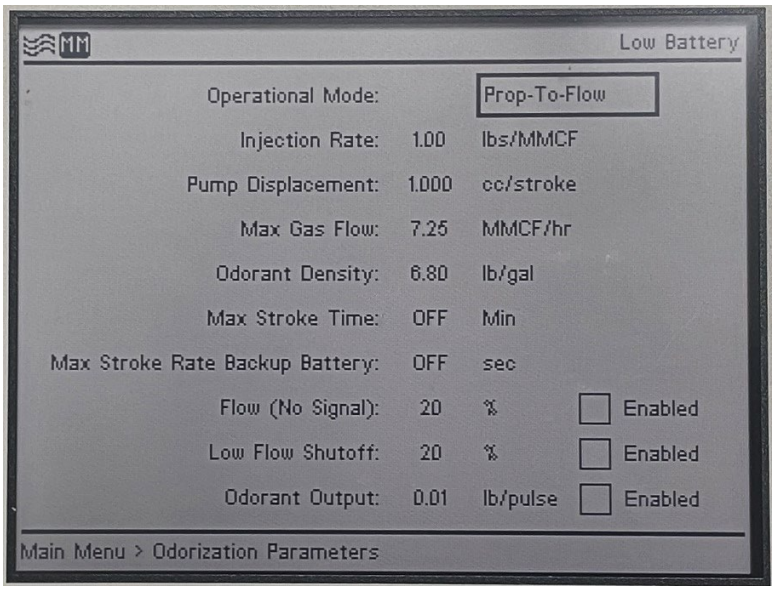


Figure 31 Odorization Parameters, Gas Mode, Prop-to-Flow

Injection Rate (Prop-to-Flow) is the target mass to injection proportional to the flow rate.

Time Per Stroke (Prop-to-Time) is the set time between strokes.

Pump Displacement is the spacer size that is supplied with the NJEX unit. Upon startup, the displacement shall be set as the size spacer and as the unit runs, the active pump displacement will be updated on the Home Screen. After running, the user shall modify this parameter in this section to the displacement displayed on the Home Screen to ensure the most accurate odorization and avoid nuisance alarms.

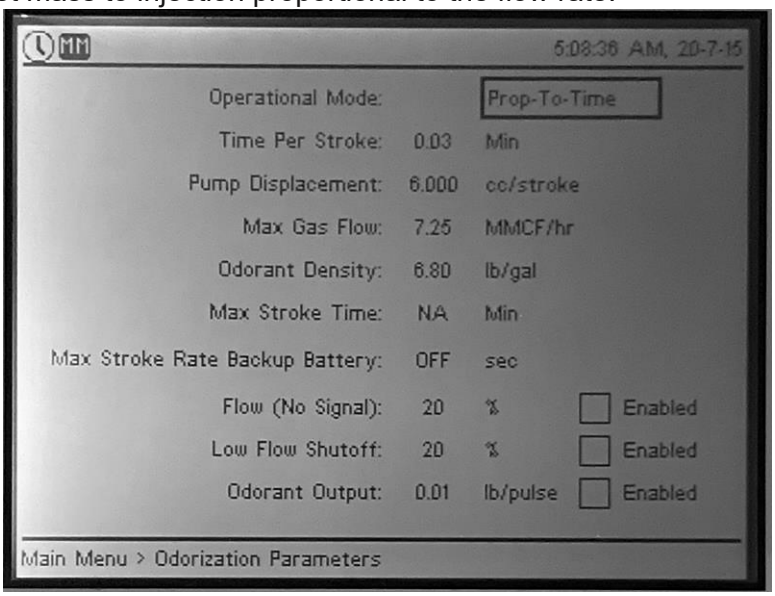


Figure 32 Odorization Parameters, Gas Mode, Prop-To-Time

Max Gas Flow (Prop-to-Flow) is the maximum gas flow that the unit should read and should correlate with the end user's flow meter. The % of flow rate is calculated based on the maximum gas flow entered in this screen. *This setting is only applicable for Prop-To-Flow operational mode.*

Max Stroke Time (Prop-to-Flow) is the maximum time between strokes. If the operating conditions are as such that the stroke time would calculate greater than this value, this value can be used to truncate the time to the next stroke. *This feature is only applicable for Prop-To-Flow operational mode not applicable under low-flow or no-flow conditions.*

Max Stroke Rate Backup Battery is the minimum time between strokes for when the unit is being powered by the backup battery. If the normally calculated time to next stroke is less than this setting, the value for this setting is used instead of the calculated time. This setting will work in prop to time and prop to flow. You may want to use this feature to save battery life if the backup battery is active. *This feature is not active under low-flow or no-flow conditions but is available in either Prop-to-Time or Prop-to-Flow.*

Flow (No Signal) is the predetermined percentage of max gas flow that the operator would like the N-400 controller to default to if the flow input signal is lost. *This setting is only applicable for Prop-To-Flow operational mode.*

Low Flow Shutoff is a percentage of the max gas flow at which the system will stop injecting odorant. This allows the controller to sense low flow conditions where the operation is not desired. When the flow signal rises above this set point, the N-400 will resume normal operation. If enabled, the low flow shutoff may also be used as the start and stop point for a liquid load cycle. *This setting is only applicable for Prop-To-Flow operational mode and only applicable with an analog flow signal.*

Odorant Output will generate a pulse for every lb or kg injected depending on the value input. The output relay is located at TB12, terminals #3 and #4, refer to the N-400 Wiring Control Document in Appendix B for reference.

To set odorization parameters

2a.1. Beginning from the home screen, press the Select Key to open the Main Menu

2a.2. Select the Odorization Parameters menu

2a.3. Verify the Injection Rate, Max Gas Flow, and Odorant Density are in the desired base unit. If units are not in the preferred base unit, see the System Configuration Parameters above.

2a.4. To continue, use the navigation arrows to navigate to the Operational Mode. Press the Select Key to modify the parameter and choose either Prop-To-Flow or Prop-To-Time. Press the Select Key to enter.

2a.4.1. To operate in Prop-To-Flow mode, a flow signal must be provided. See Calibrating Input Signals on the next page on the acceptable flow signal types and how to calibrate.

2a.5. To set the Injection Rate or Time Per Stroke, use the navigation arrows to highlight the target value. Press the select to key to begin editing. When in editing mode, the value will be filled with a dark background and the value will be displayed in light text. Press (or hold for large changes in value) the Up Arrow Key and Down Arrow Key to adjust the Injection Rate. When the desired value is displayed, press the Select Key to exit the editing mode. The value will display as standard with the default background color and dark text.

2a.6. Repeat previous step to set the remaining parameters: Maximum Gas Flow, and Odorant Density, Flow (No Signal), Low Flow Shutoff, and Odorant Output as needed.

2a.7. Set the pump displacement value to the size spacer provided with the NJEX unit.

IMPORTANT: After starting the NJEX unit, the pump displacement calculation will be updated on the Home Screen using real data of the odorant leaving the verometer. After the cc/stroke value is updated on the Home Screen, the parameter in the Odorization Parameters will be updated to reflect the cc/stroke calculated. Ensure the pump displacement is updated for the correct spacer size prior to startup to ensure the pump displacement values are correct.

2a.8. Flow (No Signal), Low Flow Shutoff, and Odorant Output parameters are not enabled by default. If they are not enabled, the N-400 controller disregards these parameters. To enable, use the navigation arrows to navigate to the box displayed next to Enable and press the Select Key. If the parameter is enabled, the box will be filled with a check mark.

2a.9. Repeat steps if necessary, to enable additional optional parameters.

2a.10. To disable these optional parameters, use the navigation arrows to select a box that is filled with a check mark next to Enable and press the Select Key. If the parameter is disabled, the box will be displayed empty.

2b - Setting the Odorization Parameters – Liquid Mode

The N-400 controller can operate in two modes: Proportional-To-Flow or Proportional-To-Time. Proportional-To-Flow reads an input signal provided by the customer to determine the flow rate of the flowing media and adjusts the amount of odorant injected at a rate to maintain the target injection rate. Proportional-To-Time mode injects odorant by setting a target time per stroke value to maintain. Use the Odorization Parameters to set the target Injection Rate and odorant parameters.

Each operation mode and parameters are available in metric units.

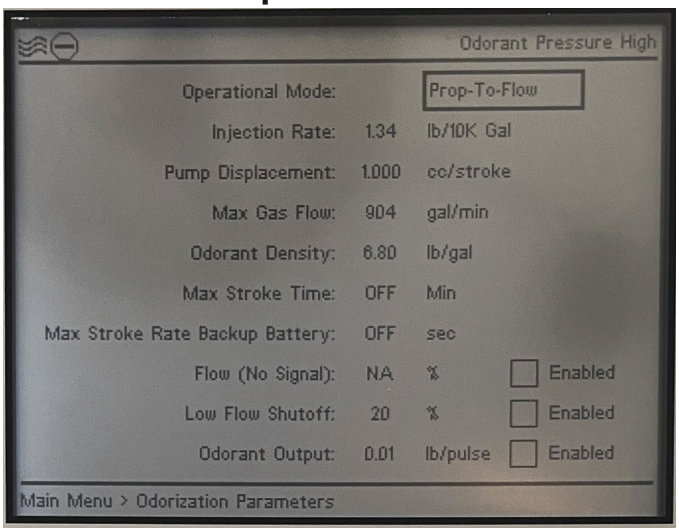


Figure 34 Odorization Parameters, Liquid Mode, Prop-to-Flow

Injection Rate (Prop-to-Flow) is the target mass to injection proportional to the load volume.

Time Per Stroke (Prop-to-Time) is the set time between strokes.

Pump Displacement is the spacer size that is supplied with the NJEX unit. Upon startup, the displacement shall be set as the size spacer and as the unit runs, the active pump displacement will be updated on the Home Screen. After running, the user shall modify this parameter in this section to the displacement displayed on the Home Screen to ensure the most accurate odorization and avoid nuisance alarms.

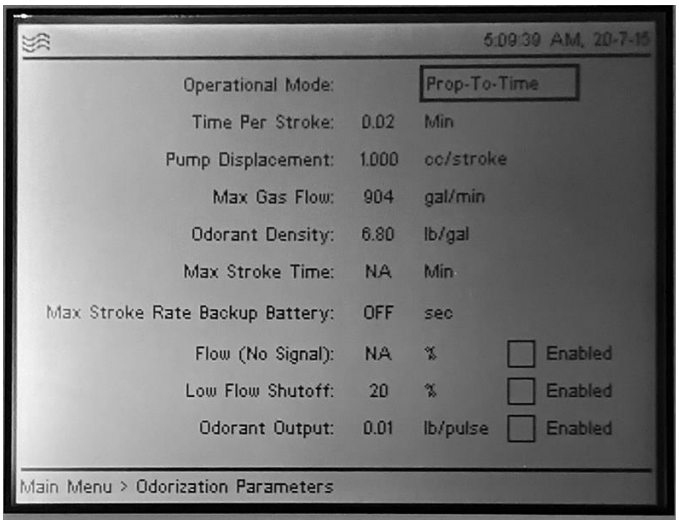


Figure 34 Odorization Parameters, Liquid Mode, Prop-to-Time

Max Gas Flow is the general maximum expected of the liquid batch being odorized in order to calculate the injection rate. *This setting is only applicable for Prop-To-Flow operational mode.*

Max Stroke Time is the maximum time between strokes. If the operating conditions are as such that the stroke time would calculate greater than this value, this value can be used to truncate the time to the next stroke. *This setting is only applicable for Prop-To-Flow operational mode and is not active under low-flow or no-flow conditions.*

Max Stroke Rate Backup Battery is the minimum time between strokes for when the unit is being powered by the backup battery. If the normally calculated time to next stroke is less than this setting, the value for this setting is used instead of the calculated time. This setting will work in prop to time and prop to flow. You may want to use this feature to save battery life if the backup battery is active. *This feature is not active under low-flow or no-flow conditions but is available in either Prop-to-Time or Prop-to-Flow.*

Odorant Output will generate a pulse for every lb or kg injected depending on the value input. The output relay is located at TB12, terminals #3 and #4, refer to the N-400 Wiring Control Document in Appendix B for reference.

Low Flow Shutoff is a percentage of the max gas flow at which the system will stop injecting odorant. This allows the controller to sense low flow conditions where the operation is not desired. When the flow signal rises above this set point, the N-400 will resume normal operation. If enabled, the low flow shutoff may also be used as the start and stop point for a liquid load cycle. *This setting is only applicable for Prop-To-Flow operational mode and only applicable with an analog flow signal.*

To set odorization parameters

2b.1. Beginning from the home screen, press the Select Key to open the Main Menu

2b.2. Select the Odorization Parameters menu

2b.3. Verify the Injection Rate, Max Process Flow, and Odorant Density are in the desired base unit. If units are not in the preferred base unit, see the System Configuration Parameters above.

2b.4. To continue, use the navigation arrows to navigate to the Operational Mode. Press the Select Key to modify the parameter and choose either Prop-To-Flow or Prop-To-Time. Press the Select Key to enter.

2b.4.1. To operate in Prop-To-Flow mode, a flow signal must be provided. See Calibrating Input Signals on the next page on the acceptable flow signal types and how to calibrate.

2b.5. To set the Injection Rate or Time Per Strtoke, use the navigation arrows to highlight the target value value. Press the select to key to begin editing. When in editing mode, the value will be filled with a dark background and the value will be displayed in light text. Press (or hold for large changes in value) the Up Arrow Key and Down Arrow Key to adjust the Injection Rate. When the desired value is displayed, press the Select Key to exit the editing mode. The value will display as standard with the default background color and dark text.

2b.6. Repeat previous steps to set the remaining parameters: Maximum Gas Flow, and Odorant Density, Flow (No Signal), Low Flow Shutoff, and Odorant Output as needed.

2b.7. Set the pump displacement value to the size spacer provided with the NJEX unit.

IMPORTANT: After starting the NJEX unit, the pump displacement calculation will be updated on the Home Screen using real data of the odorant leaving the verometer. After the cc/stroke value is updated on the Home Screen, the parameter in the Odorization Parameters will be updated to reflect the cc/stroke calculated. Ensure the pump displacement is updated for the correct spacer size prior to startup to ensure the pump displacement values are correct.

2b.8. The Odorant Output feature is not enabled by default. If they are not enabled, the N-400 controller disregards these parameters. To enable, use the navigation arrows to navigate to the box displayed next to Enable and press the Select Key. If the parameter is enabled, the box will be filled with a check mark.

2b.9. To disable an optional parameters, use the navigation arrows to select a box that is filled with a check mark next to Enable and press the Select Key. If the parameter is disabled, the box will be displayed empty.

3 - Calibrating Input Signals

The N-400 controller uses inputs from various devices to properly determine the injection rate to the flowing pipeline. The Calibration menu is used to manually calibrate each device to ensure proper measurement. The measurements that are calibrated include the Flow Signal, Odorant Tank Level, Inlet Pressure, and Expansion Tank Pressure.

Note: The N-400 controller should be in the stopped mode when performing the following calibrations.

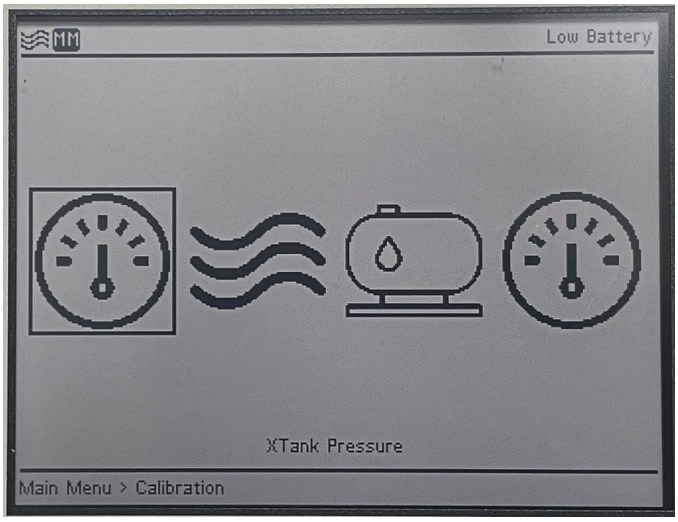


Figure 35 Calibration Sub Menu

IMPORTANT: Many factors affect the signal between the signal source and the NJEX system. Elements of the signal electrical system such as the gauge and length of the wire, isolation barrier, grounding, transient voltages, and the condition of the signal generated by the flow device can affect the signal and how that signal is received by the NJEX System. To truly calibrate the NJEX System to the signal, use only the flow equipment that will be part of the odorization system such as a flow computer, RTU, PLC, pulse index drive, or differential pressure transducer.

IMPORTANT: Analog Flow Input (TB8) and Pulse Flow Input (TB2) shall not be connected at the same time.

3.1 – Expansion Tank Pressure Calibration

The expansion tank will be calibrated at the factory. If needed to recalibrate, follow the below instructions.

3.1.1. To begin calibration the Expansion Tank Pressure, press the Select Key from the home screen to open the Main Menu

3.1.2. Navigate to the Calibration Menu and press the Select Key

3.1.3. Select the Expansion Tank Pressure

3.1.4. Prior to performing the expansion tank pressure, ensure the expansion tank is relieved from all pressure.

3.1.5. To purge and vent the expansion tank, start with the expansion tank pressure between 55-60 psi (3.4-4.0 bar) by opening/closing V4.

3.1.6. Open V14 on the expansion tank, if there is no liquid you will hear bubbling in the bulk tank or a flushing sound in the expansion tank . If the expansion tank sounds like flowing liquid, maintain pressure and wait for it to clear, up to 20 minutes, then close V14.

3.1.7. To vent the expansion tank, connect a flare or scrubbed to the V5 vent on the back of the cabinet

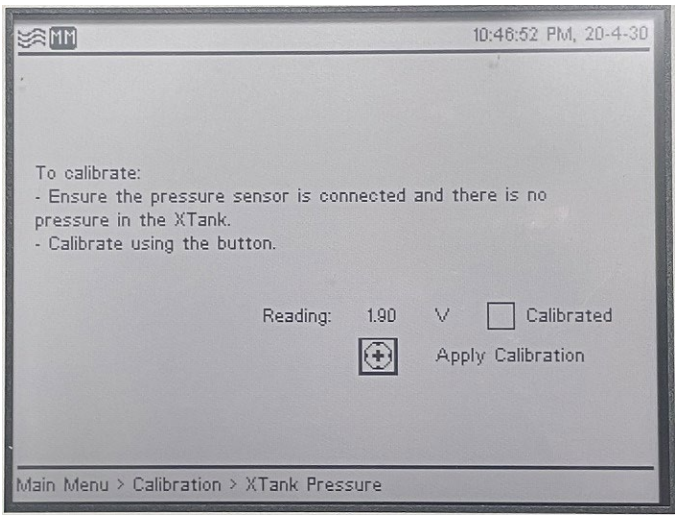


Figure 36 Expansion Tank Pressure Calibration

3.1.8. Open V2 and V3 and then slowly open V5 to release pressure.

3.1.9. When the expansion tank is vented, select apply calibration and the checkbox next to Calibrated will be checked. After calibration, the corrected reading will show 1.0 V.

3.2 - Analog Flow Input Calibration, 1-5 VDC / 4-20 mA

3.2.1. To begin calibrating the analog flow input, press the Select Key from the home screen to open the Main Menu

3.2.2. Navigate to the Calibration Menu and press the Select Key

3.2.3. Select the Flow Signal Menu

3.2.4. Select the Flow Signal Type Analog. The selected parameter will have a filled circle displayed next to it.

3.2.5. When Analog is selected, the screen will display instructions to calibrate. Select Zero to calibrate the zero set point. The N-400 controller is programmed for 0% of flow to directly correspond to 1.00 VDC (4.0 mA) at the flow input terminal board TB8 terminals #2 and #3. Refer to the N-400 Wiring Control Document in Appendix B.

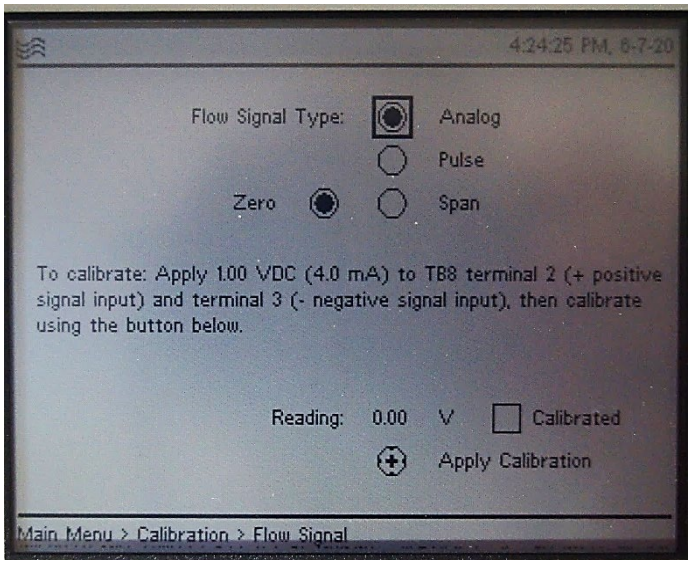


Figure 37 Analog Flow Signal Zero Calibration Screen.

3.2.6. When the Zero option is selected, instructions to calibrate the zero set point are displayed on the screen. To calibrate the zero set point, apply 1.00 VDC (4.0 mA) to TB8 terminal #2(+) and terminal #3(-).

3.2.7. After the signal has been applied, navigate to the Apply Calibration selection and press select.

3.2.8. If calibrated reading is within the acceptable calibration range, the calibration will be applied and the box next to Calibrated will display a check mark. After calibration, the corrected reading will show 1.0 V.

NOTE: If the controller does not accept the calibration value, the voltage at the input terminal is outside of the calibration range of .6V -1.4VDC (2.4 mA - 5.6 mA).

3.2.9. Select span to calibrate the span set point. This adjustment is used to calibrate the N-400 controller for 100% of metered flow in the pipeline. The N-400 controller is factory calibrated for 100% of flow to directly correspond to 5.00 VDC (20 mA) at the flow input terminal board TB8 terminals #2 and #3. Refer to the N-400 Wiring Control Document in Appendix B.

3.2.10. When the Span option is selected, instructions to calibrate the span set point are displayed on the screen. To calibrate the span set point, apply 5.00 VDC (20 mA) to TB8 terminal #2(+) and terminal #3

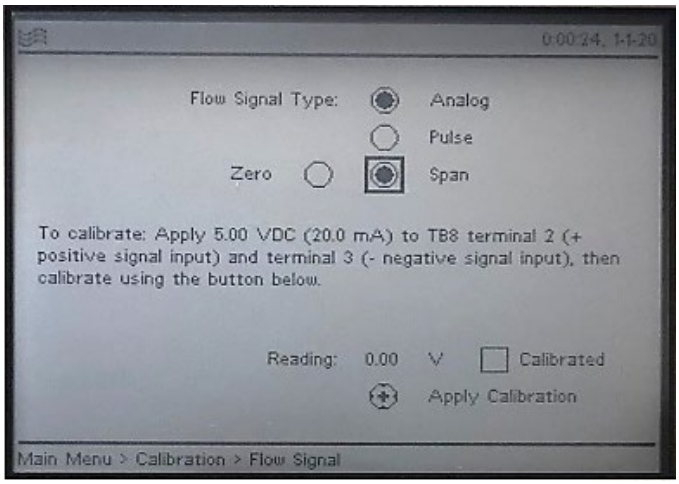


Figure 38 Analog Flow Signal Span Calibration Screen

3.2.11. After the signal has been applied, navigate to the Apply Calibration selection and press select.

3.2.12. If calibrated reading is within the acceptable calibration range, the calibration will be applied and the box next to Calibrated will display a check mark. After calibration, the corrected reading will show 5.0 V.

NOTE: If the controller does not accept the calibration value, the voltage at the input terminal is outside of the calibration range of 3.0V-5.5VDC (12 mA - 22 mA).

3.3 - Pulse Input Sensor Calibration

Note: Calculating the Pulse Input Frequency is required to calibrate the system. See the example on the next page on how to calculate this value.

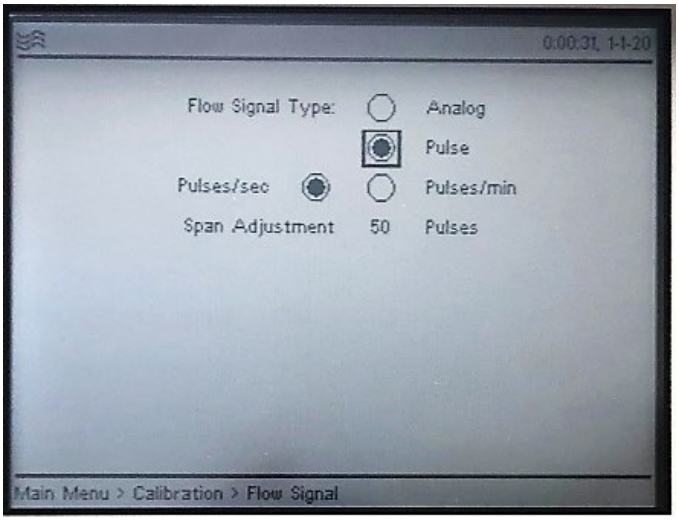


Figure 39 Pulse Flow Signal Calibration Menu

3.3.1. To begin calibrating the pulse flow input, press the Select Key from the home screen to open the Main Menu

3.3.2. Navigate to the Calibration Menu and press the Select Key

3.3.3. Select the Flow Signal Menu

3.3.4. Select the Flow Signal Type Pulse. The selected parameter will have a filled circle displayed next to it.

3.3.5. Using the navigation arrows, select Pulses/sec or Pulses/min. The selection is determined when calculating the required pulses to calibrate. See the example below for an example on calculating the span frequency.

3.3.6. After completing the span adjustment calibration calculation, use the navigation arrows to navigate to the Span Adjustment value.

3.3.7. Press the Select Key to edit the Span Adjustment value. When editable, the value will have a dark background and be displayed with light text. Press (or hold for large changes in value) the Up Arrow Key and Down Arrow Key to modify the Span Adjustment value to the desired value. Press the Select Key to confirm the value and the Span Adjustment will return to displaying as dark text on the default background.

GAS MODE

Calculation for Determining the Span Frequency

$$\frac{Pulse}{CF}\ x\ \max flow\ rate \qquad \frac{CF}{Hr} = \frac{Pulses}{Hr}$$

As determined by the flow metering device

Example:

$$\frac{1\ pulse}{10\ CF}\ x\ \frac{1{,}000{,}000\ CF}{Hr} = 100{,}000\ \frac{pulses}{Hr}$$

Since pulses per hour is not an option for programing the N-400 controller, divide by 60 minutes per hour to obtain pulses per minute.

$$\frac{100{,}000\ pulses}{Hr}\ x\ \frac{1\ Hr}{60\ min} = 1{,}666.7\ \frac{pulses}{min}$$

Since a maximum of 999 pulses per minute may be programmed into the N-400 controller, you must now divide by 60 seconds per minutes to obtain pulses per second. If this value had calculated to be less than 100 pulses per minute, it could have been programmed into the N-400 controller.

$$\frac{1{,}666.7\ pulses}{min}\ x\ \frac{1\ min}{60\ sec} = 27.7\frac{pulses}{sec}$$

LIQUID MODE

Calculation for Determining the Span Frequency

$$\frac{\frac{Pulse}{gallon\ (liter)}\ x\ \max flow\ rate\ gpm\ (lpm)}{60\ sec/min} = \frac{Pulses}{sec}$$

As determined by the flow metering device

Example 1:

$$\frac{\frac{30\ pulse}{gallon}\ x\ \frac{100\ gallon}{min}}{60\ sec/min} = 50\ PPS$$

Example 2:

$$\frac{\frac{10\ pulse}{liter}\ x\ \frac{300\ liter}{min}}{60\ sec/min} = 50\ PPS$$

3.4 - Bulk Tank Level Calibration

3.5.1. To begin calibrating the Odorant Tank Level, press the Select Key from the home screen to open the Main Menu

3.5.2. Navigate to the Calibration Menu and press the Select Key

3.5.3. Select the Odorant Tank Menu

3.5.4. Select the Level Sensor Type. The N-400 controller supports a YZ Systems provided gauge or a customer supplied Analog level sensor (4-20mA). The YZ gauge does not require calibration.

3.5.5. When the Analog sensor option is selected, the option to calibrate is displayed on the screen.

3.5.6. Select Zero to calibrate the zero set point. When Zero is selected, the calibration instructions are displayed on the screen. The N-400 controller is programmed for 0% tank fill to directly correspond to 1.00 VDC (4.0 mA) at the flow input terminal board TB11 terminals #2 and #3. Refer to the N-400 Wiring Control Document in Appendix B.

3.5.7. To calibrate the zero set point, apply 1.00 VDC (4.0 mA) to TB11 terminal #2(+) and terminal #3(-).

3.5.8. After the signal has been applied, navigate to the Apply Calibration selection and press select.

3.5.9. If calibrated reading is within the acceptable calibration range, the calibration will be applied and the box next to Calibrated will display a check mark.

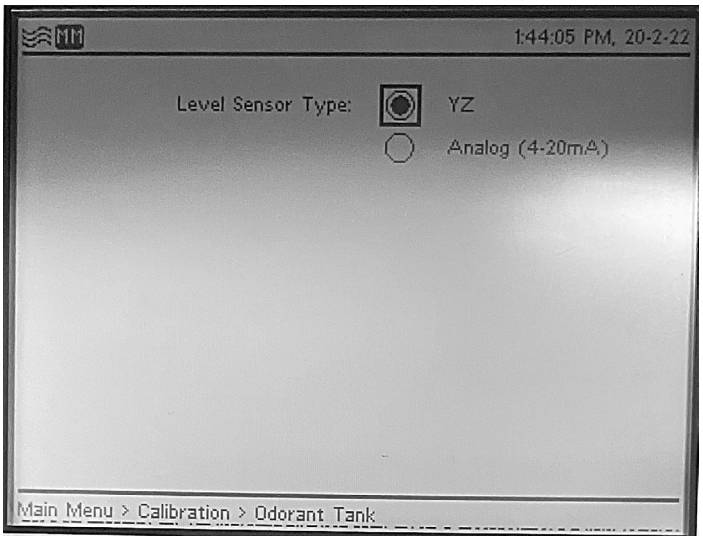


Figure 40 Level Sensor Calibration – Rochester Gauge

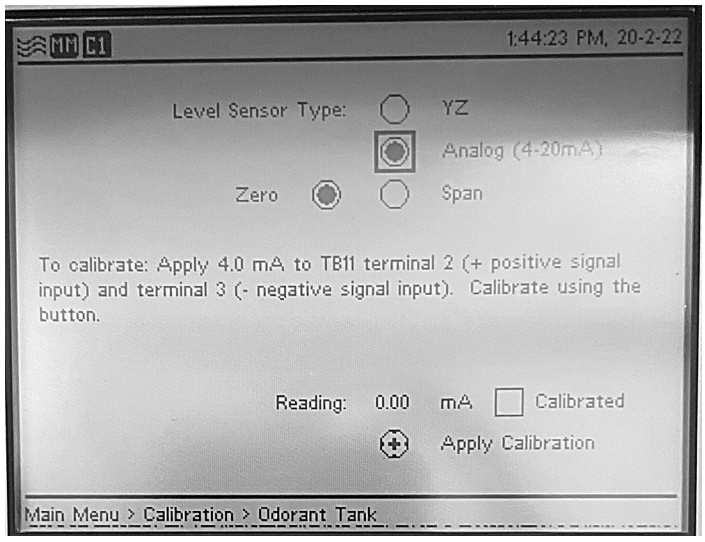


Figure 41 Level Sensor Calibration - Analog Sensor Zero

NOTE: If the controller does not accept the calibration value, the voltage at the input terminal is outside of the calibration range of 2.4 mA - 5.6 mA.

3.5.10. Select span to calibrate the span set point. When Span is selected, the calibration instructions are displayed on the screen. This adjustment is used to calibrate the N-400 controller for 100% tank volume. The N-400 controller is programmed for 100% of volume to directly correspond to 5.00 VDC (20 mA) at the flow input terminal board TB11 terminals #2 and #3. Refer to the N-400 Wiring Control Document in Appendix B.

3.5.11. To calibrate the span set point, apply 5.00 VDC (20 mA) to TB11 terminal #2(+) and terminal #3(-).

3.5.12. After the signal has been applied, navigate to the Apply Calibration selection and press select.

3.5.13. If calibrated reading is within the acceptable calibration range, the calibration will be applied and the box next to Calibrated will display a check mark.

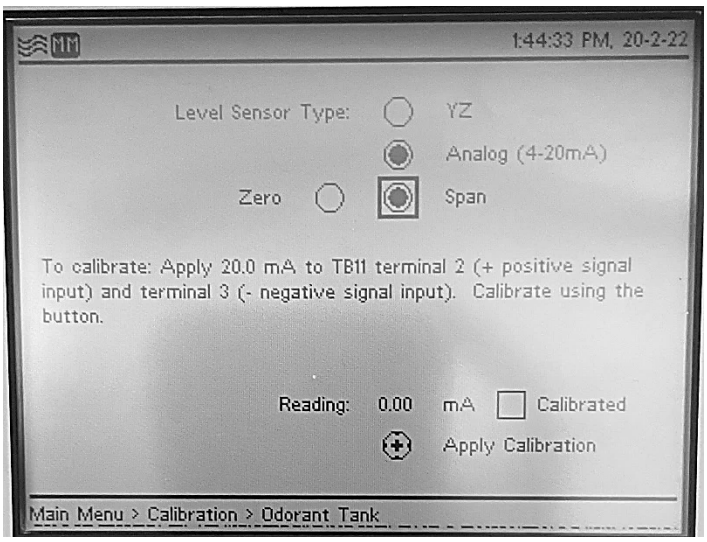


Figure 42 Level Sensor Calibration – Analog Sensor Span

NOTE: If an error message appears the voltage at the input terminal is outside of the calibration range of 12 mA - 22 mA.

3.5 – Odorant Inlet Pressure Calibration

3.5.1. To begin calibrating the Inlet Pressure, press the Select Key from the home screen to open the Main Menu

3.5.2. Navigate to the Calibration Menu and press the Select Key

3.5.3. Select the Inlet Pressure Menu

3.5.4. Prior to performing the odorant inlet calibration, purge the system (if required) and relieve all pressure from the odorant inlet.

3.5.5. If the Odorant Bulk Tank is pressurized, close V8 and the Odorant Supply Valve V17. Close V13 to isolate the process gas. Open Vent Valve V5 to release pressure.

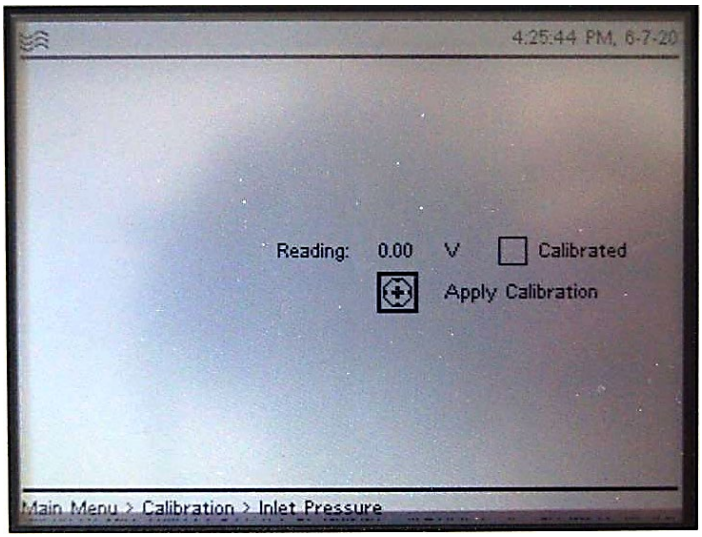


Figure 43 Odorant Inlet Pressure Calibration

IMPORTANT: V5 should be connected to a scrubber or flare to prevent odorized gas release.

3.5.6. After the pressure has been relieved, navigate to the Apply Calibration selection and press select.

3.5.7. If calibrated reading is within the acceptable calibration range, the calibration will be applied and the box next to Calibrated will display a check mark. After calibration, the corrected reading will show 1.0 V.

4 - Configuring Alarm Parameters

The N-400 has an array of alarm parameters that can be configured to send an alarm signal and illuminate the alarm LED per set conditions. Each alarm can be enabled or disabled with the option to output the alarm to external means of monitoring.

Alarms displayed in this section may be an **alarm** or **non-alarm indicator.** If an alarm is active, the red LED will blink and is indicative of an issue with the NJEX system. If a non-alarm indicator is active, the green LED will blink and should be noted but not indicative of a system failure. The yellow LED will blink if the unit is in standby.

The non-alarm indicators are as follows: Overflow (>112%), Fill Rate, Verometer and Verometer Overfill. They are not configurable and may not be turned off. The rest of the alarms listed below are standard alarms.

4 .1 - Configurable Alarm Signal Options

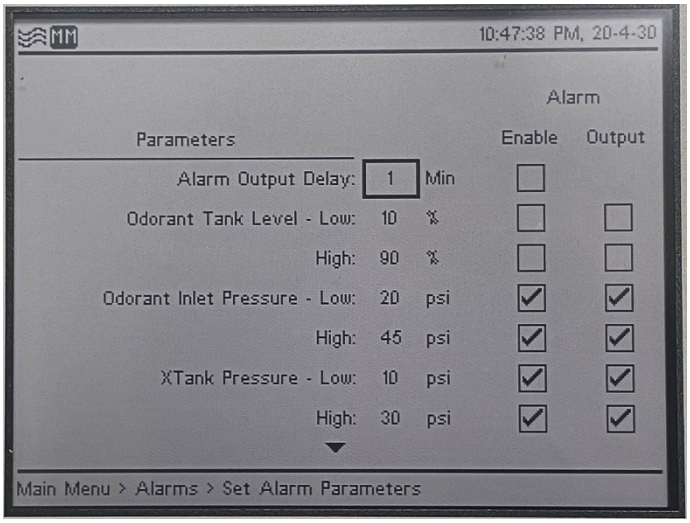
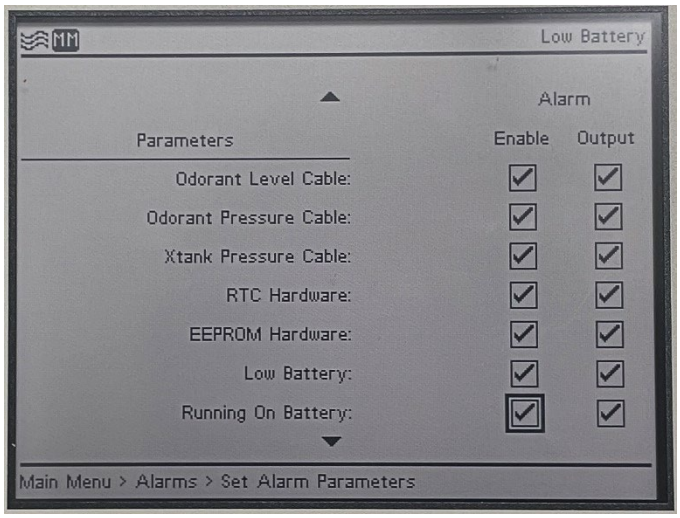


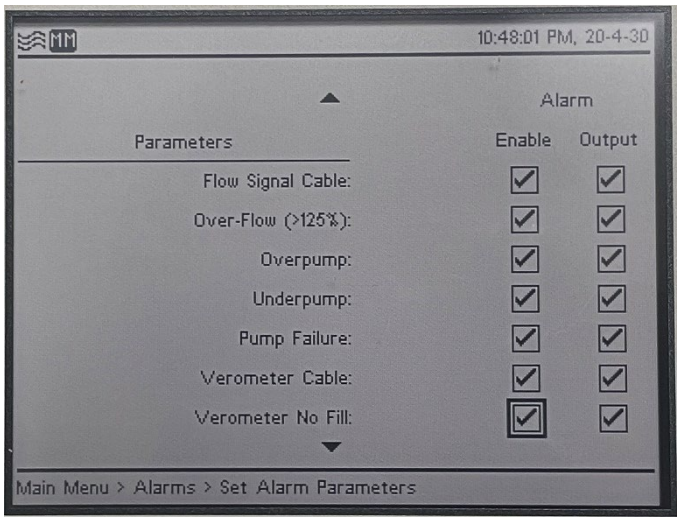
Figure 44 Configurable Alarm Signals

- **Alarm Output Delay** – A time delay can be set on the alarm output relay to prevent premature signaling if there is a brief variation in the tank level, inlet pressure, etc.
- **Odorant Tank Level** – The alarm can be enabled to signal when the odorant tank level is below or above a certain level. The low and high levels can be set in the alarm parameters.
- **Odorant Inlet Pressure** – The alarm can be enabled to signal when the odorant inlet pressure is outside an acceptable range. The bulk tank pressure is recommended to be 32 – 35 psi (2.2 - 2.4 Bar). The default values Odorant Inlet Pressure Low and High values are 31 psi (2.1 Bar) and 37 psi (2.5 Bar).
- **XTank Pressure** – The alarm can be enabled to signal when the expansion tank pressure is high or low. The recommended value for the expansion tank pressure is 25 PSI and the default values for expansion tank pressure alarms are 21 psi (1.4 Bar) and 29 psi (2.0 Bar).

4.2 - Non-Configurable Alarm Signals

- **Odorant Level Cable -** communication is lost between the N-400 and the bulk tank level cable
- **Odorant Pressure Cable** - communication is lost between the N-400 and the odorant inlet pressure sensor
- **Xtank Pressure Cable –** Communication is lost between the N-400 and the expansion tank pressure sensor
- **RTC Hardware** – When enabled, this alarm will signal if there is a failure
- in the RTC (real time clock) hardware
- **EEPROM Hardware –** When enabled, this alarm will signal if there is a failure with the EEPROM hardware.
- **Low Battery –** signals when the lithium metal non-rechargeable backup battery life is low and should be replaced.
- **Running on Battery –** is signaled when the unit has lost the main power source and is running off the lithium metal non-rechargeable backup battery.
- **Flow Signal Cable** – Alarm is signaled if the voltage for the flow signal cable drops below 0.125V (0.5mA) indicating the flow signal cable is no longer connected.
- **Over-Flow (>125%) –** Alarm is signaled when measured flow signal is greater than 125% of the max gas flow, indicating the gas flow may be higher than the unit is sized for
- **Overpump –** is signaled when the calculated pump displacement exceeds the set pump displacement by 30%.
- **Underpump –** is signaled when the calculated pump displacement is less than the set pump displacement by 30%.
- **Pump Failure –** Alarm is signaled if the calculated pump displacement is less than the set pump displacement by 75%, For example, low displacement due to an empty verometer, the pump cannot inject odorant when required if





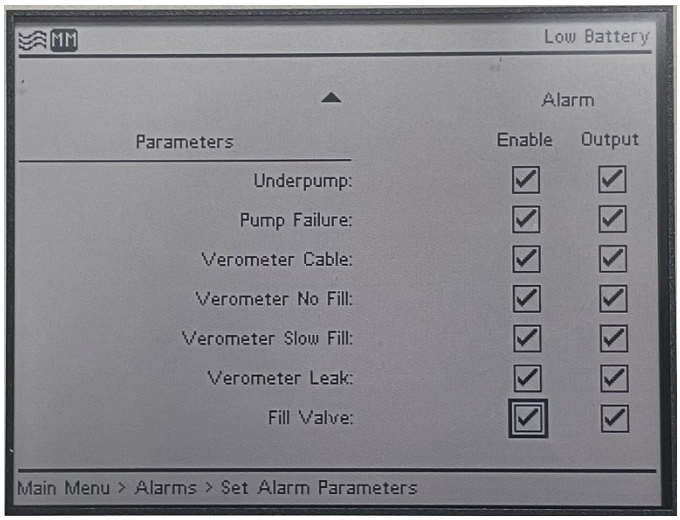


Figure 45 Set Alarm Parameters

the meter which supplies the odorant to the pump is empty.

- **Verometer Cable –** this alarm indicates a loss of signal between the verometer level sensor and the N-400 Controller. If a cable alarm is present and the unit is running, the set pump displacement will be used in prop to flow for stroke time calculations, however no mass will be totalized since it cannot be verified.
- **Verometer No Fill –** is activated if the verometer fails to fill within 6 minutes after a fill is requested. A no fill alarm will prevent automatic fills, but a manual fill may still be attempted.
- **Verometer Slow Fill –** is activated if the verometer does not fill to 100% within 3 minutes.
- **Verometer Leak –** is activated if the pump displacement is calculated above 50% of the set pump displacement value or if the verometer level drops 8% without pumping. A verometer leak alarm will stop automatic fills, but a manual fill may still be attempted.
- **Fill Valve –** indicates the fill valve has failed to close by a rise of 8% in the verometer when a fill is not active.

4.3 - To set the Alarm Parameters

4.3.1. Press the Select Key from the Home Screen to open the Main Menu

4.3.2. Select the Alarm Menu

4.3.3. Select Set Alarm Parameters

4.3.4. Using the navigations arrows, navigate to each setting to change

4.3.5. To set the limits of the odorant tank level, inlet pressure, or expansion tank pressure, navigate to the parameter. When the parameter is highlighted with a box around the value, press the Select Key to enable modification. The value is modifiable when displayed on a dark background with light text. Using the arrow keys, increase or decrease the value as needed. Press the Select Key to enter the value. The value will display as default with dark tight on the default background. Repeat this step until all values are input as needed.

4.3.6. To enable an alarm, use the arrow keys to navigate to the selected alarm. Press the Select Key to enable or disable each alarm. The alarm is enabled when a check mark is displayed next to the word “Enabled” for that parameter. Disabled alarms will not be stored within the audit trail or communicated via modbus.

4.3.7. To enable an alarm to trigger the alarm output relay, press the Select Key to enable or disable each alarm output. The output is enabled when a check mark is displayed next to the word “Output” for that parameter.

4.4 - Alarm Simulation

To test the communication system to ensure the alarms are displaying and any countermeasures are being prompted, there is a manual alarm simulation to turn off or on each alarm for testing.

To Manually Enable Alarms

4.4.1. Press the Select Key from the home screen to open the Main Menu

4.4.2. Select the Alarm Menu

4.4.3. Select Set Alarm Simulation

4.4.4. Using the navigation arrows, navigate to the desired alarm to simulate.

4.4.5. Press the Select Key to enable the alarm. The alarm will be displayed with a check mark in the box next to the parameter name.

4.4.6. Verify the alarm is outputting to the external communications system. If alarm is not communicating, check the applicable connections to ensure proper wiring and test again once confirming.

4.4.7. All alarm simulations will turn off upon exiting the Alarm Simulation Menu.

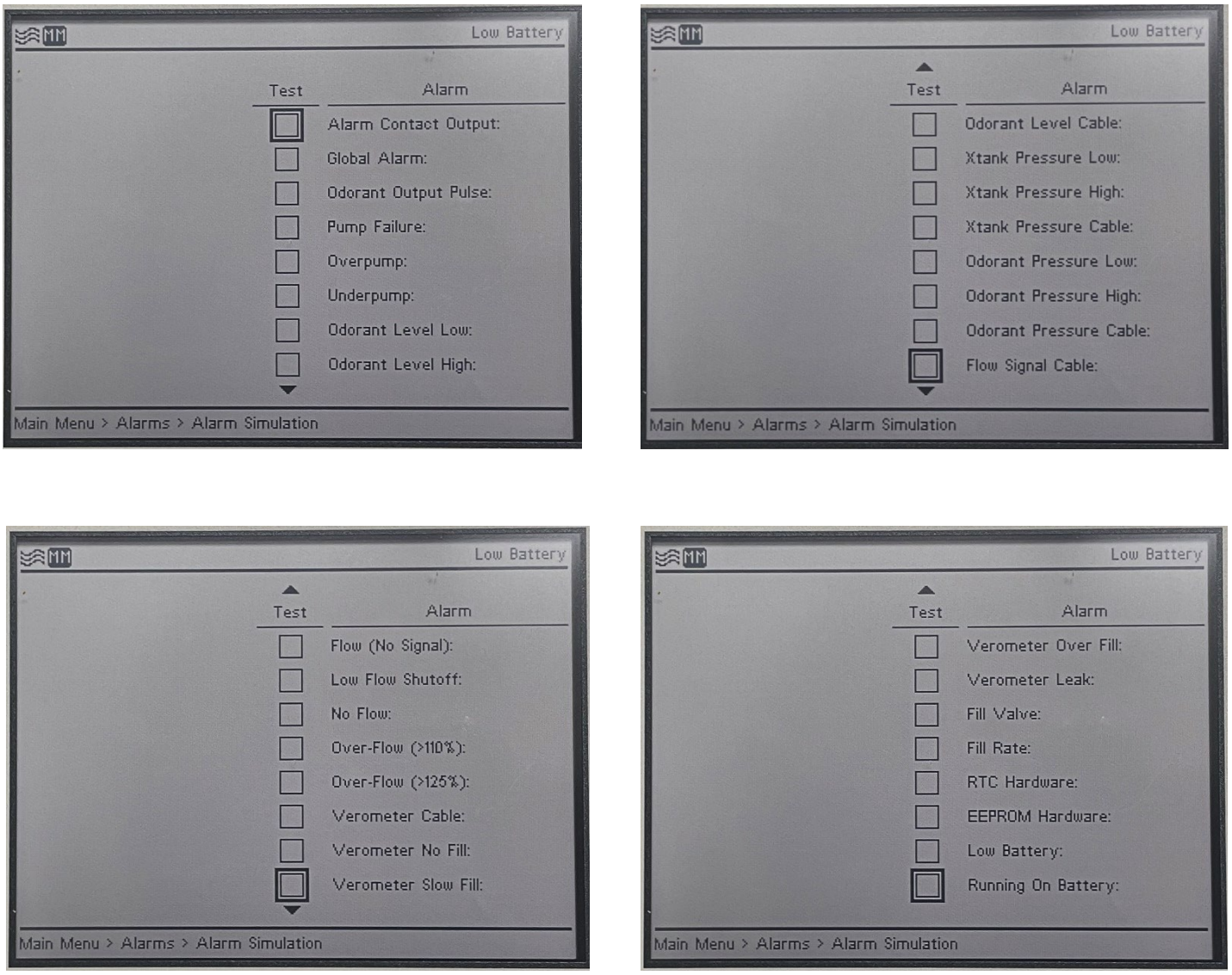


Figure 46 Alarm Simulation Options

5 - MODBUS Address

In Modbus Protocol, each piece of equipment that will be polled for information must be assigned a Slave I.D. address, to allow the SCADA or other Host device to properly address the device to be polled for information. This parameter is to program the system's Modbus address. Any address from 1-247 may be programed.

MODBUS Parameters

There are 6 items of information that may be entered on this screen. They are COM Port designation, framing Mode, Slave Address, Baud Rate, Parity, and Stop Bits.

5.1. To modify the MODBUS Parameters, press the Select Key at the Home Screen to open the Main Menu.

5.2. Navigate to the RS-485 Menu and press the Select Key.

5.3. Using the navigation arrows, select the COM port to modify. The selected COM port will be identified by the filled circle next to the COM port name.

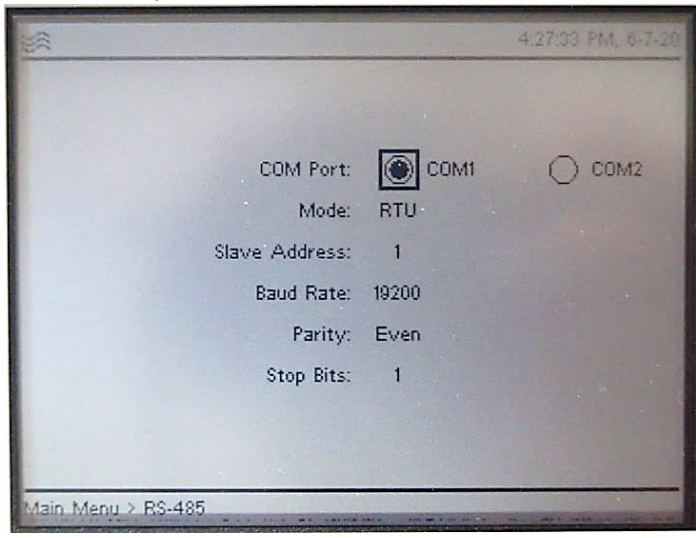


Figure 47 RS-485 Settings

5.3.1. For the selected COM port, use the navigation arrows to highlight the Mode parameter. Press select to modify. The parameter will be displayed on a dark background with light text when modifiable. The framing mode options are ASCII, RTU, or disable to disable the selected COM port. Select the desired framing mode of your MODBUS system.

5.3.2. For the selected COM port, use the navigation arrows to highlight the Slave Address to input the desired address for the SCADA or other Host device. Any address from 1-247 may be programmed. Press the Select Key to modify. When modifiable, the parameter will be displayed with light text on a dark background. Press or hold the navigation arrow keys to modify the Slave Address value. Press the Select Key to confirm the value. The value will be displayed as default with dark text on a light background.

5.3.3. For the selected COM port, use the navigation arrows to navigate to the Baud Rate parameter. Available baud rates are 1200, 2400, 4800, 9600, 19200, 38400, and 58000. Select the desired value required of your MODBUS system. Press the Select Key to confirm the value. The value will be displayed as default with dark text on a light background.

5.3.4. For the selected COM port, use the navigation arrows to navigate to the Parity parameter. Parity options are even, odd, and none. Select the desired parity that is required of your MODBUS system. Press the Select Key to confirm the value. The value will be displayed as default with dark text on a light background.

5.3.5. For the selected COM port, use the navigation arrows to navigate to the Stop Bits parameter. Select the desired Stop Bits value that is required of your MODBUS system. Press the Select Key to confirm the value. The value will be displayed as default with dark text on a light background.

6 - Totalizer

The Totalizer Menu displays information on the odorant usage of the NJEX N-400 system.

6.1. To display the Totalizer, press the Select Key from the Home Screen to open the Main Menu. Navigate to the Totalizer menu and press the Select Key.

6.2. Displayed on the screen will be the Odorant Usage in weight in the appropriate system units and the number of pump strokes since the last time the totalizer was reset

6.3. To reset back to zero, navigate to the Reset button displayed to the right of the Odorant Usage value using the navigation arrows. Press the Select Key to reset the odorant usage.

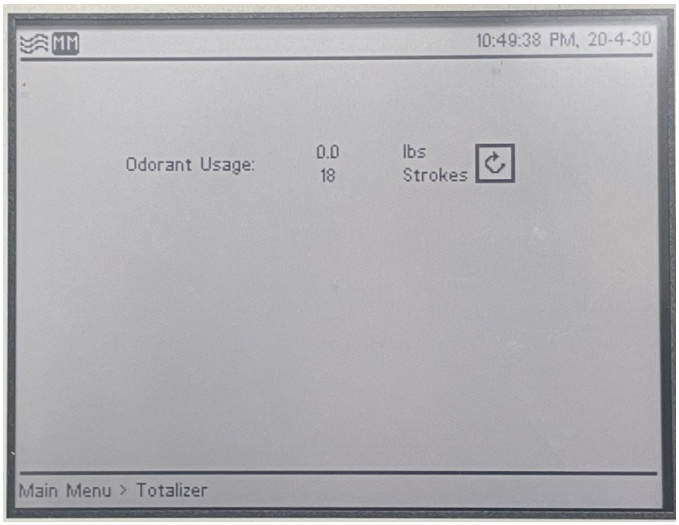


Figure 48 Totalizer Reset

7 - Display

The Display Menu allows the user to enable, disable, or adjust the screen brightness. The backlight will automatically timeout after 10 minutes and if the NJEX is running off backup battery, the backlight will be turned off to conserve power.

7.1. To open the Display Menu, press the Select Key from the Home Screen to open the Main Menu. Navigate to the Display menu and press the Select Key.

7.2. To adjust the brightness of the controller screen, press the Select Key to modify the value. When adjustable, the brightness value will be displayed with light text on a dark background.

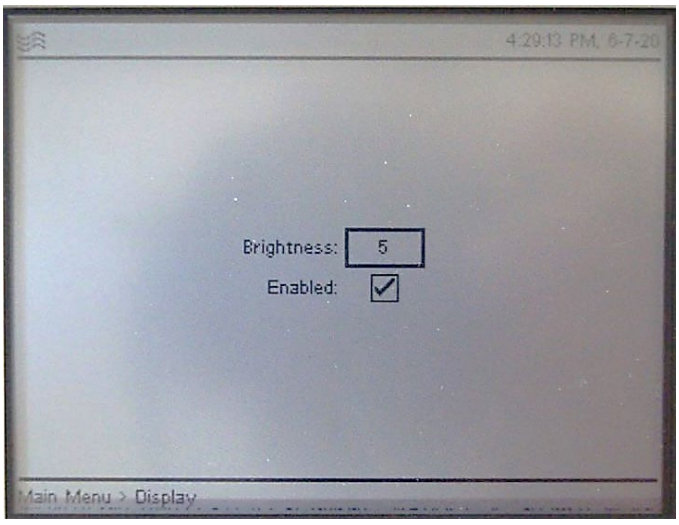


Figure 49 Display Brightness Settings

7.2.1. Use the Up Arrow Key and Down Arrow Key to adjust the brightness to the desired level. Press the Select Key to confirm the value.

7.3. To enable or disable the screen lighting, use the navigation arrows to navigate to the box next to the Enabled parameter. When enabled, the Enabled parameter will be filled with a check mark.

8 - Time & Date

The date and date format and the time can be adjusted to reflect the user preference. The clock and date should be properly maintained to reflect the current time and date where the system is installed. The date and time are used to log data for system auditing.

8.1. To open the Display Menu, press the Select Key from the Home Screen to open the Main Menu. Navigate to the Date & Time menu and press the Select Key.

8.2. Use the Navigation Arrows to navigate to the selected parameter to modify.

8.2.1. Press the Select Key on the desired parameter. The parameter will be displayed with light text on a dark background when modifying.

8.3. Before adjusting the date or time, select the desired Time Format and Date Format.

8.3.1. The Time Format can be set at a 12 Hour or 24 Hour clock.

8.3.2. The Date Format can be set in three format options depending on user preference.

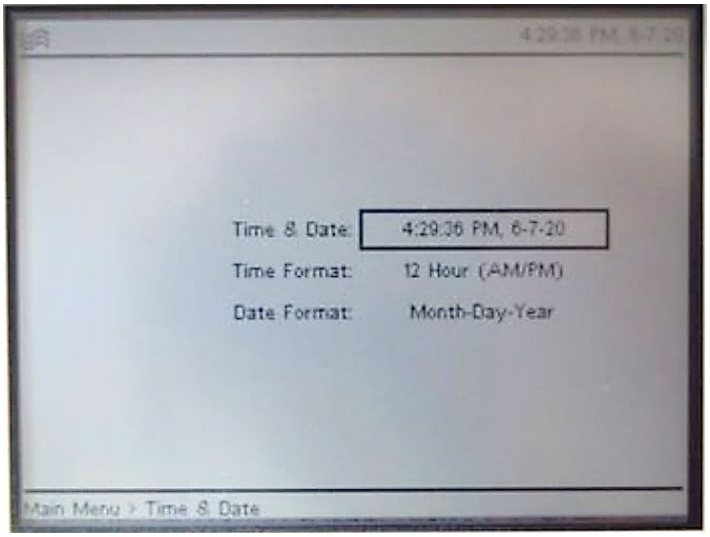


Figure 50 Time and Date Parameters

8.4. After selecting the Date and Time format, to modify the Time & Date, open the parameter within the Time & Date menu.

8.4.1. When adjusting the time, the hours, minutes, and seconds are adjusted as individual parameters.

8.4.1.1. Press the Select Key and if necessary, use the Left Arrow Key or Right Arrow Key to cycle to the hour parameter. Use the Up Arrow Key and Down Arrow Key to adjust the hour as needed.

8.4.1.2. Press the Select Key to enter the Hour value and repeat to set the minutes and seconds. If applicable, when in a 12 hour clock format, repeat to select AM or PM.

8.4.2. When adjusting the date, the month, day, and year are adjusted as individual parameters.

8.4.2.1. Press the Select Key and if necessary, use the Left Arrow Key or Right Arrow Key to cycle to the month parameter. Use the Up Arrow Key and Down Arrow Key to adjust the month as needed.

8.4.2.2. Press the Select Key to set the month parameter. Repeat to set the day and year.

8.5. To confirm the date and time adjustment, use the navigation arrows to navigate to the check mark icon displayed to the far right of the setting. Press the Select Key.

8.6. To cancel the date and time adjustment, use the navigation arrows to navigate to the X icon displayed to the far right of the setting. Press the Select Key and the modification will be cancelled.

IMPORTANT: If the clock resets to 12:00 XX/XX/XX, the backup battery BT1 may need to be replaced. See *Appendix G for N-400 Controller replacement parts.* Please contact YZ Technical Services for assistance on replacing BT1.

9 - Language

The N-400 controller supports multiple languages. The current language options are English, French, Portuguese, Spanish, German, Indonesian, Malay, and Chinese.

9.1 To open the Language Menu, press the Select Key from the Home Screen to open the Main Menu. Navigate to the Language icon and press the Select Key.

9.2 Use the navigation arrows to navigate to the desired language and press the Select Key. The selected language will be indicated by a filled circle next to the active language.

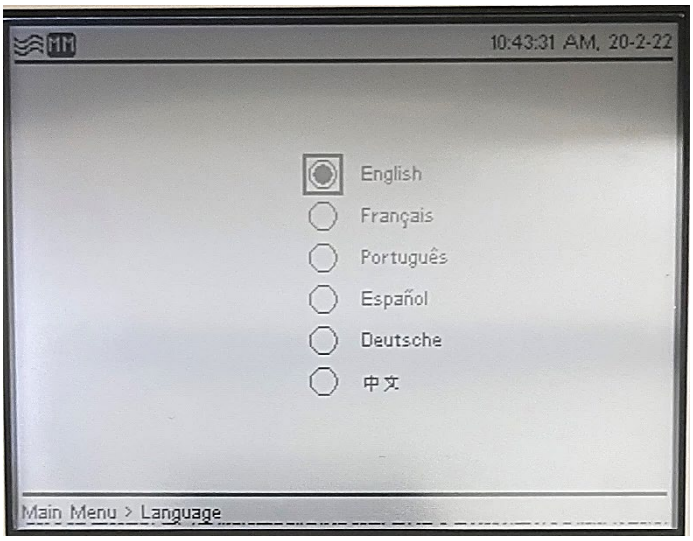


Figure 51 Language Options

10 - Factory Reset

The N-400 controller can be reset to factory default when required. The User Settings and Calibration Settings are reset as individual options.

10.1 To open the Factory Reset Menu, press the Select Key from the Home Screen to open the Main Menu. Navigate to the Factory Reset icon and press the Select Key.

10.2 Using the navigation keys, navigate to User Settings and/or Calibration Settings and press the Select Key to select each as required. The selected parameters will display a check mark in the box.

10.3 Navigate to the Reset key at the bottom of the screen. Press the Select Key to reset the parameters.

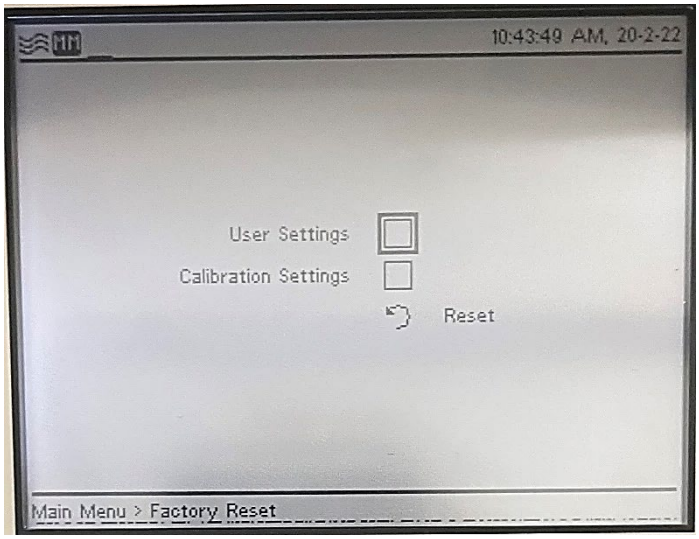


Figure 52 Factory Reset Menu

11 - About

The About menu will display important information that is factory set for your N-400 controller and the NJEX system that it controls. The About menu displays the Serial Number, Pump Model, Process type, Controller Firmware Version, and cc per 98% value. The cc per 98% value is a calibration value for the verometer. These are set at the factory and are not adjustable in the field. A low power mode may also be enabled, preventing both solenoids to be powered at the same time to conserve power if needed. This setting is not adjustable by the end user and is for factory use only. This information will be important if service is required from a YZ Systems field service technician.

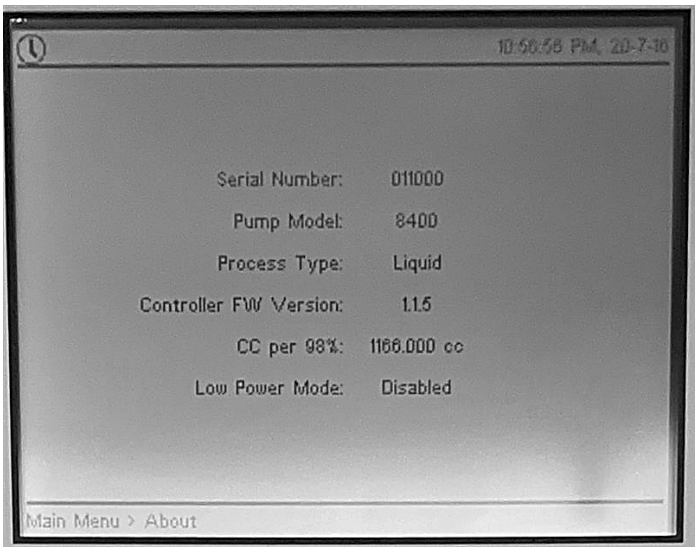


Figure 53 About Screen

12 - Maintenance

To service your NJEX system, the system may need to be purged to clear odorant from the cabinet and tubing lines. Upon purging, when restarting the system. The maintenance instructions are displayed within the Maintenance menu for each step for ease of reference. Using these instructions as well as the P&ID adhered on cabinet door will be key to performing maintenance operations.

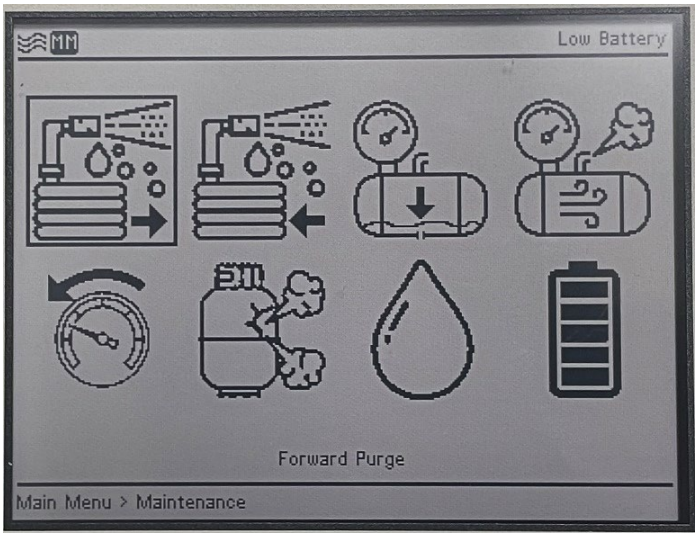


Figure 54 Maintenance Sub Menu

Forward Purge

To perform maintenance on your NJEX system, it is recommended to perform a forward, reverse, and then expansion tank purge to ensure your system is cleared of odorant. Purging odorant will push the odorant to the bulk tank.

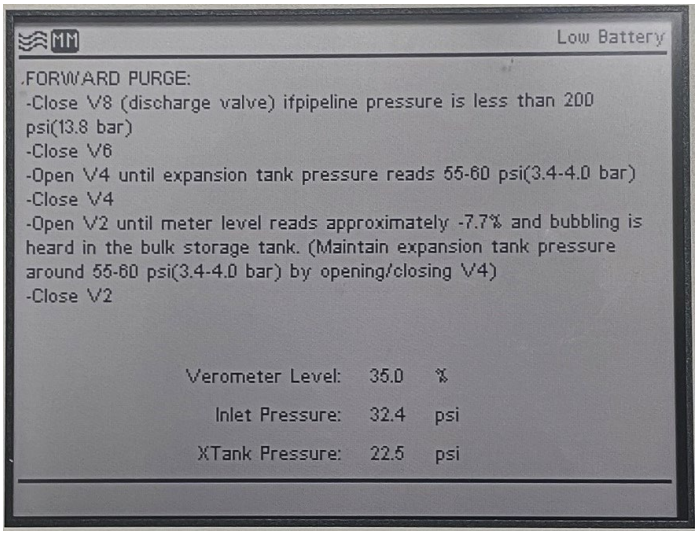


Figure 55 Forward Purge

1. To display the Forward Purge maintenance instructions, press the Select Key from the Home Screen to open the Main Menu. Navigate to the Maintenance menu and press the Select Key. Press the Select Key to open the Forward Purge screen.
2. Use the accompanying P&ID in the cabinet door for referencing valve locations
3. Follow the Forward Purge instructions shown on the screen or listed below.
4. Check the pipeline pressure is below 200 PSI (13.8 Bar). If so, close V8 (discharge valve)
5. Close V6
6. Open V4 until expansion tank pressure reads 55-60 PSI (3.4-4.0 Bar)
7. Close V4
8. Open V2 until meter level reads approximately -7.7% and bubbling is heard in the bulk storage tank. Maintain expansion tank pressure around 55-60 PSI (3.4 – 4.0 Bar) by throttling V4.
9. Close V2

Reverse Purge

To perform maintenance on your NJEX system, it is recommended to perform a forward, reverse, and then expansion tank purge to ensure your system is cleared of odorant. Purging odorant will push the odorant to the bulk tank.

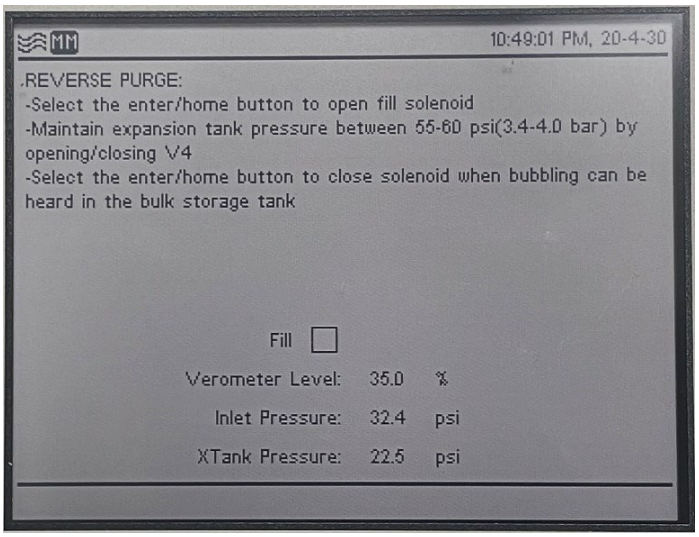


Figure 56 Reverse Purge

1. To display the Reverse Purge maintenance instructions, press the Select Key from the Home Screen to open the Main Menu. Navigate to the Maintenance menu and press the Select Key. Press the Select Key to open the Reverse Purge screen.
2. While at the Reverse Purge Menu, press the Select/Home button to open the fill solenoid valve.
3. Maintain expansion tank pressure between 55-60 PSI (3.4-4.0 Bar) by throttling V4
4. When bubbling is heard in the bulk storage tank, press the Select/Home button to close the fill solenoid valve.

Expansion Tank Purge

To perform maintenance on your NJEX system, it is recommended to perform a forward, reverse, and then expansion tank purge to ensure your system is cleared of odorant. Purging odorant will push the odorant to the bulk tank

1. To display the Expansion Tank Purge maintenance instructions, press the Select Key from the Home Screen to open the Main Menu. Navigate to the Maintenance menu and press the Select Key. Press the Select Key to open the Expansion Tank Purge screen.
2. Use the accompanying P&ID in the cabinet door for referencing valve locations
3. Follow the Expansion Tank Purge instructions shown on the screen or listed below.
4. Begin by adjusting and maintaining 55-60 PSI (3.4-4.0 Bar) expansion tank pressure by throttling V4.
5. Open V14 on the expansion tank
6. If you hear flowing liquid from the expansion tank, allow the expansion tank to empty while maintain pressure and wait for it to clear, up to 20 minutes.
7. If there is no liquid in the tank, you will hear bubbling in the bulk odorant tank or a flushing sound coming from the expansion tank.
8. Close V14 when complete

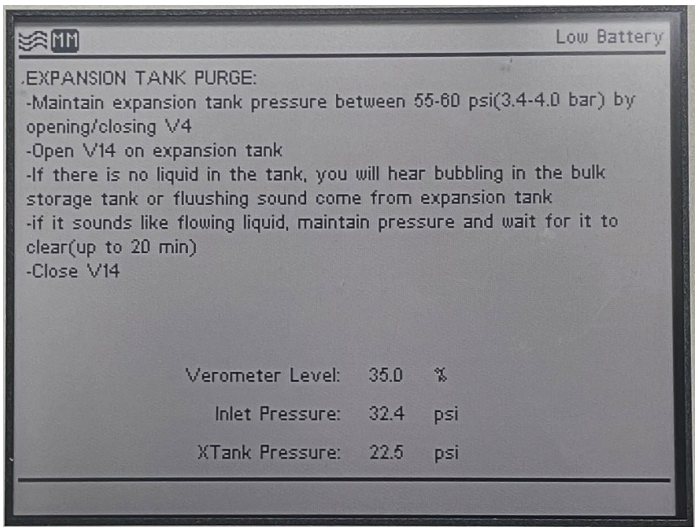


Figure 57 Expansion Tank Purge

Expansion Tank Vent

To vent the expansion tank after performing purge steps, see below.

1. To display the Expansion Tank maintenance instructions, press the Select Key from the Home Screen to open the Main Menu. Navigate to the Maintenance menu and press the Select Key. Press the Select Key to open the Expansion Tank Vent screen.

2. **IMPORTANT: Venting the expansion tank will vent odorant fumes and odorized gas. A flare or scrubber must be connected on V5 to prevent the odorant from being released to atmosphere.**

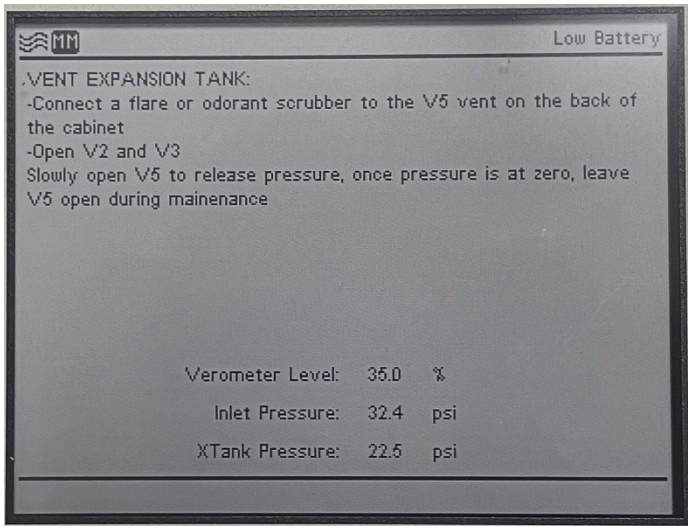


Figure 58 Vent Expansion Tank Pressure

3. After ensuring a vent or flare is connected to V5, open V2 and V3
4. Slowing open V5 to release pressure. Once the expansion tank pressure has reached 0, leave V5 open during maintenance.

Vent Actuation Pressure

After purging the NJEX unit and performing an expansion tank vent, the rest of the unit should be vented to perform maintenance. Follow the below steps to vent the actuation pressure.

1. To display the Expansion Tank maintenance instructions, press the Select Key from the Home Screen to open the Main Menu. Navigate to the Maintenance menu and press the Select Key. Press the Select Key to open the Vent Actuation Pressure screen.
2. To vent the actuation pressure, begin by closing V4 and V16

NOTE: Stainless steel cabinets will have to close the supply gas at the pipeline.

3. Slowly open V5 to release pressure

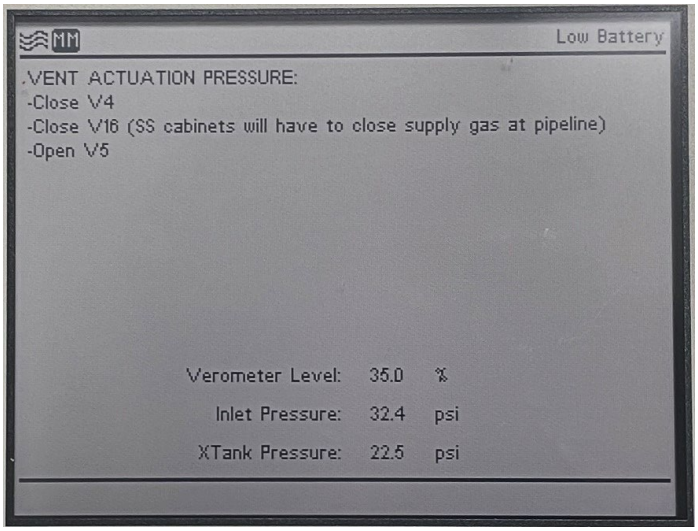


Figure 59 Vent Actuation Pressure

Leak Test

When installing unit or after performing maintenance, a leak test should be performed prior to priming the unit to ensure there are no leaks present.

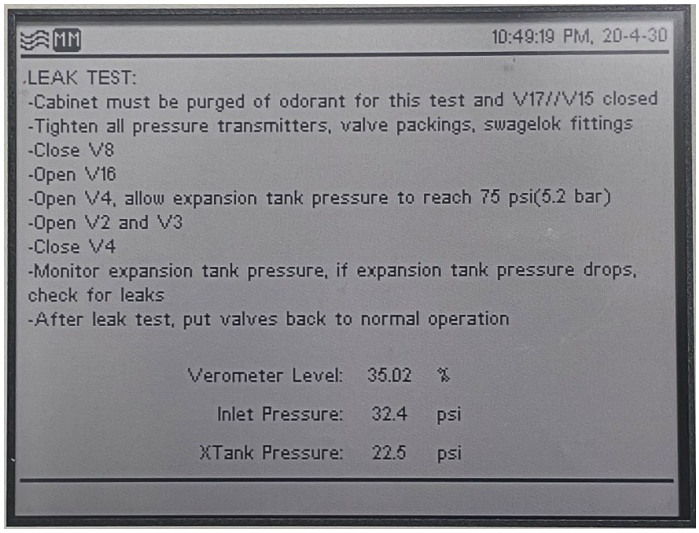


Figure 60 Leak Test

1. To display the Leak Test maintenance instructions, press the Select Key from the Home Screen to open the Main Menu. Navigate to the Maintenance menu and press the Select Key. Press the Select Key to open the Leak Test screen.
2. To perform the leak test, the cabinet must be purged of all odorant, follow the purge instructions above if needed.
3. Close V17 and V15
4. Tighten all pressure transducers, valve packings, and Swagelok fittings.
5. Close V8
6. Open V16
7. Open V4 and allow the expansion tank pressure to reach 75 PSI (5.2 Bar)
8. Open V2 and V3
9. Close V4
10. Monitor the expansion tank pressure. If the expansion tank pressure drops, check for leaks
11. After the leak test is successful, place valves back to normal operation

Prime / Fill Verometer

To begin running the unit after installation or maintenance, follow the Prime/Fill Verometer steps below. Please note that a leak test should be performed prior to priming the unit.

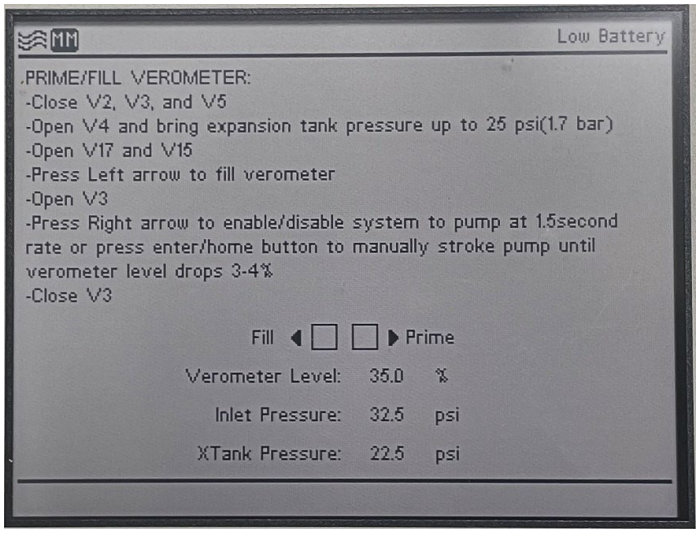


Figure 61 Prime/Fill Verometer

1. To display the Prime/Fill Verometer maintenance instructions, press the Select Key from the Home Screen to open the Main Menu. Navigate to the Maintenance menu and press the Select Key. Press the Select Key to open the Prime/Fill Verometer screen.
2. Begin by closing V2, V3, and V5
3. Open V4 and adjust expansion tank pressure to up to 25 PSI (1.7 Bar).
4. Open V17 and V15
5. Press the Left Arrow on the keypad and allow the verometer to fill
6. Open V3

7. Press the Right Arrow key on the keypad to begin a short pump stroke series in 1.5 second intervals to prime.
8. If desired, instead of pressing the right arrow key for a pump stroke series, the Select/Home key may be used to manually stroke the pump
9. Allow verometer level to drop 3-4% during the priming steps.
10. Once complete, close V3

Battery Reset

The lithium primary, non-rechargeable backup battery should be replaced when the battery pack is low or on an annual basis. The battery pack life is estimated by the operating conditions and temperature of the unit. When the battery pack is replaced, the battery capacity should be reset in the N-400 to ensure the battery life is properly estimated.

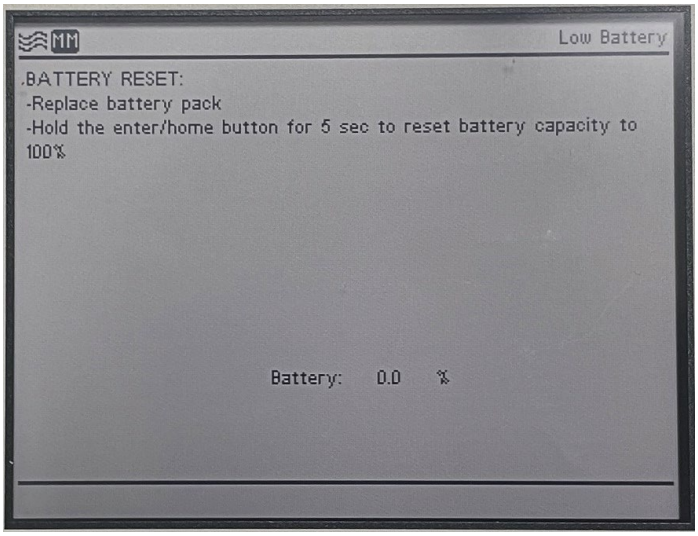


Figure 62 Battery Reset

1. To display the Battery Reset maintenance instructions, press the Select Key from the Home Screen to open the Main Menu. Navigate to the Maintenance menu and press the Select Key. Press the Select Key to open the Battery Reset screen.
2. Replace the battery pack in the power limiter enclosure

WARNING: Battery packs should only be replaced with YZ part number E3-2006 battery packs. Replacing the battery pack with a non-factory supplied battery will compromise the intrinsically safe properties of the N-400 system.

3. Hold the Select/Home key for 5 seconds to reset the battery capacity to 100%

Section 4: Mechanical System

The 8400 mechanical system, are composed of the bulk odorant filter, fill valve, Verometer, 8000F pump, odorant discharge manifold, NJEX gas supply filter, solenoid manifold, pneumatic relay manifold, and the expansion tank. Individual components of the system are shown below and described in the following pages.

Figure 63 Cabinet Front View

Figure 65 Expansion Tank

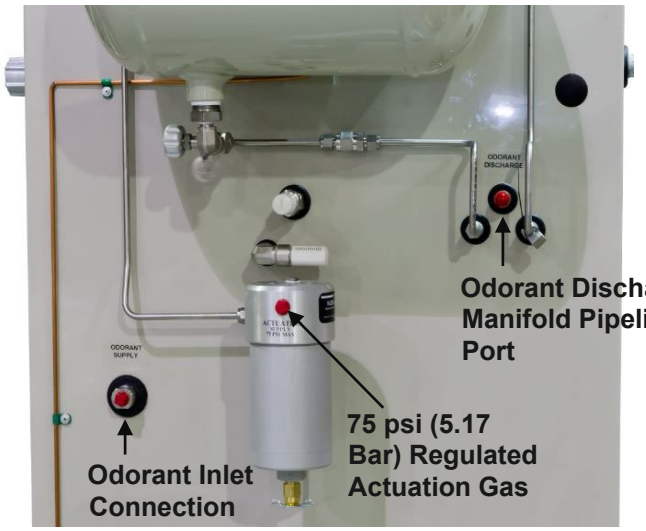


Figure 64 Cabinet Back Connections

Odorant Inlet Manifold & Bulk Odorant Filter Assembly

The odorant inlet manifold & bulk odorant filter assembly is located adjacent to each pump / verometer assembly and performs the following functions:

• Provides the system's odorant supply connection by means of a 1/4" FNPT connection located on the back of the enclosure.

• Provides a pressure gage to show odorant supply pressure from storage tank.

• Provides an odorant supply isolation valve.

• Houses the first of two odorant filter systems within the 8400 System.

• Acts as the odorant return manifold during system purge operations, *refer to Conducting a Forward Purge in Section 3.* In the event that the internal filter elements become dirty, a bulk odorant filter repair kit is available.

Figure 66 Inlet Manifold, Bulk Odorant Filter

Fill Valve

The purpose of the fill valve is to control odorant flow into the Verometer. The fill valve is opened when a pneumatic signal from the solenoid valve manifold depresses the fill valve diaphragm. The valve is closed when the pneumatic signal is removed and the fill valve spring returns the check valve wafer to its seat. The transfer of odorant from the bulk storage tank to the Verometer, when this valve is activated, is dependent on an adequate pressure differential between the bulk storage tank, verometer, and expansion tank, with the bulk storage tank retaining the higher of the two pressures. These pressures are monitored by two pressure transmitters mounted in the system. One transmitter monitors the incoming pressure from the bulk storage tank, while the other, mounted on the expansion tank, monitors the pressure in the verometer. A differential pressure range of 5 - 10 psi *(.345 - .69 Bar)* must be present, with the differential not exceeding either end of the range. The threaded inlet connection to the fill valve allows access to the check valve wafer, return spring, and o-ring seal without disturbing the diaphragm and its seals.

Figure 67 Fill Valve

Verometer

The purpose of the Verometer is to act as an odorant meter, verifying the amount of injected odorant. The Verometer contains a level monitoring device allowing the N-400 controller to compare the actual amount of odorant injected to the displacement setting of the pump. The N-400 also controls filling the Verometer and activating the Verometer alarm functions based on input from the level monitoring device. Odorant enters the Verometer from the fill valve. Odorant exits the Verometer by passing through a second filter element on its way to the pump. The filter element is held in place by the filter plug located at the bottom of the Verometer. The upper portion of the Verometer, above the odorant fluid level, is connected to the expansion tank by stainless steel tubing and the odorant discharge manifold. The purposes for this configuration are:

Figure 68 Verometer

1. The Verometer / expansion tank connection provides a closed loop system which prevents odorant escape into the atmosphere.
2. As the Verometer is filled, pressure builds within the closed Verometer / expansion tank system. The additional volume provided by the expansion tank prevents the accumulating pressure in the Verometer from equaling the blanket gas pressure in the odorant storage tank. This ensures an uninterrupted flow of odorant from the storage tank to the Verometer.

Model 8000F Pump

The NJEX 8000F pump is a pneumatically actuated, positive displacement, reciprocating plunger pump. The 8000F is actuated with compressed air or pipeline gas at a pressure of 30 - 60 psi *(2.07 - 4.14 Bar)*, *refer to Section 1, the System Flow Schematic*. The pump has an adjustable displacement of 1.0cc, 0.8cc, 0.7cc, 0.6cc, 0.5cc, 0.4cc, 0.3cc or 0.2cc. It achieves proportional-to-flow injection through adjustment of the stroke rate. The 8000F is rated for a maximum stroke rate of 60 strokes per minute.

Figure 69 8000F Pump

Each time the pump strokes, the plunger displaces hydraulic fluid against the pump diaphragm, which in turn displaces odorant through the discharge check valve. The pump diaphragm acts as an isolation device between the hydraulic fluid and the odorant, minimizing the risk of odorant escape into the atmosphere. Each time the plunger returns, it completely removes itself from the plunger seal. This allows any air trapped in the hydraulic system to be vented.

The 8000F incorporates a cartridge design in the four areas that are most likely to require maintenance. They are: the diaphragm assembly, the inlet check valve, the discharge check valve, and the plunger bushing / seal assembly. The cartridge design provides easier maintenance resulting in less down-time.

Odorant Discharge Manifold

This manifold is located on the back wall of the mechanical enclosure, just to the left of the verometer and above the pump. This manifold, located inside the enclosure, has three connections on the bottom of the manifold. The inlet connection in the center of the manifold is the pump discharge, the connection to the right is to the Verometer and the third connection to the left is to the purge bypass loop. These fittings are connected at the factory to the appropriate component.

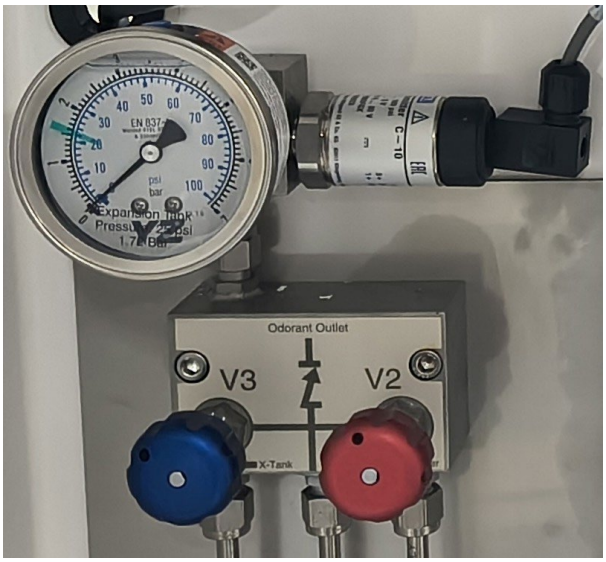


Figure 70 Odorant Discharge Manifold

Three outlet ports for the odorant discharge manifold are located on the back of the manifold and extend through the enclosure wall. When facing the back of the enclosure from right to left, these ports are for the expansion tank drain, the pipeline connection, and the expansion tank pressure connection. Two valves located in this manifold control the flow of the odorant blanket gas through the manifold. The valve located on the left, with the blue knob is the purge valve, *valve **V3***. The valve, with the red knob, is the bypass valve, *valve **V2***. During normal operation, both valves are closed. The bypass valve is opened to empty the 8400 of odorant, while the purge valve is opened as part of preparing the system for operation. *Refer to Section 6: System Maintenance.*

An integral wafer check valve is built into the odorant discharge manifold. The wafer is located on top of the plug that is inserted in the bottom of the manifold. This check valve is located in the fluid path between the pump discharge connection and the pipeline connection port.

The gage located on top of this manifold displays the Expansion Tank pressure.

NJEX Gas Filter

A 25 micron coalescent filter is provided with each 8400. This filter is installed on the back outside of the enclosure and should be connected to the regulated (75 psi / 5.17 Bar) actuation gas supply provided by the system operator. By conditioning the incoming actuation gas, a clean pneumatic supply will be provided to the solenoid valves. This will ensure a longer operational life for the pneumatic control system.

Figure 71 Gas Filter

If the actuation gas supply has a high water content and / or a low hydrocarbon dew point, additional filtration and heating of the actuation gas supply may be necessary. Bottled nitrogen can also be used as an alternate gas supply source if gas conditioning is a problem.

Solenoid Valve & Pneumatic Relay Manifold

Two low power solenoid valves are mounted on this manifold, figure 72. The solenoid valve, **SV2** located on the left, actuates the fill valve, while the other solenoid valve, **SV1** located on the right, pilots the pump pneumatic relay valve.

One pneumatic relay valve is also mounted on this manifold. It is located just below the solenoid valves and serves to actuate the pump when it receives a pneumatic signal from the pilot relay discussed in the previous paragraph.

Supply and exhaust ports are located on the outside of the manifold to permit operator connections on the back of the system enclosure. Additionally, there are three control valves located on this manifold, **V4** lower right with a gold knob, **V5** upper center with a green knob, and **V16** lower left with a black knob. Valve **V4** is normally closed, but is opened to charge the expansion tank with gas as required during system start up or purge process.

Additionally, valve **V5** is normally closed, but is opened to vent the gas from the expansion tank for maintenance. Finally, **V16** is normally open, and is the supply gas isolation valve.

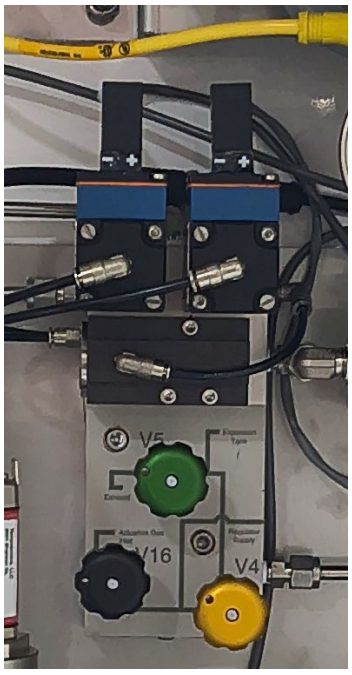


Figure 72 Relay Manifold

Expansion Tank

The expansion tank is mounted on the back of the enclosure and acts as a pressure source and buffer for the Verometer. As the Verometer is filled or emptied, blanket gas flows into or out of the expansion tank as required. Because of the relatively large difference in the volumes of the Verometer and the expansion tank, the fluctuation in operating pressure within this system is minimal.

Mounted on the expansion tank are: a relief valve, preset to 85 psi (5.86 Bar); a pressure gauge, a vent valve; and an expansion tank isolation valve. The connection on the bottom of the tank, valve **V14**, is used to connect the expansion tank to the bypass loop.

Valve **V14** is normally closed, but can be opened as an optional step in the forward purge process to purge any liquid from the expansion tank that may have accumulated, and place it back into the bulk storage tank.

Figure 73 Expansion Tank

Section 5: System Operation

Setting System Pressures and Valves

Before attempting to start the system, check for proper valve positions as indicated on the normal operation schematic on the enclosure door, and set all pressures accordingly.

1. Adjust supply gas regulator to provide 75 psi *(5.17 Bar)* to the NJEX gas filter.
2. Temporarily open valve **V4** to fill the expansion tank to a pressure of 25 psi *(1.72 Bar)* then close **V4**.
3. Verify low pressure relief operation and adjust as necessary to maintain a specific pressure of 25psi *(1.72 Bar)*.
4. Adjust the pump actuation regulator to the required pressure to inject into pipeline pressure as indicated on the normal operation schematic located on the enclosure door.
5. Adjust the blanket gas regulator for the bulk storage tank.
6. Check entire system for gas leaks and verify that the set pressures remain constant.

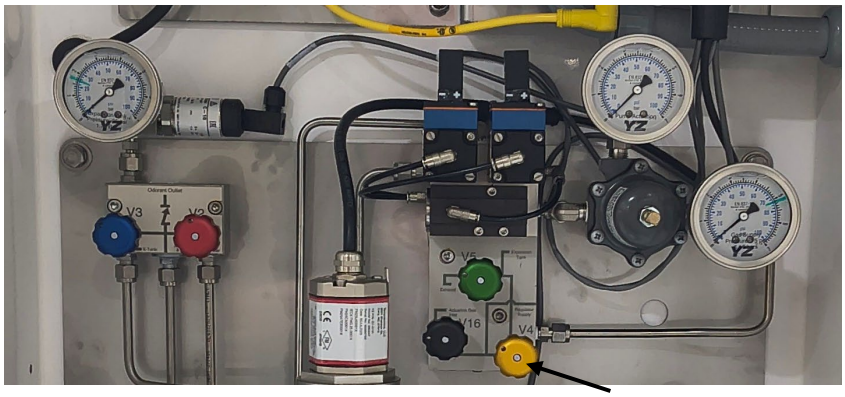


Figure 74 Operation Valves

Low Pressure Relief Adjustment

The overflow protector, *figure 75,* incorporates a low pressure relief in the cap assembly for the purpose of maintaining the maximum expansion tank pressure at 25 psi *(1.72 Bar)*.

To test and adjust follow these steps:

1. With valve **V6** open, slowly open valve **V4** until gas begins discharging at exhaust port of the overflow protector.
2. Close valve **V4** and see where pressure stabilizes which should be 25 psi *(1.72 Bar)*.
3. If adjustment is needed:
    a) First, loosen adjustment lock nut, located at the top of the overflow protector. To increase pressure in the tank, turn the adjustment screw in, or to the right. To lower pressure tank, turn the adjustment screw out, or to the left.
    b) Tighten the lock nut.
    c) Repeat until the desired pressure of 25 psi *(1.72 Bar)* is obtained as described in step 2 above.

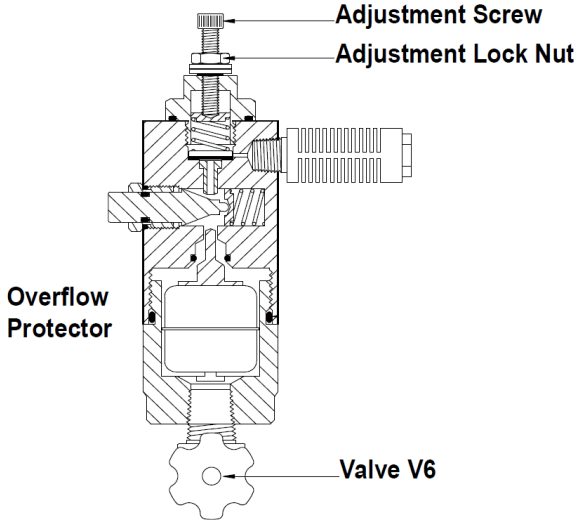


Figure 75 Overflow Protector

Starting The System

Turn the main power switch on, located inside the N-400 enclosure. To access the switch, loosen the four screws on the lid of the enclosure and remove the lid. On the circuit board inside the N-400 enclosure, the On / Off switch is located on the lower right side. Flip the switch up to turn the main power on.

Once the NJEX system is powered up, follow the steps in the controller section to confirm all the settings. Also confirm the serial number in the firmware about screen matches the serial number on the controller nameplate and the system nameplate. If there is a memory module present, confirm the MM icon is displayed in the top left of the main screen.

• For future reference, record the **Version x.xx** number, on the *For the Record form, Appendix A: Response Forms.*

IMPORTANT: If the serial number, model type or the verometer tag number does not match the corresponding numbers featured on the N-400 controller consult the factory before proceeding further.

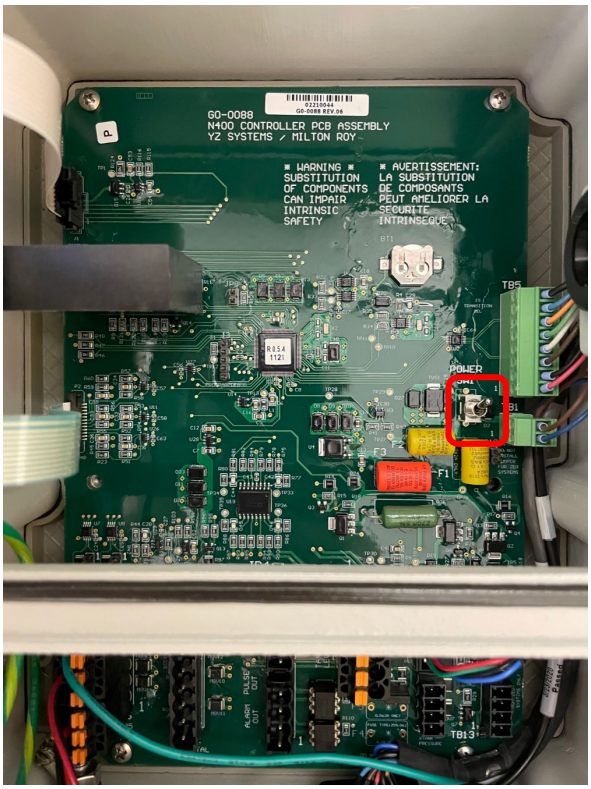


Figure 76 N-400 Main PCB

Prime / Fill Verometer

To begin running the unit after installation or maintenance, follow the Prime/Fill Verometer steps below. Please note that a leak test should be performed prior to priming the unit.

1. To display the Prime/Fill Verometer maintenance instructions, press the Select Key from the Home Screen to open the Main Menu. Navigate to the Maintenance menu and press the Select Key. Press the Select Key to open the Prime/Fill Verometer screen.
2. Begin by closing V2, V3, and V5.
3. Open V4 and adjust expansion tank pressure to up to 25 PSI (1.7 Bar).
4. Open V17 and V15.
5. Press the Left Arrow on the keypad and allow the verometer to fill. If the fill won't toggle, check if the verometer level is already over 100% or if the system is in Standby on the home screen.
6. Open V3.
7. Press the Right Arrow key on the keypad to begin a short pump stroke series in 1.5 second intervals to prime.
8. If desired, instead of pressing the right arrow key for a pump stroke series, the Select/Home key may be used to manually stroke the pump.
9. Allow verometer level to drop 3-4% during the priming steps.
10. Once complete, close V3.
11. When complete, return to the Home Screen. When the unit is started, the Verometer will fill to 100%.

Section 6: System Maintenance

See the maintenance screens in the N-400 Controller section of this manual for the purge, vent, and prime steps for the NJEX.

Preventative Maintenance Schedule

A preventative maintenance program serves to anticipate maintenance issues before the system requires service. Like changing the oil & filters in an automobile, by servicing the parts and operations in the NJEX System at regular intervals, the technician can perform the maintenance service when desired, rather than when required, such as in the middle of night.

The key is to perform maintenance before required. The preventative maintenance schedule implemented should consider the application of the odorizer. Many of these considerations include the weather environment, the condition of the odorant and bulk storage tank, etc. These issues must be considered when establishing a preventative maintenance schedule.

Caution: Some maintenance procedures listed below require purging odorant and relieving the process gas pressure. Refer to the maintenance instructions to purge and vent if maintenance is performed on tubing, manifold, etc. Purging and venting removes odorant and pressure in the suction line up to the pump. Discharge pressure and odorant will remain beyond the manifold check valve into the discharge lines and must be purged and vented by another means.

Recommended Maintenance Schedule Weekly Inspection

1. Verify gas pressure
2. Check for gas and odorant leaks
3. Examine the oil level in the injection pump
4. Visually inspect the N-400 Controller for alarm indications

Semi-Annual Inspection

1. Inspect overflow protector and service as needed
2. Inspect tube fittings and valve packings for leaks
3. Check for water collecting in the bottom of the cabinet and remove as required

Annual Inspection

1. Change bulk odorant filter elements
2. Test regulators and service as needed
3. Rebuild injection pump
4. Replace solenoids
5. Test the NJEX system performance

Table 7: Recommended Spare Parts

Part #	Description	Qty
A4-0046	NJEX N-400 replacement solenoid valve	2
A3-0290	Pneumatic relay valve	1
C4-0133	NJEX gas filter replacement filter element	1
D3-0103	Bulk odorant filter element replacement kit	1
D3-0102	Model 8000F pump seal replacement kit	1
D3-0126	Verometer filter element kit	1
D2-0001	NJEX pump oil, 1*6 oz. pint*	1
D3-0334	NJEX N-400 fuse kit	1
E3-2006	NJEX N-400 battery pack	1

Overflow Protector Assembly Inspection

The overflow protector assembly should be inspected as follows on each NJEX System in operation.

1. Isolate the protector by closing valve **V6** located just below the overflow protector on the expansion tank.
2. Slowly remove the protector upper housing by unscrewing it from the protector lower valve body.
3. Inspect the dart and o-ring seal located in the upper body. It should not be sticky or unusually shaped. If any distortion to this o-ring is found it should be replaced immediately. A normal fitting o-ring will exhibit a slight interference between the dart and the o-ring when in contact with each other. This contact is what causes the seal when necessary.
4. Inspect the cap to body o-ring, **item D**, and lubricate or replace as necessary.
5. Inspect the reset push button. When pushed in, the button should depress, then spring back freely. If any sticking occurs, the o-ring, **item E**, should be lubricated.
6. To reinstall the protector upper housing, first ensure that the dart is fully inserted into the housing contacting the o-ring seal. Second, install the upper housing onto the lower body, assuring that the cap comes to a full seated position against the protector lower body.
7. Depress the **Reset** button to reset the dart.
8. Slowly open valve V6 below the protector.
9. The **Reset** button on the side of the overflow protector is utilized to test the function of the low-pressure relief and to reset the overflow dart. Pressing this button will override the low-pressure relief and the overflow protection dart.

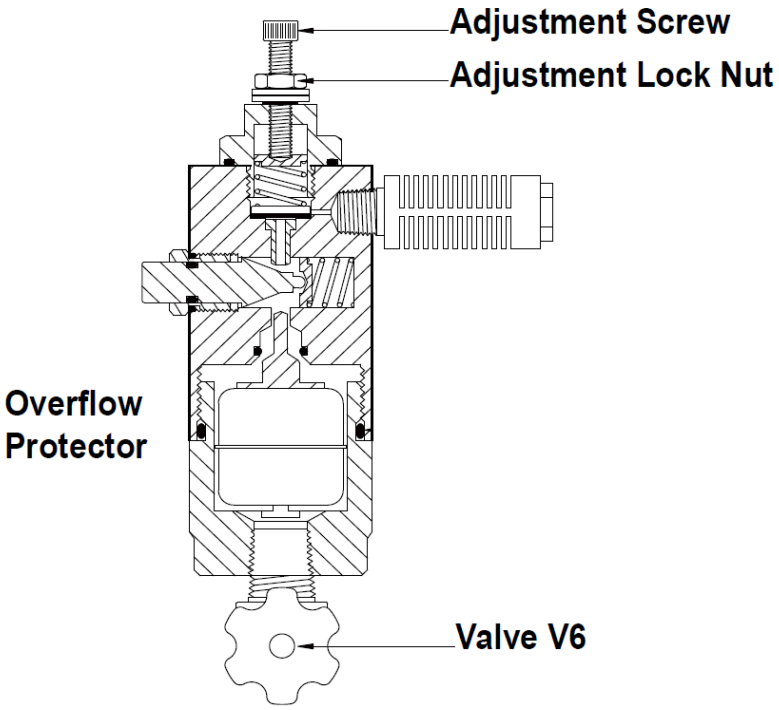


Figure 77 Overflow Protector

NOTE: This should be inspected by a maintenance technician on a regular basis. Caution should always be used as odorant may escape if the expansion tank has filled with odorant. Odorant entering the expansion tank is not a normal or recommended operating condition.

Pressure Relief Adjustment

The overflow protector incorporates a low-pressure relief in the cap assembly for the purpose of maintaining the maximum expansion tank pressure at 25 psi (1.72 Bar).

To test and adjust follow these steps:

1. With valve **V6** open, figure 78, slowly open valve **V4**, figure 78, until gas begins discharging at exhaust port.
2. Close valve **V4** and see where pressure stabilizes which should be 25 psi (1.72 Bar).
3. If adjustment is needed:
    a) First, loosen adjustment lock nut, located on top of the overflow protector. To increase pressure in the tank, turn the adjustment screw in, or to the right. To lower pressure tank, turn the adjustment screw out, or to the left.
    b) Tighten lock nut.
    c) Repeat until the desired pressure of 25 psi (1.72 Bar) is obtained as described in in step 2 above

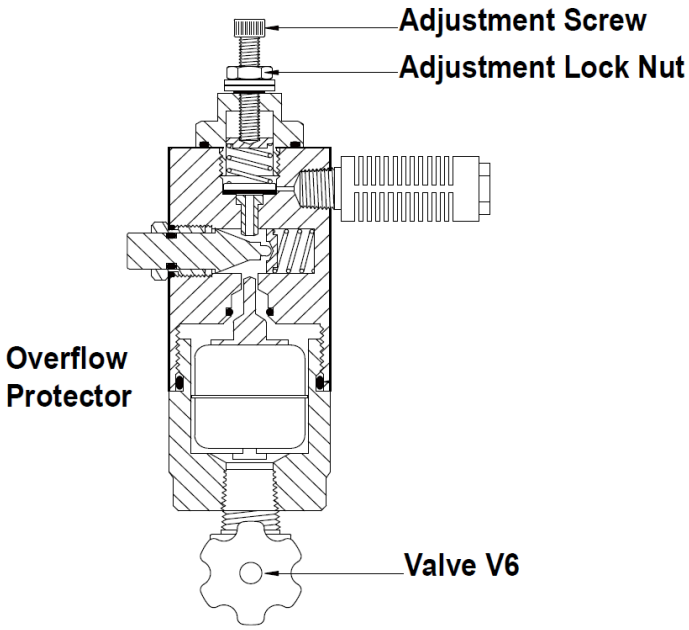


Figure 78 Overflow Protector

Safety Notes – Maintenance

- All *general safety notes in Section 1* of this manual should be reviewed prior to performing any maintenance on NJEX units.
- All installation, maintenance, troubleshooting, etc. should be performed by a trained professional.
- While servicing units, proper PPE must be worn such as gloves and protective eyewear.
- Purging and venting the NJEX system purges gas and vents pressure through the inlet of the injection pump. If maintenance is required on a discharge check valve or the discharge lines, the discharge pressure must be relieved.

WARNING: Power must be disconnected or locked out from the NJEX system before performing any troubleshooting or repair to the External Power Supply or heater.

CAUTION: Vent Valve must be closed in all operations excluding venting. Failure to close V5 during other operations will result in spilled odorant.

Section 7: Troubleshooting

How to Use This Section

The recommendations contained in this section should be used as a preliminary information resource to remedy operational issues with the NJEX N-400 System. It is important to read all the definitions and prior to initiating work.

Each sub-section contains a description of the alarm and non-alarm indicators followed by a step-by-step trouble shooting procedure.

For sub-sections containing information on alarms and non-alarm indicators, keep in mind that alarms will trigger the alarm relay output, and the red LED light on the display panel will flash. Non-alarm indicators will display on the LCD, cause the green LED to flash on and off and generate an entry in the Sentry reports but will not trigger the alarm relay.

Safety Notes – Troubleshooting

- All installation, maintenance, troubleshooting, etc. should be performed by a trained professional.
- Before performing any maintenance, power to the EPO and/or heater should be de-energized.
- While servicing units, proper PPE must be worn such as gloves and protective eyewear.

For Additional Help

For issues that cannot be resolved from using this manual, please call YZ Technical Service at:

T: 1.800.653.9435 *(1.800.NJEX-HELP)*
T: 1.281.362.6500
F: 1.281.362.6513

Assistance is available 24 hours a day, 7 days a week, and 365 days a year via the telephone numbers listed above.

Step-by-Step Resolution

Using a step-by-step method to resolve issues on the NJEX System will reduce maintenance time and assist in returning the odorization system to service quicker.

The following represent the recommended chronology to resolve issues:

1. Complete the Troubleshooting Form located in Appendix A. Some of the information entered on the For the Record Form in Appendix A can be of use.
2. Re-establish the correct pressures.
   2. Re-establish the correct pressures.
      a. Expansion Tank, 25psi *(1.72 Bar)*
      b. Bulk Storage Tank, 32-35psi *(2.2-2.41 Bar)*
      c. Actuation Supply, 75psi *(5.17 Bar)*
      d. Pump Actuation, refer to *System Flow Schematic in Section 1: System Installation*

   3. Resolve alarm issues in the following order:
      a. Tank Level

b. Flow Signal
c. Expansion Tank Pressure
d. Verometer
e. Odorant Pressure
f. Pump Alarms
g. Battery

Tank Level Alarm

The set points for these alarms are adjustable in the Alarms menu of the N-400 controller. The alarms can be set for either a Rochester gauge provided with a YZ Systems odorant tank, or a customer provided analog tank level.

CAUTION: All wiring must be in compliance with N-400 Wiring Control Document, in Appendix B of this manual.

- The **Odorant Level Low Alarm** should be set between 5% to 25%. This alarm indicates a tank level at or lower that the alarm set point.
- The **Odorant Level High Alarm** should be set between 80% to 90%. This alarm indicates a tank level at or above the alarm set point.
- The **Odorant Level Cable Alarm** is enabled by default if the Odorant Level Low or High alarm is active and indicates if communication with the tank level has been disrupted.

IMPORTANT NOTE: The Rochester tank level indication has a variance of +2% for accuracy. If the alarm is on and the mechanical level indicator is close to the alarm set point, the alarm is possibly valid, and the accuracy variance is all that is being noted.

Tank Level Alarm Troubleshooting Steps

1. Verify the tank level indication on the manual tank gauge. If the level indication does not approximately match the electronic level indication, perform the following checks.

    1.1. Inspect to verify that the wiring to the controller termination strip **TB11** is still intact. Look for loose or broken wires at **TB11**, pin number **2** *(Red Wire)*, **3** *(Black Wire)*, and **1** *(Shield)*. Repair any loose or broken wires.

    1.2. Inspect the level sensor at the tank for possible damage or moisture in the sensor head. Repair or replace as required if moisture is inside the sensor.

    1.3. Inspect the cable between the sensor and control head for damage. Repair or replace as necessary.

    1.4. Observe the other values on the N-400 controller such as the temperature and Verometer level, etc. for any unexpected values. If another value is found to be abnormal, inspect the bulkhead connector to interconnect cable connections for the presence of moisture or corrosion. If moisture or corrosion is found, correct by replacing affected components. Simply cleaning the connection may not correct the problem temporarily or permanently.

2. If the level indication on the manual gauge and the level indication on the N-400 are approximately the same, within ±2% as indicated above, then the system is working correctly. If you wish to change the alarm set points, or disable the alarm, proceed to the Set Parameters section of the controller, and make necessary changes to clear the alarm.

Flow Signal Alarms

- The **Flow Signal Cable** alarm will be active only in the **Analog Proportional-To-Flow** mode. It indicates that the flow signal voltage has dropped below .5VDC. A correct flow signal should never drop below 1VDC.

- **Over-Flow (>125%)** is an indication that the flow signal is showing greater than 125% of the maximum gas flow according to the set-up conditions indicated in the parameter and calibration sections of the controller.

Flow Signal Non-Alarm Indicators

- The **Flow (no signal)** indicator will be active only in the **Analog Proportional-To-Flow** mode. If the Flow (no signal) parameter is enabled, this alarm will be to alert the user that the system is assuming a flow rate percentage of maximum gas flow according to the value input in the Odorization Parameter menu due to no available flow signal connected.

- **No Flow** is an indication that the flow signal being received by the NJEX System currently reads a no flow situation in the pipeline and therefore no odorant is currently being injected. This alarm will be present along with the green indication LED and will only be present if Flow (No Signal) parameter is disabled.

- **Low Flow Shut Off** is an indication that the flow signal being received by the odorizer, signals that the present flow in the pipeline is less than the set value for the Low Flow Shut Off set in the in the Odorization Parameter section of the N-400 Controller. When the flow rate drops below this value odorant injection stops and therefore no odorization is presently occurring. Odorization will automatically resume when the flow signal returns to a level above the set point to stop odorization.

- **Over-Flow (>112%)** is an indication that the flow signal is measuring greater than 110% of the maximum gas flow according to the set-up conditions indicated in the parameter and calibration sections of the menu.

Signal Alarm & Non-Alarm Troubleshooting Steps

1. **Flow Signal Cable** alarm will be indicated in the Analog Prop-To-Time mode if the flow signal connection has been lost.

    a. Inspect the flow signal device for proper power and connecting cables for any damage such as cuts, crimps, etc. Restore power to flow signal device or replace connecting cables as necessary.

    b. Check the grounding system is correctly in place. Read the flow signal voltage on **TB8** pins **2** and **3**. If the voltage on the voltmeter is within the 1-5v range, the problem is most likely a grounding or isolation issue. This can be corrected by re-establishing

the ground or installing a signal isolator device. If the voltage is below 1v, the flow meter is the source and must be corrected.

2. **Over-Flow (>125%)** alarm will be indicated when the flow signal indicates 125% of the indicated span set point.

    a. If reading an analog flow signal, a grounding reference error can cause this condition. Check that the grounding system is correctly in place. Read the flow signal voltage on **TB8** pins **2** and **3**. If the voltage reading on the voltmeter is greater than 5VDC, the problem resides with the transmitted signal. Correct as necessary at the signal source. If the voltage on the voltmeter is within the 1-5VDC range, the problem is most likely a grounding or isolation issue. This can be corrected by re-establishing the ground or installing a signal isolator device.

    b. If the NJEX System is set to receive a pulse signal and this alarm activates, two issues could generate this alarm. First, the span frequency could be set incorrectly. Recalculate the span frequency and inspect the setting in the Calibration section of the N-400 Controller. The other cause could be the result of electrical noise interference resulting in the system interpreting this noise as pulses.

    c. If it is believed this is in error or the situation continues to reoccur, the flow signal calibrations, and parameters should be re-calibrated with corrected values.

3. **Low Flow Shut Off** indication is not an actual alarm, but an indication that the flow signal reading is within the shut off condition stipulated by the low flow shut off parameter. If it is felt this indicator should not be on, given the current flow, first check the parameter for the Low Flow Shut-Off to verify it is set as desired. As a second step, evaluate the flow signal being received. Verify that the signal indicates the correct flow, and that the signal spanned and zero referenced correctly. If necessary, correct as required.

4. **Flow (no signal)** indication is not an actual alarm, but an indication that the system is injecting to the rate stipulated by the Flow (no signal) parameter. This is used to continue odorizing in Prop-To-Flow mode without requiring a flow signal. If it is felt this indicator should not be on, evaluate the flow signal being received.

    a. Inspect the flow signal device for proper power and connecting cables for any damage such as cuts, crimps, etc. Restore power to flow signal device or replace connecting cables as necessary.

    b. Check the grounding system is correctly in place. Read the flow signal voltage on **TB8** pins **2** and **3**. If the voltage on the voltmeter is within the 1-5v range, the problem is most likely a grounding or isolation issue. This can be corrected by re-establishing the ground or installing a signal isolator device. If the voltage is below 1v, the flow meter is the source and must be corrected.

5. **Over-Flow (>110%)** indication is not an alarm but an indication that the measured flow signal is greater than 110% of the input max gas flow and the flow signal may need to be checked.

a. If reading an analog flow signal, a grounding reference error can cause this condition. Check that the grounding system is correctly in place. Read the flow signal voltage on **TB8** pins **2** and **3**. If the voltage reading on the voltmeter is greater than 5VDC, the problem resides with the transmitted signal. Correct as necessary at the signal source. If the voltage on the voltmeter is within the 1-5VDC range, the problem is most likely a grounding or isolation issue. This can be corrected by re-establishing the ground or installing a signal isolator device.

b. If the NJEX System is set to receive a pulse signal and this alarm activates, two issues could generate this alarm. First, the span frequency could be set incorrectly. Recalculate the span frequency and inspect the setting in the Calibration section of the N-400 Controller. The other cause could be the result of electrical noise interference resulting in the system interpreting this noise as pulses.

c. If it is believed this is in error or the situation continues to reoccur, the flow signal calibrations, and parameters should be re-calibrated with corrected values.

6. **No Flow** is a non-alarm indicator to indicate when the flow signal is measuring between 0.125VDC to 1VDC. If the pipeline is not in a no flow condition, the incoming flow signal should be checked.

a. Inspect the flow signal device for proper power and connecting cables for any damage such as cuts, crimps, etc. Restore power to flow signal device or replace connecting cables as necessary.

b. Check the grounding system is correctly in place. Read the flow signal voltage on **TB8** pins **2** and **3**. If the voltage on the voltmeter is within the 1-5v range, the problem is most likely a grounding or isolation issue. This can be corrected by re-establishing the ground or installing a signal isolator device. If the voltage is below XVDC, the flow meter is the source and must be corrected.

Expansion Tank Alarms

There are three alarms within the NJEX system to monitor the expansion tank pressure. Managing the expansion tank pressure is critical to proper system performance as the system relies on differential pressure to fill the NJEX verometer.

Expansion Tank Cable alarm indicates a loss of signal between the Expansion Tank transducer on the fill valve assembly and the N-400 controller.

Expansion Tank Pressure Low alarm indicates the pressure in the expansion tank has dropped below the defined minimum set point for the Expansion Tank.

Expansion Tank Pressure High alarm indicates the pressure in the expansion tank has exceeded the defined high pressure set point for the Expansion Tank.

Expansion Tank Alarm Troubleshooting

1. **Expansion Tank Cable** alarm indicates a loss of signal between the Expansion Tank pressure transducer located in the fill valve assembly and the N-400 controller.
    1. Inspect all cables for any external damage such as cuts or crimps in the external cable sleeve or moisture inside the cable connector.
    2. Loosen and inspect the cable orientation pins for correct positioning. All cables have a specific mating connection to ensure that the correct pins on the opposing sides of the connector align. These pins must be correctly aligned to ensure the electronic signals reach the correct electronic address in the microprocessor.
    3. Reconnect cables as noted above, ensuring that the alignment pins are mated correctly and that locking rings are tight. Observe if the alarm is still active, if it is, contact YZ Technical Services.
2. **Expansion Tank Pressure Low** alarm indicates the pressure in the expansion tank has dropped below the defined minimum set point for the Expansion Tank.
    1. Verify that the expansion tank pressure is at 25 psi *(1.72 Bar)* and correct if necessary.
    2. Inspect the alarm set point programmed into the N-400 controller and verify that it is correctly programmed and correct if necessary, *refer to the parameters section on programming the N-400 controller Sections 3 depending on the mode of operation.*
    3. Observe if the alarm is still active, if it is, contact YZ Technical Services.

Verometer Expansion Tank High Alarm Troubleshooting Steps

When an active **XTank High** alarm is indicated the following steps should be taken:

1. Verify that the expansion tank pressure is at 25 psi *(1.72 Bar)* and correct if necessary.

2. Inspect the alarm set point programmed into the N-400 controller and verify that it is correctly programmed and correct, if necessary, *refer to the parameters section on programming the N-400 controller Sections 3, depending on the mode of operation.*

3. Observe if the alarm is still active, if it is, contact YZ Technical Services.

Verometer Alarms

There are a variety of Verometer alarms monitored by the N-400 Controller to ensure correct and safe operation of the NJEX System. The alarms relating to Verometer performance and their description is as follows:

- **Verometer Cable** alarm indicates a loss of signal between the verometer and the N-400 controller.

- **No Fill** alarm is activated triggered if the Verometer fails to fill to 100% within 3 minutes after a fill is requested.

- **Slow Fill** alarm is indicated when a fill of the Verometer is requested and the Verometer does not fill 100% within 90 seconds. This alarm actuates with either an automatic or manual fill request.

- **Leakage** is indicated when the pump displacement is calculated with a greater than 50% of the set pump displacement.

- **Fill Valve** is indicated when the verometer level continues to increase while the solenoid valve is signaled to be closed indicating the fill valve is stuck open.

- **Odorant Pressure Cable** indicates a loss of signal between the fill valve pressure transducer that measures the bulk storage tank and the N-400 Controller.

- **Odorant Pressure Low** indicates the odorant pressure has dropped lower than the defined parameter in the N-400 Controller.

- **Odorant Pressure High** indicates the odorant pressure has exceeded the defined parameter set in the N-400 Controller.

- **Odorant Level Cable** indicates a loss of signal with the bulk odorant tank level sensor.

Non-Alarm Verometer Indicators

- **Over Fill** is indicated when the Verometer has filled to a level of 112% or greater.

- **Fill Rate** is indicated when the verometer level fills to greater than 112% in less than 10 seconds

Verometer Cable Alarm Troubleshooting Steps

When an active **Verometer Cable** alarm is indicated, the following steps should be taken:

1. Inspect all cables for any external damage such as cuts or crimps in the external cable sleeve or moisture inside the cable connector.

2. If damage is observed on cable, contact YZ Technical Services for replacement.

3. If no damage is observed, please contact YZ Technical Services for additional assistance.

Verometer No Fill Alarm Troubleshooting Steps

When an active **No Fill** alarm is indicated, the following steps should be taken:

IMPORTANT NOTE: Before attempting to troubleshoot the fill valve, verify that the NJEX is in run position and the Verometer is not in a full level position. The fill valve commands can not be processed if the Verometer is full, or the NJEX is in Standby.

1. Check actuation gas supply filter and valves for possible restriction or closure, and adjust or replace as necessary.

2. Check odorant filters for possible restrictions and replace as necessary.

3. Check tubing between bulk odorant storage tank and enclosure for damage. If tubing is crimped, bent or damaged by any form that could restrict flow, replace the tubing.

4. Test for adequate fill valve pneumatic actuation pressure. Place a gauge at the tubing connection located on top of the fill valve by disconnecting tubing. During a fill, the valve actuation pressure should be 75 psi *(5.17 Bar)*.

5. Verify that the status switch be in the run position. If no pneumatic pressure is received at the fill valve when a fill is initiated, measure the DC voltage using a voltmeter fill valve solenoid located on the left. The voltage should read between 13VDC and 14VDC at the fill valve solenoid when a fill is active. If voltage is present when a fill is active, but gas will not flow to the fill valve, replace the solenoid.

    a. If a volt meter is unavailable, you may test fire the pump with the test switch to verify the other solenoid and cable are active. To test, temporarily switch the solenoid cables. Now when the test switch is activated, the fill valve solenoid should send pneumatic supply gas to the loosened connection at the fill valve for approximately .3 seconds each time the test switch is activated. If this does occur there is a problem with the fill signal getting to the fill solenoid. However, if the solenoid still does not send actuation gas to the fill valve the solenoid is bad and should be replaced.

    b. If the signal is not getting to the solenoid, test at terminal strip **TB13**, located inside the termination enclosure just below the N-400 Controller, with a volt meter at pins **1** positive and **2** negative, for 13VDC to 14VDC when the fill is requested from the N-400 controller. If the voltage is present, check the wiring for proper polarity connections.

6. If no voltage is present when a fill is active, remove fuses F4 and F5 and check for continuity. Replace fuses if required and check voltage again.

7. If there is still no voltage is present when a fill is active, check all cables for corrosion, moisture, or damage and replace if any signs of the previous mentioned problems are present and perform the test again.

8. If voltage is still not present contact YZ Systems Technical Service.

Verometer Slow-Fill Alarm Troubleshooting Steps

IMPORTANT NOTE: Prior to troubleshooting a slow fill alarm, verify that the Verometer is not in a full level position as the fill valve commands can not be processed if the Verometer is full.

1. Inspect the actuation gas supply filter for possible restriction and replace as necessary.
2. Inspect the odorant filters for possible restrictions and replace as necessary.
3. Check tubing between bulk odorant storage tank and enclosure for damage. If tubing is crimped, bent or damaged by any form that could restrict flow, replace the tubing. Verify that an adequate flow of odorant is supplied to the fill valve.
4. Test for adequate fill valve pneumatic actuation pressure. Place a gauge at the tubing connection located on top of the fill valve by disconnecting tubing. During a fill, the valve actuation pressure should be 75 psi *(5.17 Bar)*.
5. Disassemble, clean, and rebuild valve assembly

Verometer Leakage Alarm Troubleshooting Steps

When an active Leakage alarm is indicated, the following steps should be taken:

1. Inspect the system for any obvious leaks and repair as necessary.

2. If the Leakage alarm occurs during purging of the system or the packing of the lines with odorant on a new system, a manual refill of the verometer will be required and this will clear the alarm.
3. Verify that the pump displacement parameter correctly matches the actual pump performance on the system, and correct if necessary.
4. Verify the correct balance of pressures between the pump actuation pressure and the pipeline pressure, refer to the System Flow Schematic, Section 1: System Installation for specific system pressures.
5. If the pipleine pressure is near or below 250 psi (17.24 Bar), a back pressure regulating device must be installed immediately outside the NJEX enclosure, on the odorant line leading to the pipeline injection point. If this device is installed, verify that is is maintaining a back pressure regulating device above 250 psi (17.24 Bar).
6. Verify that the total run of tubing from the pipeline to the NJEX System does not exceed 15’ (4.5 Meters).

Verometer Fill Valve Alarm Troubleshooting Steps

Verify the following prior to commencing work:

1. Actuation pressure is not excessive. This can cause the fill valve solenoid to open slightly when the pump strokes, which would open the fill valve and trigger an alarm.
2. Verify that all valves in the system are in the correct position. A valve in the incorrect position may allow odorant to enter the Verometer via a path other than through the fill valve, resulting in a fill valve alarm. For example, if valves V2 and V3 were left open, the result would cause a fill valve alarm.

Verometer at 116%

1. Initiate a forward purge to lower Verometer level to approximately 50% and return the NJEX System to normal operating pressures and valve positions.
2. Place the NJEX System in standby mode and observe level changes in the Verometer by monitoring the Verometer level status on the N-400 controller display.
3. If the level increases disconnect the pneumatic supply tube at the top of the fill valve to inspect if actuation gas is present. If actuation gas is not present when the tube is disconnected, and the Verometer level continues to increase, repair or replace the fill valve. If the actuation gas is present in the tube when disconnected, the Verometer level should stabilize after disconnecting the fill valve pneumatic supply tube. Proceed to step 4.
4. While the fill valve pneumatic supply tube is disconnected, toggle the mode switch from run to standby and back again. This should stop and start the pneumatic supply.
    a. If the pneumatic supply stays on, disconnect the fill valve solenoid cable. If disconnecting the cable does not stop the pneumatic supply, replace the solenoid.
    b. If disconnecting the cable in step 4a listed above caused the pneumatic supply to stop, check the electrical connections for the presence of moisture. Dry the connections if moisture is present and try test again. If moisture on the solenoid

was not the problem, check the interconnect cable for possible moisture or corrosion where it connects to the mechanical enclosure. Replace if corrosion or moisture is present.

5. If the step taken above do not resolve the issue, the entire control head assembly must be replaced

Verometer Over Fill Non-Alarm Indicator Troubleshooting Steps

When an active **Over Fill** non-alarm is indicated, the following steps should be taken:

1. Stop the system and empty the verometer by performing a purge.

2. Cycle power to the system and fill verometer. Allow unit to run and discharge one full verometer volume until the verometer fills again.

3. If the verometer continues to overfill, please contact YZ Technical Services. Note to the technician if the inlet pressure rises while the transfer pump is running.

Verometer Fill Rate Non-Alarm Indicator Troubleshooting Steps

Verometer Fill Rate Non-Alarm Indicator Troubleshooting Steps

When an active **Fill Rate** non-alarm is indicated the following steps should be taken:

1. Verify the correct set pints on the following pressures.
    a. Expansion Tank set at 25 psi (1.72 Bar)
    b. Bulk Tank set at 32 - 35 psi (2.2-2.4 Bar)
    c. System Supply set at 75 psi (5.17 Bar)
2. Empty the Verometer by performing a forward purge. Re-establish the pressures and valves to their normal operating position, and then proceed to step 3.
3. Perform the Verometer fill procedure as indicated in Section 6: System Maintenance, and adjust fill rate control valve V9 to achieve an appropriate fill rate.

Odorant Pressure Alarms

The NJEX unit requires 32-35 psi (2.2-2.4 Bar) blanket pressure on the bulk tank. If the blanket pressure is less than or exceeds this range, the Inlet Pressure Alarm will indicate if enabled. The default inlet pressure alarms are set at 31 psi (2.1 Bar) and 37 psi (2.5 Bar) but can be modified.

- **Odorant Pressure Low** alarm indicates that the odorant pressure has dropped lower than defined in the set-up parameters in the N-400 controller.
- **Odorant Pressure High** alarm indicates that the odorant pressure has exceeded the maximum pressure as defined in the set-up parameters in the N-400 controller.
- **Odorant Pressure Cable** alarm indicates that the N-400 controller is no longer receiving a pressure signal and the cable connection should be verified.

Odorant Pressure Low Alarm Troubleshooting

When an active Odorant Pressure Low Alarm is indicated, the following steps should be taken:

1. Verify the blanket pressure on the bulk odorant tank is in the range of 32 – 35 psi (2.2 – 2.4 Bar) and reestablish the correct pressure if applicable.

2. If the alarm is still active, verify the programmed high and low values in the Set Alarm Parameters menu.

3. Recalibrate the Inlet Pressure per the instructions given in Section 3.

4. If the odorant pressure is reading 0.00 PSI (bar) and all connections are connected properly, replace F1 on the controller circuit board. See the labeled located on the inside of the door for the relative location of F1.

5. If the alarm is still active, please contact YZ Technical Services for additional assistance.

Odorant Pressure High Alarm Troubleshooting

When an active Odorant Inlet Pressure High Alarm is indicated, the following steps should be taken:

1. Verify the blanket pressure on the bulk odorant tank is in the range of 32 – 35 psi (2.2 – 2.4 Bar) and reestablish the correct pressure if applicable.

2. If the alarm is still active, verify the programmed high and low values in the Set Alarm Parameters menu.

3. Recalibrate the Inlet Pressure per the instructions given in Section 3.

4. If the alarm is still active, please contact YZ Technical Services for additional assistance.

Odorant Pressure Cable Alarm Troubleshooting

When an active Odorant Pressure Cable Alarm is indicated, the following steps should be taken:

1. Inspect all cables for any external damage such as cuts or crimps in the external cable sleeve or moisture inside the cable connector.

2. Loosen and reinstall the cable in the controller. Inspect pluggable terminal block for damage and replace if necessary.

3. Observe if the alarm is still active, if it is, contact YZ Technical Services.

Battery Alarms

There are two battery alarms within the N-400 NJEX system to monitor the usage and health of the backup battery.

- **Running on Battery** is indicated when the unit has lost the main power source and is running on backup battery
- **Low Battery** is indicated when the N-400 Controller has determined the backup battery life is reaching the end and should be replaced.

Battery Alarm Troubleshooting Steps

Running on Battery Alarm Troubleshooting

If main power is available and the system is indicating it is Running on Battery, the following steps should be taken:

1. Verify the main power cable that is connected to the power limiter board is intact and free of damage.

2. Cycle power on the NJEX system

3. Using a voltmeter, check the wire terminals for the incoming power, a minimum of 15VDC is required to supply power to the N-400.

4. If less than 15VDC is measured, trace the incoming power to determine where the power is failing.

5. If greater than 16.5VDC is measured, the power limiter board must be replaced.

6. If the Running on Battery alarm persists, please contact YZ Technical Services for additional assistance.

Low Battery Alarm Troubleshooting

The low battery alarm will indicate when the N-400 Controller determines the battery should be replaced. The battery will provide approximately 2 weeks of battery life upon loss of main power, but will vary due to stroke rate, ambient temperature, and battery health. If the Low Battery alarm is present, the battery should be replaced by following these steps:

1. Unplug the battery from the power limiter board

2. Remove the battery from the battery holder

3. Replace the battery with YZ battery pack E3-2006.

4. Dispose of the used battery according to local laws and regulations

5. Reset the battery life by following the instruction under the Battery Reset menu within the maintenance wizard.

IMPORTANT:

The battery pack should only be replaced with YZ battery pack part number E3-2006. Using another battery pack will impair the intrinsic safety of the system.

Batteries should be disposed of safely according to local laws and regulations for which the site is located.

The battery pack must be reset within the maintenance screen when replaced to properly estimate the battery life.

Controller Alarms

There are two controller alarms within the N-400 NJEX Controller:

- **RTC Hardware** will enable if there is a failure with the RTC hardware on the N-400 circuit board
- **EEPROM Hardware** will enable if there is a failure the EEPROM on the N-400 circuit board.

When an active **RTC Hardware** or **EEPROM Hardware** alarm is active, please contact YZ Technical Services for support.

Notes

Appendix A: NJEX Response Forms

For the Record

To assist in troubleshooting, if required, please record the following information as the NJEX is initialized for the first time.

Basic information on the NJEX System

Serial number: _____

Model Number: _____

N-400 version (x.xx): _____

Manufacturing date: _____

Date of Startup: _____

Technician's Name: _____

Location

Site ID: _____

Startup Technician: _____

Site Telephone: _____

Conditions

Pipeline Pressure: _____

Supply Pressure: _____

Pump Actuation Pressure: _____

Expansion Tank Pressure: _____

Bulk Tank Pressure: _____

Supply Pressure: _____

Gas Flow Rate: _____
Record in MMCF/hr or m3/sec.

Bulk Odorant Storage Level: _____

Ambient Temp Range: _____

Parameters

Injection Rate: _____

Pump Displacement: _____

Max time per Stroke: _____

Odorant Density: _____

Max Gas Flow: _____

Flow Input: _____

Low Flow Shutoff: _____

Flow (no signal): _____

Odorant Output: _____

Run Mode

Select One

____ Proportional-to-Time
____ Proportional-to-Flow

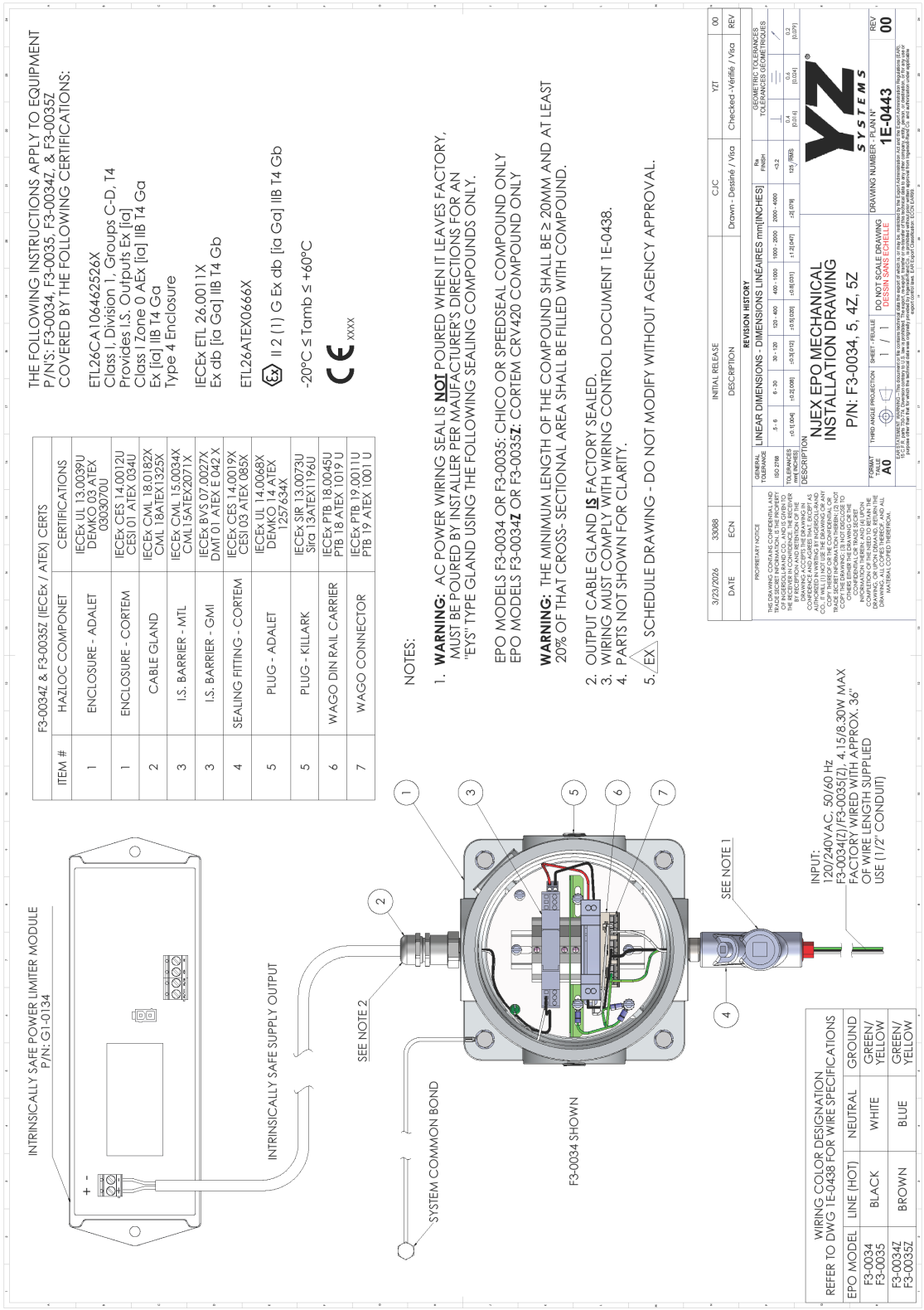
If Proportional to-Flow, select one

____ Analog
____ Pulses-per-Second
____ Pulses-per-Minute

Appendix B: N-400 Wiring Control Document (1E-0440)

Appendix C: NJEX System Level Control Document (1E-0441)

Appendix D: EPO Mechanical Installation Drawing (1E-0443)



Appendix E: EPO Wiring Installation Drawing (1E-0438)

NJEX EPO INTRINSICALLY SAFE EXTERNAL POWER SUPPLY
HAZARDOUS AREA INSTALLATION INSTRUCTIONS AND DRAWINGS

Conditions for safe use:
The system shall not be connected to any associated apparatus which uses or generates more than 250VRMS.

Installations:

USA- Installations shall be in accordance with the National Electric Code (NEC), NFPA-70, and ANSI/ISA-RPI206.1
Canada - Installation shall be in accordance with Canadian Electrical Code (CEC) Part 1 (CSA22.1).
ATEX/IECEx - Installations shall be in accordance with all applicable local and national electrical codes, EN60079-14, IEC60079-25, and all Essential Health and Safety Regulations of Directive 2014/34/EU.

NJEX EPO Assemblies are rated as follows:

F3-0034 & F3-0035
Class I, Division 1, Groups C-D, T4
Provides I.S. Outputs Ex [ia]
Class I Zone 0 AEx [ia] IIB T4 Ga
Ex [ia] IIB T4 Ga
-20°C ≤ Tamb ≤ +60°C

F3-0034Z & F3-0035Z
Ex db [ia Ga] IIB T4 Gb
Ⓔx II 2 (1) G Ex db [ia Ga] IIB T4 Gb
-20°C ≤ Tamb ≤ +60°C

WARNING: Do not open when explosive atmosphere is present. To reduce the risk of ignition of hazardous atmospheres, disconnect the equipment from the supply circuit before opening. Keep assembly tightly closed when in operation.
AVERTISSEMENT: Ne pas ouvrir en présence d'une atmosphère explosive. Pour réduire le risque d'inflammation dans des atmosphères dangereuses, déconnectez l'équipement du circuit d'alimentation avant de l'ouvrir. Maintenez l'ensemble hermétiquement fermé pendant le fonctionnement.

WARNING: To avoid the risk of electrical shock or burns, always connect safety (or earth) ground before making any other connections.
AVERTISSEMENT: Pour éviter tout risque d'électrocution ou de brûlure, connectez toujours la terre de sécurité (ou la terre) avant toute autre connexion.

NOTES:

1. ALTERING OR SUBSTITUTION OF COMPONENTS MAY IMPAIR THE INTRINSIC SAFETY OF THE SYSTEM.
2. FACTORY SUPPLIED INTRINSICALLY SAFE OUTPUT CABLE- USES 18 GA CSA/UL LISTED, 2 CONDUCTOR, UN-SHIELDED TRAY CABLE, TYPE: EXTRA HARD USAGE OR TC-ER-HL 50FT MAXIMUM LENGTH CABLE.
3. RECOMMENDED TO REMOVE EXCESSIVE OUTPUT CABLE DURING INSTALLATION.
4. MINIMUM WIRE SIZE FOR INCOMING AC SUPPLY SHALL BE 16AWG.
5. ROUTINE TEST - DIELECTRIC VOLTAGE WITHSTAND TEST.
5. REFERENCE MECHANICAL INSTALLATION DOCUMENT 1E-0443 FOR ADDITIONAL INFORMATION.
6. EXPLOSION PROOF / FLAMEPROOF ENCLOSURE SHALL PROVIDE A MINIMUM OF IP54 PROTECTION.
7. ⚠Ex **SCHEDULE DRAWING - DO NOT MODIFY WITHOUT AGENCY APPROVAL.**

DATE	ECN	DESCRIPTION	UPD BY	APR BY	REV
03/30/2026	32148	INITIAL RELEASE	RRH	CJC	00

REVISION HISTORY

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE INCH[mm]
INTERPRET DIM AND TOL PER ASME Y14.5-2009
TOLERANCES:

.X	± .050[1.27]
.XX	± .010[.254]
.XXX	± .005[.127]
∠	± .5°
FRACTIONS	± 1/64[.397]
FINISH:	125 √RMS

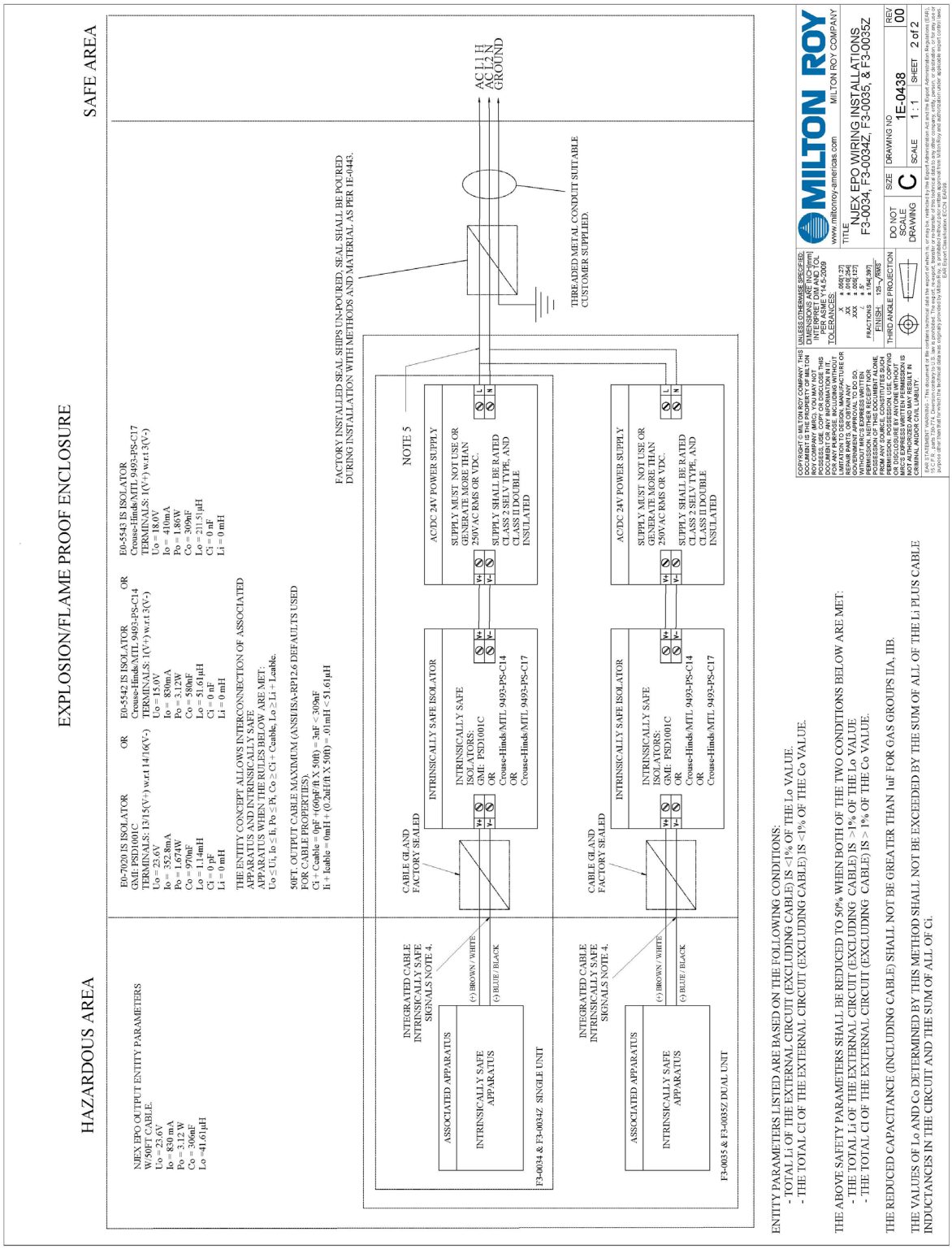
THIRD ANGLE PROJECTION

MILTON ROY
www.miltonroy-americas.com MILTON ROY, LLC

TITLE
NJEX EPO WIRING INSTALLATIONS
F3-0034, F3-0034Z, F3-0035, & F3-0035Z

DO NOT SCALE DRAWING | SIZE A | DRAWING NO 1E-0438 | REV 00 | SCALE 1 : 1 | SHEET 1 of 2

Appendix E: EPO Wiring Installation Drawing (1E-0438)



Appendix F: NJEX N-400 Series Modbus Map Draft

Communication Settings

Protocol	Modbus
Data Framing	Modbus RTU, ASCII
Slave Address Range	1-247
Baud Rates	1200, 2400, 4800, 9600, 19200, 38400, and 58000
Number of Data Bits	7 or 8
Parity	None, Odd, Even
Stop Bits	1 or 2
Serial Communications	Redundant RS-485 2 Wire

N-400 Modbus Function Support

Code	Function	Description
1	Read Coil Status	Reads the ON/OFF status of discrete outputs (coils)
3	Read Holding Registers	Reads the binary contents of holding registers
5	Force Single Coil	Forces a single coil to either the ON or OFF state
6	Preset Single Registers	Presets a value into a single holding registers
16	Preset Multiple Registers	Presets values into a sequence of holding registers

Boolean Registers

The Boolean data type can be used for status or control. The discrete outputs or “coils” as defined by the Modbus specifications are read/write registers. This ON/OFF data type can be manipulated using Modbus functions 1 and 5.

The valid address range for this data type is 00001 to 09999.
Function 1 allows reading a single coil per query
Function 5 allows writing single or multiple coils per query.

Control Functions

The control functions available via Modbus are listed below. The registers are accessed using Modbus functions 1 and 5. For coils 00001-00003, the master device can initiate a state change by toggling the relevant control coil. For example, to stop the system (coil 00001 reads '1' = started) write a '0' to coil 00001. Write a '1' to coils 0004- 00005 to reset the related measurement. Coil 00006 determines whether a remote inhibit can be initiated by a contact closure (local) connected to the inhibit inputs on the controller or by Modbus coil 00007 (remote).

Address	Access	Descriptions
00001	Read/Write	Start/Stop the pump (toggle)
00002	Read/Write	System Standby (toggle)
00003	Read/Write	Reset Accumulated Stroke Count (Read always returns 0)
00004	Read/Write	Reset Accumulated Odorant Injected (Read always returns 0)
00005	Read/Write	Fill Verometer (toggle)
00006	Read/Write	Start/Stop a Load Cycle (toggle) (Liquid System Only)

Boolean Registers
Control Functions, Continued

Address	Access	Descriptions
00007	Read/Write	Local/Remote Load Cycle Control (toggle) (Liquid System Only)
00008	Read/Write	Proportional to Time/Flow mode (toggle)
00009	Read/Write	Not used in NJEX N-400 Series
00010	Read/Write	Modbus Remote Inhibit Control Enabled/Disabled
00011	Read/Write	Modbus Remote Inhibit On/Off

Status Functions

The status functions available via Modbus are listed below. The registers are accessed using Modbus function 1. Status labeled with an “L” after the Access types are latching type status. A latching status provides a “since the last read” type status where a set condition will hold it’s state until a read of that particular register was made by the master device. Once a read is made, the status will reflect the current state.

Address	Access	Descriptions
00101	Read Only	System Stopped (0) / Running (1)
00102	Read Only	Verometer Not-Filling (0) / Filling (1)
00103	Read Only	Not in Standby (0) / Standby (1)
00104	Read Only	Memory Module Invalid (0) / Valid (1)
00105	Read Only	NBS Backup Disabled (0) / Enabled (1)
00106	Read Only	English (0) / Metric (1)
00107	Read Only	Proportional to Time (0) / Proportional to Flow (1)
00108	Read Only	Analog (0) / Pulse (1)
00109	Read Only	Pulses/Sec (0) / Pulses/Min (1)
00110	Read Only	Gas (0) / Liquid (1)
00111	Read Only (L)	No Power-Up (0) / Power-Up (1) since last coil read
00112	Read Only	Odorant Tank Low Alarm Enabled (0) / Disabled (1)
00113	Read Only	System Redundancy Enabled (0) / Disabled (1)
00114	Read Only	Redundancy Status - Primary System (1) / Backup System (0)
00115	Read Only	Redundancy Status - Odorizing (1) / Standby (0)
00116	Read Only	Low Battery Alarm Enabled (0) / Disabled (1)
00117	Read Only (L)	No Parm Change (0) / Parm Change (1) since last coil read
00118	Read Only	Normal (0) / No Flow Standby (1)
00119	Read Only	Normal (0) / Remote Inhibit (1)
00120	Read Only (L)	New HOU/LOU Available
00121	Read Only	No Load Cycle (0) / Load Cycle Active (1) – Liquid System Only
00122	Read Only	Load Cycle Mode Flow Detect (1) / Load Input (0) - Liquid System Only
00123	Read Only	Low Flow Shutoff Active (1) / Inactive (0)
00124	Read Only	Flow No Signal Active (1) / Inactive (0)
00125	Read Only	Resume on Power Loss Enabled (1) / Disabled (0)
00126	Read Only	Odorant Output Enabled (1) / Disabled (0)

00127	Read Only	RTC Chip Alarm Enabled (1) / Disabled (0)
00128	Read Only	EEPROM Alarm Enabled (1) / Disabled (0)
00129	Read Only	Running on Battery alarm Enabled (1) / Disabled (0
00130	Read Only	Flow No Signal Parameter Enabled (1) / Disabled (0)
00131	Read Only	Flow Signal Cable Alarm Enabled (1) / Disabled (0)
00132	Read Only	Signal Overflow Alarm Enabled (1) / Disabled (0)
00133	Read Only	Overpump Alarm Enabled (1) / Disabled (0)
00134	Read Only	Underpump Alarm Enabled (1) / Disabled (0)
00135	Read Only	Pump Failure Alarm Enabled (1) / Disabled (0)
00136	Read Only	Verometer Cable Alarm Enabled (1) / Disabled (0)
00137	Read Only	Verometer No Fill Alarm Enabled (1) / Disabled (0)
00138	Read Only	Verometer Slow Fill Alarm Enabled (1) / Disabled (0)
00139	Read Only	Verometer Leak Alarm Enabled (1) / Disabled (0)
00140	Read Only	Odorant Inlet Pressure Low Alarm Enabled (1) / Disabled (0)
00141	Read Only	Odorant Inlet Pressure High Alarm Enabled (1) / Disabled (0)
00142	Read Only	Odorant Inlet Pressure Cable Alarm Enabled (1) / Disabled (0
00143	Read Only	Expansion Tank Pressure Low Alarm Enabled (1) / Disabled (0)
00144	Read Only	Expansion Tank Pressure High Alarm Enabled (1) / Disabled (0)
00145	Read Only	Expansion Tank Pressure Cable Alarm Enabled (1) / Disabled (0)
00146	Read Only	Bulk Tank High Alarm Enabled (1) / Disabled (0)
00147	Read Only	Bulk Tank Cable Alarm Enabled (1) / Disabled (0)
00148	Read Only	Fill Valve Stuck Alarm Enabled (1) / Disabled (0)

Alarm Functions

The alarm functions available via Modbus are listed below. The registers are accessed using Modbus function 1. All the alarms are latching and provide a “since the last read” output where a set condition will hold it’s state until a read of that particular register was made by the master device. Once a read is made, the alarm will reflect the current state.

Address	Access	Descriptions
01001	Read Only	Global Alarm (1) (set if any alarm condition exists)
01002	Read Only	Pump Failure Alarm (1)
01003	Read Only	Over Pump Alarm (1)
01004	Read Only	Under Pump Alarm (1)
01005	Read Only	Verometer Cable Alarm (1)
01006	Read Only	Verometer Slow Fill Alarm (1)
01007	Read Only	Verometer No Fill Alarm (1)
01008	Read Only	Verometer Over Fill non-Alarm (1)
01009	Read Only	Verometer Leakage Alarm (1)
01010	Read Only	Verometer Fill Valve Stuck Alarm (1)
01011	Read Only	Verometer Fill Rate non-Alarm (1)
01012	Read Only	Signal Low Flow Shutoff non-Alarm (1)
01013	Read Only	Signal No Flow non-Alarm (1)
01014	Read Only	Signal Overflow non-Alarm (1)

01015	Read Only	Signal Overflow Alarm (1)
01016	Read Only	Flow Signal Cable Alarm (1)
01017	Read Only	Low Battery Alarm (1)
01018	Read Only	Bulk Tank level High Alarm (1)
01019	Read Only	Bulk Tank level Low Alarm (1)
01020	Read Only	Expansion Tank Pressure High Alarm (1)
01021	Read Only	Expansion Tank Pressure Low Alarm (1)
01022	Read Only	Expansion Tank Pressure Cable Alarm (1)
01023	Read Only	Odorant Inlet Pressure High Alarm (1)
01024	Read Only	Odorant Inlet Pressure Low Alarm (1)
01025	Read Only	Odorant Inlet Pressure Cable Alarm (1)
01026	Read Only	Flow No Signal (1)
01027	Read Only	Controller RTC Chip Alarm (1)
01028	Read Only	Controller EEPROM Alarm (1)
01029	Read Only	Bulk Tank Cable Alarm(1)
01030	Read Only	Battery Backup Active (1)
01031	Read Only	Alarm Contact Out (1)

Integer Registers

The integer data type could be used for the Results data and configuration/control parameters. The “holding registers” as referred to by the Modbus specification, are read/write registers. This 16-bit integer data type can be manipulated using functions 3, 6, and 16.

Function 3 Allows the host to read one or more holding registers per query
Function 5 Allows the host to write a single holding register per query
Function 16 Allows the host to write multiple registers per query

Result Data Functions

The result data functions are listed below. The registers are accessed using Modbus Function 3

Address	Access	Descriptions
40001	Read Only	HOU/LOU – Accum. Odorant Usage – High, (32-bit unsigned integer, most-significant word first) *See formatting info
40002	Read Only	HOU/LOU – Accum. Odorant Usage – Low, (32-bit unsigned integer, most-significant word first) *See formatting info
40003	Read Only	HOU/LOU - Accumulated Flow rate – High, (32-bit unsigned integer, most-significant word first) *See formatting info.
40004	Read Only	HOU/LOU - Accumulated Flow rate – Low, (32-bit unsigned integer, most-significant word first) *See formatting info
40005	Read Only	HOU/LOU Start Date (Day of Month/Month) (1-31/1-12) - BCD
40006	Read Only	HOU/LOU Start Date (Century/Year) (0000-9999) - BCD
40007	Read Only	HOU/LOU Start Time (Seconds/Minutes) (00-59/00-59) - BCD
40008	Read Only	HOU/LOU Start Time (Hours/Day of Week) (00-23/0-6) - BCD (0=Sunday 6=Saturday)
40009	Read Only	HOU/LOU End Date (Day of Month/Month) (1-31/1-12) - BCD
40010	Read Only	HOU/LOU End Date (Century/Year) (0000-9999) – BCD
40011	Read Only	HOU/LOU End Time (Seconds/Minutes) (00-59/00-59) – BCD
40012	Read Only	HOU/LOU End Time (Hours/Day of Week) (00-23/0-6) – BCD (0=Sunday 6=Saturday

40013	Read Only	Stroke Count High (0000-9999) – BCD
40014	Read Only	Stroke Count Low (0000-9999) – BCD
40015	Read Only	Total Odorant Injected High (0000-9999) – BCD *See formatting info.
40016	Read Only	Total Odorant Injected Low (0000-9999) – BCD *See formatting info.
40017	Read Only	Model Number (16-bit unsigned Integer) *See formatting info.
40018-40019	Read Only	Serial Number (32-bit Unsigned Integer, most-significant word first)
40020	Read Only	Odorant Tank Level (xxx %) – (16-bit unsigned Integer)
40021	Read Only	Expansion Tank Pressure (xxx.x psi / x.xxx bar) – (16-bit unsigned Integer)
40022	Read Only	Odorant Inlet Pressure (xxx.x psi / x.xxx bar) – (16-bit unsigned Integer)
40023	Read Only	Calculated Time per Stroke (x.xx sec) – High, (32-bit unsigned integer, most-significant word first)
40024	Read Only	Calculated Time per Stroke Low, (32-bit unsigned integer, most-significant word first) - (x.xx sec.)
40025	Read Only	Verometer Level (xxx.x %) – (16-bit signed Integer)
40026	Read Only	Battery Life (xx.x %) – (16-bit unsigned Integer)
40027	Read Only	Verometer Calibration Data - (16-bit unsigned Integer) *See formatting info.
40028	Read Only	Odorant Temperature (xxx.x F/C) (16-bit Signed Integer)
40029	Read Only	Flow Signal Percent (xxx.x%) (16-bit unsigned Integer)
40030-40031	Read Only	1hr flow-based IR (lb/MMCF, mg/m3, lb/10kgal, mg/Liter) (IEEE 754 floating-point, most sig. word first)
40032-40033	Read Only	1hr time-based IR (lb/hr, kg/hr) (IEEE 754 floating-point, most sig. word first)
40034-40035	Read Only	cc per stroke (IEEE 754 floating-point format, most significant word first)
40036-40037	Read Only	HOU/LOU - accumulated odorant injected (IEEE 754 floating-point format, most significant word first)
40038-40039	Read Only	HOU/LOU - accumulated flow (IEEE 754 floating-point format, most significant word first)
40040	Read Only	HOU/LOU - Start Date - Day of Month
40041	Read Only	HOU/LOU - Start Date - Month
40042	Read Only	HOU/LOU - Start Date - Year
40043	Read Only	HOU/LOU - Start Date - Hours (24 hour format)
40044	Read Only	HOU/LOU - Start Date - Minutes
40045	Read Only	HOU/LOU - Start Date - Seconds
40046	Read Only	HOU/LOU - End Date - Day of Month
40047	Read Only	HOU/LOU - End Date - Month
40048	Read Only	HOU/LOU - End Date - Year
40049	Read Only	HOU/LOU - End Date - Hours (24 hour format)
40050	Read Only	HOU/LOU - End Date - Minutes
40051	Read Only	HOU/LOU - End Date - Seconds
40052-40053	Read Only	Stroke count (32-bit Unsigned Integer)
40054-40055	Read Only	Mass Injected Totalizer (IEEE 754 floating-point format, most significant word first)
40056	Read Only	Model Number (6400, 7400, 8400)

Model Specific Formatting Information for Result Data Functions

Address	Formatting
40001	High bytes for Accumulated odorant injected, combine with address 40002 for total.
40002	6400GE/LE = .XXXXX, 7400GE/LE = X.XXXX, 8400GE/LE = XX.XXX (lbs), 6400GM/LM = .XXXXX, 7400GM/LM = X.XXXX, 8400GM/LM = XX.XXX (kg) Note: Low bytes only, combine with address 40001 for total odorant injected.
40003	High bytes for Accumulated flow, combine with address 40004 for total.
40004	6400GE = .XXXXX, 7400GE = X.XXXX, 8400GE = XX.XXX (MMCF), 6400GM = X.XXXX, 7400GM = XX.XXX, 8400GM = XXX.XX (M3) 6400LE = XXX.XX, 7400LE = XXXX.X, 8400LE = XXXXX (gallons) 6400LM = XXX.XX, 7400LM = XXX.X, 8400LM = XXXXX (liters) Note: Low bytes only, combine with address 40003 for total accumulated flow.
40015	High bytes only, combine with address 40016 for total odorant injected.
40016	6400 = .XXXX, 7400 = X.XXX, 8400 = XX.XX (lbs/kg) Note: Low bytes only, combine with address 40015 for total odorant injected.
40017	Model number format: 64XX = 6400, 74XX = 7400, 84XX = 8400. XX= 11= GE, XX=12=GM, XX=21=LE, XX=22=LM. Example: 6411 = 8400 Gas English, 7422 = 7400 Liquid Metric
40027	6400 = XX.XXX, 7400 = XXX.XX, 8400 = XXXX.X (cc)

Parameter functions

The result data functions available via Modbus are listed below. The registers are accessed using Modbus functions 3, 6, and 16. Note: The system must be stopped in order for any parameter changes to be accepted. An exception response will be returned if a parameter change query is issued while the system is running.

Address	Access	Descriptions
40101	Read/Write* *	Current Date (Day of Month / Month) (01-31 / 01-12) – BCD
40102	Read/Write* *	Current Date (Century / Year) (0000-9999) – BCD
40103	Read/Write* *	Current Time (Seconds / Minutes) (00-59 / 00-59) – BCD
40104	Read/Write* *	Current Time (Hours / Day of Week) (00-23/0-6) – BCD (0=Sunday 6=Saturday)
40105	Read/Write	Injection Rate - (16-bit unsigned Integer) *See formatting info.
40106	Read/Write	Pump Displacement (cc/Stroke) – XX.XXX cc/stroke
40107	Read/Write	Odorant Density – (16-bit unsigned Integer) (GE/LE = X.XX lbs/gal, GM/LM = X.XXX g/cc)
40108	Read/Write	Proportional to Time Stroke Rate X.XX (minutes) – (16-bit unsigned Integer)
40109	Read/Write	Maximum Gas Flow – (16-bit unsigned Integer) *See formatting info
40110	Read/Write	Low Flow Shutoff (xxx% of Max Gas Flow) – (16-bit unsigned Integer)

40111	Read/Write	Flow No Signal (xxx% of Max Gas Flow) – (16-bit unsigned Integer)
40112	Read/Write	Maximum time per stroke (xxx minutes/stroke) – (16-bit unsigned Integer) (0=OFF)
40113	Read/Write	Odorant Output - (16-bit unsigned Integer) *See formatting info
40114	Read/Write	Pulses per Second (xx Pulses/Seconds) – (16-bit unsigned Integer)
40115	Read/Write	Pulses per Minute (xx Pulses/Minute) – (16-bit unsigned Integer)
40116	Read/Write	Bulk Tank Level High (xx %) – (16-bit unsigned Integer)
40117	Read/Write	Bulk Tank Level Low (xx %) – (16-bit unsigned Integer)
40118	Read/Write	Expansion Tank Pressure High (xxx psi / xx.x bar) – (16-bit unsigned Integer)
40119	Read/Write	Expansion Tank Pressure Low (xxx psi / xx.x bar) – (16-bit unsigned Integer)
40120	Read/Write	Odorant Inlet Pressure High (xxx psi / xx.x bar) – (16-bit unsigned Integer)
40121	Read/Write	Odorant Inlet Pressure Low (xxx psi / xx.x bar) – (16-bit unsigned Integer)
40122	Read/Write	System Redundancy (0=Default, 1=Primary, 2=Backup)
40123	Read/Write	Minimum Time between strokes on backup battery (xx.x seconds) (1.2seconds=OFF)
40124	Read/Write* *	Current Time - day of month
40125	Read/Write* *	Current Time - month
40126	Read/Write* *	Current Time - year
40127	Read/Write* *	Current Time - hours (24 hour format)
40128	Read/Write* *	Current Time - minute
40129	Read/Write* *	Current Time - seconds

Model Specific Formatting Information for Parameter Functions

Address	Formatting
40105	GE = X.XX (lbs/MMCF) GM = XX.XX (mg/m^3) LE = X.XX (lbs/10K gal) LM = XX.XX (mg/liter)
40109	6400GE = X.XXX, 7400/8400GE = XX.XX (MMCF/hr) 6400GM = XX.XX, 7400/8400GM = XXX.X (m3/sec) 6400LE = XXXX.X, 7400/8400LE = XXXXX (gal/min) 6400LM = XXXX.X, 7400/8400LM = XXXXX (liter/min)
40113	6400 = X.XXXX, 7400 = X.XXX, 8400 = X.XX (English = lbs/pulse, Metric = kg/pulse)

** Read only. Data written to these registers will be ignored but treated as legal modbus communication

Appendix G: Controller Replacement Components

The N-400 controller circuit board has replaceable fuses in the instance of failure.

Please refer to the component layout label inside the controller door for quick reference on relative fuse position, or the location can be seen in Figure 79.

The solid state relays, U22, U25 can also be replaced if required. Please refer to the component layout label inside the controller door for quick reference on relative fuse position, or the location can be seen in Figure 79.

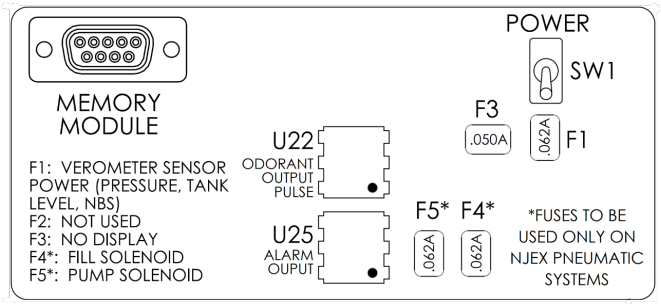


Figure 79: Component layout label. Use this label to see relative location of replacement components and the memory module and power switch.

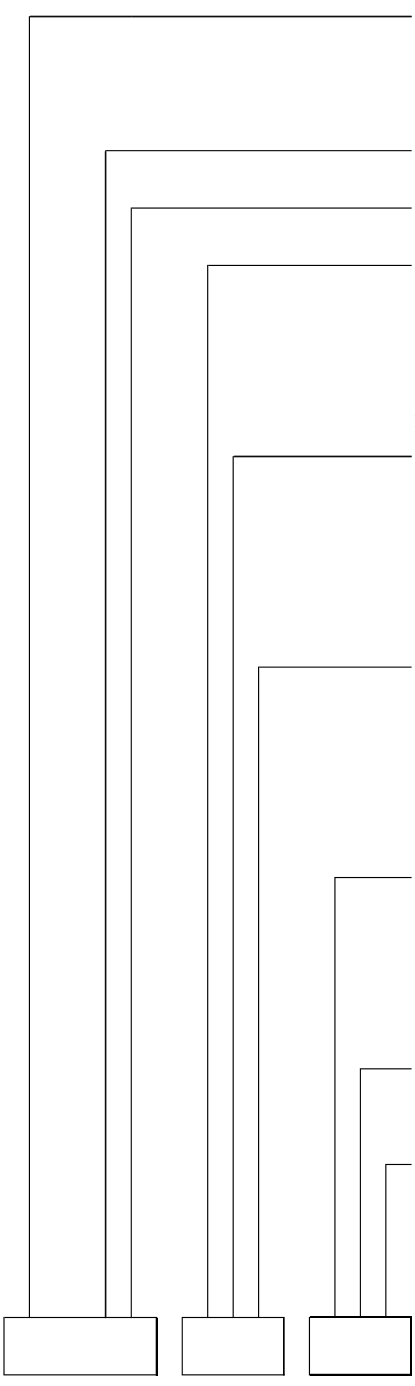
Warning: Substitutions of the fuses can impair intrinsic safety. It is recommended to order replacements directly from YZ Systems to ensure proper components are installed. A fuse kit will be provided with each controller. Additional fuses can be purchased individually with the part numbers below or a kit containing all required fuses can be purchased from YZ Systems with part number D3-0334.

Component	Specification	Description	Manuf. Part Number	YZ Part Number
F1	62mA 125V / 300A Breaking	Fuse, PICO hazardous area. ENCAPSULATED	Littelfuse 259.062	E0-6522
F2	62mA 125V / 300A Breaking	Fuse, PICO hazardous area. ENCAPSULATED	Littelfuse 259.062	E0-6522
F3	50mA 277V/ 1500A Breaking	Fuse, ENCAPSULATED hazardous area.	ISF11-050-LF	E0-6525
F4	62mA 125V / 300A Breaking	Fuse, PICO hazardous area. ENCAPSULATED	Littelfuse 259.062	E0-6522
F5	62mA 125V / 300A Breaking	Fuse, PICO hazardous area. ENCAPSULATED	Littelfuse 259.062	E0-6522
BT1	3V 12mm 35mAH	Battery, Coin Cell	Panasonic CR1220	-

Appendix H: N-400 NJEX Model Code

NJEX 64/74/84 Odorization Systems

Model Code



NJEX Gas Odorization series
- **8402 -** Dual unit, high volume primary odorizer
- **8400 -** Single unit, high volume primary odorizer
- **7402 -** Dual unit, mid volume primary odorizer
- **7400 -** Single unit, mid volume primary odorizer
- **6402 -** Dual unit, low volume primary odorizer
- **6400 -** Single unit, low volume primary odorizer

Application
- **G -** Gas
- **L -** Liquid

Hazardous Approvals Selection:
- **D -** Div –Class I, Div 1. Grp C&D, Class 1, Zone 1. Grp C&D (UL/CSA), T4
- **Z -** Zone 1 - ex h, ia IIB (IECEx/ATEX), T4

Odorant Tank Selection
- **00 -** No selection
- **01 -** 20 gallon
- **02 -** 60 gallon
- **03 -** 120 gallon
- **04 -** 250 gallon
- **05 -** 500 gallon
- **06 -** 1000 gallon
- **07 -** 2000 gallon

Note: Larger, non-skid mounted tanks available

Relief Valve Package
- **N -** No selection (Relief required with tanks)
- **S -** Standard tank relief valve
- **F - Odorant tank relief valve fire sized rated**
  - 20 gallon
  - 60 gallon
  - 120 gallon
  - 250 gallon
  - 500 gallon
  - 1000 gallon
  - 2000 gallon

Containment Skid
- **N -** No Selection
- **R -** Rail Skid
- **C -** Secondary containment skid selection (110% of tank capacity)
  - 20 gallon
  - 60 gallon
  - 120 gallon
  - 250 gallon
  - 500 gallon
  - 1000 gallon
  - 2000 gallon

Spacer Size*
- **Q -** For quote preparation only
- **1 -** .1cc, 1.0cc
- **2 -** .02cc, .2cc, 2.0cc
- **3 -** .3cc, 3.0cc
- **4 -** .04cc, .4cc, 4.0cc
- **5 -** .5cc, 5.0cc
- **6 -** .06cc, .6cc, 6.0cc
- **7 -** .7cc
- **8 -** .8cc

Power Option
- **S -** SPS, solar power, std. (w/ heat REQUIRES add. 120 VAC Supply)
- **A -** EPO - 120/220VAC External Line Power Option, single unit
  EPO - 120/220VAC External Line Power Option, dual unit
- **R -** Customer supplied I.S. Power

Enclosure/ Heater Options
- **0 - Insulated Cabinet / no heater (Standard All Models)**
- **1 - Insulated Cabinet / 120 VAC Heater ****
- **2 - Insulated Cabinet / 220 VAC Heater****
- **3 - Stainless Steel/ No Heater ****
  Not available for dual units
- **4 - Stainless Steel / 120 VAC Heater ****
  Not available for dual units
- **5 - Stainless Steel / 220 VAC Heater ****
  Not available for dual units
- **P - Pole mount for enclosure option #3, #4, or #5**
  When not ordered with a skid mounted tank

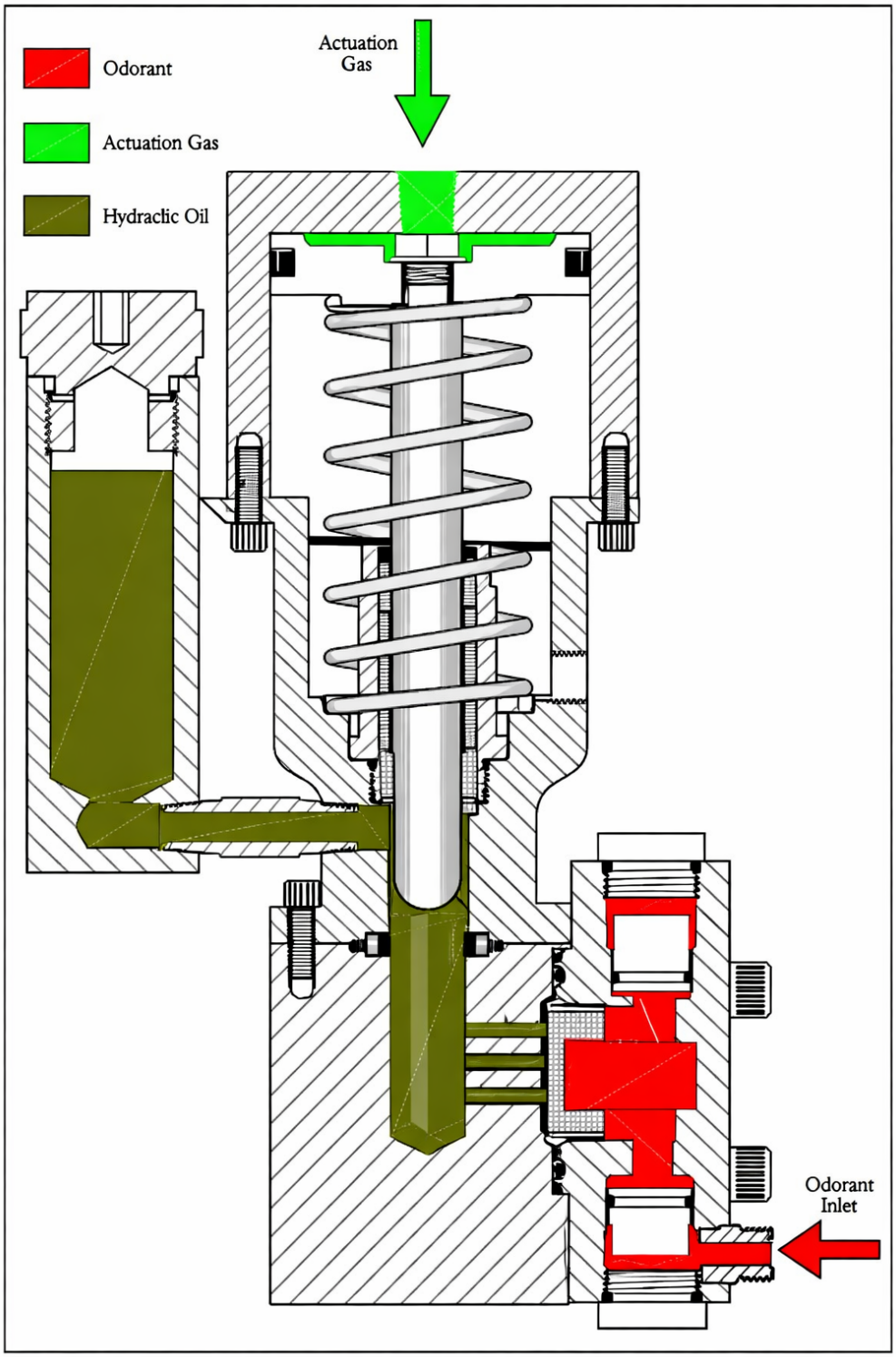
* Model 6400= 0.1 or .06 cc/injection
Model 7400= 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8 or 1.0 cc/injection
Model 8400= 2.0, 3.0, 4.0, 5.0, or 6.0 cc/injectiion

** Non-Heated Enclosures recommended for installation in environments where temperatures are maintained above freezing, and Heated Stainless Steel Enclosure conditions should not go below 20 F

Appendix I: Illustrations

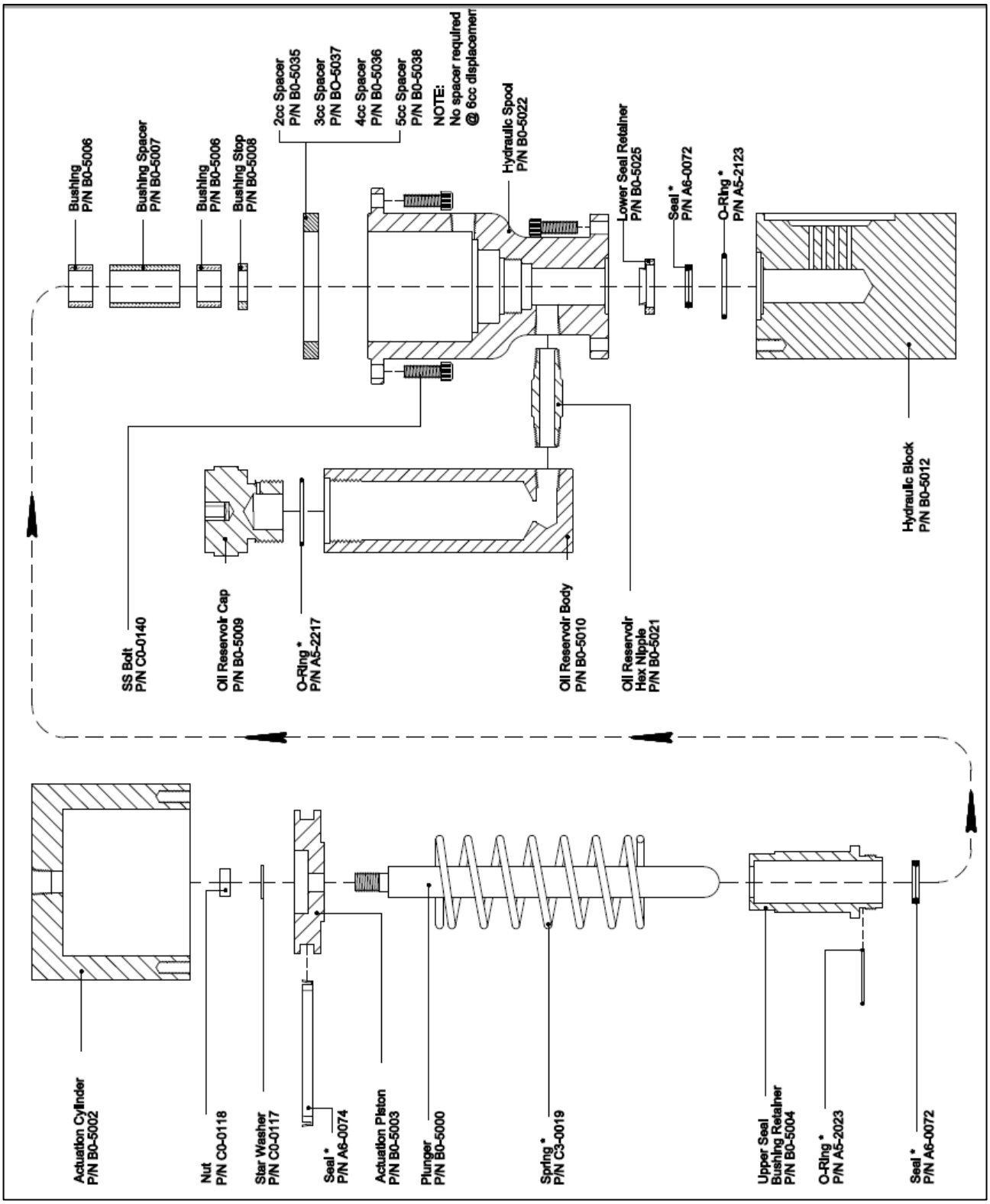
NJEX 8000 Pump

Figure 80



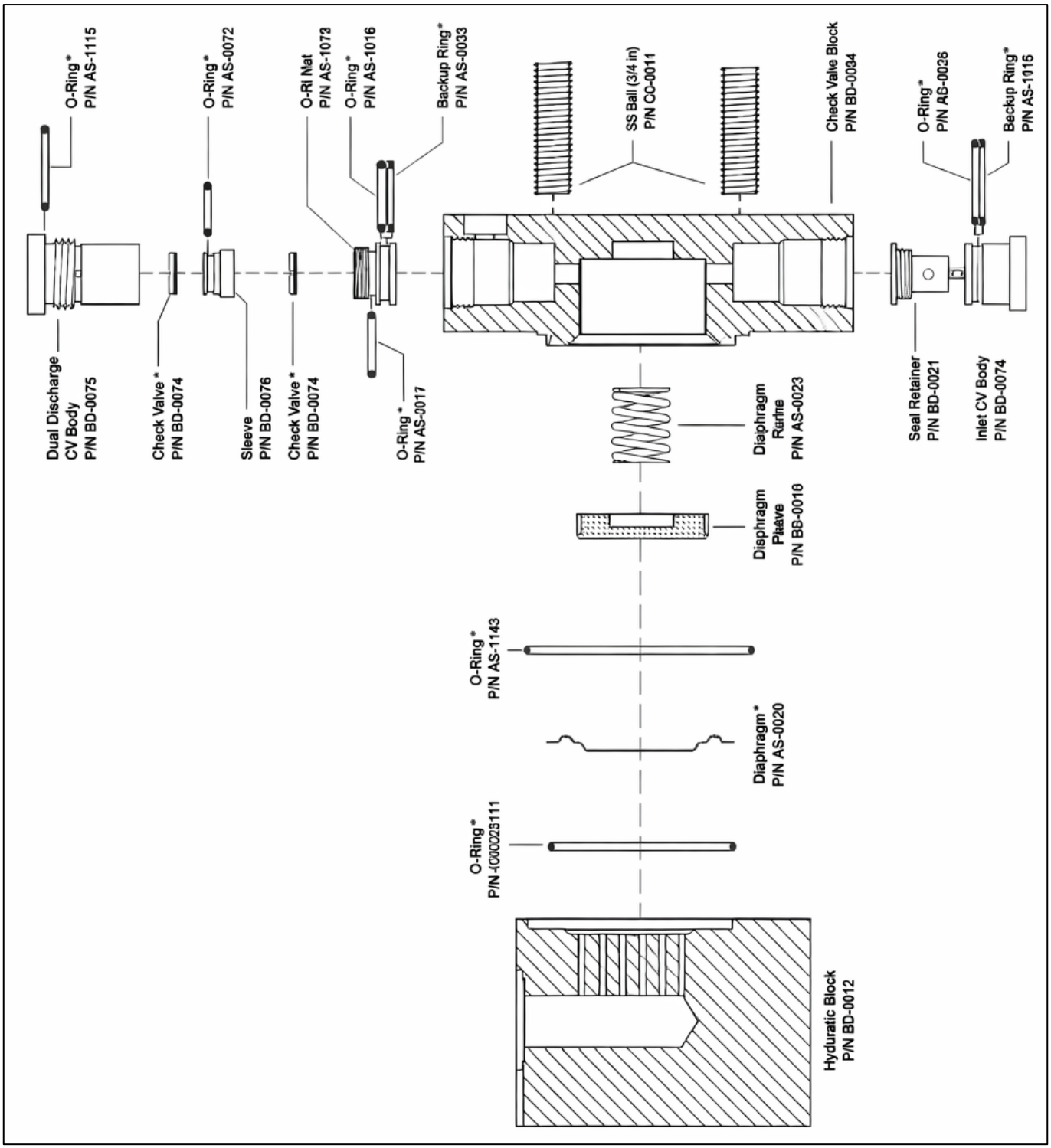
NJEX 8000 Pump Actuation Assembly

Figure 81



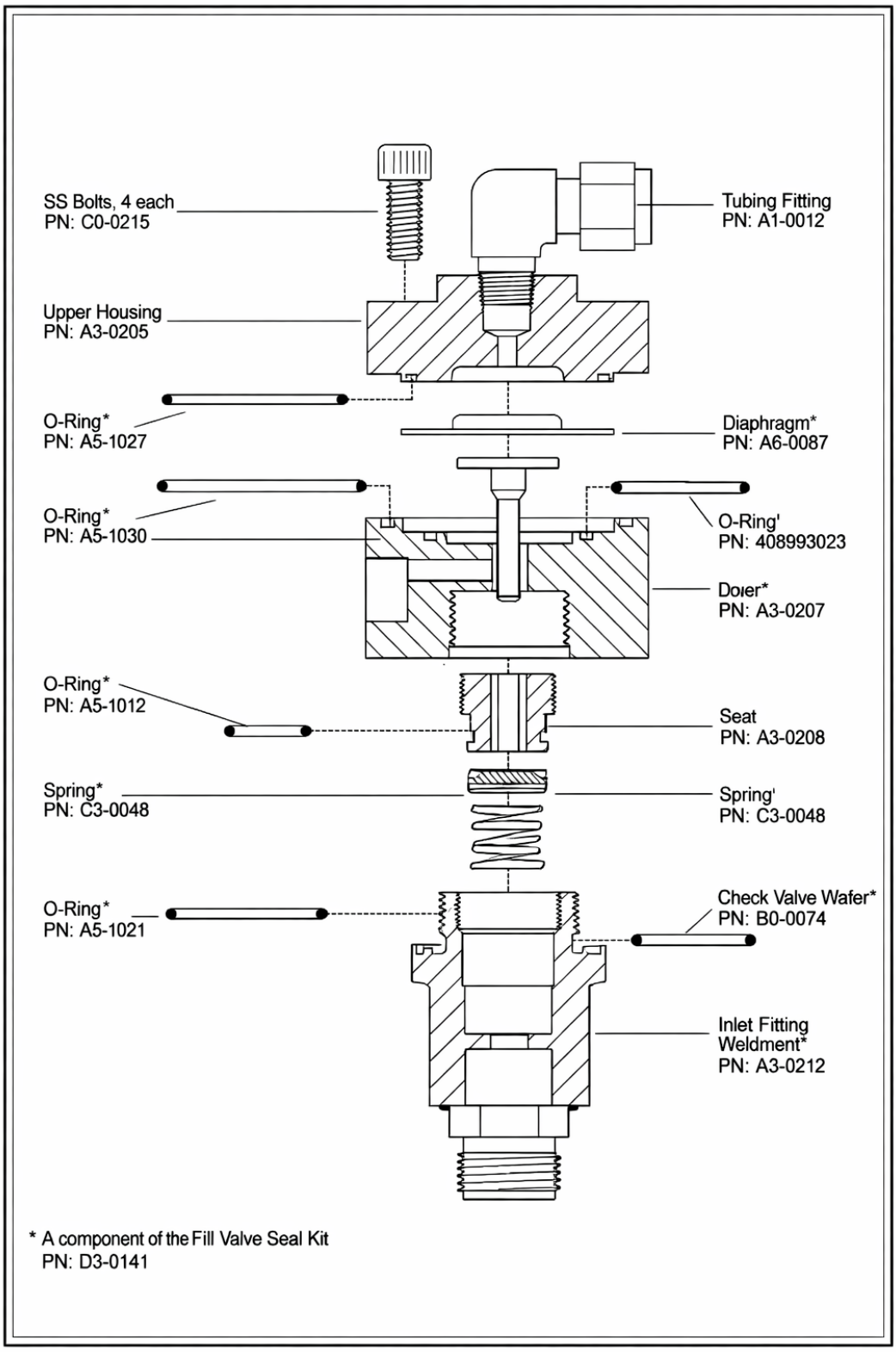
NJEX 8000 Diaphragm / Check Valve Assembly

Figure 82



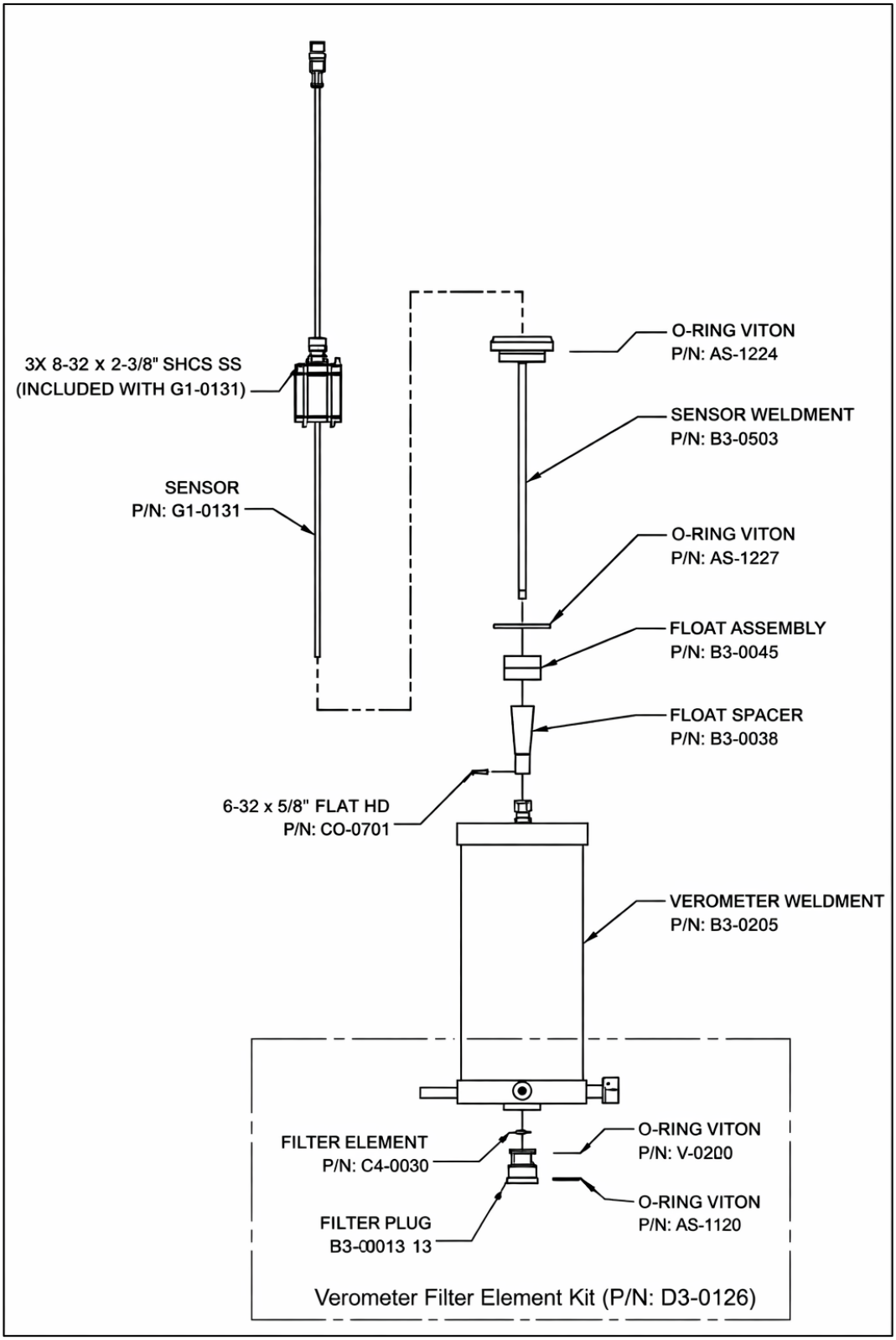
Fill Valve Assembly

Figure 83



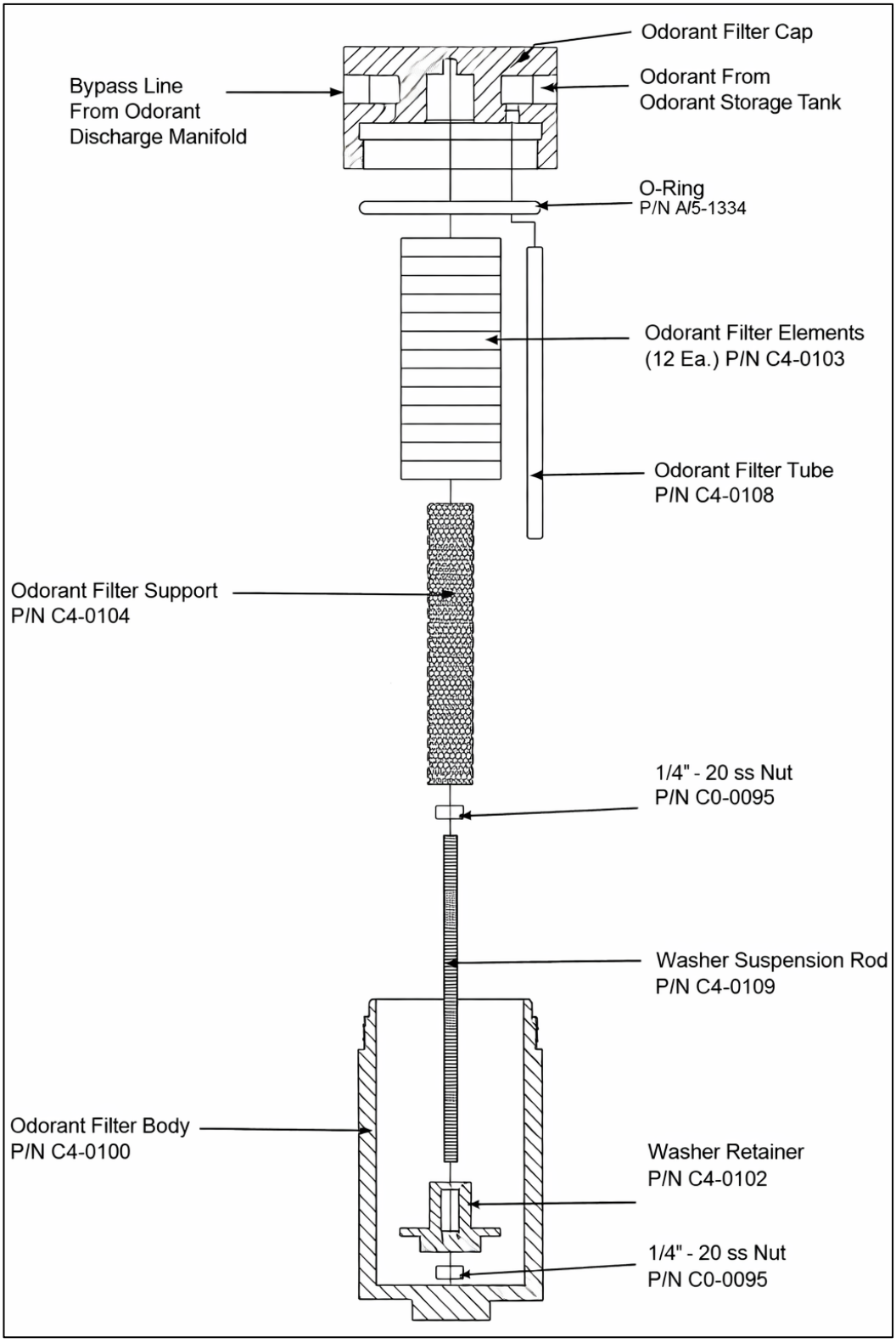
VM-1100 Verometer Assembly

Figure 84



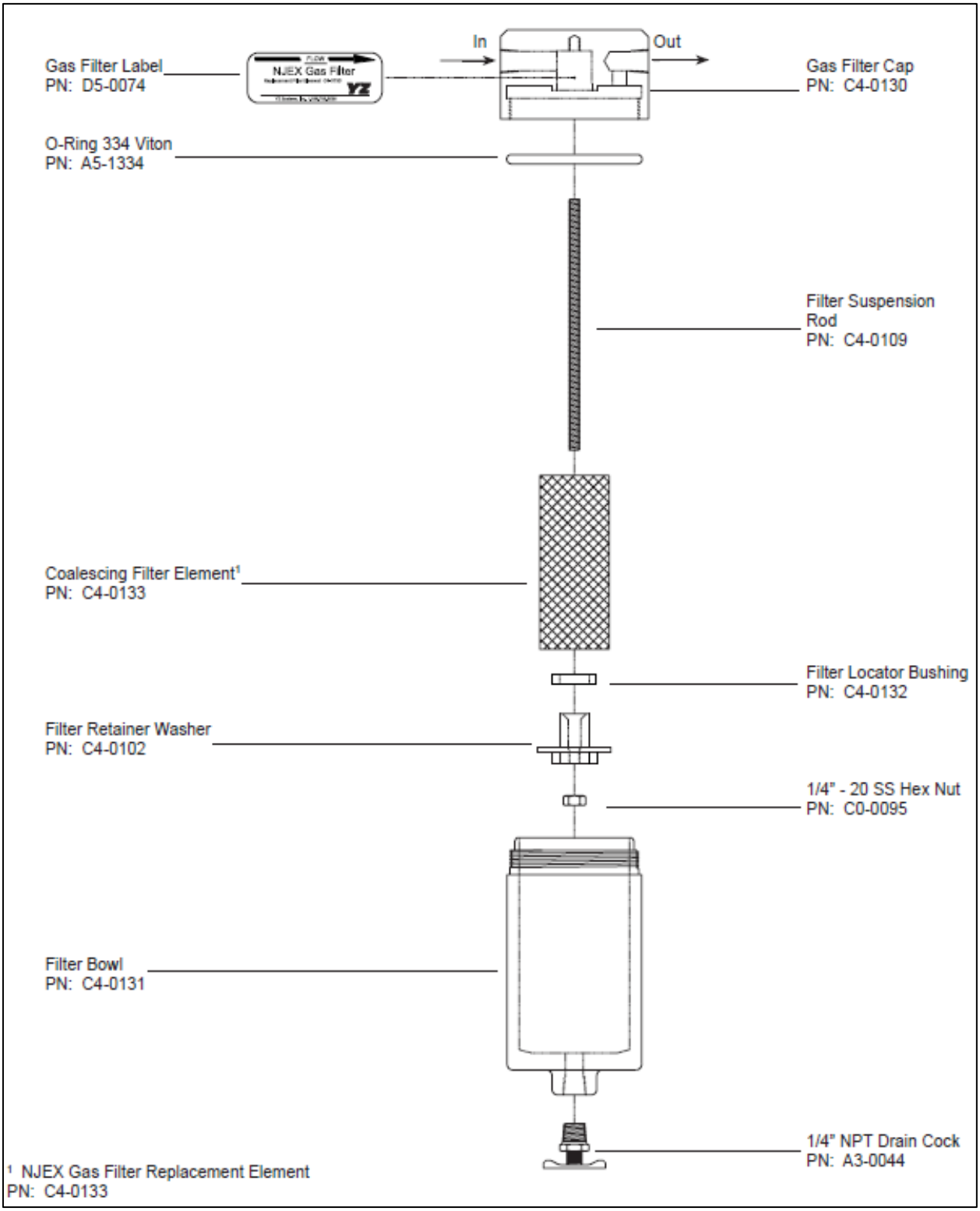
Bulk Odorant Filter Assembly

Figure 85



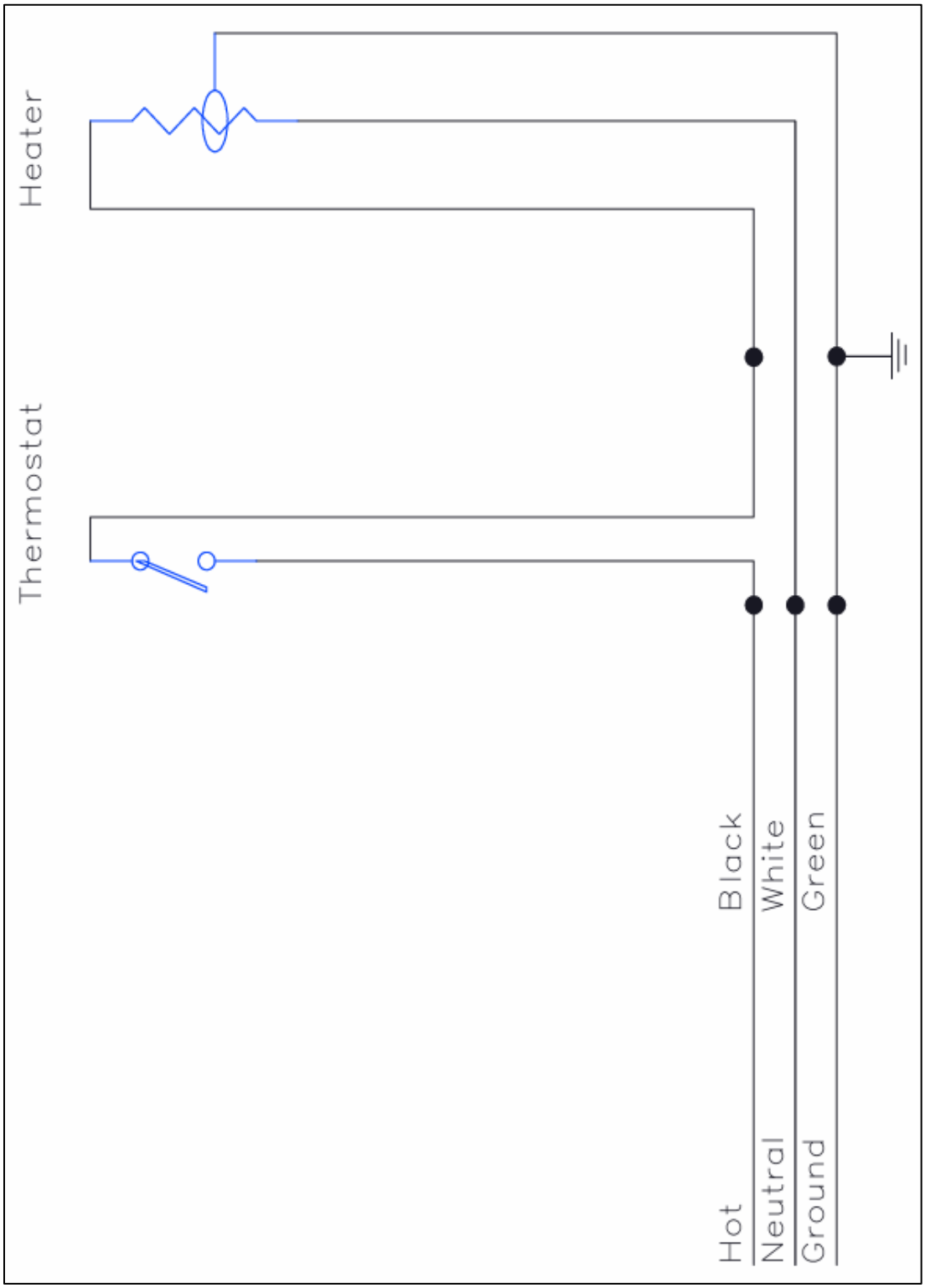
NJEX Gas Filter Assembly

Figure 86



Heating Wiring Diagram – Class & Div Rated Unit

Figure 87



Heating Wiring Diagram – IECEx & ATEX Units

Figure 88