

NJEX ZEO

6400

7400

8400

9400

Instruction & Operating Manual

ZERO EMISSIONS ODORIZATION SYSTEM



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Section 1: Things to Know – NJEX ZEO

How to Use this Manual

The NJEX ZEO Operations Manual is a step-by-step guide containing the procedures needed to work with the NJEX ZEO System.

The NJEX ZEO Series of odorizers implement the most advanced technology available in the industry. It is recommended that the technicians working with the NJEX ZEO 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 ZEO 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 ZEO 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 and IS Transition Board 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.

Operation and Power Specifications

Table 1: Operation Specifications

Operation Specification	Model			
	6400	7400	8400	9400
Maximum odorant output at 1800 PSI (124 Bar)				
MMCF/hr @ 0.5 lb/mmcf (m3/sec) @ 8 mg/m3	2.5 (14.8)	7.3 (59.3)	21.5 (121.5)	41.7 (231.5)
MMCF/hr @ 1.0 lb/mmcf (m3/sec) @ 16 mg/m3	1.25 (7.4)	3.7 (29.6)	10.7 (60.8)	20.8 (115.7)
MMCF/hr @ 1.5 lb/mmcf (m3/sec) @ 24 mg/m3	0.83 (4.9)	2.4 (19.8)	7.2 (40.5)	13.9 (77.2)
Maximum operating pressure – psig (Bar)	1800 (124)			
Operating Temp Range*	-20° to +50°C -4° to +122°F			
Flow Rate Input Signal	4-20 mA, 1-5VDC, Pulse (PPS, PPM)			

*The ambient temperature rating is 122°F (50°C). All components are rated to at least 140°F (60°C) to accommodate the natural temperature rise inside the cabinet due to the AC motors in normal operation. If the unit will be installed in direct sunlight close to the max ambient temperature, we advise installing a shade structure over the cabinets to protect them from direct sunlight to ensure the ambient temperature inside the cabinet does not exceed the limit.

Table 2: Power Requirements

Each system will require the four power connections outlined below:

Power Requirements – Class 1, Division 1	
Overall System	AC: 1 Ph. 115/230VAC, 15/8A, 60Hz
Injection Pump Power, C1D1	AC: 1 Ph. 115/230VAC, 6.6/3.3A, 60Hz
Transfer Pump Power, C1D1	AC: 1 Ph. 115/230VAC, 6.6/3.3A, 60Hz
ACC Power	AC: 85-260VAC, 1A Max, 50/60Hz
24V Power Supply	AC: 90-264VAC, 0.8/0.6A, 50/60 Hz
Power Requirements – Zone 1 ATEX and IECEx	
Overall System	AC: 1 Ph. 115/230VAC, 8.2/5.2A, 50/60Hz
Injection Pump Power, Zone 1	AC: 1 Ph. 115/230VAC, 2.9/1.5A, 50Hz 1 Ph. 115/230VAC, 3.2/1.7A, 60 Hz
Transfer Pump Power, Zone 1	AC: 1 Ph. 115/230VAC, 2.9/1.5A, 50Hz 1 Ph. 115/230VAC, 3.2/1.7A, 60 Hz
ACC Power	AC: 85-260VAC, 1A Max, 50/60Hz
24V Power Supply	AC: 90-264VAC, 0.8/0.6A, 50/60 Hz
<i>N-400 Controller Power Consumption</i>	<i>DC: 24VDC, 250mA, 6W Max</i> <i>AC: 90-250VAC RMS Max., 50/60Hz, <1A</i>

*N-400 Controller power is intrinsically safe and supplied internally from the explosion proof or flameproof enclosure.

System Certifications

The NJEX ZEO 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-0378* must be followed for any connections to the N-400 controller. See the system level Wiring Control Documents *1E-0384* or *1E-0385* for requirements for connecting incoming power per the hazardous location listing.

North America, Class and Division Hazardous Location*

Class 1, Division 1, Groups C and D

Class 1, Zone 1, Group IIB

T3C

Type 3R

***WARNING: To comply with the North American hazardous location requirements and to reduce the risk of ignition of hazardous atmospheres, conduit runs must have a sealing fitting (not provided) connected within 18 inches of the enclosure.**

ATEX, IECEx Zone Hazardous Location

IECEx ETL 20.0051X

Ex db ia [ia IIC Ga] IIB T4 Gb

ITS21UKEX0038X



ITS-I21ATEX29212X

II 2 G Ex db ia [ia IIC Ga] IIB T4 Gb



-20°C ≤ Ta ≤ + 50°C

IP43

Specific Conditions of Use

1. External non-metallic materials represent a potential electrostatic charging hazard. See the safety notes in this manual for details.
2. The flameproof joints are not intended to be repaired in the Actuator Capacity Control (ACC). For repair of flameproof joints, see the manufacturer for more information.
3. To guarantee the tensile strength of the screws of the flameproof junction box present in the Actuator Capacity Control (ACC) and flameproof enclosure, the supplied screws have a tensile strength of equal to or greater than 700 N/mm². Fasteners are factory supplied.
4. The property class of the special fasteners used in the Elnor Motors (Transfer Pump and Injection Pump Motors) must be at least: Hexagon cap screws [4.6], Hexagon nut [5] (if used), Socket Cap Screws [8.8]. Fasteners are factory supplied.

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 local electrical codes for which it is located.
- All mechanical and electrical work on NJEX ZEO 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 ZEO 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 ZEO system before performing any troubleshooting or repair to electrical components.

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

Theory of Operation

The NJEX ZEO brings a change to how we odorize gas. With the legacy NJEX systems, gas is odorized by running a pneumatically driven pump at a varying stroke rate with a fixed pump displacement. The NJEX ZEO odorizes gas by running an electrically driven pump at a constant stroke rate and varying the pump displacement. The advantage of the ZEO system is you are always odorizing with each stroke (at least 24 times per minute) and only the amount changes to maintain the injection rate.

Operation of the NJEX ZEO centers around four primary components: the transfer pump, verometer, injection pump with actuator, and the N-400 controller.

During normal operation, the injection pump injects odorant into the system at a rate determined by the N-400 controller. The injection pump runs at a fixed stroke rate and the amount of odorant injected is controlled by the actuator (ACC) which adjusts diaphragm displacement by controlling the amount of hydraulic fluid pushed against the diaphragm.

The verometer serves as a temperature compensated meter, which verifies the amount of odorant injected by the injection 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 0%, the N-400 controller prompts the transfer pump to fill the verometer. Once the verometer is filled, the N-400 controller stops the transfer pump.

The N-400 controller allows the ZEO system to operate in either a proportional-to-time or a proportional-to-flow mode. In the proportional-to-time mode of operation, the user inputs the target lb/hr or kg/hr rate. The ACC adjusts the injection pump capacity to maintain this target.

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 maintain the injection rate setpoint per the measured flow signal. These operator input values include the odorant injection rate (lb/MMCF or mg/m³) 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, and if programmed, the controller automatically defaults back to a pre-selected percentage of the flow input.

If system redundancy is required, the NJEX ZEO system has two main options for the backup system, NBS Output (Default) or Redundancy.

For NBS Output (NJEX Backup System), the NBS output terminal can be connected to another YZ system such as the N-300 Controller in a pneumatic NJEX unit or the Z-65 Controller in an LVO unit. In the instance of power loss, injection pump diaphragm failure, pump capacity alarm, or intrinsically safe (IS) transition board signal loss, the unit will be put into standby mode and will signal the backup system to run.

For Redundancy, dual ZEO systems can be configured as Primary or Secondary on the N-400 controller and wired together to send a signal in the occurrence of a failure. The primary cabinet will inject odorant and in the case of power loss, a low injection rate alarm, pump capacity alarm, pump failure, or (IS) transition board cable signal loss, the backup system will be started. During normal operation, the backup system will be held in Standby mode. If the backup system also

fails due to one of the above alarms, both the primary and backup units will run until the systems are stopped and serviced.

During operation, the N-400 controller will record the injection rate and log this data and any active alarms to the MM-400 Memory Module. The MM-400 Memory Module can be removed from the N-400 controller so the data can be retrieved using YZ System's Sentry Utility Software for future reference.

CAUTION: Excessive tubing lengths should be avoided. Installation of the NJEX ZEO 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 50 feet (15 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.

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".
- **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 A3-0024).
- **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 ZEO 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.

[illegible]

Section 2: System Installation

NJEX ZEO systems can be installed outdoors or indoors. The ambient temperature year-round must be within the system limits of 122°F (50°C). 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 is recommended. NJEX ZEO 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 ZEO include the following:

1. **System Enclosure upper cabinet.** The System Enclosure houses the mROY injection pump with ACC, the verometer integrated with the bulk odorant filter and suction and discharge manifold, and the N-400 intrinsically safe system controller. The upper cabinet has an integrated solar shield to reduce internal temperatures in the cabinet from solar exposure.
2. **System Enclosure lower cabinet.** The System Enclosure lower cabinet houses the magnetic drive transfer pump and Explosion Proof Enclosure.
3. **N-400 Intrinsically Safe Controller.** Intrinsically safe system controller.
4. **Explosion Proof or Flameproof Electrical Housing.** Houses the intrinsically safe transition board, bridging the non-intrinsically safe and intrinsically safe electrical connections. Customer supplied AC power routes through the explosion proof box.
5. **mROY injection pump with ACC.** The injection pump is housed in the System Enclosure upper cabinet. The injection pump stroke rate will vary for each system size. The injection pump runs at a fixed stroke rate and the amount of odorant injected is controlled by the actuator which adjusts stroke length of the diaphragm by controlling the amount of hydraulic fluid pushed against the diaphragm.
6. **Verometer assembly.** The verometer assembly verifies the volume of odorant injected while compensating for odorant temperature. The verometer, bulk odorant filter, and odorant manifold are integrated into a single assembly.

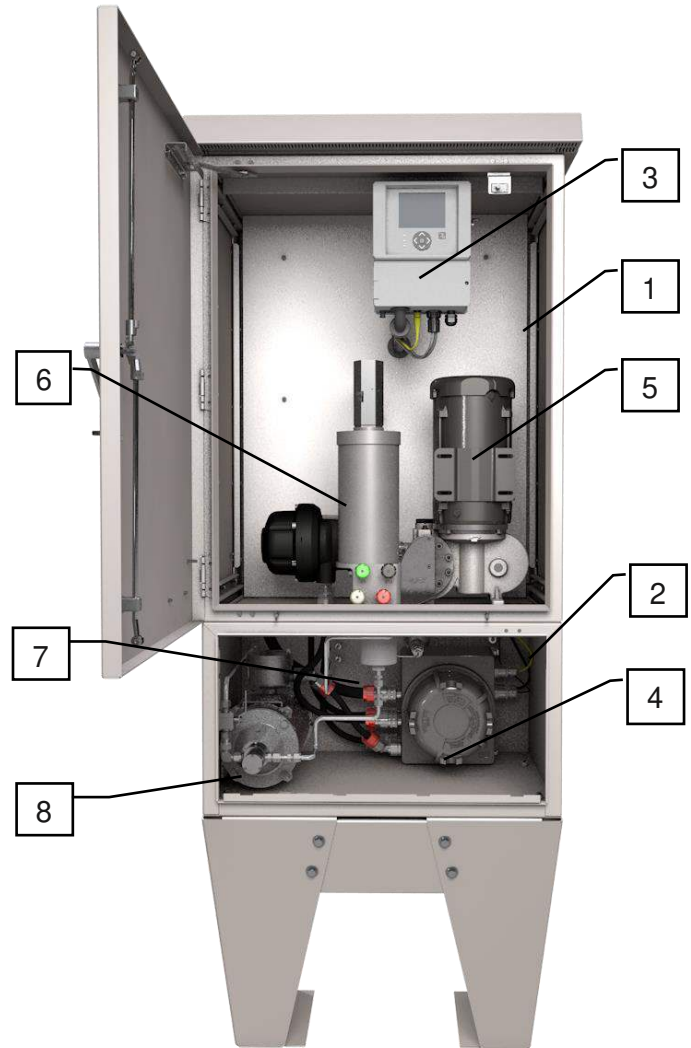
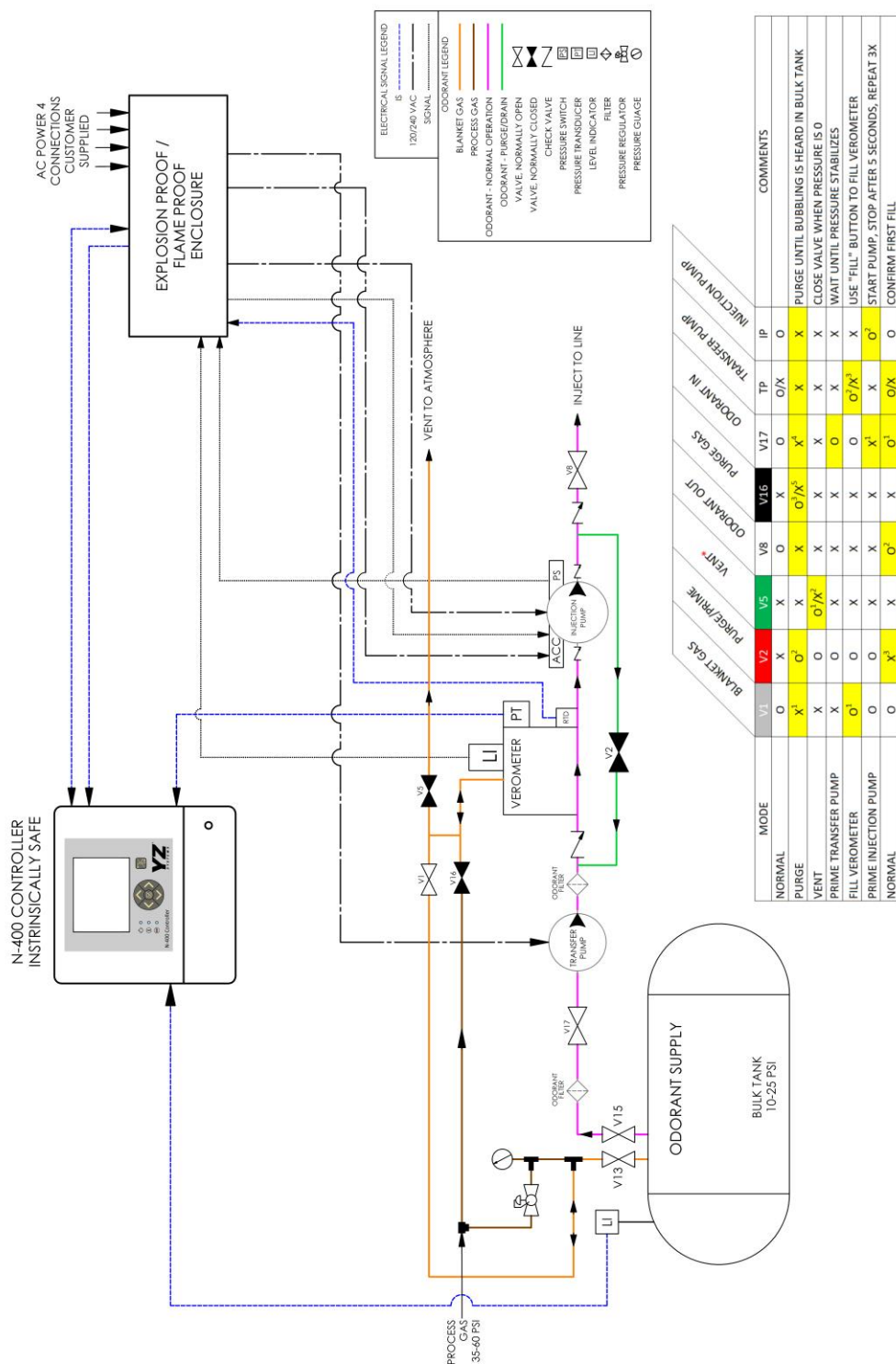


Figure 1 NJEX ZEO Cabinet subsystems, open doors

SECTION 2: SYSTEM INSTALLATION

7. **Bulk Odorant Filter.** Provides primary odorant filtration between the storage tank and the NJEX ZEO system. The Bulk Odorant Filter is integrated into the verometer assembly in the System Enclosure and is field replaceable.
8. **Transfer Pump Assembly.** Transfers odorant from bulk odorant tank through the bulk odorant filter and into the verometer.

System Flow Schematic



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Milton Roy Industrial Co. Ltd. | 201 Ivyland Rd. Ivyland, PA 18974 | (800) NJEX-HELP or (281) 362-6500 | www.yzsystems.com

IR Ingersoll Rand

Standard System Lifting and Mounting

The cabinets are provided with three 1.25" (31.8mm) lifting eyes. The cabinet should be lifted from these lifting eyes with a suitable device. The lifting eyes can be removed after the system is installed if so desired.

WARNING: While lifting, all personnel should stand clear of the cabinet. Keep all hands, fingers, etc. free from under the cabinet while setting down. Lifting must be performed with an adequate lifting system.

Bolt down the system enclosure to a concrete slab using the four mounting slots (5/8") provided in the bottom of each leg of the enclosure. Recommended bolt or stud size for mounting the enclosure is 1/2". See Figure 3 for mounting dimensions. Cabinets will be supplied with either tapered or straight legs depending on the application. Please see the model code of the NJEX ZEO system to determine which leg type your system has. If you have additional questions, contact your local YZ Systems sales representative.

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

WARNING: If the cabinets are installed within a skid system, do not lift the assembled skids by the cabinet lifting eyes. The cabinet lifting eyes are sized to lift the cabinet and its contents only.

SECTION 2: SYSTEM INSTALLATION

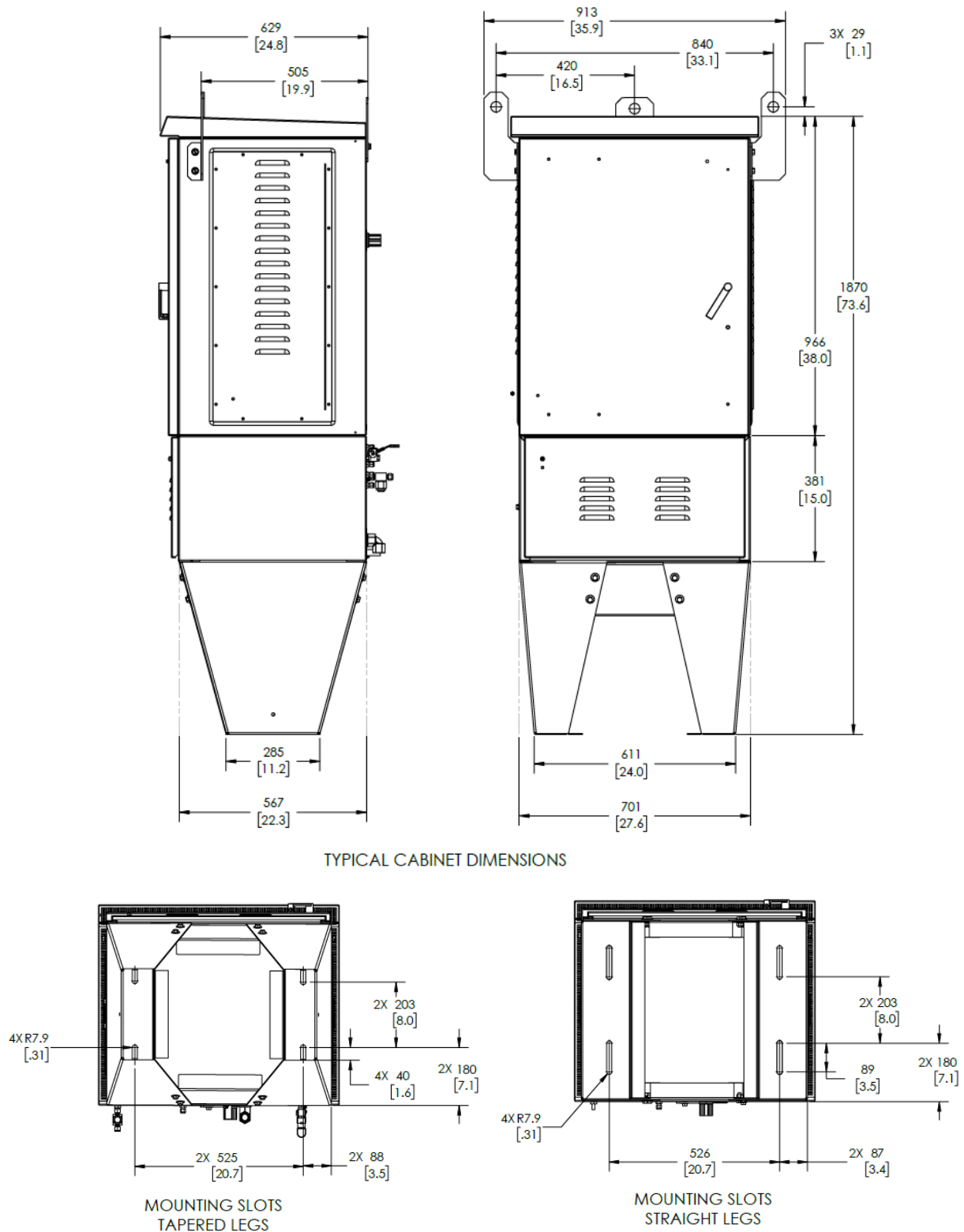


Figure 2 NJEX ZEO Cabinet Footprint – Dimensions mm[in]. Dotted lines in cabinet front and side view represent straight leg width and depth. Reference the ZEO Model Code to determine if your cabinet has straight or tapered legs.

Standard System Connections

Required field connections to place the NJEX ZEO system into operation are as follows:

1. AC Power Connections - There are two possible AC power connections configurations depending on the cabinet installation location.
 - a For cabinets in North America with a Class 1, Division 1 hazardous location certification, there are four AC power connections that share a common ground that route through the explosion proof box located in the lower cabinet of the system enclosure for a total of nine wires. A $\frac{3}{4}$ " conduit fitting is provided at the back of the cabinet for connection.
 - b For cabinets outside of North America with a Zone 1 hazardous location certification, there is a 12 conductor 14AWG power cable that is supplied through a grommet and out the back of the cabinet. There are four pairs with individual grounds that are connected in the flameproof enclosure located in the lower cabinet of the system enclosure.
2. See *Power Requirements in Section 1* for the required specifications on the incoming power connections. The incoming power connections shall be terminated in a junction box (not provided) in accordance with local codes and regulations for the area in which the system is installed.

IMPORTANT: Suitably rated overcurrent protection must be applied to the AC wiring for both the Injection Pump motor and Transfer Pump motor in accordance with local codes and regulations.

3. 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 *Wiring Control Document in Appendix B* and the Wiring Diagram reference label located inside the N-400 Controller Door or below in Figure 4.
4. 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 *Wiring Control Document in Appendix B* and the Wiring Diagram reference label located inside the N-400 Controller Door or below in Figure 4.
5. If used, connect the optional Remote Inhibit Input signal to the termination block (TB2) located in the N-400 Controller. Refer to the *Wiring Control Document in Appendix B* and the Wiring Diagram reference label located inside the N-400 Controller Door or below in Figure 4.

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 7 below for wiring for redundancy.

6. If used, connect the RS-485 communication wiring as required to the termination block (TB16) located in the N-400 Controller. Refer to the *Wiring Control Document in Appendix B* and the Wiring Diagram reference label located inside the N-400 Controller Door or below in Figure 4.

SECTION 2: SYSTEM INSTALLATION

7. If applicable, to wire 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 *Wiring Control Document in Appendix B*, the Wiring Diagram reference label located inside the N-400 Controller Door or below in Figure 4, and the Redundancy Wiring Diagram in Figure 5 if needed.
 - a On both the primary and backup system, remove the shunt across jumper JP11 and replace the shunt covering pins 2 and 3. For standard remote inhibit operation without a backup system, JP11 should be shunted as supplied from the factory across pins 1 and 2.

Note: To make the connection for redundancy wiring, it is recommended to install a conduit tee to the flexible conduit fitting located on the back of each cabinet. This allows for the wiring to be run between each unit and still permit for signal wires to run from the cabinets as needed.

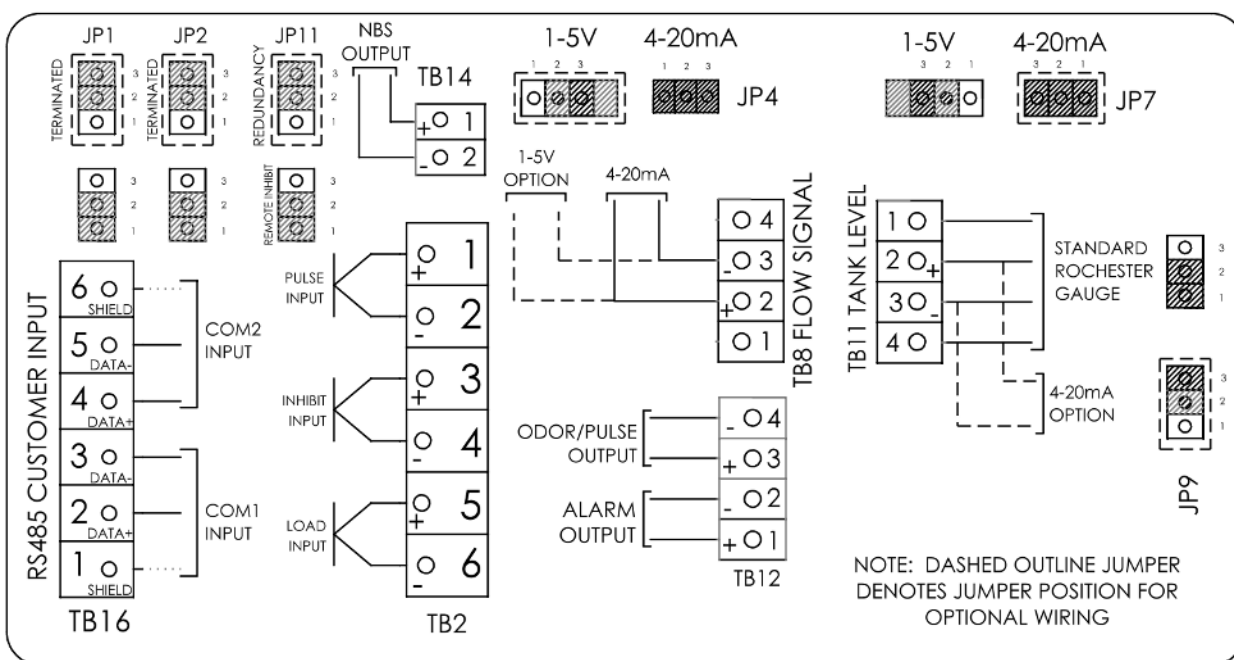


Figure 3 N-400 Controller Wiring Diagram Label

SECTION 2: SYSTEM INSTALLATION

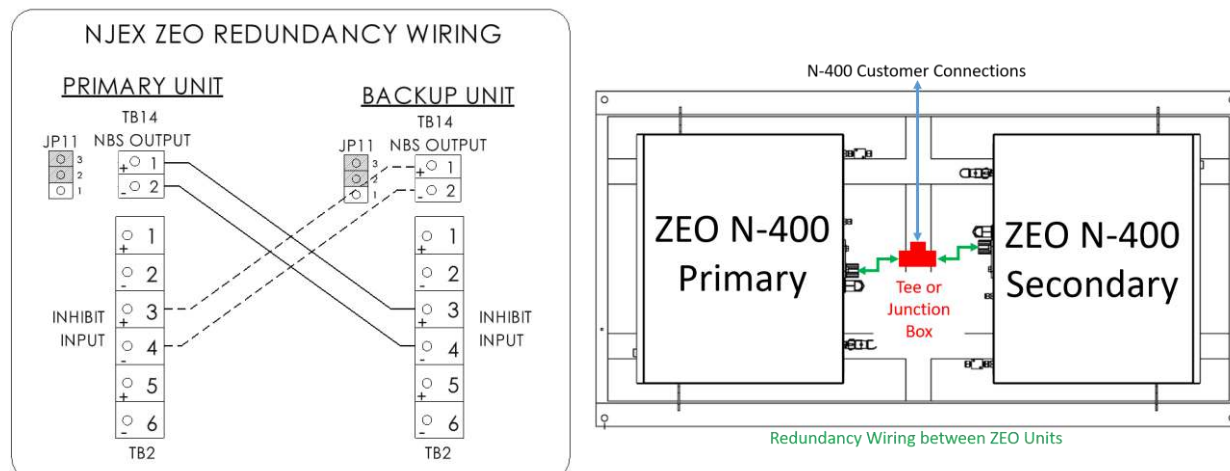


Figure 4 Redundancy Wiring Diagram

CAUTION: Excessive tubing lengths should be avoided. Installation of the NJEX ZEO 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 50 feet (15 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 cannot be used as the supply gas source for NJEX ZEO installations.

8. Connect the odorant supply source to the odorant inlet bulkhead with the recommended 3/8" stainless steel tubing (Figure 6 & 8). The 3/8" inlet tubing size is standard across all NJEX ZEO models. A tank isolation valve (V15) should be incorporated between the storage tank and this connection.
9. Connect the process gas source using 1/4" stainless steel tubing regulated to 35-60 psi (2.4-4.1 Bar) supplied by the NJEX ZEO system owner, with a dielectric union, to the labeled bulkhead on the back of the system enclosure. The 1/4" process gas tubing size is standard across all NJEX ZEO models.
10. Connect the blanket gas line, regulated to 10-25 psi (0.7-1.7 Bar) using 1/4" stainless steel tubing with a dielectric union at the fitting located at the odorant supply tank that leads to the labeled bulkhead on the back of the system enclosure. The 1/4" blanket gas tubing size is standard across all NJEX ZEO models.
11. Connect the discharge tubing bulkhead using 1/4" stainless steel tubing to the pipeline connection using a dielectric union and check valve. The 1/4" odorant discharge tubing size is standard across all NJEX ZEO models.

SECTION 2: SYSTEM INSTALLATION

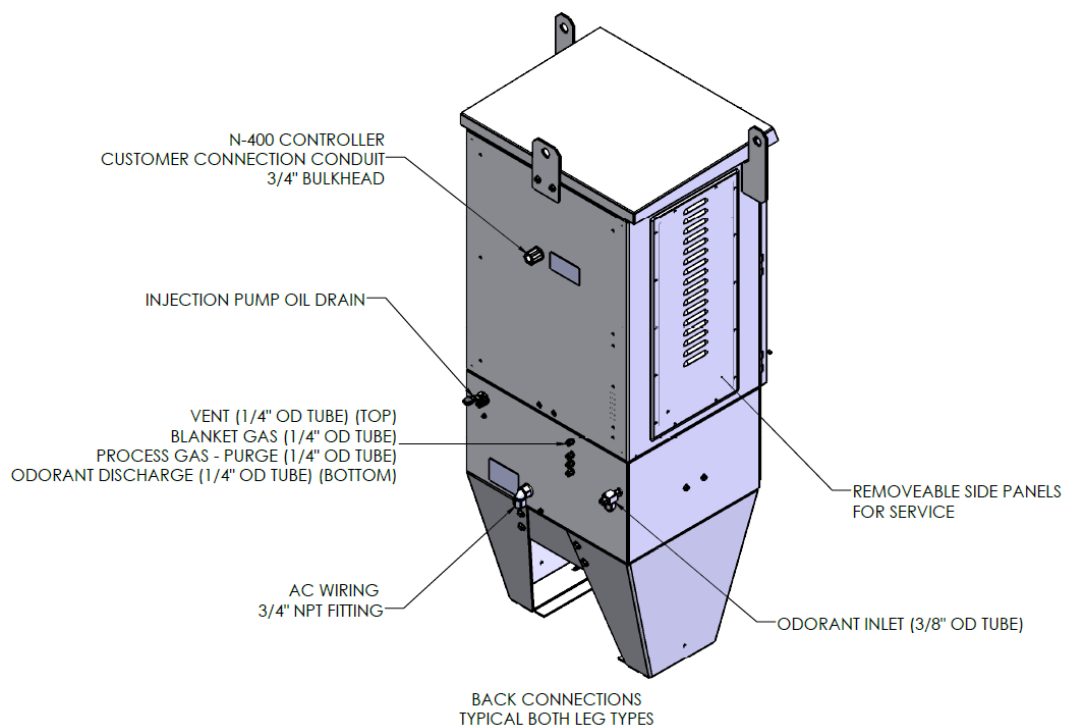


Figure 5 Class 1, Division 1 North American Cabinet Connections

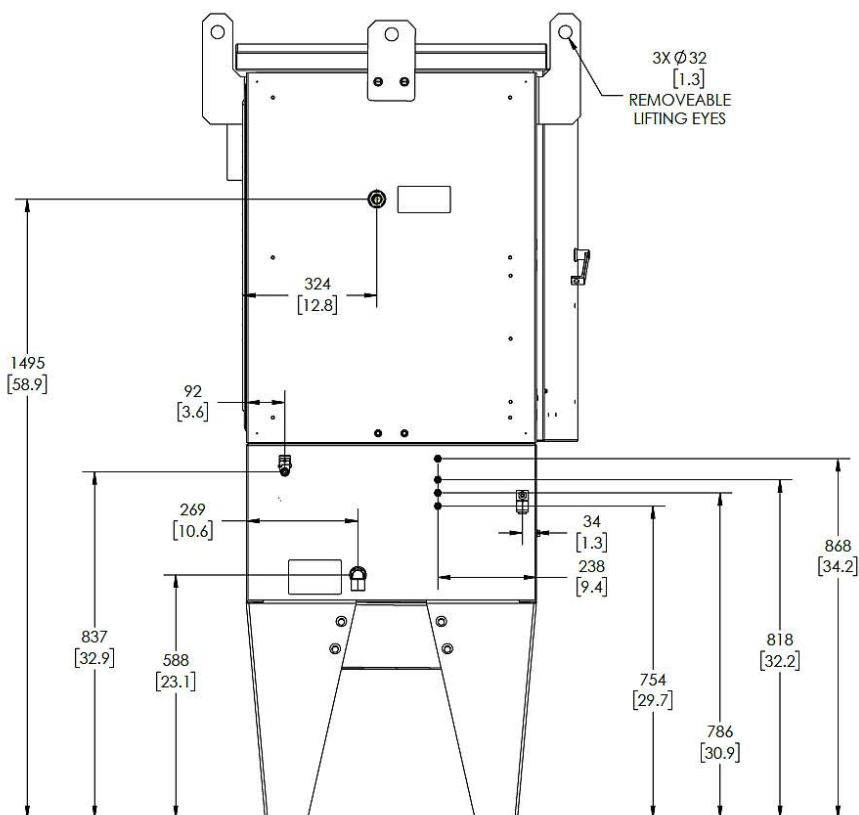


Figure 6 Class 1, Division 1 North American Cabinet Connection Dimensions mm[in]

SECTION 2: SYSTEM INSTALLATION

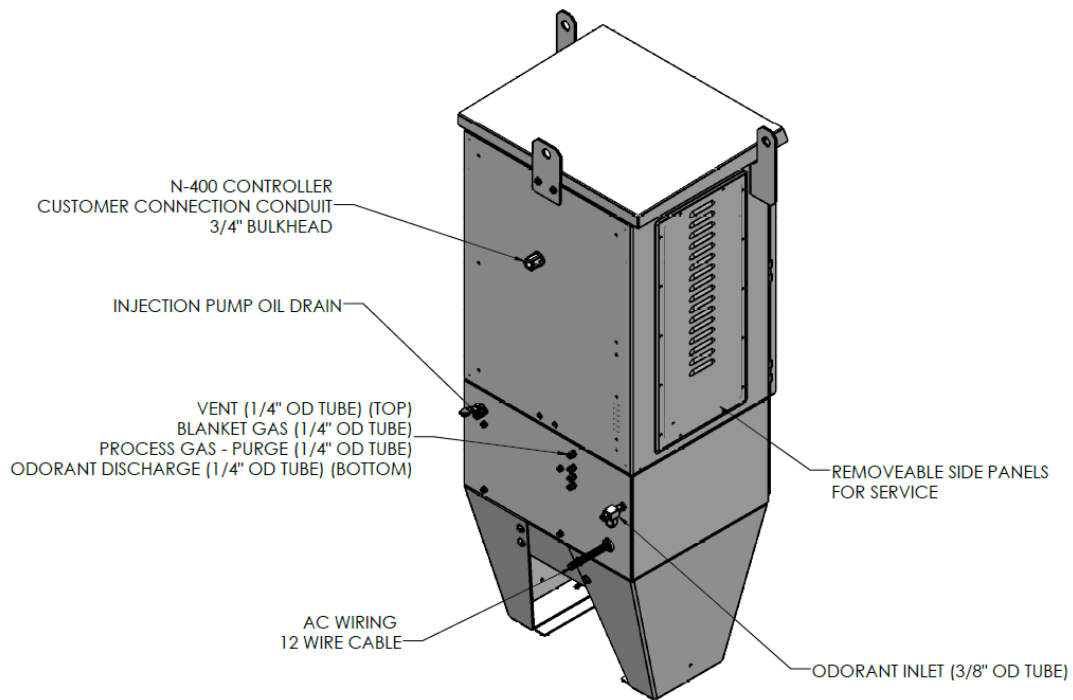


Figure 7 Zone 1 Cabinet Connections

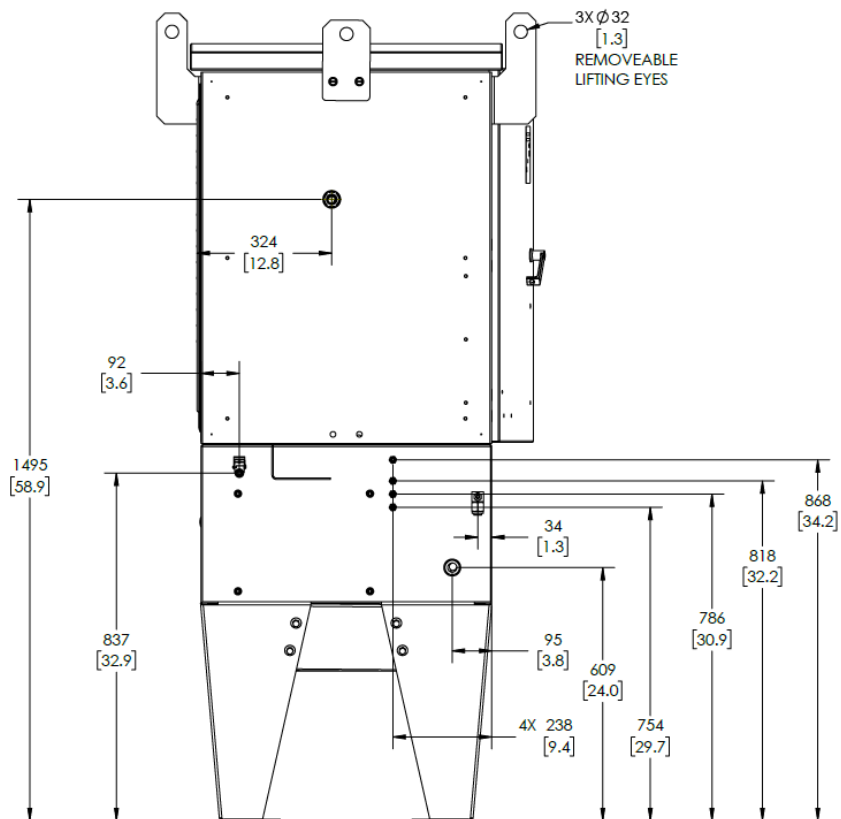


Figure 8 Zone 1 Cabinet Connections Dimensions mm[in]

Standard Skid Connections

The NJEX ZEO 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 ZEO Skid Mount Systems offer all the advantages of our standard NJEX ZEO Systems plus the added benefit of an onboard odorant storage tank. The configuration allows for a total systems approach to odorization.

An NJEX ZEO Skid Mount system is available in a rail skid version or a containment skid version that would contain 110% of the odorant tank volume. The skids are available in a single cabinet or dual cabinet option if system redundancy is required.

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).

1. Skid and Skid Mounted Tank. Preassembled and tested structural steel skid with odorant tank, valve package, skid piping, and complete system enclosure(s).
2. NJEX ZEO System. See the section **System Installation - Standard System Components** for details on the system components.

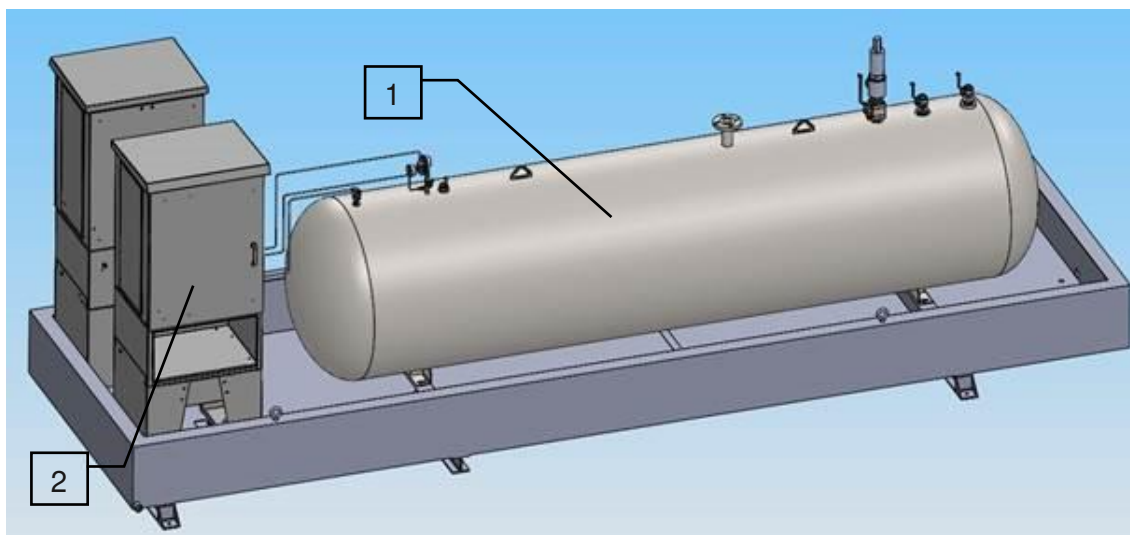


Figure 9 NJEX ZEO Dual Cabinet Containment Skid with Bulk Odorant Tank

SECTION 2: SYSTEM INSTALLATION

TABLE 3: RAIL SKID SYSTEMS						
TANK <i>gallons (liters)</i>	CABINET	BL <i>inches (mm)</i>	BW <i>inches (mm)</i>	L <i>inches (mm)</i>	W <i>inches (mm)</i>	WEIGHT <i>Pounds (kg)</i>
20 (76)	Single	47 (1194)	47 (1194)	49 (1245)	49 (1245)	700 (317)
	Double	TBD	TBD	TBD	TBD	TBD
60 (227)	Single	52 (1321)	52 (1321)	54 (1372)	54 (1372)	800 (363)
	Double	TBD	TBD	TBD	TBD	TBD
120 (454)	Single	96 (2438)	47 (1194)	98 (2489)	49 (1245)	1000 (454)
	Double	TBD	TBD	TBD	TBD	TBD
250 (946)	Single	122 (3099)	47 (1194)	124 (3150)	49 (1245)	1400 (635)
	Double	TBD	TBD	TBD	TBD	TBD
500 (1893)	Single	154 (3912)	47 (1194)	156 (3962)	49 (1245)	2000 (907)
	Double	TBD	TBD	TBD	TBD	TBD
1000 (3785)	Single	220 (5588)	47 (1194)	222 (5639)	49 (1245)	3000 (1361)
	Double	TBD	TBD	TBD	TBD	TBD
2000 (7570)	Single	318 (8077)	48 ½ (1232)	322 (8179)	52 ½ (1334)	6900 (3130)
	Double	TBD	TBD	TBD	TBD	TBD

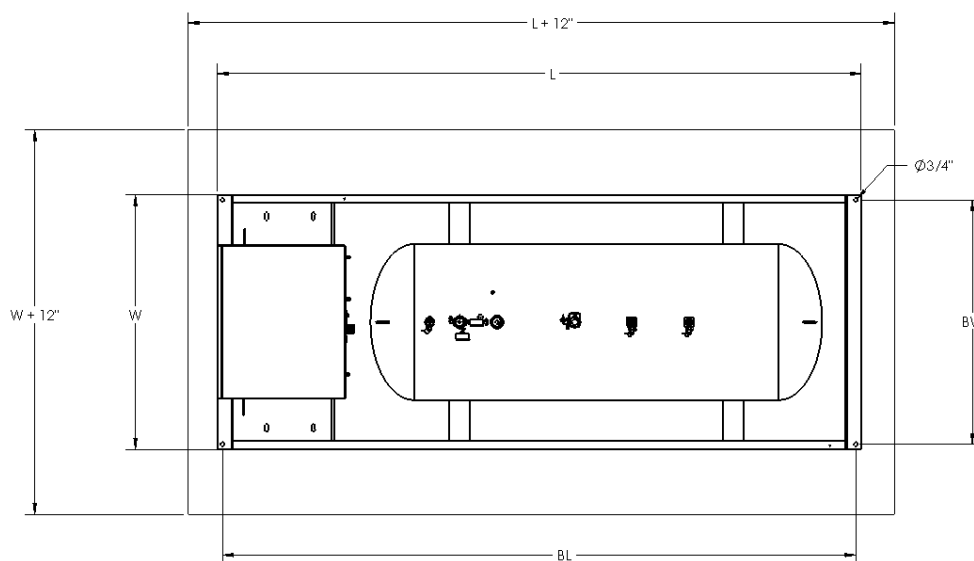


Figure 10 Overall Rail Skid Dimensions

SECTION 2: SYSTEM INSTALLATION

TABLE 4: CONTAINMENT SKID SYSTEMS							
TANK <i>gallons (liters)</i>	CABINET	BL <i>inches (mm)</i>	BW <i>inches (mm)</i>	O <i>inches (mm)</i>	L <i>inches (mm)</i>	W <i>inches (mm)</i>	WEIGHT <i>Pounds (kg)</i>
20 (76)	Single	31 (787)	58 (1473)	7 (178)	45 (1143)	62 (1575)	1100 (500)
	Double	TBD	TBD	TBD	TBD	TBD	TBD
60 (227)	Single	36 (914)	58 (1473)	7 (178)	50 (1270)	62 (1575)	1250 (570)
	Double	TBD	TBD	TBD	TBD	TBD	TBD
120 (454)	Single	82 (2083)	54 (1372)	8 (203)	98 (2489)	58 (1473)	1600 (725)
	Double	94 (2388)	80 (2032)	8 (203)	110 (2794)	85 (2159)	1810 (825)
250 (946)	Single	108 (2743)	58 (1473)	8 (203)	124 (3150)	62 (1575)	2100 (953)
	Double	108 (457)	80 (2032)	20 (508)	136 (3454)	85 (2159)	2850 (1293)
500 (1893)	Single	116 (2946)	58 (1473)	8 (203)	154 (3912)	62 (1575)	2850 (1293)
	Double	116 (2946)	80 (2032)	21 (533)	167 (4241)	85 (2159)	3600 (1633)
1000 (3785)	Single	192 (4877)	64 (1626)	8 (203)	240 (6096)	68 (1727)	4500 (2041)
	Double	TBD	TBD	TBD	TBD	TBD	TBD
2000 (7570)	Single	252 (6401)	69 (1753)	14 (356)	318 (8077)	73 (1854)	8100 (3674)
	Double	252 (6401)	80 (2032)	18 (457)	320 (8128)	85 (2159)	8650 (3925)

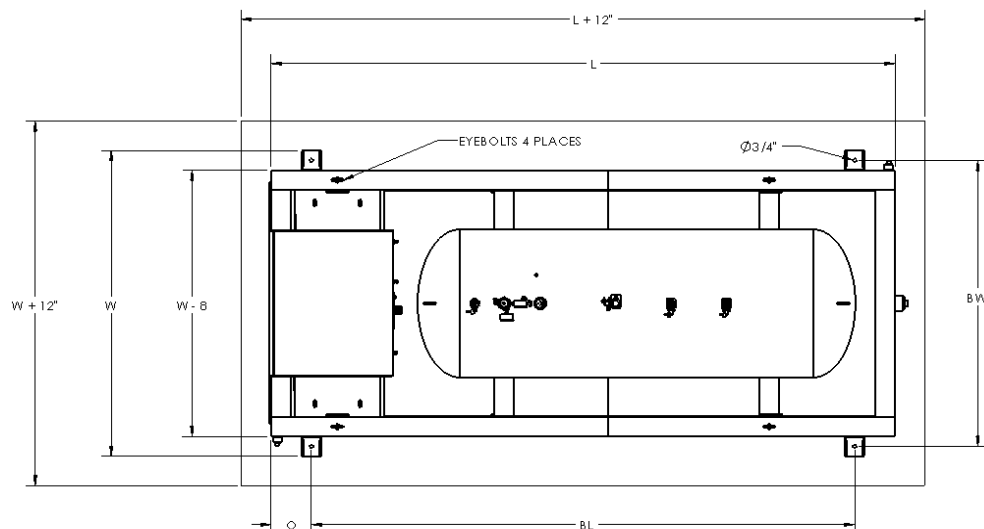


Figure 11 Overall Containment Skid Dimensions

Skid System Mounting

1. Prepare a concrete slab that exceeds the NJEX ZEO 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 skid. Ensure lifting straps will not interfere with any valves installed on tank or any system tubing before lifting. Adjust four-point lift if necessary.
 - b. Lift rail skid systems from the bottom of the skid by forklift or another device.
 - c. Do not lift a system by the tank lugs, these lugs are designed only for the weight of the empty tank.
 - d. Do not move a system with liquid in the odorant tank.

WARNING: While lifting, all personnel should stand clear of the skid assembly. Keep all hands, fingers, etc. free from under the cabinet while setting down. Lifting must be performed with an adequate lifting system.

CAUTION: Do not move or lift a system with odorant in the tank. Tank must be empty and any pressure vented prior to lifting.

CAUTION: Do not lift the skid by the eyebolts provided on the cabinet or the tank. System can only be lifted by the eyebolts welded on the skid (if provided) or by lifting below with a forklift.

3. Bolt the system to the concrete slab using the $\frac{3}{4}$ " mounting holes provided in the skid. Recommended mounting bolt/stud sizes are either 11/16" or 5/8".
4. Connect a ground wire from one of the grounding lugs located on the skid foot to a properly installed ground rod located adjacent to the skid. *(Resistance to ground must be less than 1 ohm)

Section 3: 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 1/4" NPT tee must be installed under the regulator to supply the blanket gas to the system. See the P&ID on page 13 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. 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**.

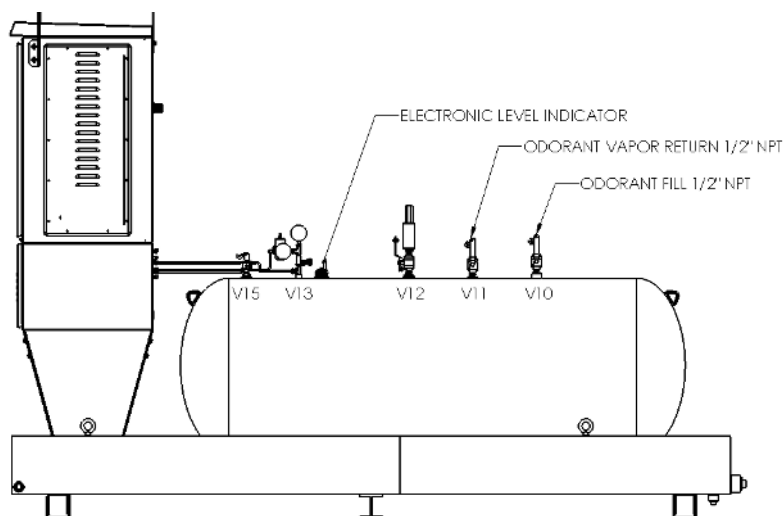


Figure 12 Odorant Tank Valves

SECTION 3: FILLING THE BULK ODORANT TANK

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.

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 1/4" NPT tee must be installed under the regulator to supply the blanket gas to the system. See the P&ID on page 13 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 ZEO system by pressing the Right 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. Monitor blanket gas pressure – allow tank to settle into regulated blanket pressure of 10-25 psi (0.7-1.7 Bar) before continuing.
8. Resume system operation by pressing the Right Arrow Key on the keypad on the N-400 controller.

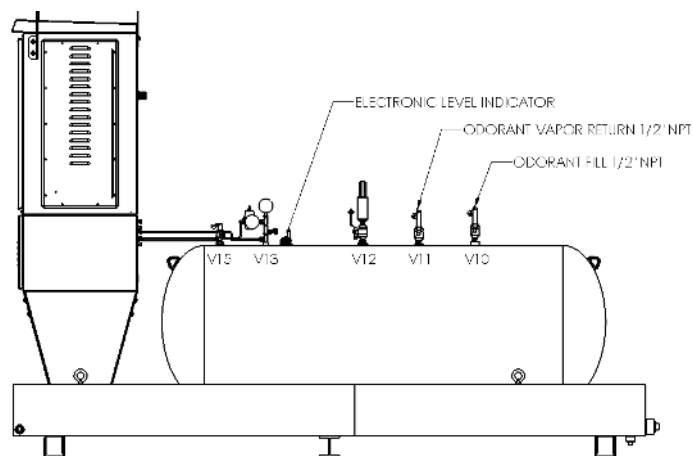


Figure 13 Odorant Tank Valves

Section 4: System Operation

Starting the System

To begin operating the NJEX ZEO system, ensure power is provided to the ZEO cabinet. The system power switch is located inside the N-400 enclosure. To access the switch, pull out and upward on the lever located on the right side of the N-400 enclosure. On the circuit board inside the N-400 enclosure, the On / Off switch is located on the upper right side. Flip the switch up to turn the main power on.

Once the NJEX ZEO System is powered, navigate to the About Menu to view the controller information. Record this information on the Maintenance sheet in *Appendix A* of this system for quick reference.

Observe the LCD screen to ensure the Serial Number and Model Type shown match the Serial Number and Model Type on the inside of the enclosure door.

See *Setting Operator Parameters in Section 5* of this manual to set the target injection rate, selected units, operational mode, flow signal type where applicable, etc. The real time clock and date must be maintained to ensure it is accurate for the location of the system installation and recorded audit trail.

Follow the P&ID located in the door of the cabinet and the *Maintenance Instructions in Section 5* of this manual to prime the transfer pump and fill the verometer. Before priming the injection pump, **follow the *Injection Pump Oil Fill Procedure in Appendix G* of this manual to fill the injection pump with the required oil.**

After filling the injection pump with oil, refer to the P&ID and the *Maintenance Instructions in Section 5* to prime the injection pump.

After completing the priming steps, follow the *Calibration instructions in Section 5* of this manual to calibrate the injection pump, odorant tank level, inlet pressure, and flow signal where applicable.

To continue startup, ensure all valves are position in the normal operational state. See the P&ID provided on the inside of the cabinet door for valve positions necessary for normal operation. **Confirm the vent valve V5 is closed during operation to prevent spilled odorant.**

To start the system, return to the N-400 controller Home Screen and press the Right Arrow Key to start. When the system is powered up and running, in the upper right section of the N-400 controller Home Screen, the words RUNNING will be displayed. To stop the system, press the Right Arrow Key again. In the upper right section of the N-400 controller Home Screen, it will now display STOPPED.

To change any settings, see the *Setting Operator Parameters in Section 5* of this manual. Operating parameters may be viewed when the system is running, but to change any settings, the system must be stopped. If the system displays it is running, press the Right Arrow Key to stop, change any parameters, and restart the system.

Stopping the System

To stop the system, when necessary, from the N-400 controller Home Screen, press the Right Arrow Key and in the upper right section, the word STOPPED should be displayed.

If purging and venting is required for maintenance, see the *Maintenance instructions in Section 5* of this manual for purging and venting instructions. Before disassembling or servicing any system components, the system must be disconnected from the provided power source and an appropriate amount of time passed to dissipate any remaining voltage.

WARNING: Explosion Hazard - To prevent ignition of an explosion atmosphere remove power before disconnecting any equipment or wiring unless the area known to be non-hazardous.

SECTION 4: SYSTEM OPERATION

Notes

[illegible]

[illegible]

Section 5: System Control Electronics

Controller Overview

The N-400 Controller is intrinsically safe and holds the following approvals outlined in Figure 15. The controller and any accessories must be installed grounded, wired, and I.S. Barrier Protected in accordance with all applicable electrical codes and the *Wiring Control Document in Appendix B*.

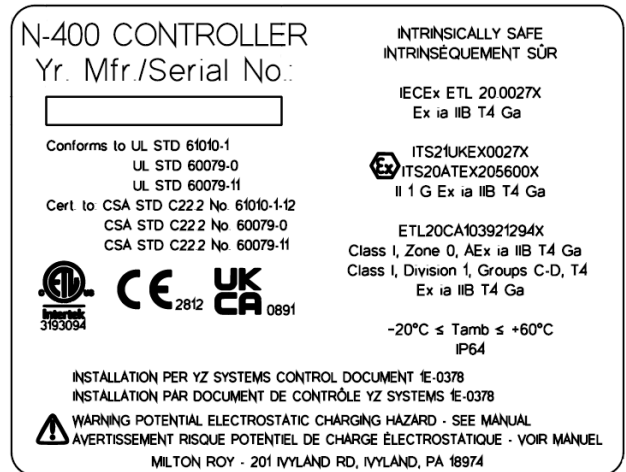
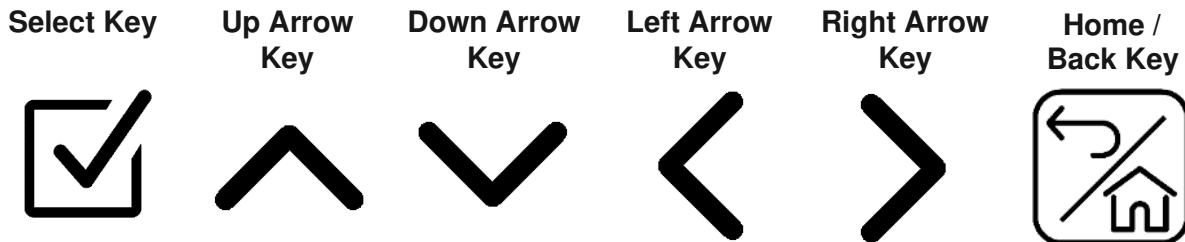


Figure 14 Controller label with intrinsically safe markings

Using the Keypad

The keypad has 6 keys to navigate through the menus.



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 right arrow key is used to start or stop the system.

At the home screen, the left arrow key is used to manually fill the verometer.

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.

SECTION 5: SYSTEM CONTROL ELECTRONICS

Home / Back Key

The home/back key is used in multiple ways. 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.

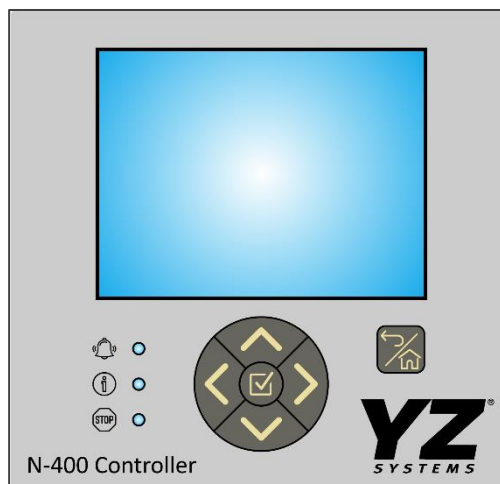


Figure 15 Controller Keypad - Note locations of keypad keys

LED Communication Icons

Alarm Icon

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

Alarm Icon



Information Icon

The Information Icon LED will flash green when the unit is running.

Information Icon



Stop Icon

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

Stop Icon



To Power Up the System

The toggle switch **SW1** located just below center on the right side of the Printed Circuit Board – PCB. Turn on the main power switch by toggling the switch to up position.

After turning on the power switch to the controller, the controller screen will illuminate and display the Home Screen.

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 C: N400 Modbus Specifications.
- Connections are via an RS-485 two-wire connection. In a safe, nonhazardous area, this may be connected to a RS-232 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 second output relay is for an Odorant Output Pulse relative to a volume of odorant injected by the system, refer to the *Wiring Control Document* in Appendix B.



Figure 16 Controller board component layout with power switch location highlighted in a red rectangle.

Using the N-400 Home Screen

The N-400 Home Screen displays important information about your NJEX ZEO system and is used to start, stop, or fill the NJEX ZEO system.

The Home Screen displays eight information sections with key information. The upper and lower display bars, Sections 1 and 2, display operational information and instructions for starting and stopping the system. The six main blocks of the home screen, Sections 3-8, display various operating parameters. See Figure 18 to reference each section location.

Section 1 is the upper display bar, which displays information dependent on the system settings. In the upper left corner, an icon will be displayed as a quick reference for which operational mode the system is operating in. The operational modes are Proportional-To-Flow or Proportional-To-Time. See Setting Operator Input Parameters below on how to adjust these parameters.

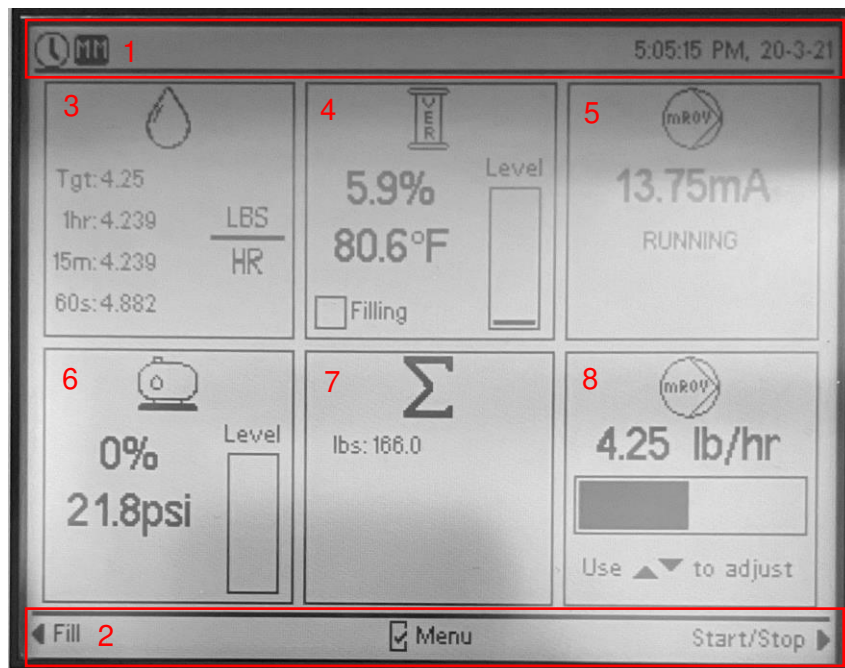



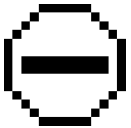
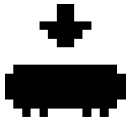

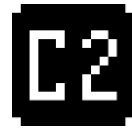


Figure 17 N-400 Controller Home Screen Section Outlines

Additional Icons that will display are the Memory Module icon, which notifies the user that the MM-400 Memory Module is plugged in, properly recognized, and collecting data. 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. The load Input icon is displayed when the system has a load input device wired and is active. The Modbus communication icons will display when there is an active Modbus connection in either the COM1 or COM2 port respectively.

Table 4: N-400 Home Screen Upper Display Bar Reference Icons

Operational Mode Icon		Memory Module Present	Remote Inhibit Active	Load Input	Modbus Communication	
Prop-To-Time	Prop-To-Flow (Pulse or Analog)				COM1	COM2
						

SECTION 5: SYSTEM CONTROL ELECTRONICS

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 19 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 Troubleshooting section below on how to address alarms.

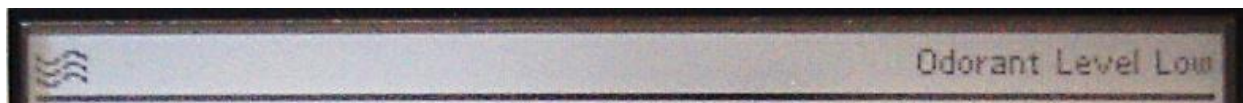


Figure 18 N-400 Alarm Display Example

Section 2 is the lower display bar which indicates how to start, stop, or fill the NJEX ZEO 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 ZEO 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.

To open the Main Menu, from the Home Screen press the Select Key as indicated by the middle of the lower display bar.

Section 3 is the real time injection rate of the active NJEX ZEO system. The first value displayed is the Target Injection Rate. See Setting Operator Input Parameters below to set this parameter. The following values are the 60 second, 15 minute, and 1 hour injection rate average to monitor the injection rate over time for the system. The values are displayed with the user selected units.

Section 4 displays key information on the verometer. The percentage displayed shows the level of the verometer while presenting a visual representation of the fill level. The odorant temperature is also monitored to compensate the volume of odorant injected as the temperature fluctuates. While the system is running and filling the verometer, the Filling indicator will be filled with a black square to indicate that the verometer is filling.

Section 5 displays three status values correlating to the performance of the mROY injection pump and ACC. The top value will switch between a pump capacity in volume/hr, a percentage, and a mA value. The pump capacity displayed is the real time pump capacity of the injection pump. The percentage displayed is the percentage of full pump capacity the pump is currently running. The full pump capacity is determined during the injection pump calibration step. The mA value is the current 4-20mA signal the N-400 controller is sending to the ACC. This value can be used as a diagnostic tool when required.

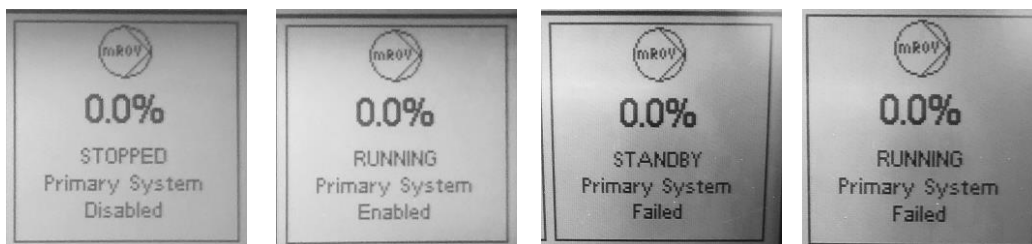
This section also displays either STOPPED or RUNNING dependent on if the unit is running or stopped. If redundancy is enabled, Section 5 will note if the system is set as the Primary or Secondary unit. See below for details on the possible system statuses.

SECTION 5: SYSTEM CONTROL ELECTRONICS

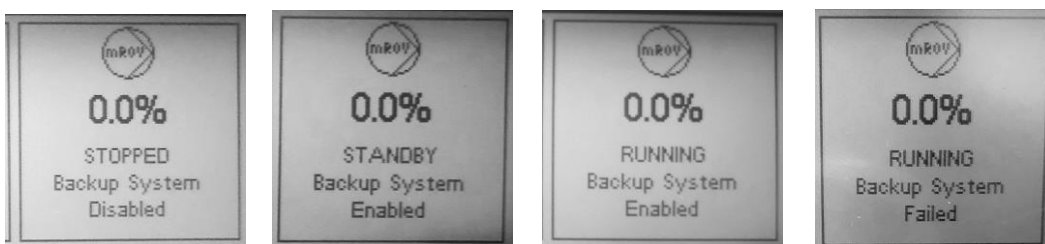
In **Default (NBS Backup)** mode, Section 5 will display either STOPPED or RUNNING. Use the Right Arrow Key on the Home Screen to start and stop the unit. If the unit is stopped by a remote inhibit signal, the status will be indicated as STANDBY. Remote Inhibit standby status will be accompanied by the inhibit icon in the upper left corner of the controller.



In N-400 **Primary Redundancy** mode, Section 5 can display four statuses for the primary system. While the unit is STOPPED it will indicate the primary system is disabled. While the unit is RUNNING with no failure, it will indicate the primary system is enabled. Use the Right Arrow Key on the Home Screen to start and stop the unit. If the primary unit fails and the backup unit is running, the primary unit will display STANDBY. If the backup system fails following failure of the primary system, both units will run. The primary system status will show failed while the system status shows RUNNING.



In N-400 **Backup Redundancy** mode, Section 5 can display four status for the backup system. While the unit is STOPPED, it will indicate the backup system is disabled. Once the unit is started, or enabled, the backup system will be held in STANDBY. In order for the secondary system to be ready for switchover in the instance of failure of the primary system, the unit must show STANDBY. Use the Left Arrow Key to stop or place the unit in standby while at the Home Screen. If the primary system fails, the backup system will indicate RUNNING and the backup system will be enabled. If the backup system fails following the primary system failure, the backup system will continue to run while indicating it has failed.



SECTION 5: SYSTEM CONTROL ELECTRONICS

IMPORTANT: The redundancy failover is triggered by power loss of the primary system, an injection rate low alarm, a pump capacity alarm, an injection pump diaphragm failure, or loss of signal to the IS Transition circuit board.

IMPORTANT: The backup system will run if enabled and the primary system is stopped. For normal operation, start the primary system first followed by starting the backup system which will place the backup in standby. If the primary system must be stopped for service or parameter adjustment, the backup system should be stopped first unless running the backup system is desired while the primary system is disabled.

Section 6 shows the bulk odorant tank level percentage with a visual indicator. This section also displays the bulk odorant tank pressure in the units that are selected under System Configuration. The tank requires 10-25 psi (0.7 – 1.7 bar) blanket pressure during normal operation.

Section 7 is the Totalizer display. The totalizer shows the total odorant injected in the units that are selected under System Configuration.

Section 8 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 will be displayed. If the flow signal is Pulse, a PWM signal icon is displayed. If Proportional-To-Time mode is selected, a lb/hr or kg/hr adjustable target will be displayed. Use the Up Arrow Key and Down Arrow Key to adjust as needed.

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. At any time, the Home / Back Key can be pressed and held to return to the Home Screen.

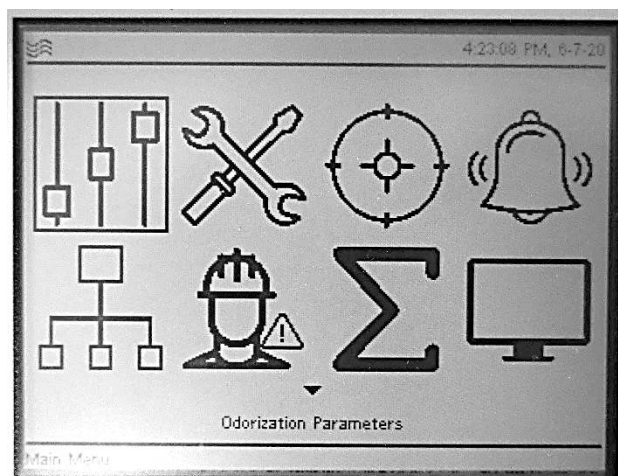


Figure 19 N-400 Controller Main Menu

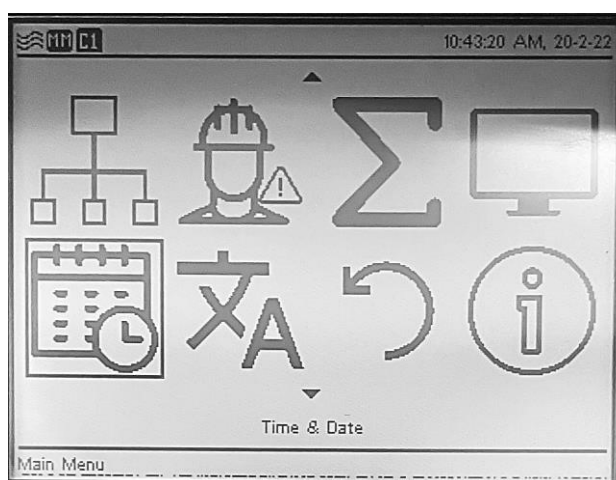


Figure 20 N-400 Controller Main Menu, Continued

Setting Operator Input Parameters

Before adjusting any parameters, ensure the system is stopped. The Home Screen will display *STOPPED* or *RUNNING* in the upper right section of the screen. The ability to adjust input parameters is disabled when the system is running. To stop or start the system, press the Right Arrow Key on the Home 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 press the select key. If selected, the selection box will be filled next to Enabled. If this parameter is enabled and the NJEX ZEO system loses power while stopped, the system will resume in the stopped mode.
- 1.5. If the NJEX ZEO 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.

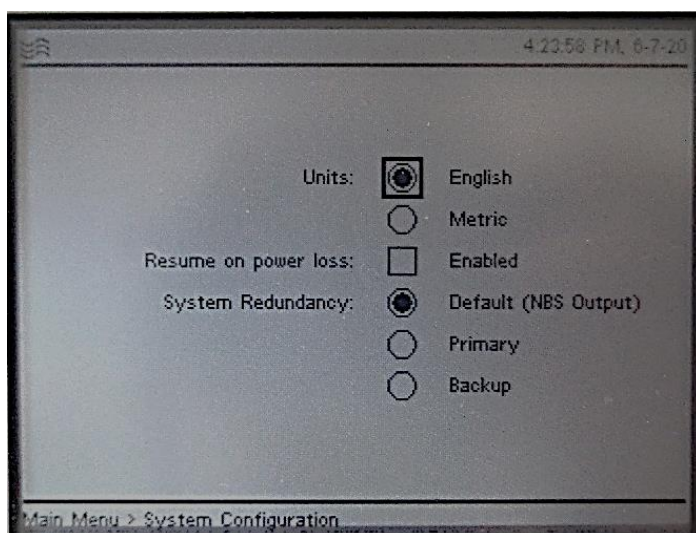
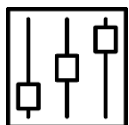


Figure 21 System Configuration Parameters



2 - Setting the Odorization Parameters

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 target mass per unit time value to maintain. Use the Odorization Parameters to set the target Injection Rate and odorant parameters.

SECTION 5: SYSTEM CONTROL ELECTRONICS

Additional adjustable parameters within the Odorization Parameters menu are defined as below:

Flow (No Signal) is the predetermined percentage of max gas flow that the operator would like the N-400 controller to default to in the event that the actual flow input signal is lost. To enable, see step 2.7 below.

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. The Low Flow Shutoff parameter is only applicable with an analog flow signal. To enable, see step 2.7 below.

Pump Capacity is set during the mROY calibration during system installation. The maximum pump capacity is dependent on the back pressure for the system. The maximum pump capacity is used to create an accurate performance curve of the ZEO system upon startup. It is recommended that if the discharge pipeline pressure has large variations over time or during high and low seasons, the pump be recalibrated to prevent nuisance alarms and allow for the most accurate monitoring.

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 Wiring Control Document in Appendix B for reference. To enable, see step 2.7 below.

To set odorization parameters

2.1. Beginning from the home screen, press the Select Key to open the Main Menu

2.2. Select the Odorization Parameters menu

2.3. 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.

2.4. To continue, use the navigation arrows to navigate to the desired Operational Mode, Prop-To-Flow or Manual. Press the Select Key to select the Operational Mode. The selected mode will be identified by a filled circle next to the mode options.

2.4.1. 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.

2.5. To set the Injection Rate, use the navigation arrows to highlight the Injection Rate 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

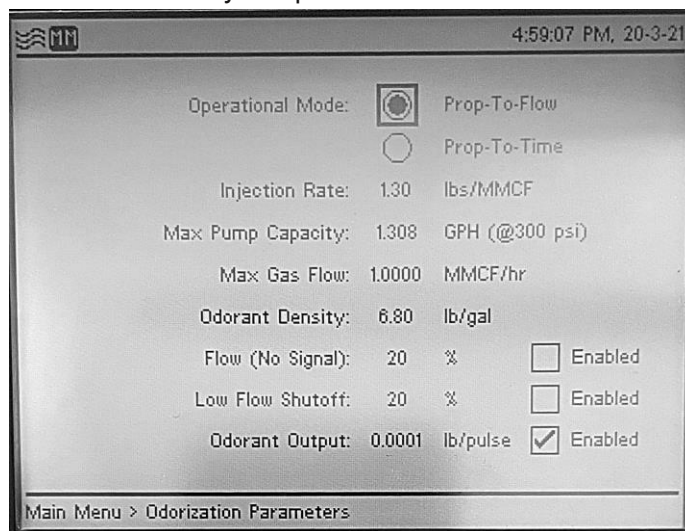
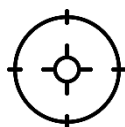


Figure 22 Odorization Parameters Menu

SECTION 5: SYSTEM CONTROL ELECTRONICS

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.

- 2.6. Repeat step 2.5 to set the remaining parameters: Maximum Gas Flow, and Odorant Density, Flow (No Signal), Low Flow Shutoff, and Odorant Output. Maximum Pump Capacity will be a read-only parameter taken from the pump calibration procedure.
- 2.7. 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.
- 2.8. Repeat step 2.7, if necessary, to enable additional optional parameters.
- 2.9. 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.



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 Injection Pump, Flow Signal, Odorant Tank Level, and Inlet Pressure.

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

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

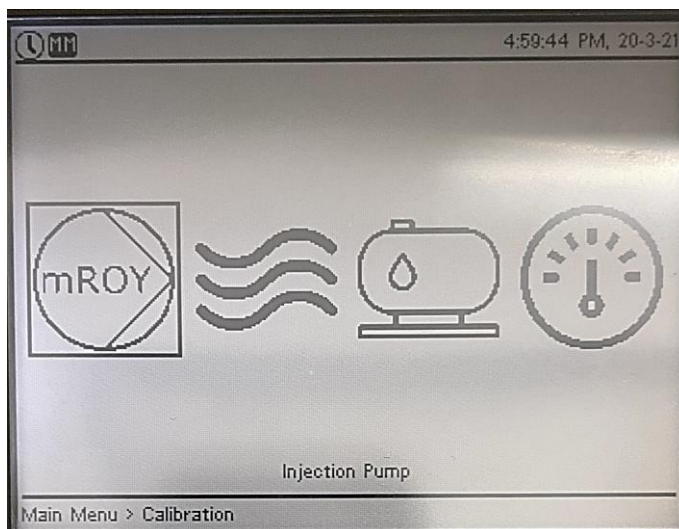


Figure 23 Calibration Menu



3.1 – Injection Pump Calibration

Calibrating the injection pump against the pipeline pressure sets the system operational curve and reduces the time it takes to reach the injection rate target.

IMPORTANT: The pump calibration accuracy is dependent on inputting an accurate pipeline back pressure. If the pipeline pressure varies over time due to seasonal changes or flow changes, it is recommended to visit the ZEO system and recalibrate the injection pump. Proper calibration allows for the most efficient system performance.

IMPORTANT: The pump calibration must be performed after the system is installed and the priming maintenance function has been performed.

SECTION 5: SYSTEM CONTROL ELECTRONICS

- 3.1.1. To begin calibrating the injection pump, 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 Injection Pump Calibration Menu
- 3.1.4. To calibrate, follow the directions displayed. The verometer level should be filled to approximately 50% before starting the calibration procedure. The verometer level is displayed for reference. If the verometer level is lower, return to the Home Screen and manually begin a verometer fill by pressing the Left Arrow Key. The fill process will stop automatically.

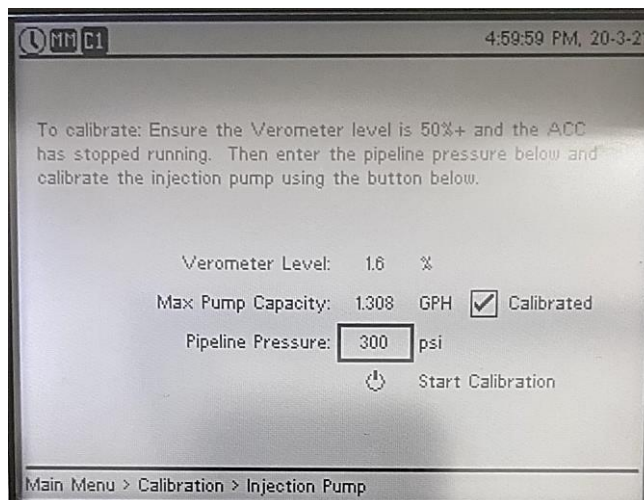


Figure 24 Injection Pump Calibration Screen.

- 3.1.5. Return to the injection pump calibration screen. When opening this menu, the ACC position will adjust to the 100% capacity position and can be seen on the micrometer between the ACC and injection pump. **Wait for the ACC to cease adjusting before starting the calibration procedure.**
- 3.1.6. Using the navigation keys, navigate to the Pipeline Pressure and enter the typical pipeline pressure. Press the Select Key to enter the value.
- 3.1.7. Navigate to the Start Calibration icon at the bottom of the screen. Press the Select Key to start the calibration procedure. The injection pump will inject odorant against the current back pressure for 30 to 40 seconds and calculate the Max Pump Capacity. Once calibration is complete, select the Apply Calibration button, and the Calibrated indicator box will be filled with a check mark. The Max Pump Capacity value will be mirrored to the Odorization Parameters menu for easy reference.



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

Important: Many factors affect the signal between the signal source and the NJEX ZEO 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.

- 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

SECTION 5: SYSTEM CONTROL ELECTRONICS

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 *Wiring Control Document in Appendix B*.

3.2.5.1. 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(-).

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

3.2.5.3. 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.

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).

3.2.6. 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 *Wiring Control Document in Appendix B*.

3.2.6.1. 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

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

3.2.6.3. 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.

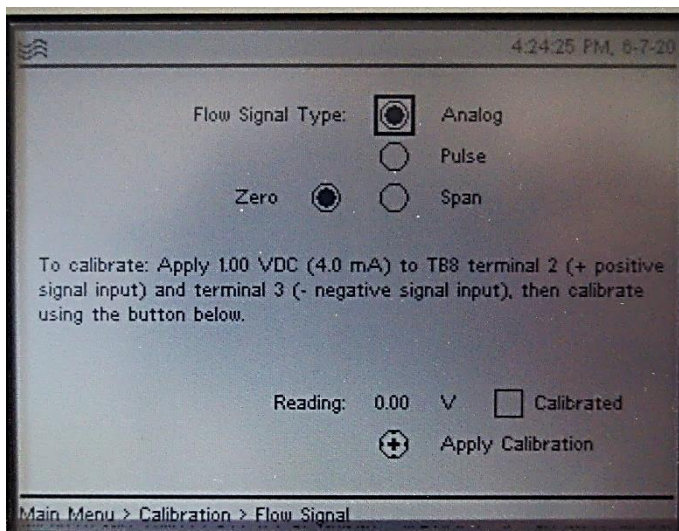


Figure 25 Analog Flow Signal Zero Calibration Screen.

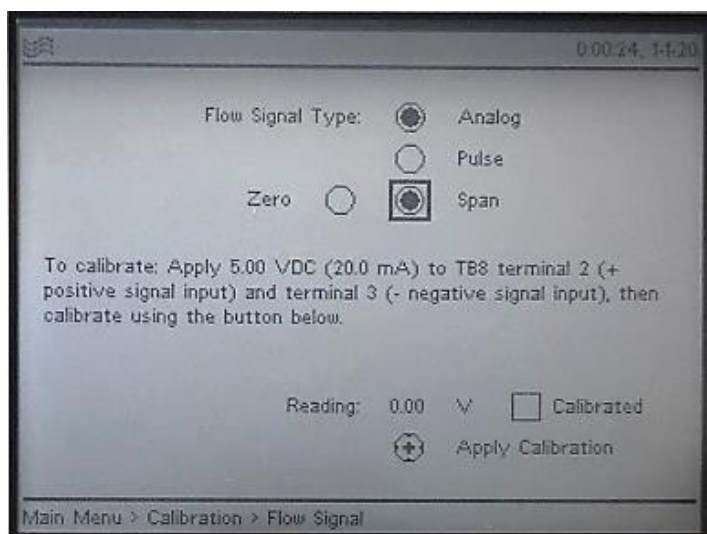


Figure 26 Analog Flow Signal Span Calibration Screen

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

Important: Many factors affect the signal between the signal source and the NJEX ZEO 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.

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.

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

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

3.3.2. Select the Flow Signal Menu

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

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

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

3.3.5.1. 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.

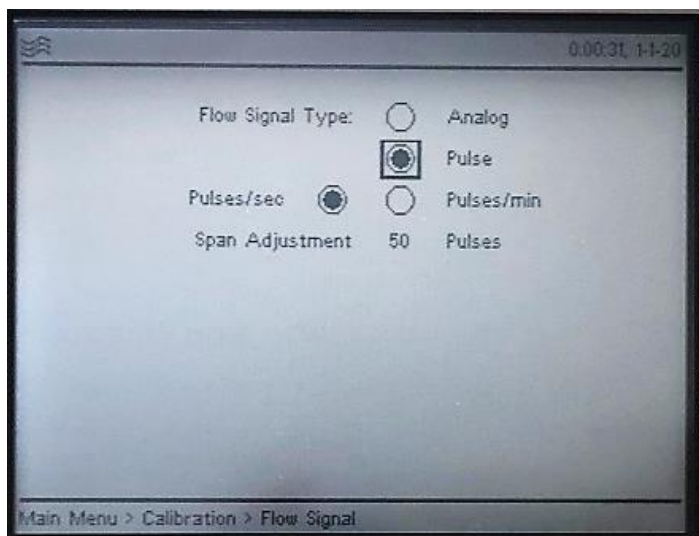


Figure 27 Pulse Flow Signal Calibration Menu

SECTION 5: SYSTEM CONTROL ELECTRONICS

Calculation for Determining the Span Frequency

$$\frac{\text{Pulse}}{CF} \times \text{max flow rate} \quad \frac{CF}{Hr} = \frac{\text{Pulses}}{Hr}$$

As determined by the flow metering device

Example:

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

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

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

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.

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



3.4 - Bulk Tank Level Calibration

- 3.4.1. To begin calibrating the Odorant Tank Level, press the Select Key from the home screen to open the Main Menu
- 3.4.2. Navigate to the Calibration Menu and press the Select Key
- 3.4.3. Select the Odorant Tank Menu
- 3.4.4. 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.
- 3.4.5. When the Analog sensor option is selected, the option to calibrate is displayed on the screen.
- 3.4.6. 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 *Wiring Control Document in Appendix B*.
 - 3.4.6.1. To calibrate the zero set point, apply 1.00 VDC (4.0 mA) to TB11 terminal #2(+) and terminal #3(-).
 - 3.4.6.2. After the signal has been applied, navigate to the Apply Calibration selection and press select.
 - 3.4.6.3. 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.

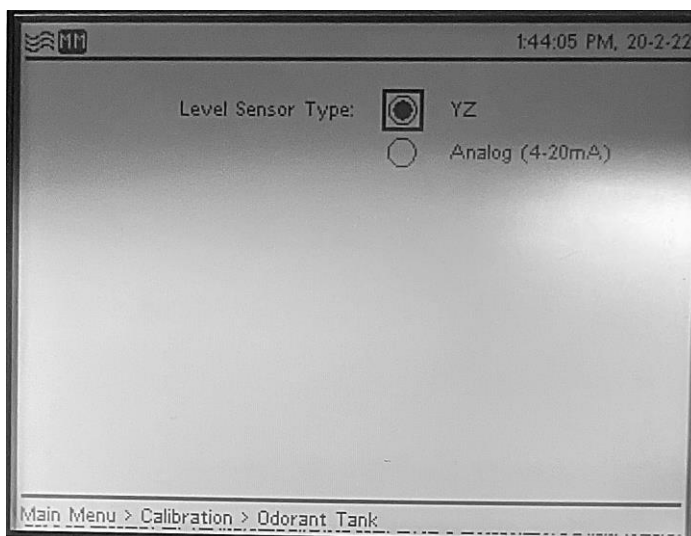


Figure 29 Level Sensor Calibration - Rochester Gauge

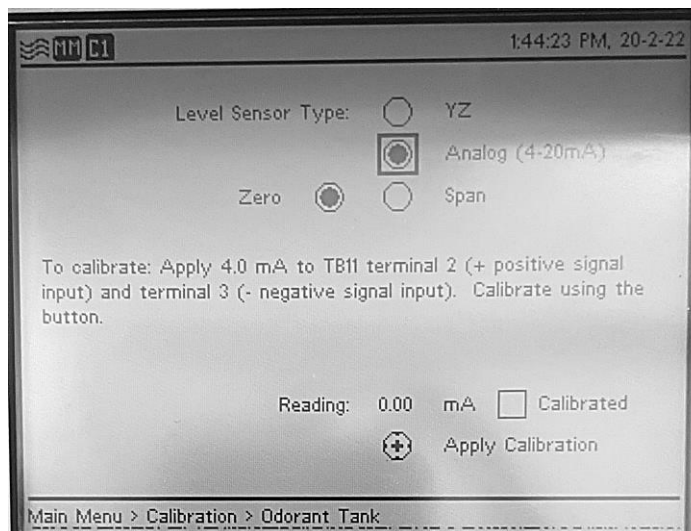


Figure 29 Level Sensor Calibration - Analog Sensor Zero

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.

SECTION 5: SYSTEM CONTROL ELECTRONICS

- 3.4.7. 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 *Wiring Control Document in Appendix B*.

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

- 3.4.8. After the signal has been applied, navigate to the Apply Calibration selection and press select.
- 3.4.9. 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.

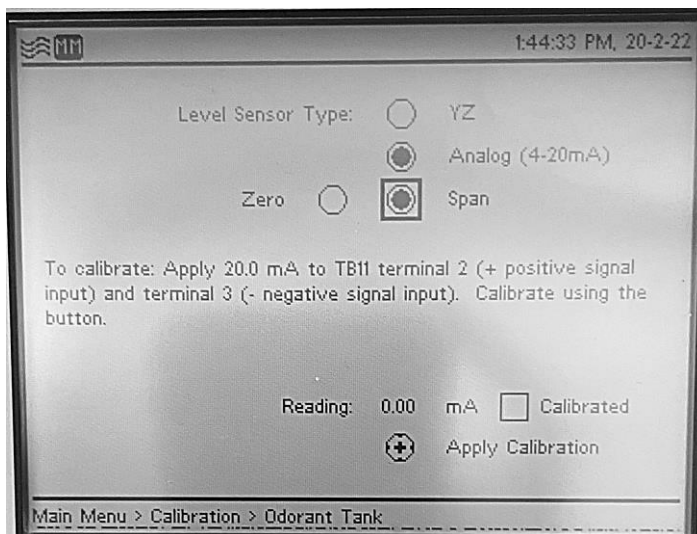


Figure 30 Level Sensor Calibration – Analog Sensor Span

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

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

- 3.5.4. 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.
- 3.5.5. After the pressure has been relieved, navigate to the Apply Calibration selection and press select.
- 3.5.6. 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.

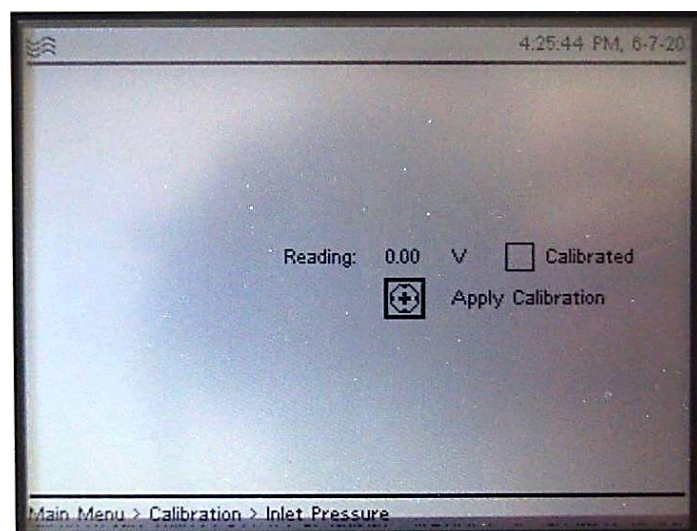


Figure 31 Odorant Inlet Pressure Calibration



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.

4.1 - Configurable Alarm Signal Options

- **Injection Rate** – The controller measures the odorant injected by monitoring the verometer levels and converts this to an injection rate over time. An alarm can signal if the calculated injection rates is deviating from the target input parameters by a percentage.
- **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. If an odorant tank level alarm is enabled, a secondary **Odorant Tank Cable** alarm will indicate if the communication with the bulk tank level is lost.
- **Odorant Inlet Pressure** – The alarm can be enabled to signal when the odorant inlet pressure is outside an acceptable range. The NJEX ZEO requires 10 – 25 psi (.68-1.73 Bar) blanket pressure. The default values Odorant Inlet Pressure Low and High values are 10 psi (.68 Bar) and 30 psi (2.0 Bar). If an odorant inlet pressure alarm is active, a secondary **Odorant Pressure Cable** alarm will indicate if communication with the inlet pressure transducer is lost.
- **Alarm Out Delay** – A time delay can be set on the alarm out to prevent premature signaling if there is a brief variation in the tank level, inlet pressure, etc.

4.2 - Non-Configurable Alarm Signals

- **Flow Signal** – When enabled, it will alarm if the flow signal meets any of the following conditions:
 - Gas flow rate measured above the maximum flow rate
 - Loss of flow signal
 - No flow condition is reached
- **Verometer** – Alarm can be enabled to signal for changes in the verometer measurements. When enabled, it will alarm if the verometer meets any of the following conditions:
 - Verometer is overfilled
 - Leak detected within the verometer
 - Leak detected within the transfer pump
 - Slow or no fill
 - Loss of signal
 - Loss of temperature sensor cable

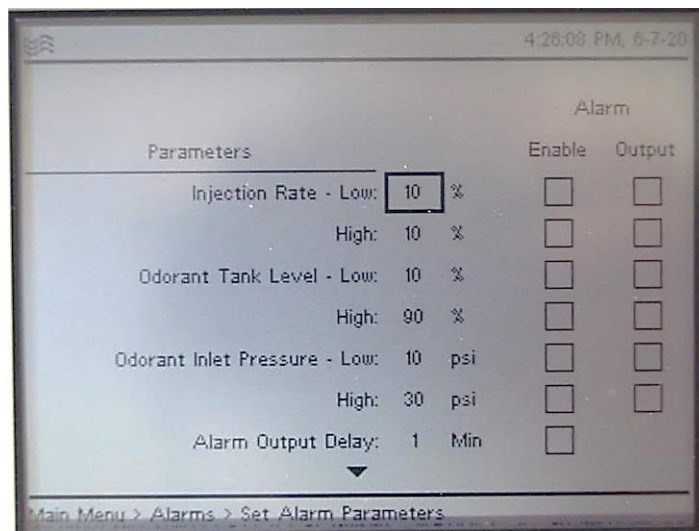


Figure 32 Configuring Alarm Parameters

SECTION 5: SYSTEM CONTROL ELECTRONICS

- **Injection Pump** – When enabled it will alarm out if the pressure switch senses the following conditions:
 - a diaphragm failure
 - pump capacity low or high
 - loss of signal to the ACC
 - ACC adjustment fails to change the pump capacity

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 navigation arrows, navigate to each setting to change

4.3.5. To set the limits of the odorant tank level, inlet pressure, or injection rates, 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 text on the default background. Repeat this step until all values are input as needed.

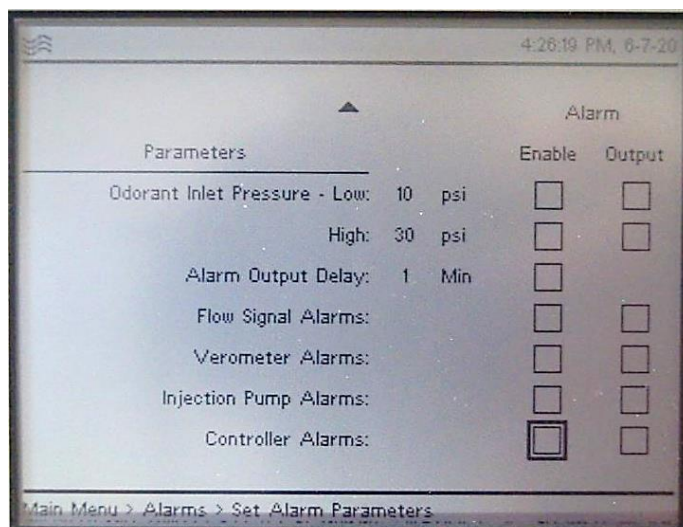


Figure 33 Configuring Alarm Parameters, Continued

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.

4.3.7. To enable the system to communicate the alarm to external the communications system, use the arrow keys to navigate to the selected alarm output. 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. The Alarm Simulation has three display columns, Alarm Category, Test, and Alarm.

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

SECTION 5: SYSTEM CONTROL ELECTRONICS

- 4.4.5.1. 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.
- 4.4.5.2. 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.
- 4.4.6. All alarm simulations will turn off upon exiting the Alarm Simulation Menu.

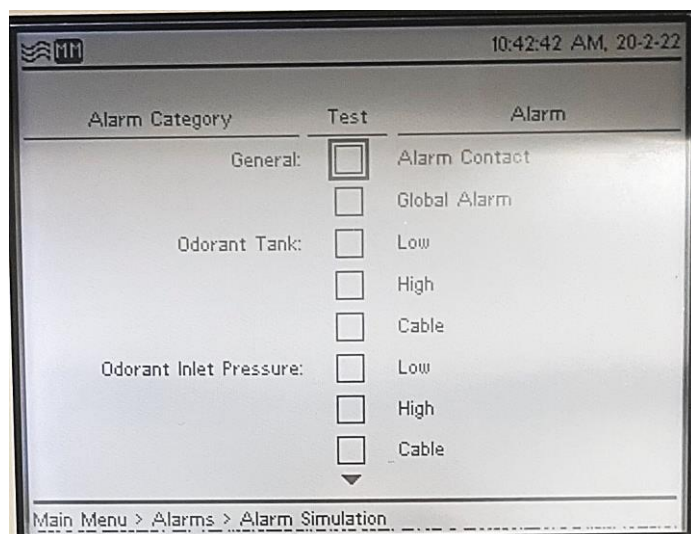


Figure 35 Alarm Simulation Menu 1

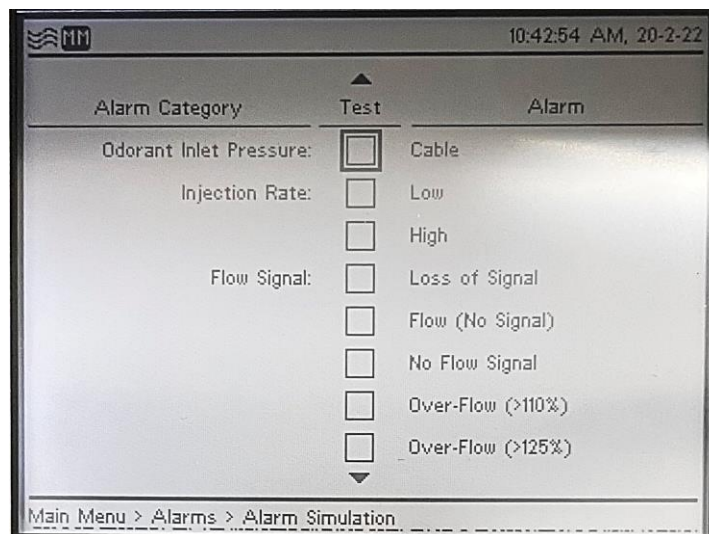


Figure 36 Alarm Simulation Menu 2

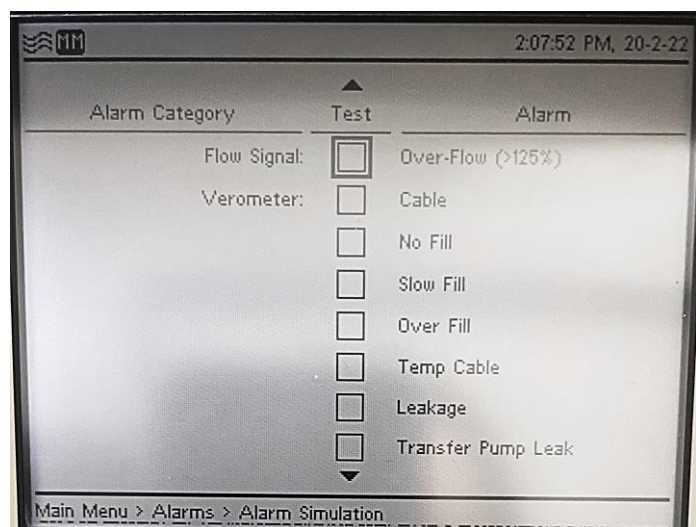


Figure 37 Alarm Simulation Menu 3

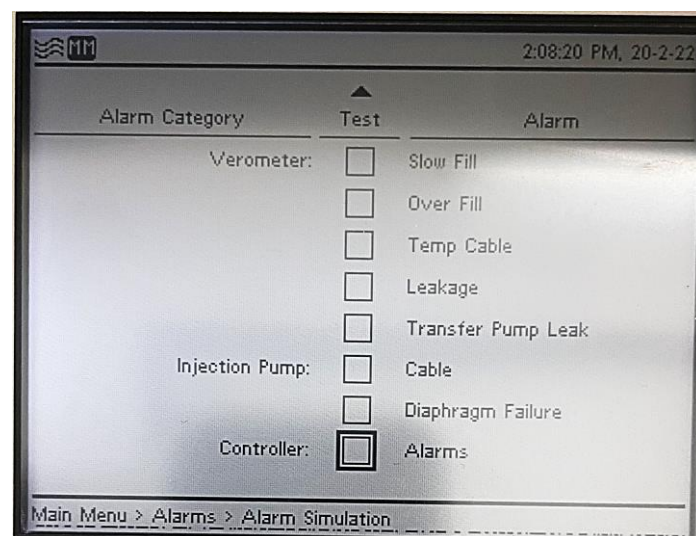
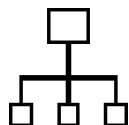


Figure 34 Alarm Simulation Menu 4



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 programmed.

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.
 - 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 56000. 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.

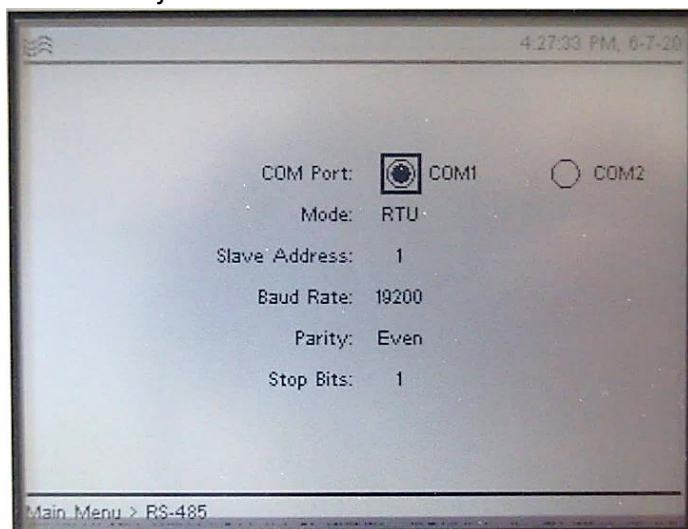


Figure 38 RS485 Parameter Menu

SECTION 5: SYSTEM CONTROL ELECTRONICS

- 5.4. Repeat step 5.2.1 – 5.2.5 to set the parameters on the second COM port. To disable COM port communication, set the Mode parameter as Disabled.



6 - Totalizer

The Totalizer Menu displays information on the odorant usage of the NJEX ZEO 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.
 - 6.2.1. To reset back to zero, navigate to the Refresh displayed to the right of the Odorant Usage value using the navigation arrows. Press the Select Key to refresh.
- 6.3. Also displayed on the screen will be the calculated Odorant Injection Rate that is also shown on the Home Screen. The Odorant Injection rate is shown averaged over 60 seconds, 15 minutes, and 1 hour with the user selected units.
 - 6.3.1. To refresh, navigate to the Refresh Key displayed to the right of the Injection Rate values using the navigation arrows. Press the Select Key to refresh.

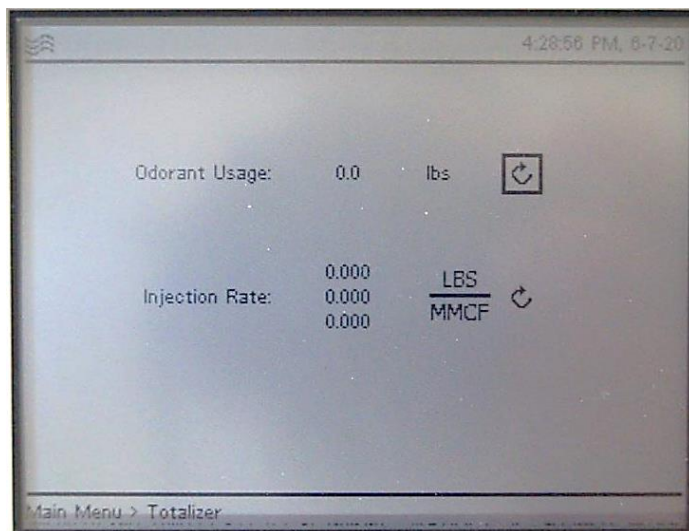


Figure 39 Totalizer Menu



7 - Display

The Display Menu allows the user to enable, disable, or adjust the screen brightness.

- 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.
 - 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.

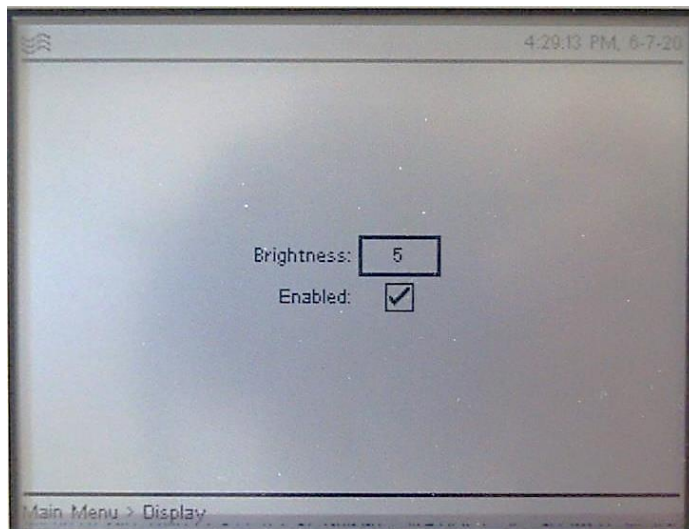


Figure 40 Display Parameters



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.

SECTION 5: SYSTEM CONTROL ELECTRONICS

- 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.
- 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.

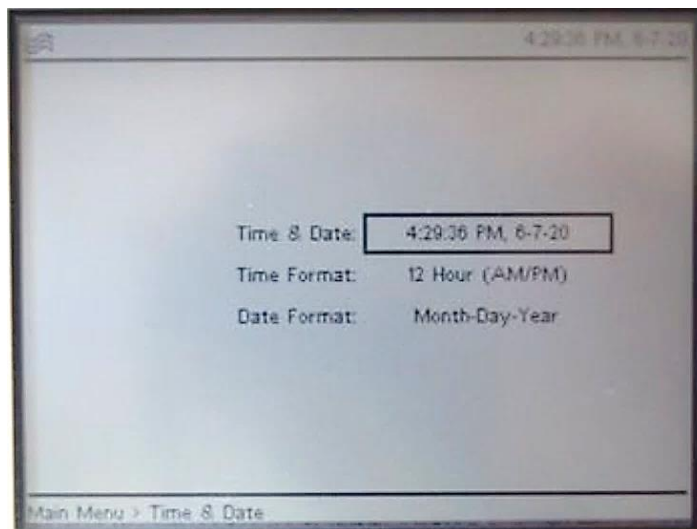


Figure 41 Time and Date Parameters

IMPORTANT: If the clock resets to 12:00 XX/XX/XX, the backup battery BT1 may need to be replaced. See *Appendix D 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.

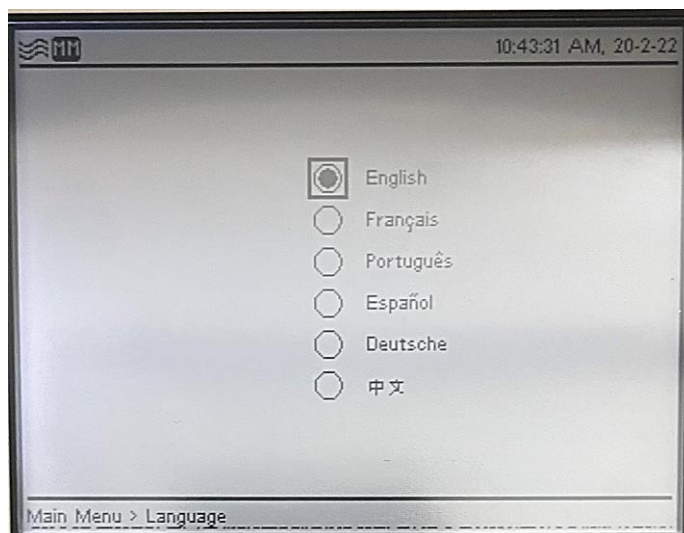


Figure 42 Language Options

10 - Factory Reset

The N-400 controller can be reset to factor default when required.

The User Settings and Calibration Settings are reset as individual options.

- 10.1 To open the Factor 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.

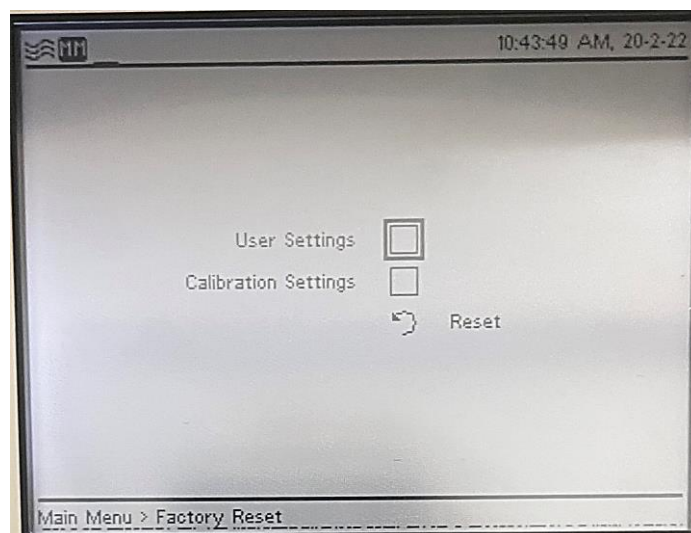


Figure 43 Factory Reset Menu



11 - About

The About menu will display important information that is factory set for your N-400 controller and the NJEX ZEO system that it controls. The About menu displays the Serial Number, Pump Model, Process type, Controller Firmware Version, and Intrinsically Safe Transition Board Firmware version. These are set at the factory and are not adjustable in the field. This information will be important if service is required from a YZ Systems field service technician.

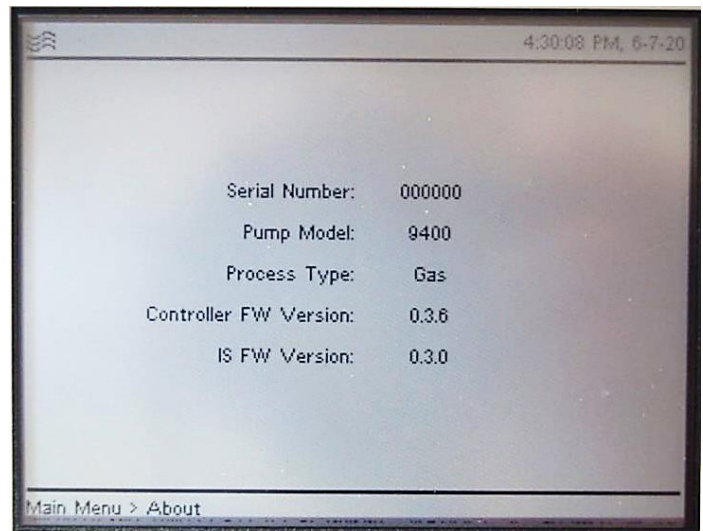


Figure 44 About Parameters



12 - Maintenance

To service your NJEX ZEO 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.

The Maintenance instructions are structured to allow the user to navigate through the instructions without having to leave this Menu. While within a specific maintenance step, navigation arrows will be displayed along the lower display bar. To navigate to the previous or next maintenance step, press the Left Arrow Key or Right Arrow Key.

12.1 - System Purge

Purging the system will remove odorant from the system and purge it back to the odorant tank.

12.1.1. To display the 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 Purge Menu

12.1.2. Use the accompanying P&ID in the cabinet door for referencing valve locations.

12.1.3. Follow the Purge Instructions shown on the screen or they will be listed below.

12.1.3.1. Stop the system (if still running, press the Select Key to stop)

12.1.3.2. Close V8 if pipeline pressure is less than 200 psi (13.8 bar)

12.1.3.3. Close V1

12.1.3.4. Open V2

12.1.3.5. Open V16

12.1.3.6. Wait about 2 minutes until you hear the bubbling in the bulk tank stop

12.1.3.7. Close V17

12.1.3.8. Close V16

12.1.4. The verometer level is displayed within the Purge menu for reference. Verometer level should display 0% when purged but ensure the bubbling in the tank has stopped to ensure all odorant has been purged.

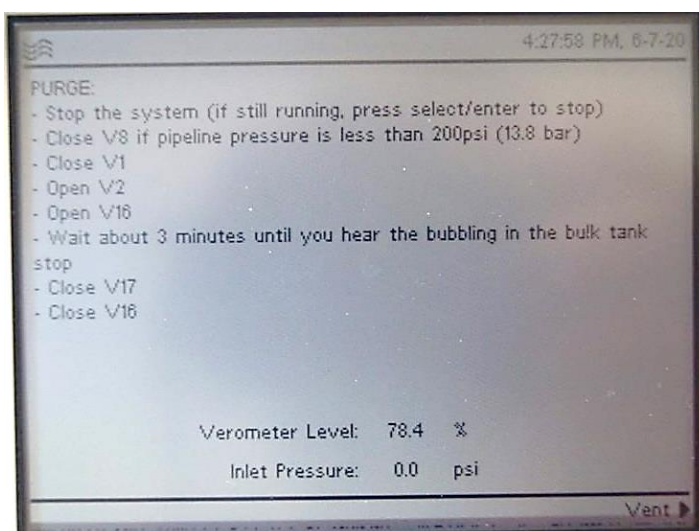


Figure 45 Maintenance - Purge

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12.2 - System Venting

Vent the system after purging to equalize pressure within the NJEX ZEO system before performing maintenance tasks.

12.2.1. To display the vent 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. Navigate to the Vent menu and press the Select Key.

12.2.2. Use the accompanying P&ID in the cabinet door for referencing valve locations.

12.2.3. Follow the Vent instructions on the screen or they will be listed below.

12.2.3.1. Open V5

12.2.3.2. Wait until verometer inlet pressure reaches zero.

12.2.3.3. Begin maintenance

12.2.3.4. After maintenance is complete, restore all connections to the normal state

12.2.3.5. Confirm all vales are in the position indicated for the Vent mode

12.2.3.6. Close V5

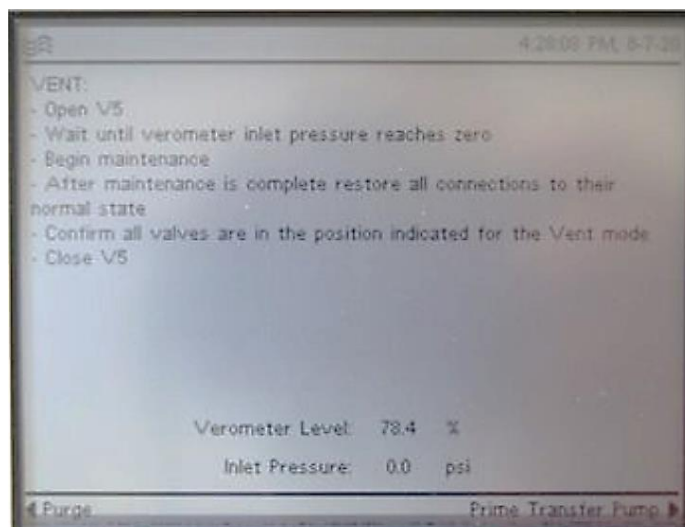


Figure 46 Maintenance - Venting

Caution: Vent valve V5 must be closed in all operations excluding venting.

SECTION 5: SYSTEM CONTROL ELECTRONICS

12.3 – Prime Transfer Pump

To begin starting or restarting the NJEX ZEO system, the transfer pump located in the lower compartment of the cabinet must be primed to ensure no entrained air is in the system for proper performance.

Ensure the bulk odorant tank is properly pressurized to 10-25 psi (0.7-1.7 bar) before proceeding with priming the transfer pump.

12.3.1. To display the prime transfer pump 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. Navigate to the Prime Transfer Pump menu and press the Select Key.

12.3.2. Use the accompanying P&ID in the cabinet door for referencing valve locations.

12.3.3. Follow the Prime Transfer Pump instructions shown on the screen or they will be listed below.

12.3.3.1. Open V17 to allow odorant to flow from the bulk tank through the inlet lines

12.3.3.2. Momentarily open/close V5 to relieve any built up pressure to push odorant to the verometer faster

12.3.3.3. The verometer should slowly begin filling. Fill the verometer to about 5% before moving to the next step.

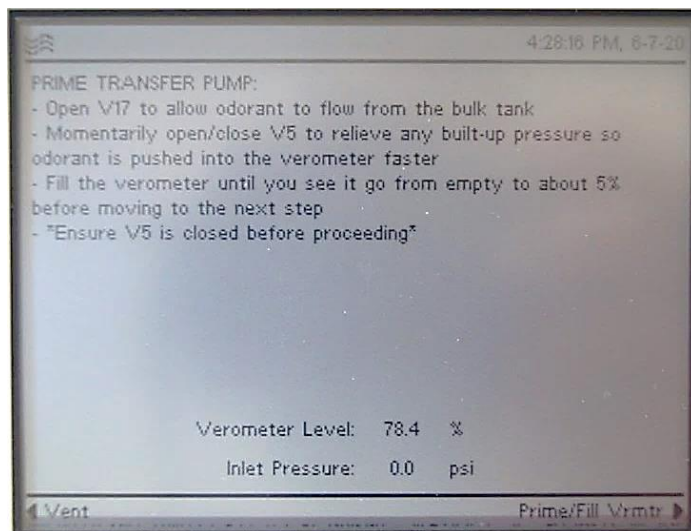


Figure 47 Maintenance - Prime Transfer Pump

Caution: Ensure Vent valve V5 is closed following priming the transfer pump before proceeding.

SECTION 5: SYSTEM CONTROL ELECTRONICS

12.4 – Prime / Fill Verometer

Prime and fill the verometer prior to starting the system to ensure level sensors are monitoring and preventing air trapped in the system.

Caution: Ensure the Vent valve V5 is closed before filling the verometer.

- 12.4.1. 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. Navigate to the Prime Prime/Fill Vrmtr menu and press the Select Key.
- 12.4.2. Use the accompanying P&ID in the cabinet door referencing valve locations.
- 12.4.3. Follow the Prime / Fill Verometer instructions shown on the screen or they will be listed below.
 - 12.4.3.1. Open V1
 - 12.4.3.2. Press the Select Key to begin filling the verometer
 - 12.4.3.3. The transfer pump will begin filling the verometer and shut off at 100%.
 - 12.4.3.4. The verometer level is shown at the bottom of the screen for reference.

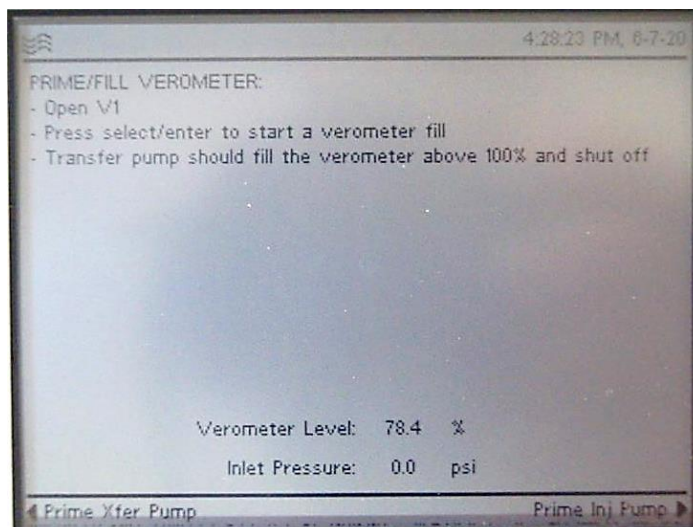


Figure 48 Maintenance - Prime / Fill Verometer

12.5 – Prime Injection Pump

Priming the mROY injection pump prior to starting the system will ensure no trapped air is in the injection pump for accurate pump performance.

- 12.5.1. To display the prime injection pump 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. Navigate to the Prime Injection Pump menu and press the Select Key.
- 12.5.2. Use the accompanying P&ID in the cabinet door referencing valve locations.
- 12.5.3. Follow the Prime Injection Pump instructions shown on the screen or they will be listed below.
 - 12.5.3.1. Close V17
 - 12.5.3.2. Ensure V2 is open
 - 12.5.3.3. Press the Select Key to start and stop the injection pump

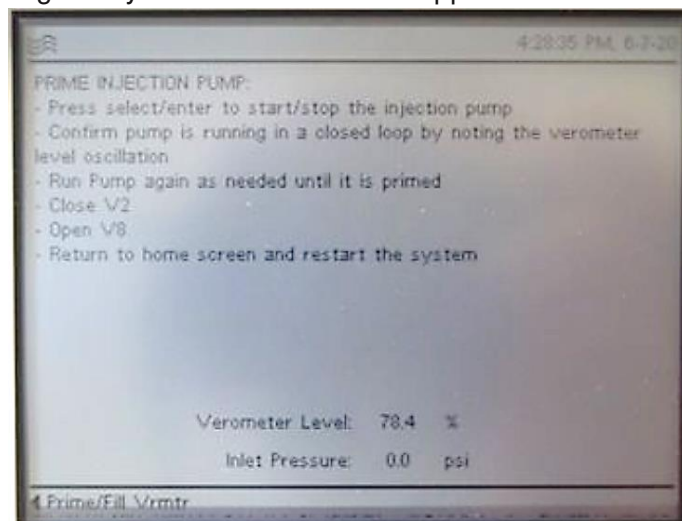


Figure 49 Maintenance - Prime Injection Pump

SECTION 5: SYSTEM CONTROL ELECTRONICS

- 12.5.3.4. Confirm the injection pump is running in a closed loop by noting the verometer level oscillation
- 12.5.3.5. Press the Select Key to start and stop the system again as needed until the injection pump is primed.
- 12.5.3.6. Close V2
- 12.5.3.7. Open V8
- 12.5.3.8. Open V17
- 12.5.3.9. Return to the Home Screen and Press the Right Arrow Key to start the system

Section 6: 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 ZEO System. It is important to read all of 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 cabinet must 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 ZEO 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.
 - a. Bulk Storage Tank, 10 – 25 psi (*0.7 - 1.7 Bar*)
3. Resolve alarm issues in the following order:
 - a. Tank Level
 - b. Flow Signal
 - c. Verometer
 - d. Injection Pump

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 Wiring Control Document 1E-0378 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 than 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 Tank 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 probably 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 electronic level indication are approximately the same, within $\pm 2\%$ 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 **Loss of Signal** 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.
- **Over-Flow (>110%)** is an indication that the flow signal is showing greater than 110% and less than 125% of maximum gas flow according to the set-up conditions indicated in the Odorization Parameter and Calibration sections of the N-400 controller.
- **No Flow** is an indication that the flow signal being received by the NJEX ZEO 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.

Signal Alarm & Non-Alarm Troubleshooting Steps

1. **Loss of Signal** 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 **TB 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.

SECTION 6: TROUBLESHOOTING

- 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 5v, the problem resides with the transmitted signal. Correct as necessary at the signal source. 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.
 - b. If the NJEX ZEO 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 **TB** 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%)** indicator will activate when the flow signal is showing greater than 110% and less than 125% of the maximum gas flow according to the set-up conditions indicated in the parameter and calibration sections of the N-400 controller.
 - 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 5v, the problem resides with the transmitted signal. Correct as necessary at the signal source. If the voltage on the voltmeter is within the 1-5v range, the problem

SECTION 6: TROUBLESHOOTING

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 ZEO System is set to receive a pulse signal and receive this alarm, 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.

Verometer Alarms

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

- **Verometer Cable** alarm indicates a failure to communicate between the verometer and the N-400 controller.
- **No Fill** alarm is activated triggered if the Verometer fails to fill to 100% within 6 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 to 100% within 3 minutes. This alarm actuates with either an automatic or manual fill request.
- **Leakage** is indicated when the verometer level drops while the injection pump is not energized.
- **Transfer Pump Leak** is indicated when the verometer level increases while the transfer pump is not energized.
- **Temp Cable** alarm indicates a failure to communicate between the verometer RTD cable and the N-400 controller.

Non-Alarm Verometer Indicators

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

Verometer Cable Alarm Troubleshooting Steps

WARNING: Power must be disconnected or locked out from the NJEX ZEO system before performing any troubleshooting or repair to electrical components.

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.

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Verometer No Fill Alarm Troubleshooting Steps

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

1. Refer to the P&ID to ensure the correct valves are open to allow the verometer to fill.
2. Check the bulk odorant supply filter and valves for possible restriction or closure and adjust or replace as necessary.
3. Check tubing between bulk odorant storage tank and enclosure for damage or leaks. If tubing is crimped, bent, or damaged, by any form that could restrict flow, replace the tubing.
4. Check the inlet pressure read on the N-400 controller screen – ensure inlet pressure is within 10-25 psi (0.7–1.7 Bar). If the pressure is increasing when the transfer pump turns on, contact YZ Technical Service.
5. If the verometer is still not filling, contact YZ Systems Technical Service.

Verometer Slow Fill Alarm Troubleshooting Steps

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

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

1. Refer to the P&ID to ensure the correct valves are fully open to allow the verometer to fill.
2. Check bulk odorant supply filter and valves for possible restriction or closure and adjust or 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. Check tubing between the bulk odorant storage tank and the blanket gas connection on the back of the cabinet. If tubing is crimped, bent, or damaged by any form that could restrict flow, replace the tubing. Disconnect the blanket gas line and check for misdirected odorant and drain if discovered.

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 the odorant supply pressure is between 10 - 25 psi (.68 - 1.72 Bar)

SECTION 6: TROUBLESHOOTING

4. Inspect the check valve located on the left side of the manifold and repair if components are damaged.

Transfer Pump Leakage Alarm Troubleshooting Steps

When an active **Transfer Pump** alarm is indicated, the following steps should be taken:

1. Inspect the system for any obvious leaks and repair as necessary.
2. Verify valve positions are in the correct position according to the P&ID located in the cabinet door.
3. 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.
4. Verify the odorant supply pressure is between 10 - 25 psi (.68 - 1.72 Bar)

Verometer Temp Cable Alarm Troubleshooting Steps

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

1. Inspect RTD cable 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 RTD connection threaded into the back of the verometer.
3. Reinstall RTD in the back of the verometer. Observe if the alarm is still active, if it is, contact YZ Technical Services.

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.

Odorant Pressure Alarms

The NJEX ZEO unit requires 10 – 25 psi (.68-17.2 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 10 psi (.68 Bar) and 30 psi (2.0 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.

SECTION 6: TROUBLESHOOTING

- **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 Inlet 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 10 – 25 psi (.68 – 17.2 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 5.
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 10 – 25 psi (.68 – 17.2 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 5.
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.

Injection Pump Alarms

There are two Injection Pump alarms monitored by the N-400 Controller to ensure correct and safe operation of the NJEX ZEO System. The alarms relating to the Injection Pump and their description is as follows:

- **ACC Cable** alarm indicates a failure to communicate between the Injection Pump and the N-400 controller.
- **Injection Pump Diaphragm Failure** alarm indicates leakage has been detected in the pump head signifying a diaphragm failure.
- **Pump Capacity Low** alarm indicates the injection pump capacity is low based on the ACC position, for example if the ACC position indicates 100% flow but the injection pump is not flowing.
- **Pump Capacity High** alarm indicates the injection pump capacity is high based on the ACC position, for example if the ACC position lowers to 0% flow, but the injection pump is continuing to flow.
- **Capacity Control (ACC)** alarm monitors the signal sent to the ACC and the pump capacity to ensure the ACC is responding to changing signals. If the ACC makes a series of adjustments and the pump capacity stays constant, the controller will show a Capacity Control Alarm.

ACC Cable Troubleshooting Steps

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

1. Inspect the injection pump 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 assistance.

Injection Pump Diaphragm Failure Troubleshooting Steps

When an active **Diaphragm Failure** alarm is indicated, the following steps should be taken:

1. Disconnect or lock power to NJEX ZEO System before performing maintenance.
2. Inspect the pressure switch tubing running from the Injection Pump head to the explosion proof or flameproof enclosure. If damaged, replace and restore power to the system and check for the alarm again.
3. If the Injection Pump alarm is still active, begin replacing the diaphragms. See *Appendix H for Injection Pump diaphragm replacement*.

Pump Capacity Alarm Troubleshooting Steps

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

1. Check the injection pump calibration within the N-400 controller and ensure the pump has been calibrated to the current pipeline pressure. Calibrate if necessary and check for the alarm again.
2. Inspect all valve positions and ensure valve positions are in the normal operation position based on the P&ID located on the inside of the cabinet door.
3. Ensure the verometer has odorant and the blanket gas pressure is within the required window.
4. Inspect all check valves within the manifold and pump head to ensure they are properly installed. To remove the check valves, properly purge and vent the system. If any damage is seen on any check valves, replace and prime and restart system and check if injection rate alarm reoccurs.
5. Inspect the discharge tubing for any damage and replace if necessary.
6. If the alarm is still active, please contact YZ Technical Services for additional assistance.

Capacity Control Alarm Troubleshooting Steps

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

1. Check the injection pump calibration within the N-400 controller and ensure the pump has been calibrated to the current pipeline pressure. Calibrate if necessary and check for the alarm again.
2. Inspect all valve positions and ensure valve positions are in the normal operation position based on the P&ID located on the inside of the cabinet door.
3. Ensure the verometer has odorant and the blanket gas pressure is within the required window.
4. Inspect all check valves within the manifold and pump head to ensure they are properly installed. To remove the check valves, properly purge and vent the system. If any damage is seen on any check valves, replace and prime and restart system and check if injection rate alarm reoccurs.
5. Inspect the discharge tubing for any damage and replace if necessary.
6. If the alarm is still active, please contact YZ Technical Services for additional assistance.

Injection Rate Alarms

The NJEX ZEO system monitors and controls the volume of odorant injected and calculates an injection rate over time. The injection rate alarm is tied to the 1-hour injection rate value. If the system detects a deviation in the injection rate compared to the input target, an injection rate alarm will be displayed. The injection rate alarm high and low values can be adjusted in the Alarm Parameters. The recommended setting for the injection rate alarm limit is +/-25%.

Injection Rate Alarm Troubleshooting Steps

1. Inspect the system for any obvious leaks and repair as necessary.
2. Refer to the P&ID to ensure the valves are in the proper position for normal operation.
3. Check the oil level in the injection pump and fill if necessary.
4. The injection pump is built with an internal pressure relief valve. If the pressure relief valve is set at a lower pressure than the discharge pressure, the relief will open and a knocking noise will be heard with each pump stroke.
 - 4.1. To increase the cracking pressure of the relief valve, identify the adjusting screw by the yellow cap installed in front of the oil fill cap. Remove the adjusting screw cap and using a hex key, rotate the adjusting screw clockwise until the pump is no longer bypassing. The knocking noise will no longer be heard with the pump stroke. After bypassing discontinues, adjust the screw one additional full turn clockwise to provide a buffer zone for the discharge line pressure.
5. Inspect all check valves within the manifold and pump head to ensure they are properly installed. To remove the check valves, properly purge and vent the system. If any damage is seen on any check valves, replace and prime and restart system and check if injection rate alarm reoccurs.

Controller Alarms

There are four controller alarms that monitor the communication of the controller to the Intrinsically Safe Transition Circuit Board (ISTB) located within the explosion proof or flame proof enclosure in the lower cabinet.

- **IS Transition Board Cable** will enable if the N-400 Controller has lost connection with the ISTB.
- **IS Transition Board Sync** will enable if the N-400 Controller is unable to sync with the ISTB.
- **HW Error 1** will enable if the N-400 controller is unable to write to its internal memory.
- **HW Error 2** will enable if the N-400 real time clock has failed.

SECTION 6: TROUBLESHOOTING

IS Transition Board Cable Troubleshooting Steps

When an active **IS Transition Board** alarm is indicated, the following steps should be taken:

1. Verify the wiring is properly connected within the N-400 controller. Please refer to the *Wiring Control Document located in Appendix B*.
2. If the alarm persists, inspect wiring that runs from the controller to the explosion proof or flame proof enclosure located in the lower compartment for signs of damage. Replace as necessary.
3. If the alarm continues, please contact YZ Technical Services for additional support.

IS Transition Board Sync Troubleshooting Steps

When an active **IS Board Sync** alarm is indicated, the following steps should be taken:

1. Verify the wiring is properly connected within the N-400 controller. Please refer to the *Wiring Control Document located in Appendix B*.
2. If the alarm persists, inspect wiring that runs from the controller to the explosion proof or flame proof enclosure located in the lower compartment for signs of damage. Replace as necessary.
3. If the alarm continues, please contact YZ Technical Services for additional support.

HW Error 1 Troubleshooting Steps

When an active **HW Error 1** or **HW Error 2** is active, please contact YZ Technical Services for support.

SECTION 6: TROUBLESHOOTING

Notes

[illegible]

SECTION 6: TROUBLESHOOTING

Notes

[illegible]

Section 7: System Maintenance

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 ZEO 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, intermediate block, etc. Purging and venting removes odorant and pressure in the suction line up to the pump head and intermediate block. 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 odorant tank pressure and level
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 tube fittings for leaks
2. Inspect and clear odorant filter located in the inlet line.

Annual Inspection

1. Change filter located on exterior of cabinet
2. Change bulk odorant filter elements within manifold
3. Test regulators and service as needed
4. Drain and replace injection pump oil
5. Test the NJEX ZEO System performance

Recommended Spare Parts		
Part #	Description	Quantity
D3-0295	ZEO Diaphragm Replacement Tools	1
D3-0307	ZEO Check Valve Kit	1
C4-1222	Odorant Inlet Filter	1
D3-0305	ZEO Bulk Filter Kit	1
D3-0296*	ZEO Diaphragm Replacement Kit	1
D2-0077	ZEO Hydraulic/Gear Oil SHC-629 (Quart)	1
D3-0297	N-400 Fuse Replacement Kit	1

* Injection pump diaphragms should only be changed on an as needed basis such as the injection pump was run dry (without fluid), or an injection pump diaphragm alarm has been indicated.

Safety Notes – Maintenance

- All *general safety notes in Section 1* of this manual should be reviewed prior to performing any maintenance on NJEX ZEO 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 ZEO system purges gas and vents pressure in the suction lines of the system. This allows for maintenance on the inlet filters, transfer pump, and suction check valves. 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 ZEO system before performing any troubleshooting or repair to electrical components.

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: SYSTEM MAINTENANCE

Notes

[illegible]

[illegible]

Appendix A: NJEX ZEO Response Forms

For the Record

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

Basic information on the NJEX ZEO 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: _____

Bulk Tank: _____

10-25 psi (0.7-1.7 Bar) bulk tank pressure range is required.

Supply Pressure: _____

35-60 psi (2.4-4.1 Bar) supply pressure is required.

Gas Flow Rate: _____

Record in MMCF/hr or m3/sec.

Bulk Odorant Storage Level: _____

Ambient Temp Range: _____

Parameters

Injection Rate: _____

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

NJEX ZEO Troubleshooting Form

For assistance in troubleshooting your NJEX ZEO system, complete this form and remit to:

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

Basic Information on the NJEX ZEO System:

Location

Site ID: _____

Attending Technician: _____

Site Telephone: _____

Conditions

Pipeline Pressure: _____

Bulk Tank: _____

Supply Pressure: _____

Gas Flow Rate: _____

Bulk Odorant Storage Level: _____

Ambient Temp Range: _____

Date of Last Problem (mm/yy): _____

Parameters

Injection Rate: _____

Odorant Density: _____

Max Gas Flow: _____

Pipeline Pressure: _____

Low Flow Shutoff: _____

Flow (no signal): _____

System Stopped

- | | |
|--|---|
| <input type="checkbox"/> Remote Inhibit | <input type="checkbox"/> No Flow Signal |
| <input type="checkbox"/> Low Flow Shut Off | <input type="checkbox"/> Standby |

Alarms

Verometer

- | | |
|---|---|
| <input type="checkbox"/> Loss of Signal | <input type="checkbox"/> Leakage |
| <input type="checkbox"/> No Fill | <input type="checkbox"/> Temp Cable |
| <input type="checkbox"/> Leak | <input type="checkbox"/> Transfer Pump Leak |

Flow Signal

- | | |
|---|---|
| <input type="checkbox"/> Loss of Signal | <input type="checkbox"/> Flow (no signal) |
| <input type="checkbox"/> Overflow (>125%) | |

Pump

- | | |
|--|------------------------------------|
| <input type="checkbox"/> Diaphragm Failure | <input type="checkbox"/> ACC Cable |
|--|------------------------------------|

Odorant Inlet Pressure

- | | |
|--------------------------------|-------------------------------|
| <input type="checkbox"/> Low | <input type="checkbox"/> High |
| <input type="checkbox"/> Cable | |

Injection Rate

- | | |
|------------------------------|-------------------------------|
| <input type="checkbox"/> Low | <input type="checkbox"/> High |
|------------------------------|-------------------------------|

Odorant Tank

- | | |
|--------------------------------|-------------------------------|
| <input type="checkbox"/> Low | <input type="checkbox"/> High |
| <input type="checkbox"/> Cable | |

Injection Pump

- | | |
|---|---|
| <input type="checkbox"/> Diaphragm Failure | <input type="checkbox"/> Cable |
| <input type="checkbox"/> Pump Capacity Low | <input type="checkbox"/> Pump Capacity High |
| <input type="checkbox"/> Capacity Control (ACC) | |

Controller

- | | |
|-------------------------------------|-------------------------------------|
| <input type="checkbox"/> ISTB Cable | <input type="checkbox"/> PCB RTC |
| <input type="checkbox"/> ISTB Sync | <input type="checkbox"/> PCB EEPROM |

Non Alarm Indicators

Verometer

- | | |
|------------------------------------|------------------------------------|
| <input type="checkbox"/> Slow Fill | <input type="checkbox"/> Over Fill |
|------------------------------------|------------------------------------|

Flow Signal

- | | |
|--|---|
| <input type="checkbox"/> Low Flow Shut off | <input type="checkbox"/> Overflow (>115%) |
| <input type="checkbox"/> No Flow Signal | |

Redundancy

- | |
|--------------------------------------|
| <input type="checkbox"/> Failed Over |
|--------------------------------------|

Appendix B: Wiring Control Document



ZERO EMISSIONS ODORIZER SYSTEMS HAZARDOUS AREA INSTALLATION INSTRUCTIONS AND DRAWINGS

The following instructions apply to equipment covered by the following certificate numbers:

IECEX: IECEX ETL 20.0027X, IECEX ETL 20.0051X
ATEX: ITS20ATEX205600X, ITS-I21ATEX29212X
UKEX: ITS21UKEX0027X, ITS21UKEX0038X

NORTH AMERICA:

UNITED STATES: 103921294DAL-003, 104331989DAL-001

CANADA: ETL20CA103921294X

The N400 Controller Assembly may be used in hazardous area locations with flammable gases and vapors of Class I group IIB Zone 0 and Division 1 Group C, D with a temperature class rating of T4 with an ambient temperature range of -20C to +60C, when installed in accordance to this document.

The N400 Controller interconnected to the IS Transition Board assembly are used in a Zero Emissions Odorizer System, the ZEO system, depending on model, may be used in hazardous area locations with flammable gas and vapors of Class I group IIB Zone 1 or Division 1 Group C, D with a temperature class rating of T3C for Division 1, and T4 for Zone1 Installations with an ambient temperature range of -20C to +50C.

A Zero Emissions Odorizer System contains an N400 Intrinsically Safe Controller Assembly, and G0-0089 Intrinsically Safe Transition Board Assembly mounted in a flameproof / explosion proof enclosure, and factory interconnect wiring. For safe operation and installation the information in this document, 1E-0384, 1E-0385, and The NJEX ZEO Instruction & Operating Manual shall be observed. Factory wiring shall not modified (exception factory supplied G2-0012 Tank Level Cable Assembly can be shortened during installation as needed).

The system shall only be installed and maintained by qualified personnel in accordance with all local and national laws, directives, and standards applicable to the country and area of installation.

22 FEB 21	25581	CORRECTED AREA SAFETY RATINGS / MARKINGS	GSS	SPH	06
25 AUG 20	24401	INTERTEK REQUIRED CHANGES	GSS	SPH	05
05 AUG 20	24401	CORRECTED TYPO. CLARIFIED JUMPER DETAIL	GSS	SPH	04
13 JUL 20	24401	MODIFICATIONS PER INTERTEK	GSS	SPH	03
27 MAY 20	24401	ADDITIONAL INTERTEK CHANGES	GSS	SPH	02
30 APR 20	24401	UPDATES FROM INTERTEK REVIEW	GSS	SPH	01
DATE	ECN	DESCRIPTION	UPD BY	APR BY	REV

REVISION HISTORY

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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



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MILTON ROY, LLC

TITLE

INSTALLATION DRAWING ZEO INJECTION SYSTEM INSTALLATION INSTRUCTIONS

DO NOT SCALE DRAWING	SIZE A	DRAWING NO 1E-0378	REV 06
SCALE 1 : 1		SHEET 1 of 6	

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ZERO EMISSIONS ODORIZER SYSTEMS HAZARDOUS AREA INSTALLATION INSTRUCTIONS AND DRAWINGS

WARNING: Substitution of components may impair intrinsic safety.

AVERTISSEMENT: La substitution de composants peut compromettre la sécurité intrinsèque.

WARNING: Explosion Hazard - To prevent ignition of an explosion atmosphere remove power before disconnecting any equipment or wiring unless the area is known to be non-hazardous.

AVERTISSEMENT: Risque d'explosion - Pour éviter l'inflammation d'une atmosphère d'explosion, coupez l'alimentation avant de déconnecter tout équipement ou câblage, à moins que la zone ne soit connue pour être non dangereuse.

WARNING: Replace removable fuses with the same type and rating to provide protection against the risk of fire and shock.

AVERTISSEMENT: Remplacez les fusibles amovibles avec le même type et les mêmes caractéristiques pour vous protéger contre les risques d'incendie et de choc.

WARNING: Controller and IS Transition programming ports are for maintenance only. Do not use or connect any devices unless the area is known to be non-hazardous.

AVERTISSEMENT: Les ports de programmation Controller et IS Transition sont destinés à la maintenance uniquement. N'utilisez ni ne connectez aucun appareil à moins que la zone ne soit pas dangereuse.

WARNING: F2-0238 Controller real time clock backup battery (BT1) may explode if mistreated. Do Not Recharge, Disassemble or Dispose of in fire.

AVERTISSEMENT: F2-0238 La pile de secours de l'horloge en temps réel du contrôleur (BT1) peut exploser si elle est malmenée. Ne pas recharger, démonter ou jeter au feu.

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.

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

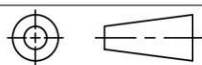
AVERTISSEMENT: RISQUE DE CHARGE STATIQUE POTENTIEL - Pour éviter l'accumulation d'électricité statique, utilisez un chiffon humide pour nettoyer toutes les surfaces peintes ou non métalliques.

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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]
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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-RP1206.1

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.

G0-0089 Intrinsically Safe Transition Board assembly shall be mounted in a suitable Explosion Proof / Flameproof enclosure, and complete enclosure assembly shall be separately evaluated and certified per all applicable requirements.

F2-0238 Controller Assembly when paired with the G0-0089 Intrinsically Safe Transition Board, F0-0021 intrinsically safe pressure transmitter, and simple device E0-3504 RTD as a system are rated as follows:

Controller Assembly

Ex ia IIB T4 Ga

Ex II 1 G Ex ia IIB T4 Ga

Class I, Zone 0, AEx ia IIB T4 Ga

Class I Division 1, Groups C-D, T4

IS Transition Board


Ex db [ia] IIC T4 Gb

Ex II 2 G Ex db [ia] IIC T4 Gb

Class I, Zone 1, AEx db [ia] IIC T4 Gb

Class I, Division 1, Groups A-D, T4

NOTES:

- INTRINSICALLY SAFE INTERCONNECT WIRING BETWEEN DEVICES SHOWN IS FACTORY INSTALLED.
- F0-0021 1-5V PRESSURE TRANSDUCERS ARE RATED CLASS I DIV.1 GROUP C,D, ZONE 0 IIB. INTRINSICALLY SAFE "ia" T4. THE METAL CASE OF INTRINSICALLY SAFE PRESSURE TRANSDUCERS SHALL BE ADEQUATELY BONDED DURING INSTALLATION.
- SUBSTITUTION OF COMPONENTS COULD IMPAIR INTRINSIC SAFETY.
- THE IS TRANSITION BOARD ASSEMBLY SHALL BE MOUNTED IN A FLAMEPROOF/EXPLOSION PROOF ENCLOSURE OR LOCATED IN AN UNCLASSIFIED SAFE AREA.
- THE INTRINSICALLY SAFE POWER SUPPLY SHALL BE MOUNTED IN A FLAMEPROOF/EXPLOSION PROOF ENCLOSURE, DIV.2/ZONE 2, OR UNCLASSIFIED SAFE AREA.
- THE 24V POWER SUPPLY SHALL BE MOUNTED IN A FLAMEPROOF/EXPLOSION PROOF ENCLOSURE OR UNCLASSIFIED SAFE AREA.
- CABLE(S) X SHALL BE SHIELDED TWISTED PAIR TYPE. CABLE SHIELDS SHALL BE EARTHED PER 60079-14 IN NON-HAZAROUS AREA.
- WHEN USING MULTI-CORE TYPE CABLE(S) FOR CABLE X THE CABLE SHALL BE TYPE A OR B PER 60079-25 CLAUSE 9.
- IF USING DIODE SAFETY BARRIERS, FOLLOW MANUFACTURERS INSTALLATION INSTRUCTIONS FOR PROPER SAFETY GROUNDING TO PROTECTIVE EARTH.
- ANALOG FLOW INPUT (TB8) AND PULSE FLOW INPUTS (TB2) SHALL NOT BE CONNECTED AT THE SAME TIME.
- INTRINSIC SAFETY BARRIERS OR ISOLATORS SHALL BE COMPLIANT WITH THE SAFETY PARAMETERS LISTED FOR EACH INPUT OR OUTPUT.
- THE AMBIENT TEMPERATURE RANGE FOR F2-0238 IS -20C TO +60C.
- F2-0238 INTRINSIC SAFETY PROTECTION LEVEL IS "ia".
- STANDARD TANK LEVEL AND 4-20mA TYPE SHALL NOT BE CONNECTED TO TB11 AT THE SAME TIME.
- REFERENCE RELATED DOCUMENT "NJEX ZEO" USERS MANUAL.
- MATERIALS USED IN THE CONSTRUCTION OF GROUP II ENCLOSURES FOR EPL Ga EXCEEDS 10% IN TOTAL OF ALUMINUM, MAGNESIUM, TITANIUM AND ZIRCONIUM. PLEASE SEE MANUAL FOR INSTRUCTIONS TO AVOID IGNITION HAZARD DUE TO IMPACT OR FRICTION.
-  **SCHEDULE DRAWING - DO NOT MODIFY WITHOUT AGENCY APPROVAL.**

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UNLESS OTHERWISE SPECIFIED:

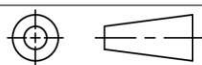
DIMENSIONS ARE INCH[mm]
INTERPRET DIM AND TOL
PER ASME Y14.5-2009

TOLERANCES:

.X ± .050[1.27]
.XX ± .010[.254]
.XXX ± .005[.127]
L ± .5"
FRACTIONS ± 1/64[.397]

FINISH: 125-√RMS

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DRAWING NO

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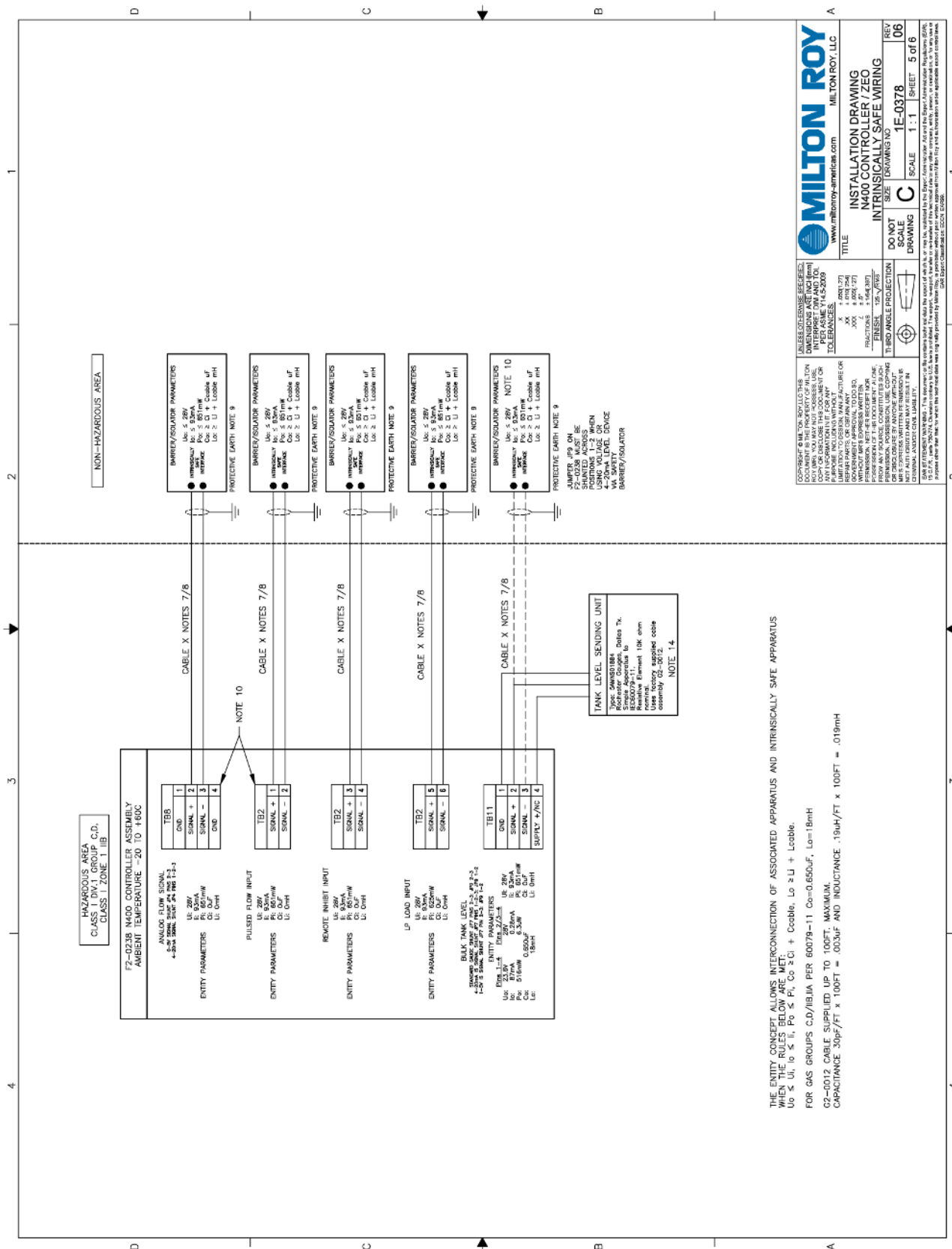
SCALE

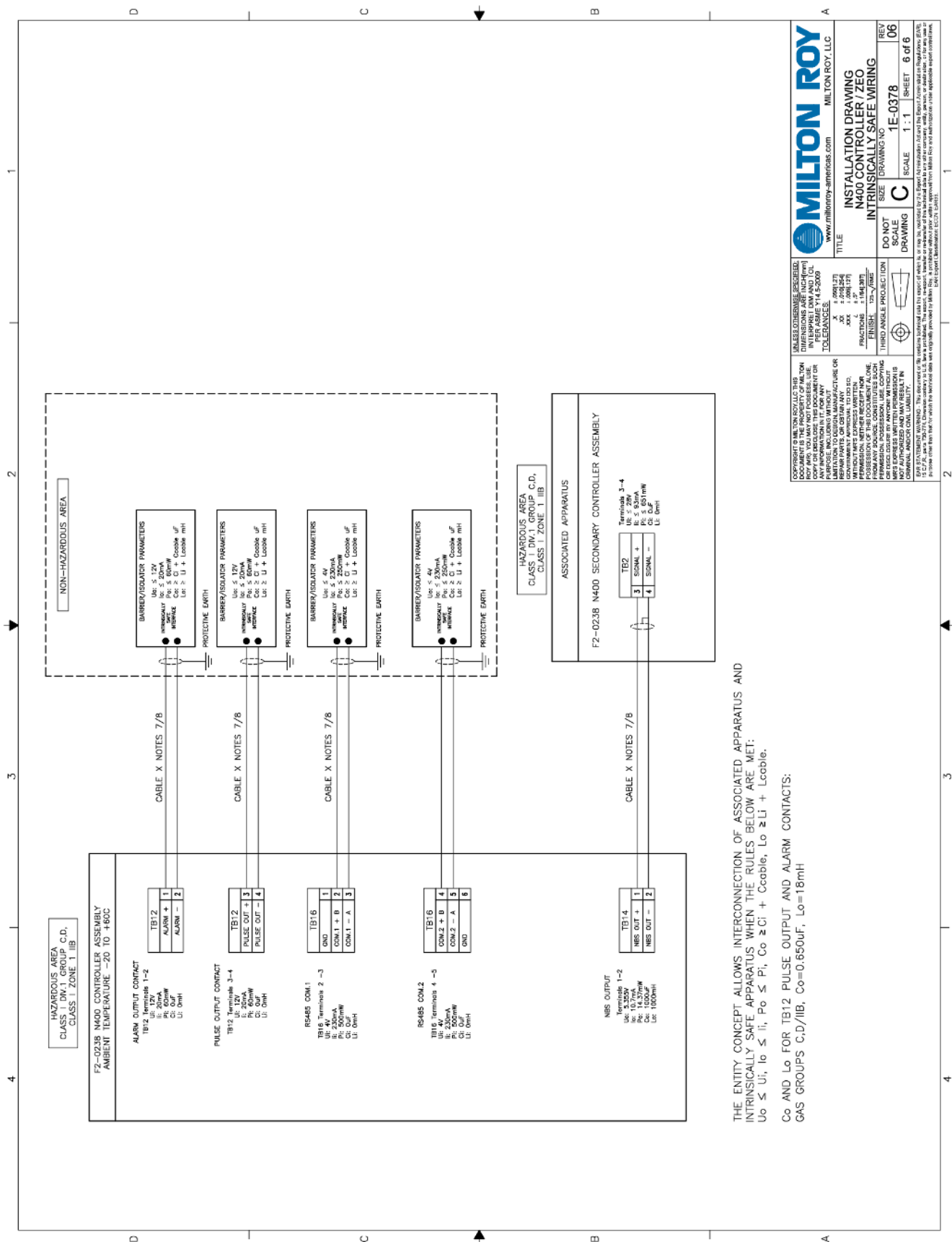
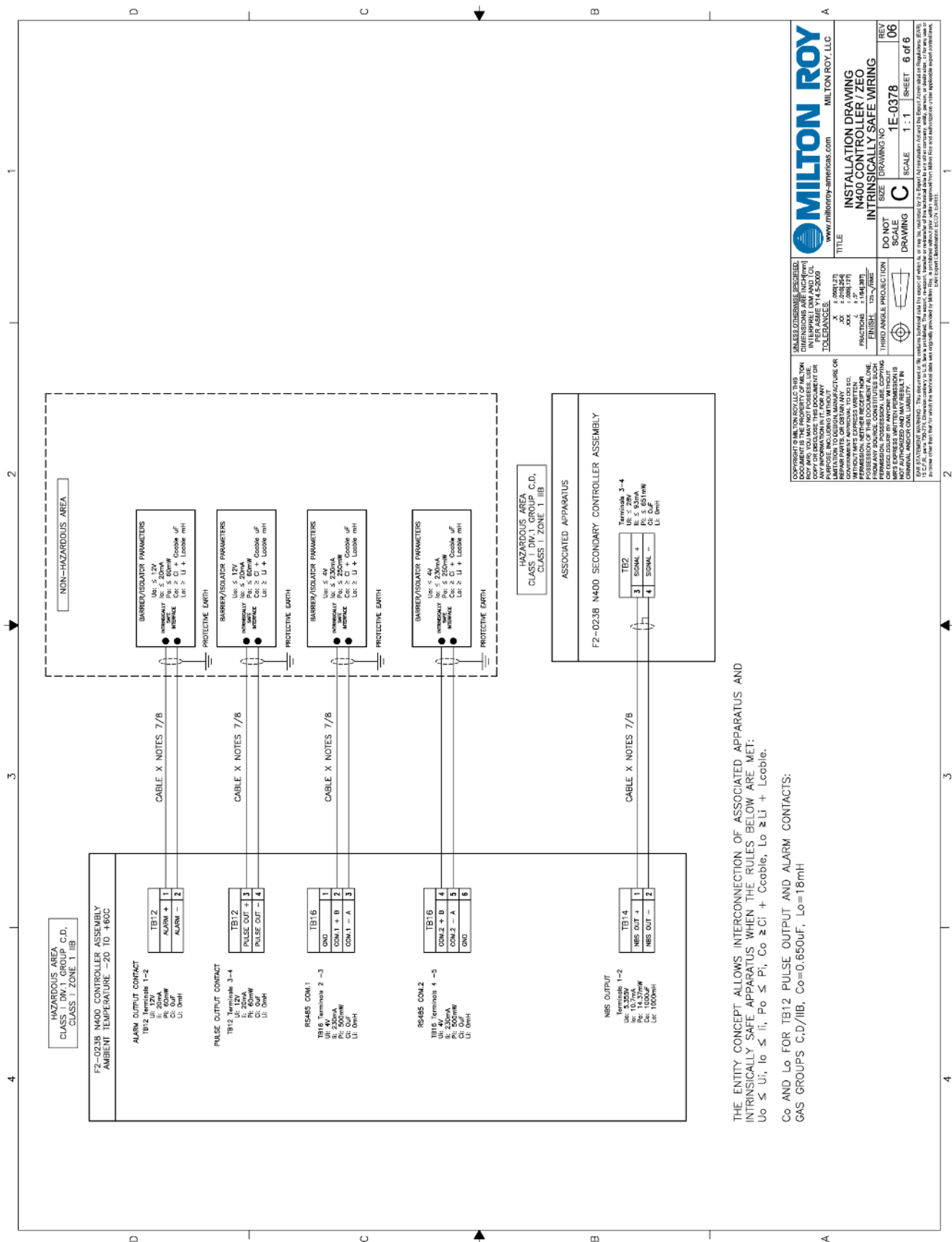
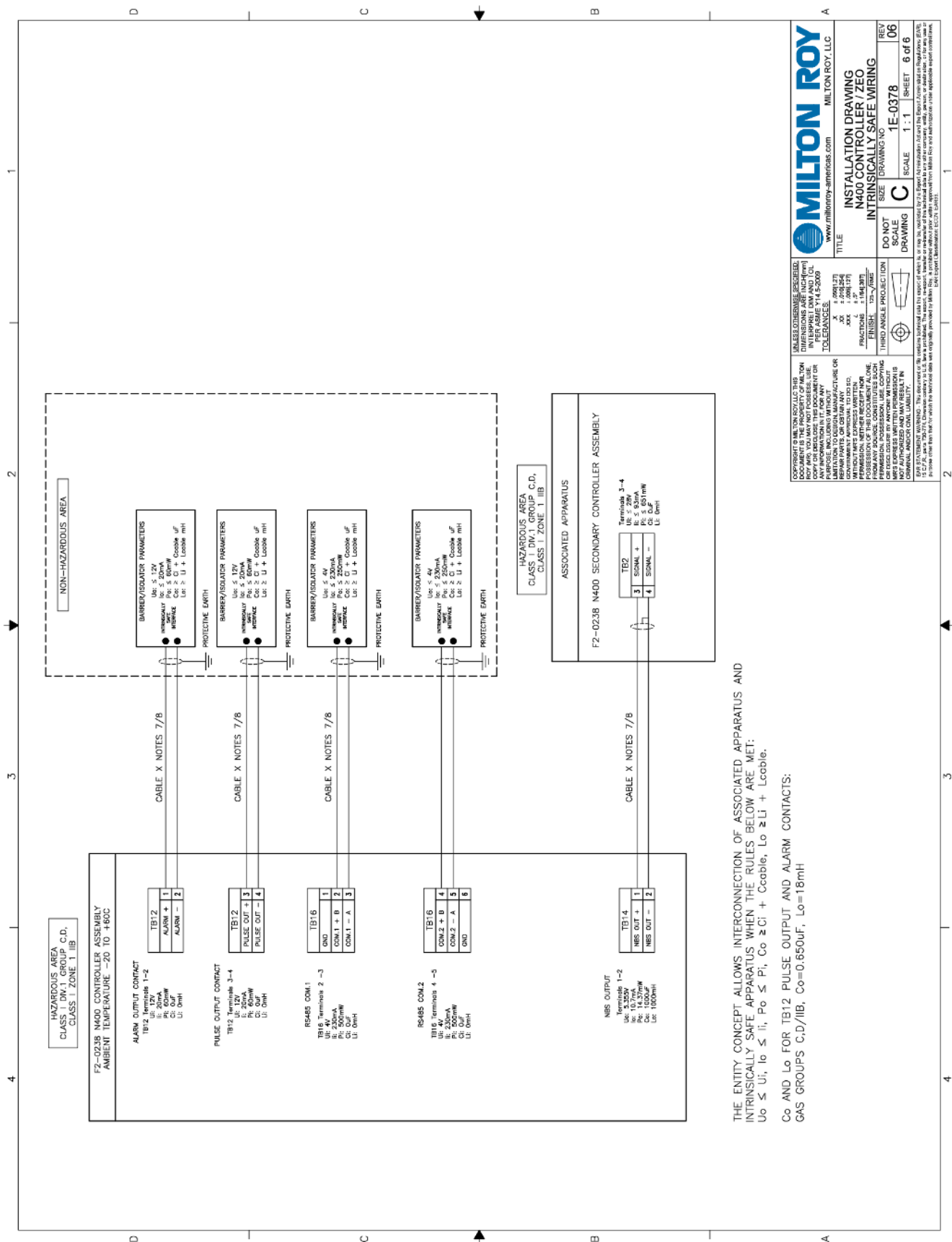
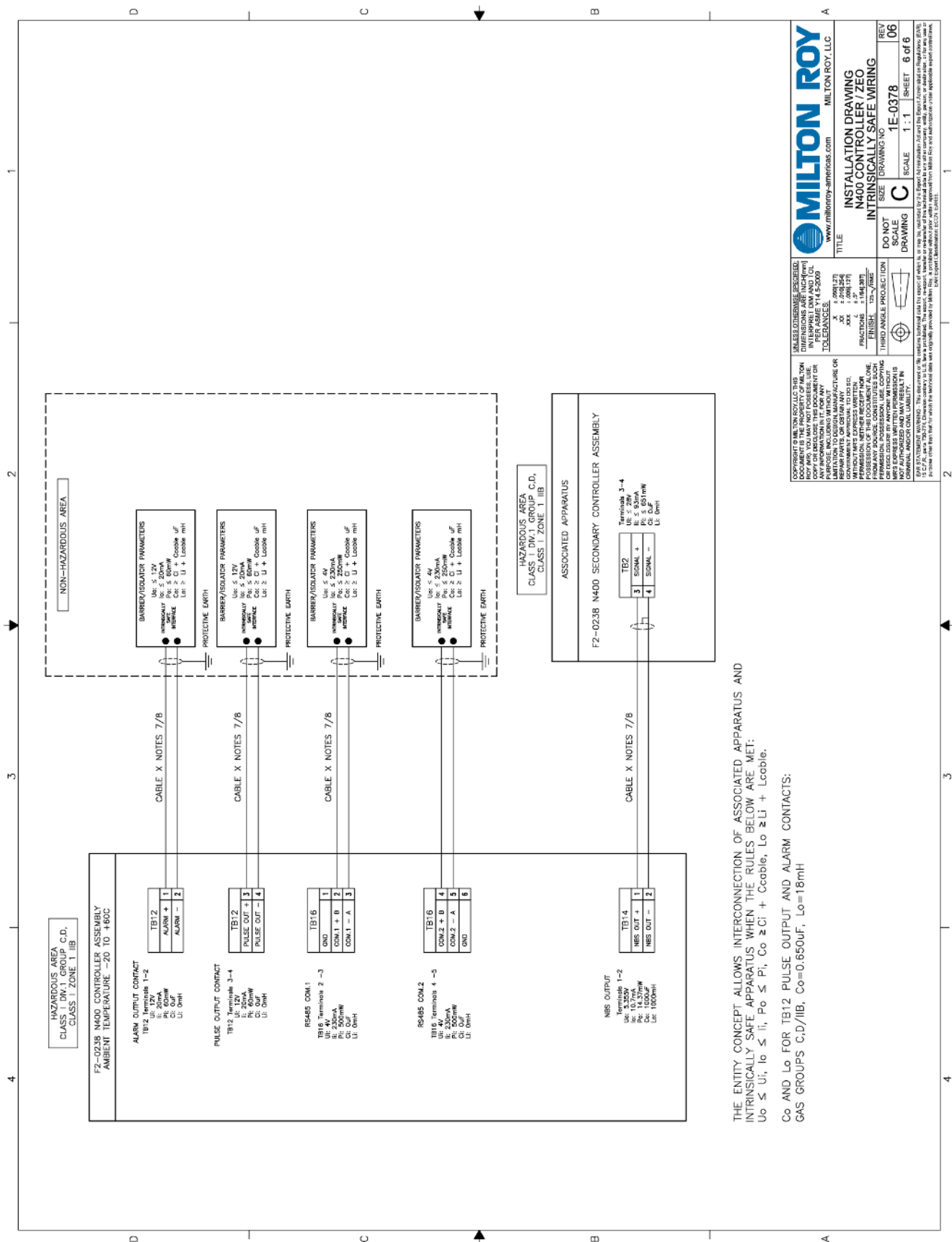
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SHEET

3 of 6

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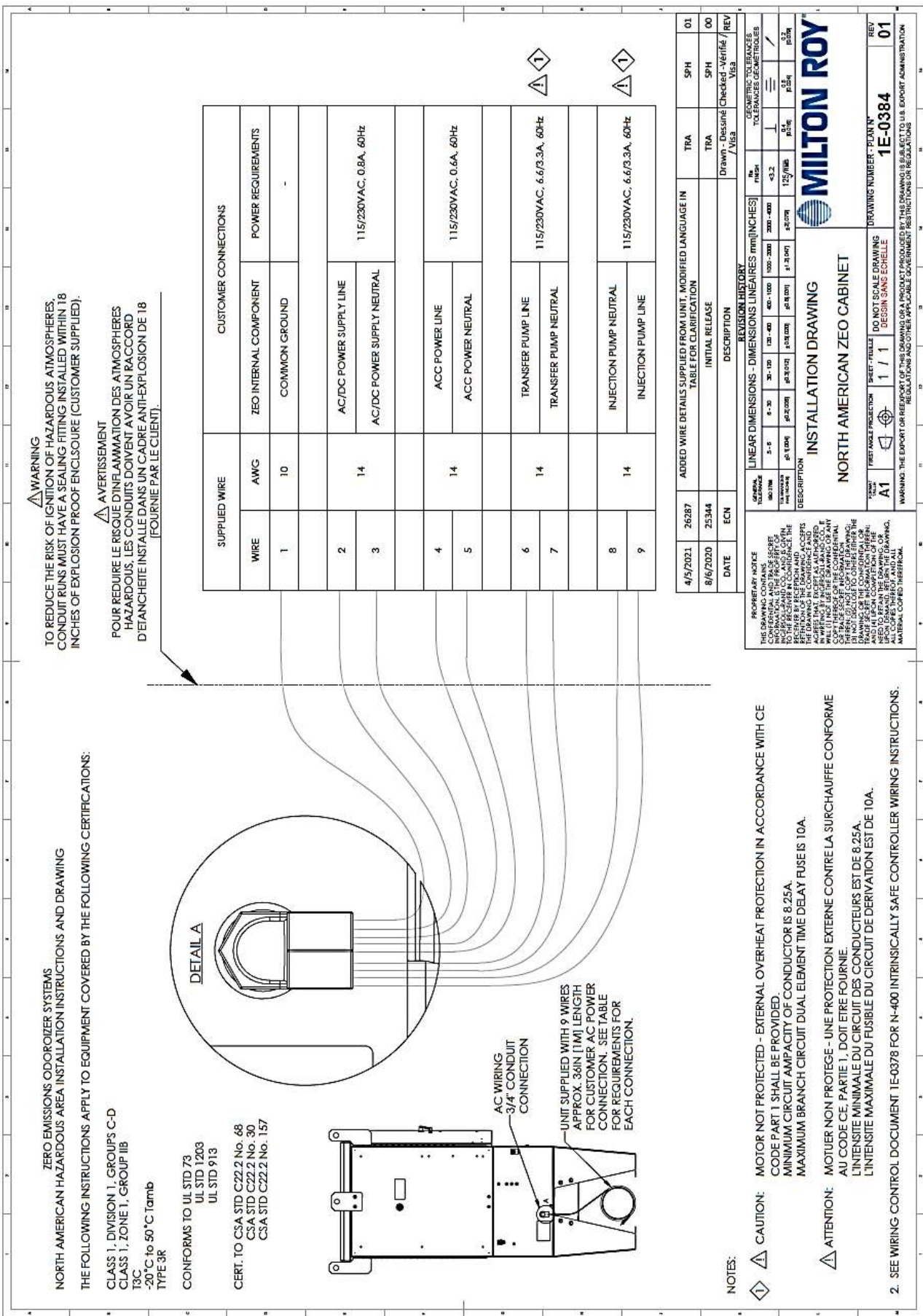


THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF ASSOCIATED APPARATUS AND INTRINSICALLY SAFE APPARATUS WHEN THE RULES BELOW ARE MET:

$Uo \leq Ui$, $Io \leq Ii$, $Po \leq Pi$, $Co \geq Ci$ + Ccable, $Lo \geq Li$ + Lcable.

Co AND Lo FOR TB12 PULSE OUTPUT AND ALARM CONTACTS:
GAS GROUPS C,D/IIB, Co=0.650uF, Lo=18mH

		MILTON ROY, LLC www.miltonroy-america.com	
<p align="center">INSTALLATION DRAWING N400 CONTROLLER / ZEO INTRINSICALLY SAFE WIRING</p>			
<p>INCHES (CONVERSION: 25.4MM PER INCH) MILLIMETERS (ARE INCHES) INTERPRET 1/8" AND 1/16" AS 0.125" AND 0.0625" TOLERANCES</p>	<p> A = 5091 21/32" B = 5091 21/32" C = 5091 21/32" D = 5091 21/32" E = 5091 21/32" F = 5091 21/32" G = 5091 21/32" H = 5091 21/32" I = 5091 21/32" J = 5091 21/32" K = 5091 21/32" L = 5091 21/32" M = 5091 21/32" N = 5091 21/32" O = 5091 21/32" P = 5091 21/32" Q = 5091 21/32" R = 5091 21/32" S = 5091 21/32" T = 5091 21/32" U = 5091 21/32" V = 5091 21/32" W = 5091 21/32" X = 5091 21/32" Y = 5091 21/32" Z = 5091 21/32" AA = 5091 21/32" AB = 5091 21/32" AC = 5091 21/32" AD = 5091 21/32" AE = 5091 21/32" AF = 5091 21/32" AG = 5091 21/32" AH = 5091 21/32" AI = 5091 21/32" AJ = 5091 21/32" AK = 5091 21/32" AL = 5091 21/32" AM = 5091 21/32" AN = 5091 21/32" AO = 5091 21/32" AP = 5091 21/32" AQ = 5091 21/32" AR = 5091 21/32" AS = 5091 21/32" AT = 5091 21/32" AU = 5091 21/32" AV = 5091 21/32" AW = 5091 21/32" AX = 5091 21/32" AY = 5091 21/32" AZ = 5091 21/32" BA = 5091 21/32" BB = 5091 21/32" BC = 5091 21/32" BD = 5091 21/32" BE = 5091 21/32" BF = 5091 21/32" BG = 5091 21/32" BH = 5091 21/32" BI = 5091 21/32" BJ = 5091 21/32" BK = 5091 21/32" BL = 5091 21/32" BM = 5091 21/32" BN = 5091 21/32" BO = 5091 21/32" BP = 5091 21/32" BQ = 5091 21/32" BR = 5091 21/32" BS = 5091 21/32" BT = 5091 21/32" BU = 5091 21/32" BV = 5091 21/32" BW = 5091 21/32" BX = 5091 21/32" BY = 5091 21/32" BZ = 5091 21/32" CA = 5091 21/32" CB = 5091 21/32" CC = 5091 21/32" CD = 5091 21/32" CE = 5091 21/32" CF = 5091 21/32" CG = 5091 21/32" CH = 5091 21/32" CI = 5091 21/32" CJ = 5091 21/32" CK = 5091 21/32" CL = 5091 21/32" CM = 5091 21/32" CN = 5091 21/32" CO = 5091 21/32" CP = 5091 21/32" CQ = 5091 21/32" CR = 5091 21/32" CS = 5091 21/32" CT = 5091 21/32" CU = 5091 21/32" CV = 5091 21/32" CW = 5091 21/32" CX = 5091 21/32" CY = 5091 21/32" CZ = 5091 21/32" DA = 5091 21/32" DB = 5091 21/32" DC = 5091 21/32" DD = 5091 21/32" DE = 5091 21/32" DF = 5091 21/32" DG = 5091 21/32" DH = 5091 21/32" DI = 5091 21/32" DJ = 5091 21/32" DK = 5091 21/32" DL = 5091 21/32" DM = 5091 21/32" DN = 5091 21/32" DO = 5091 21/32" DP = 5091 21/32" DQ = 5091 21/32" DR = 5091 21/32" DS = 5091 21/32" DT = 5091 21/32" DU = 5091 21/32" DV = 5091 21/32" DW = 5091 21/32" DX = 5091 21/32" DY = 5091 21/32" DZ = 5091 21/32" EA = 5091 21/32" EB = 5091 21/32" EC = 5091 21/32" ED = 5091 21/32" EE = 5091 21/32" EF = 5091 21/32" EG = 5091 21/32" EH = 5091 21/32" EI = 5091 21/32" EJ = 5091 21/32" EK = 5091 21/32" EL = 5091 21/32" EM = 5091 21/32" EN = 5091 21/32" EO = 5091 21/32" EP = 5091 21/32" EQ = 5091 21/32" ER = 5091 21/32" ES = 5091 21/32" ET = 5091 21/32" EU = 5091 21/32" EV = 5091 21/32" EW = 5091 21/32" EX = 5091 21/32" EY = 5091 21/32" EZ = 5091 21/32" FA = 5091 21/32" FB = 5091 21/32" FC = 5091 21/32" FD = 5091 21/32" FE = 5091 21/32" FF = 5091 21/32" FG = 5091 21/32" FH = 5091 21/32" FI = 5091 21/32" FJ = 5091 21/32" FK = 5091 21/32" FL = 5091 21/32" FM = 5091 21/32" FN = 5091 21/32" FO = 5091 21/32" FP = 5091 21/32" FQ = 5091 21/32" FR = 5091 21/32" FS = 5091 21/32" FT = 5091 21/32" FU = 5091 21/32" FV = 5091 21/32" FW = 5091 21/32" FX = 5091 21/32" FY = 5091 21/32" FZ = 5091 21/32" GA = 5091 21/32" GB = 5091 21/32" GC = 5091 21/32" GD = 5091 21/32" GE = 5091 21/32" GF = 5091 21/32" GG = 5091 21/32" GH = 5091 21/32" GI = 5091 21/32" GJ = 5091 21/32" GK = 5091 21/32" GL = 5091 21/32" GM = 5091 21/32" GN = 5091 21/32" GO = 5091 21/32" GP = 5091 21/32" GQ = 5091 21/32" GR = 5091 21/32" GS = 5091 21/32" GT = 5091 21/32" GU = 5091 21/32" GV = 5091 21/32" GW = 5091 21/32" GX = 5091 21/32" GY = 5091 21/32" GZ = 5091 21/32" HA = 5091 21/32" HB = 5091 21/32" HC = 5091 21/32" </p>		



WARNING
TO REDUCE THE RISK OF IGNITION OF HAZARDOUS ATMOSPHERES,
CONDUIT RUNS MUST HAVE A SEALING FITTING INSTALLED WITHIN 18
INCHES OF EXPLOSION PROOF ENCLOSURE (CUSTOMER SUPPLIED).

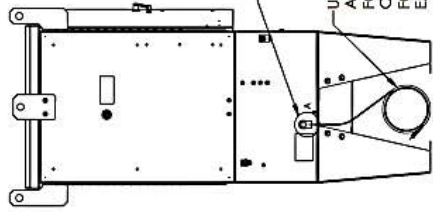
AVERTISSEMENT
POUR REDUIRE LE RISQUE D'INFLAMMATION DES ATMOSPHERES
HAZARDEUSES, LES CONDUITS DOIVENT AVOIR UN RACCORD
D'ETANCHETE INSTALLE DANS UN CADRE ANTI-EXPLOSION DE 18
POUCHES (FOURNIE PAR LE CLIENT).

ZERO EMISSIONS ODORIZER SYSTEMS
NORTH AMERICAN HAZARDOUS AREA INSTALLATION INSTRUCTIONS AND DRAWING
THE FOLLOWING INSTRUCTIONS APPLY TO EQUIPMENT COVERED BY THE FOLLOWING CERTIFICATIONS:

CLASS 1, DIVISION 1, GROUPS C-D
CLASS 1, ZONE 1, GROUP IIB
T3C
-20°C to 50°C Tamb
TYPE 3R

CONFORMS TO UL STD 73
UL STD 1203
UL STD 913

CERT. TO CSA STD C22.2 No. 68
CSA STD C22.2 No. 30
CSA STD C22.2 No. 157



UNIT SUPPLIED WITH 9 WIRES
APPROX. 36IN (1M) LENGTH
FOR CUSTOMER AC POWER
CONNECTION. SEE TABLE
FOR REQUIREMENTS FOR
EACH CONNECTION.

NOTES:

- CAUTION:** MOTOR NOT PROTECTED - EXTERNAL OVERHEAT PROTECTION IN ACCORDANCE WITH CE CODE PART 1 SHALL BE PROVIDED.
MINIMUM CIRCUIT AMPACITY OF CONDUCTOR IS 8.25A.
MAXIMUM BRANCH CIRCUIT DUAL ELEMENT TIME DELAY FUSE IS 10A.
- ATTENTION:** MOTEUR NON PROTEGE - UNE PROTECTION EXTERNE CONTRE LA SURCHAUFFE CONFORME AU CODE CE, PARTIE 1, DOIT ETRE FOURNIE.
L'INTENSITE MINIMALE DU CIRCUIT DES CONDUCTEURS EST DE 8.25A.
L'INTENSITE MAXIMALE DU FUSIBLE DU CIRCUIT DE DERIVATION EST DE 10A.

2. SEE WIRING CONTROL DOCUMENT 1E-0378 FOR N-400 INTRINSICALLY SAFE CONTROLLER WIRING INSTRUCTIONS.

SUPPLIED WIRE		CUSTOMER CONNECTIONS	
WIRE	AWG	ZEO INTERNAL COMPONENT	POWER REQUIREMENTS
1	10	COMMON GROUND	-
2	14	AC/DC POWER SUPPLY LINE	115/230VAC, 0.8A, 60Hz
3	14	AC/DC POWER SUPPLY NEUTRAL	
4	14	ACC POWER LINE	115/230VAC, 0.6A, 60Hz
5	14	ACC POWER NEUTRAL	
6	14	TRANSFER PUMP LINE	115/230VAC, 6.6/3.3A, 60Hz
7	14	TRANSFER PUMP NEUTRAL	
8	14	INJECTION PUMP NEUTRAL	115/230VAC, 6.6/3.3A, 60Hz
9	14	INJECTION PUMP LINE	

4/5/2021	26287	ADDED WIRE DETAILS SUPPLIED FROM UNIT, MODIFIED LANGUAGE IN TABLE FOR CLARIFICATION	TRA	SPH	01
8/6/2020	25344	INITIAL RELEASE	TRA	SPH	00
DATE	ECN	DESCRIPTION	Drawn - Dessiné	Checked - Vérifié	REV

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MILTON ROY CORP. 1990

LINEAR DIMENSIONS - DIMENSIONS LINEAR (INCHES)

5-8	9-10	11-12	13-14	15-16	17-18	19-20	21-22	23-24	25-26	27-28	29-30	31-32	33-34	35-36	37-38	39-40	41-42	43-44	45-46	47-48	49-50	51-52	53-54	55-56	57-58	59-60	61-62	63-64	65-66	67-68	69-70	71-72	73-74	75-76	77-78	79-80	81-82	83-84	85-86	87-88	89-90	91-92	93-94	95-96	97-98	99-100	101-102	103-104	105-106	107-108	109-110	111-112	113-114	115-116	117-118	119-120	121-122	123-124	125-126	127-128	129-130	131-132	133-134	135-136	137-138	139-140	141-142	143-144	145-146	147-148	149-150	151-152	153-154	155-156	157-158	159-160	161-162	163-164	165-166	167-168	169-170	171-172	173-174	175-176	177-178	179-180	181-182	183-184	185-186	187-188	189-190	191-192	193-194	195-196	197-198	199-200	201-202	203-204	205-206	207-208	209-210	211-212	213-214	215-216	217-218	219-220	221-222	223-224	225-226	227-228	229-230	231-232	233-234	235-236	237-238	239-240	241-242	243-244	245-246	247-248	249-250	251-252	253-254	255-256	257-258	259-260	261-262	263-264	265-266	267-268	269-270	271-272	273-274	275-276	277-278	279-280	281-282	283-284	285-286	287-288	289-290	291-292	293-294	295-296	297-298	299-300	301-302	303-304	305-306	307-308	309-310	311-312	313-314	315-316	317-318	319-320	321-322	323-324	325-326	327-328	329-330	331-332	333-334	335-336	337-338	339-340	341-342	343-344	345-346	347-348	349-350	351-352	353-354	355-356	357-358	359-360	361-362	363-364	365-366	367-368	369-370	371-372	373-374	375-376	377-378	379-380	381-382	383-384	385-386	387-388	389-390	391-392	393-394	395-396	397-398	399-400	401-402	403-404	405-406	407-408	409-410	411-412	413-414	415-416	417-418	419-420	421-422	423-424	425-426	427-428	429-430	431-432	433-434	435-436	437-438	439-440	441-442	443-444	445-446	447-448	449-450	451-452	453-454	455-456	457-458	459-460	461-462	463-464	465-466	467-468	469-470	471-472	473-474	475-476	477-478	479-480	481-482	483-484	485-486	487-488	489-490	491-492	493-494	495-496	497-498	499-500	501-502	503-504	505-506	507-508	509-510	511-512	513-514	515-516	517-518	519-520	521-522	523-524	525-526	527-528	529-530	531-532	533-534	535-536	537-538	539-540	541-542	543-544	545-546	547-548	549-550	551-552	553-554	555-556	557-558	559-560	561-562	563-564	565-566	567-568	569-570	571-572	573-574	575-576	577-578	579-580	581-582	583-584	585-586	587-588	589-590	591-592	593-594	595-596	597-598	599-600	601-602	603-604	605-606	607-608	609-610	611-612	613-614	615-616	617-618	619-620	621-622	623-624	625-626	627-628	629-630	631-632	633-634	635-636	637-638	639-640	641-642	643-644	645-646	647-648	649-650	651-652	653-654	655-656	657-658	659-660	661-662	663-664	665-666	667-668	669-670	671-672	673-674	675-676	677-678	679-680	681-682	683-684	685-686	687-688	689-690	691-692	693-694	695-696	697-698	699-700	701-702	703-704	705-706	707-708	709-710	711-712	713-714	715-716	717-718	719-720	721-722	723-724	725-726	727-728	729-730	731-732	733-734	735-736	737-738	739-740	741-742	743-744	745-746	747-748	749-750	751-752	753-754	755-756	757-758	759-760	761-762	763-764	765-766	767-768	769-770	771-772	773-774	775-776	777-778	779-780	781-782	783-784	785-786	787-788	789-790	791-792	793-794	795-796	797-798	799-800	801-802	803-804	805-806	807-808	809-810	811-812	813-814	815-816	817-818	819-820	821-822	823-824	825-826	827-828	829-830	831-832	833-834	835-836	837-838	839-840	841-842	843-844	845-846	847-848	849-850	851-852	853-854	855-856	857-858	859-860	861-862	863-864	865-866	867-868	869-870	871-872	873-874	875-876	877-878	879-880	881-882	883-884	885-886	887-888	889-890	891-892	893-894	895-896	897-898	899-900	901-902	903-904	905-906	907-908	909-910	911-912	913-914	915-916	917-918	919-920	921-922	923-924	925-926	927-928	929-930	931-932	933-934	935-936	937-938	939-940	941-942	943-944	945-946	947-948	949-950	951-952	953-954	955-956	957-958	959-960	961-962	963-964	965-966	967-968	969-970	971-972	973-974	975-976	977-978	979-980	981-982	983-984	985-986	987-988	989-990	991-992	993-994	995-996	997-998	999-1000
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INSTALLATION DRAWING

NORTH AMERICAN ZEO CABINET

MILTON ROY

DO NOT SCALE DRAWING

DRAWING NUMBER - PLAN N° 1E-0384

REV 01

DO NOT SCALE DRAWING

DESIGN: JANS CORRELE

WARNING: THE EXPORT OR REEXPORT OF THIS DRAWING IS SUBJECT TO U.S. EXPORT ADMINISTRATION REGULATIONS AND OTHER APPLICABLE DOCUMENT RESTRICTIONS ON REGULATIONS

[illegible]

Appendix C: N-400 Modbus Specifications

Communication Settings

Protocol	Modbus
Data Framing	Modbus RTU
Slave Address Range	0-247, 0 = Modbus Disabled
Baud Rates	1200, 2400, 4800, 9600, 19200, 38400, and 56000
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	Write '1' to Start the system; Write '0' to Stop the system
00002	Read/Write	Write '1' to Start a verometer fill; Write '0' to Stop a verometer fill
00003	Read/Write	Write '1' to set system in Prop. to Flow mode; Write '0' to set system in Prop. to Time mode
00004	Read/Write	Write '1' to reset the measured injection rate; always reads '0'
00005	Read/Write	Write '1' to reset the odorant injected totalizer; always reads '0'
00006	Read/Write	MODBUS Remote Inhibit Control Enabled (1); Local Remote Inhibit Control (0)
00007	Read/Write	MODBUS Remote Inhibit On (1), Off (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 its state until a read of that register was made by the master device. Once a read is made, the alarm will reflect the current state.

Address	Access	Descriptions
00201	Read Only	Alarm contact output
00202	Read Only	Global alarm
00203	Read Only	Pump ACC cable loss of signal
00204	Read Only	Pump Diaphragm Failure
00205	Read Only	Pump Capacity Low
00206	Read Only	Pump Capacity High
00207	Read Only	Capacity Control (ACC)
00208	Read Only	Flow (no signal) active (non-alarm)
00209	Read Only	Flow Signal loss of signal
00210	Read Only	Flow Signal no-flow (non-alarm)
00211	Read Only	Flow Signal >110% (non-alarm)
00212	Read Only	Flow Signal >125%
00213	Read Only	Verometer loss of signal
00214	Read Only	Verometer no fill
00215	Read Only	Verometer slow fill
00216	Read Only	Verometer overfill (non-alarm)
00217	Read Only	Verometer temp loss of signal
00218	Read Only	Verometer leak
00219	Read Only	Verometer transfer pump
00220	Read Only	Inlet pressure low
00221	Read Only	Inlet pressure high
00222	Read Only	Inlet pressure loss of signal
00223	Read Only	Injection rate low
00224	Read Only	Injection rate high
00225	Read Only	Bulk tank level low
00226	Read Only	Bulk tank level high
00227	Read Only	Bulk tank loss of signal
00228	Read Only	Controller

Status Functions

The status functions available via Modbus are listed below. The registers are accessed using Modbus function 1.

Address	Access	Descriptions
01001	Read Only	System - Started (1); Stopped (0)
01002	Read Only	Verometer - Filling (1); Not Filling (0)
01003	Read Only	Mode - Prop. to Flow Mode (1); Prop. to Time Mode (0)
01004	Read Only	Flow Signal Type - Pulse (1), Analog (0)
01005	Read Only	Pulse Mode - PPM (1); PPS (0)
01006	Read Only	Load Cycle Active (1) / Not Active (0) -- Liquid system only
01007	Read Only	No-Flow Standby - Active (1); Operating Normally (0)
01008	Read Only	Remote Inhibit - Active (1); Inactive (0)
01009	Read Only	Low Flow Shutoff - Active (1); Inactive (0)
01010	Read Only	Flow No Signal - Active (1); Inactive (0)
01011	Read Only	Power Up (1) / No Power Up (0) since last coil read
01012	Read Only	Parameter Change (1) / No Parameter Change (0) since last coil read
01013	Read Only	New HOU/LOU Data Available (1) / not available (0) since last coil read
01014	Read Only	Units - Metric Units (1); English Units (0)
01015	Read Only	Memory Module - Present (1); Not Present (0)
01016	Read Only	Resume Operation on Power-Loss - Enabled (1); Disabled (0)
01017	Read Only	Low Injection Rate Alarm - Enabled (1); Disabled (0)
01018	Read Only	High Injection Rate Alarm - Enabled (1); Disabled (0)
01019	Read Only	Bulk Tank Low Alarm - Enabled (1) / Disabled (0)
01020	Read Only	Bulk Tank High Alarm - Enabled (1) / Disabled (0)
01021	Read Only	Low Inlet Pressure Alarm - Enabled (1); Disabled (0)
01022	Read Only	High Inlet Pressure Alarm - Enabled (1); Disabled (0)
01023	Read Only	Signal Alarms - Enabled (1) / Disabled (0)
01024	Read Only	Verometer Alarms - Enabled (1) / Disabled (0)
01025	Read Only	Pump Alarms - Enabled (1) / Disabled (0)
01026	Read Only	Controller Alarms - Enabled (1) / Disabled (0)
01027	Read Only	Odorant Output - Enabled (1); Disabled (0)
01028	Read Only	Redundancy - Enabled (1); Default (NBS Output) (0)
01029	Read Only	NJEX Backup System Output - Active (1); Inactive (0) -- always reads '0' if redundancy is enabled
01030	Read Only	Redundancy Setting - Primary System (1); Backup System (0) -- always reads '0' if redundancy is disabled
01031	Read Only	Redundancy Status - Odorizing (1); Standby (0) -- always reads '0' if redundancy is disabled

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 6 allows the host to write a single holding register per query.

Function 16 allows the host to write multiple holding registers per query.

Result Data Functions

The result data functions available via Modbus are listed below. The registers are accessed using Modbus function 3. If variable type is not specified, the default variable type is a 16 bit unsigned integer.

Address	Access	Descriptions
40001-40002	Read Only	Most-recent HOU/LOU accumulated odorant injected (IEEE 754 floating-point format, most-significant word first)
40003-40004	Read Only	Most-recent HOU/LOU accumulated flow (IEEE 754 floating-point format, most-significant word first)
40005-40006	Read Only	Most-recent HOU/LOU average injection rate (IEEE 754 floating-point format, most-significant word first)
40007	Read Only	Most-recent HOU/LOU Start Date - Day of Month
40008	Read Only	Most-recent HOU/LOU Start Date - Month
40009	Read Only	Most-recent HOU/LOU Start Date - Year
40010	Read Only	Most-recent HOU/LOU Start Date - Hours (24 hour format)
40011	Read Only	Most-recent HOU/LOU Start Date - Minutes
40012	Read Only	Most-recent HOU/LOU Start Date - Seconds
40013	Read Only	Most-recent HOU/LOU End Date - Day of Month
40014	Read Only	Most-recent HOU/LOU End Date - Month
40015	Read Only	Most-recent HOU/LOU End Date - Year
40016	Read Only	Most-recent HOU/LOU End Date - Hours (24 hour format)
40017	Read Only	Most-recent HOU/LOU End Date - Minutes
40018	Read Only	Most-recent HOU/LOU End Date - Seconds
40019-40020	Read Only	System odorant injected totalizer (IEEE 754 floating-point format, most-significant word first)
40021-40022	Read Only	Serial Number (32-bit unsigned integer, most-significant word first)
40023	Read Only	Model Number (6400, 7400, 8400, 9400)
40024	Read Only	Process Type (1 = Gas, 2 = Liquid, 3 = Liquid Continuous)
40025	Read Only	Bulk tank level (0-100 %)
40026	Read Only	Odorant inlet pressure (XXX.X PSI; X.XXX Bar)
40027	Read Only	Verometer level (XXX.X %) (16-bit signed integer)
40028	Read Only	Odorant temperature (XX.X F/C) (16-bit signed integer)
40029	Read Only	Flow signal (XX.X %)
40030	Read Only	ACC output current (X.XX mA)
40031	Read Only	Measured pump capacity (XXX.X %)
40032-40033	Read Only	1 hour time-based injection rate average (IEEE 754 floating-point format, most-significant word first)

40034-40035	Read Only	1 hour flow-based injection rate average (IEEE 754 floating-point format, most-significant word first)
40036-40037	Read Only	15 minute time-based injection rate average (IEEE 754 floating-point format, most-significant word first)
40038-40039	Read Only	15 minute flow-based injection rate average (IEEE 754 floating-point format, most-significant word first)
40040-40041	Read Only	60 second time-based injection rate average (IEEE 754 floating-point format, most-significant word first)
40042-40043	Read Only	60 second flow-based injection rate average (IEEE 754 floating-point format, most-significant word first)

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 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 time - day of month
40102 *	Read/Write	Current time - month
40103 *	Read/Write	Current time - year
40104 *	Read/Write	Current time - hours (24 hour format)
40105 *	Read/Write	Current time - minutes
40106 *	Read/Write	Current time - seconds
40107 **	Read/Write	Injection Rate **See formatting info
40108 **	Read/Write	Maximum gas flow **See formatting info
40109 **	Read/Write	Maximum Injection pump capacity **See formatting info
40110 **	Read/Write	Odorant density **See formatting info
40111	Read/Write	Prop-to-time setpoint (X.XX lb(kg)/hr)
40112	Read/Write	Flow no signal (XXX % range 1-100)
40113	Read/Write	Low flow shutoff (XXX % range 1-100)
40114 **	Read/Write	Odorant output **See formatting info
40115	Read/Write	Pulses per Second
40116	Read/Write	Pulses per Minute
40117	Read/Write	Bulk Tank low (XXX % range 1-100)
40118	Read/Write	Bulk Tank high (XXX % range 1-100)
40119	Read/Write	Inlet pressure low (XXX PSI range 1-100; X.XX Bar range 0-689)
40120	Read/Write	Inlet pressure high (XXX PSI range 1-100; X.XX Bar range 0-689)
40121	Read/Write	Injection rate low (XXX % range 1 to 100)
40122	Read/Write	Injection rate high (XXX % range 1 to 100)
40123	Read/Write	System Redundancy (0 - Default; 1 - Primary; 2 - Backup)

*** Note: Registers 40101-40106 are Read-Only. Writes to these registers are ignored.**

Model Specific Formatting

The below formatting is specific to the addresses listed. For formatting parameters that are identical across all models, see the parameter description for the defined formatting.

Address	Formatting
40107	GE = X.XX lb/MMCF GM = X.XX mg/m ³
40108	6400GE = X.XXXX 7400GE, 8400GE, 9400GE = X.XXX MMCF/hr 6400GM = X.XXX 7400GM, 8400GM, 9400GM = X.XX m ³ /s
40109	GE = X.XXX gal/hr GM = X.XXX litre/hr
40110	GE = X.XX lb/gal GM = X.XXX g/cc
40114	6400GE = 0.0XXX lb/pulse 7400GE = 0.XXX lb/pulse 8400GE, 9400GE = X.XX lb/pulse 6400GM = 0.0XXX kg/pulse 7400GM = 0.XXX kg/pulse 8400GM, 9400GM = X.XX kg/pulse

Exception Responses

Exception responses are a means for the Slave device to indicate to the Master device that a query received could not be acted upon for a particular reason. Below is a listing of Exception codes.

Exception Code	Name/Description
1	Illegal Function: Function received in the query is not supported by the slave
2	Illegal Data Address: Data address received in the query is not supported by the slave
3	Illegal Data Value: Value contained in the query data field is not supported by the slave
4	Slave Device Failure: An unrecoverable error occurred while performing this action
5	Acknowledge: Query being processed but needs some time to complete
6	Slave device busy: Slave cannot process an incoming query at this time
7	Negative Acknowledge: Slave cannot perform the program function received
8	Memory parity error: A memory parity error occurred in the slave read attempt

Appendix D: 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 51.

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 51.

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 D3-0297.

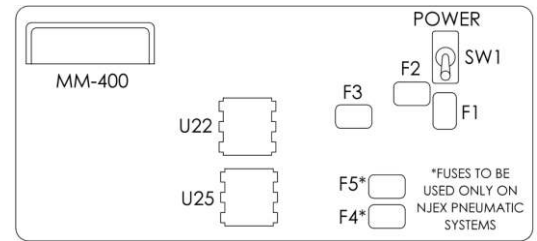


Figure 50: Component layout label. Use this label to see relative location of replacement components and the memory module and power switch.

Component	Specification	Description	Manuf. Part Number
F1	62mA 125V / 300A Breaking	Fuse, PICO hazardous area. ENCAPSULATED	Littelfuse 259.062
F2	62mA 125V / 300A Breaking	Fuse, PICO hazardous area. ENCAPSULATED	Littelfuse 259.062
F3	50mA 277V/ 1500A Breaking	Fuse, PICO hazardous area.	Littelfuse 305.05
F4*	62mA 125V / 300A Breaking	Fuse, PICO hazardous area. ENCAPSULATED	Littelfuse 259.062
F5*	62mA 125V / 300A Breaking	Fuse, PICO hazardous area. ENCAPSULATED	Littelfuse 259.062
BT1	3V 12mm 35mAH	Battery, Coin Cell	Panasonic CR1220

*NOTE: Fuses F4 and F5 are only required on NJEX pneumatic systems. Do not install F4 and F5 if the N-400 controller is used in an NJEX ZEO system.

Appendix E: Controller Mounting

The N-400 controller is to be mounted with the supplied hardware to the backplate that is fastened in the NJEX ZEO cabinet. The controller is rated for an IP64 environment and must be installed inside the cabinet to maintain proper environmental protection.

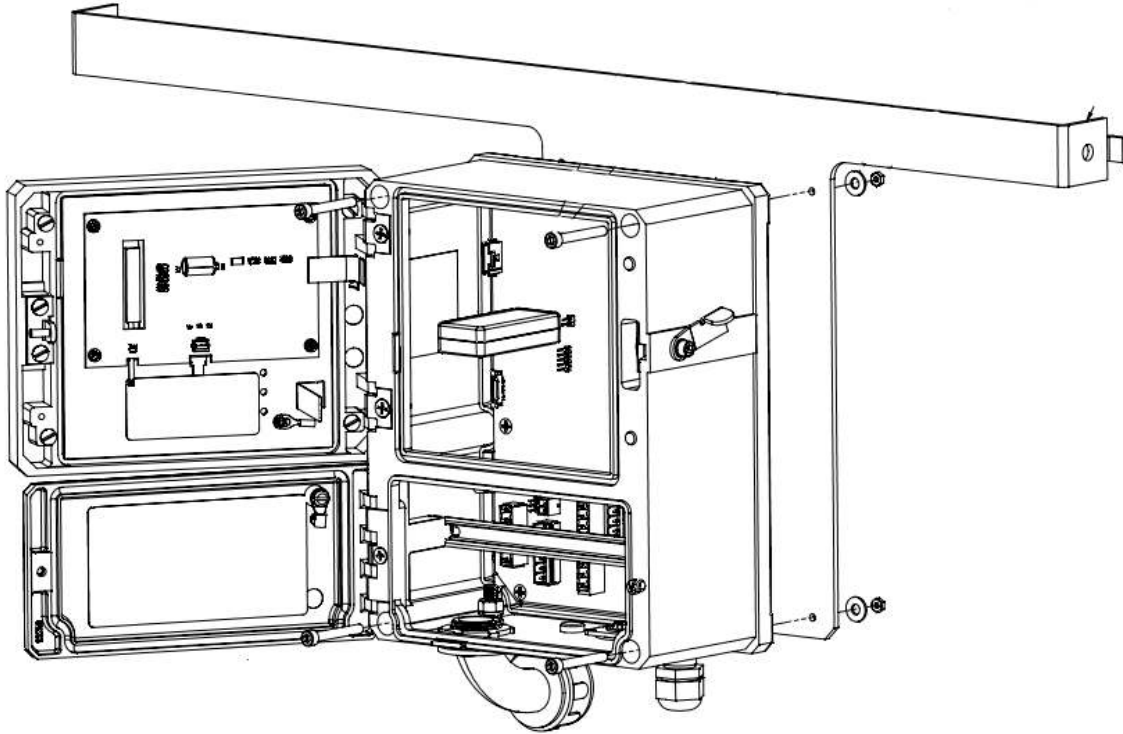
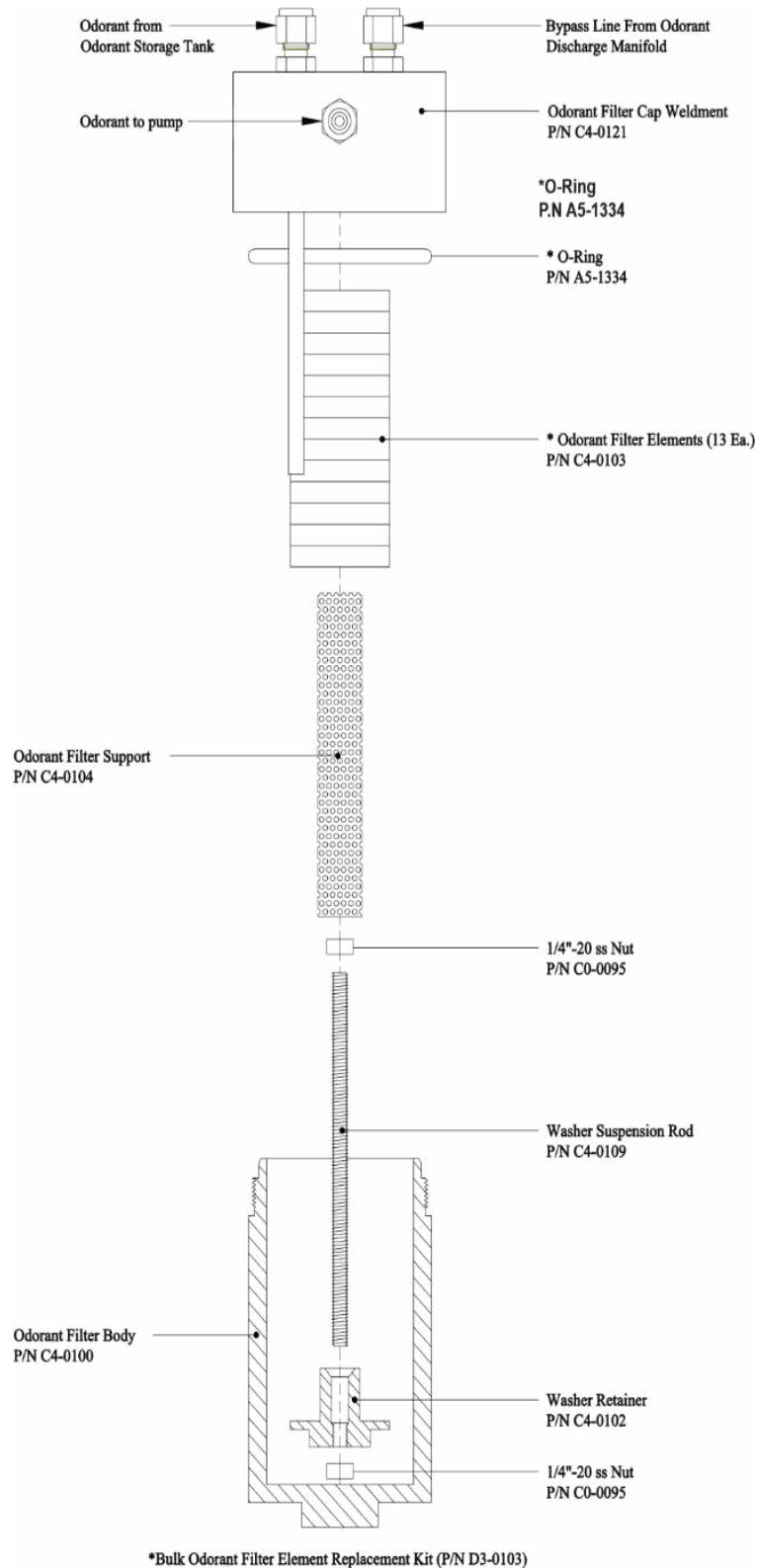


Figure 51 N-400 Controller Mounting

Appendix F: Bulk Odorant Filter Replacement



Appendix G: Injection Pump Oil Fill Procedure

Before startup of a new system installation or after routine maintenance on the injection pump, the injection pump must be filled with oil. The oil fill procedure will take approximately 15 minutes. See Table 5 for the type of oil recommended. The injection pump requires approximately 3/4 quart (24 fluid ounces) of oil for operation. After startup, the pump oil level should be monitored for the 1st hour or more.

To reduce the time to fill the oil reservoir, a sight glass located on the back of the injection pump housing, Figure 54, can be removed to provide an air vent while filling the oil chamber. The sight glass can be accessed when the side panel closest to the injection pump is removed.

TABLE 5: RECOMMENDED INJECTION PUMP OIL	
Oil Type	YZ Part Number
Mobil SHC 629	D2-0077

To begin the oil fill process:

1. Remove the right-hand side panel (optional but recommended).
2. Remove the oil reservoir cap, Figure 53.
3. Remove the sight glass port, Figure 54 (optional but recommended).
4. Pour oil into reservoir in thin, slow stream to avoid overflow.
5. While filling, monitor the open sight glass port, if applicable. Reinstall the sight glass if oil begins to purge from this port or reinstall after approximately 20 ounces of oil has been added.
6. Continue to fill until the sight glass appears approximately one quarter (1/4) to one third (1/3) full. Oil will expand after warming – do not overfill.
7. Purge the oil drain line tubing into a suitable container until little to no air is entrained. The oil drain valve is located on the back of the cabinet.
8. Check the oil level in the sight glass and add additional oil if needed after purging drain tubing. If oil level is above 1/3 full, drain additional oil until level is correct.

CAUTION: Before continuing, follow maintenance procedures to prime the transfer pump and fill verometer steps prior to turning on the injection pump.

9. In the Odorization Parameters in the N-400 controller, change operational mode to Prop-To-Time.
10. Set target injection rate to 0 lb/hr (kg/hr). The injection rate in Prop-To-Time mode can be adjusted in the Odorization Parameters menu or at the Home Screen.



Figure 52 Oil Reservoir Cap Location (Yellow) and Pressure Relief (Red)



Figure 53 Oil Level Sight Glass Location

11. Allow the ACC to adjust to position and press the Right Arrow Key to start the system.
12. Allow the system to run for 10 seconds and press the Right Arrow Key to stop the system. Check oil level in the sight glass and add oil if the oil level drops.
13. At the home screen, adjust target injection rate to 30-40% using the Up Arrow Key. Allow the ACC to adjust to position and then start the system. Allow the system to operate for 5 minutes while monitoring the oil level and add oil as needed.
14. Stop the system and adjust the target injection rate to approximately 90-100% and allow the ACC to adjust to position and restart. Allow to operate for 10 minutes while monitoring the oil level.

As the pump runs, the oil will heat and expand slightly. Check the sight glass on the back of the pump and ensure it is approximately 1/2 full. Add oil if required. Replace the oil reservoir cap and tighten hand tight. Adjust the valves for normal operation. Adjust the parameters as applicable to the application and continue starting up the system.

If the oil reservoir has been overfilled and the oil expands after warming, the sight glass will be full, and oil may overflow from the oil reservoir cap. In this case, oil should be drained from the oil drain valve and collected in a suitable container. Drain as needed until the sight glass is half full or slightly above. Collected oil must be disposed of according to local laws and regulations.

Continue to monitor the oil level for at least an hour after starting the system. If the oil level is low, the injection pump will stop injecting odorant to the discharge and the injection rate will fall. Stop the system and add additional oil if required.



Figure 54: Oil Level Guide

Appendix H: Injection Pump Diaphragm Replacement

NOTE: A set of custom tools to replace the diaphragms without removing the pump from the cabinet and a diaphragm replacement kit will be required. The custom tools were supplied with the cabinet upon purchase. Please contact your local sales representative if replacements are required.

1. Follow the Purge and Vent instructions in the Maintenance instructions in Section 5 of this manual to purge odorant and vent the suction pressure within the system.

CAUTION: The NJEX ZEO unit must be purged and vented prior to disassembling for diaphragm replacement.

2. Open the oil drain valve located in the back of the cabinet and drain the oil. Oil should be collected in a suitable container. Draining the oil will take approximately 20 to 30 minutes. Please dispose of used oil in accordance with local laws and regulations for where the system is installed.
3. Remove the intermediate block to perform maintenance on the injection pump by removing the three screws on the front face and two on the right face.
4. Note the location of the face seal o-rings on both the manifold and pump head. Collect o-rings and discard.
5. Collect any hardware for reuse when reassembling.
6. Remove the 1/8" tube fitting from the pump head for the pressure switch line on the lower right side of the pump head.
7. Remove the exposed pump head by removing the eight socket head cap screws. Remove the pump head and contour plate.
8. Remove the diaphragms and shims. Discard diaphragms.

Tools Required

- (1) Diaphragm Replacement Kit (D3-0296)
 - (2) Stud Assembly Tool (Custom) (Included in D3-0295)
 - (1) Diaphragm Retaining Tool (Custom) (Included in D3-0295)
- Allen Wrenches (Imperial)
 - Phillips Head Screwdriver
 - Threadlocker (Loctite 242 or equivalent)

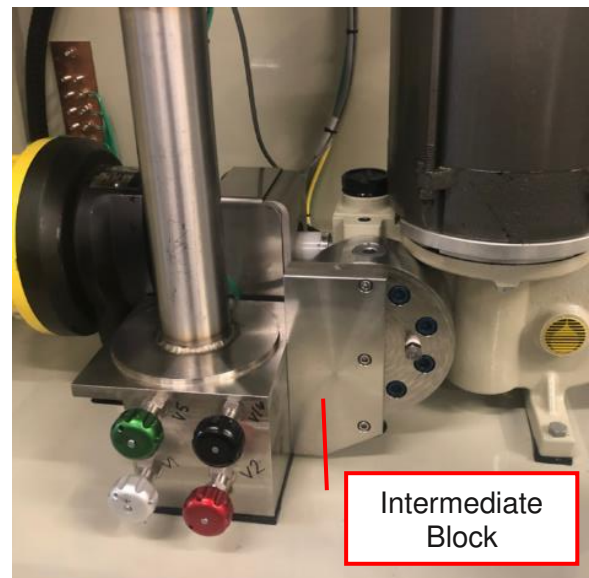


Figure 55 Intermediate Block in Cabinet

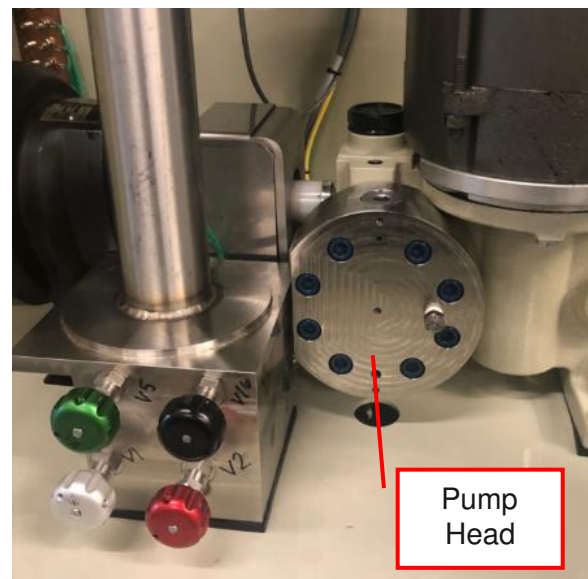


Figure 56 Pump Head in Cabinet

NOTE: A second contour plate is located within the pump housing and does not need disassembled. If it is removed during assembly, when reassembling, ensure the locating pin is aligned with the hole located in the 6 o'clock position on the pump housing.

9. Thread the stud tools into the pump housing at the bolt holes located at 11 o'clock and 5 o'clock. Stud tools should be threaded in partially until about two to three threads are exposed.
10. Install the diaphragm retaining tool between the two stud tools. The retaining tool slides into the thread relief on the stud tool. See Figure 59 Stud Tools with Diaphragm Retaining Tool Installed for Reference.
11. Install diaphragm and shim group behind the retaining tool. Shims should be alternated between the two styles for four shims total. See Figure 65 Injection Pump Liquid End Assembly for reference. Ensure the diaphragms are not scratched or damaged by the exposed locating pins. See Figure 58 Placing Diaphragms and Shims for reference.
12. Replace the o-ring within the pump head. Install the contour plate in the pump head aligning the pin in the contour plate with the mating pinhole in the pump head.
13. Prepare the pump head with contour plate and o-ring for installation by sliding the head over the threaded stud tools and slide cap screws through the six open bolt holes.
14. Using the syringe and mineral oil provided in the diaphragm replacement kit, inject mineral oil between the diaphragms. See Figure 62 Adding Mineral Oil Between Diaphragms for reference.
15. Slide the pump head into place against the pump housing. While holding the pump housing in place, slide the diaphragm retaining tool out and hand tighten the six cap screws in a star pattern.
16. Remove the threaded stud tools and fasten the remaining two cap screws.



Figure 57 Placing Diaphragms and Shims



Figure 58 Stud Tool with Diaphragm Retaining Tool Installed



Figure 59 Diaphragms and Shims Installed

17. In a star pattern, torque the eight pump head cap screws (Item 558) to 265-275 ft-lbs (30-31 Nm). Do not use a threadlocker on these fasteners.
18. Reconnect the 1/8" tubing on the lower right side of the pump head.
19. Using grease or lubricant to hold in place, install the replacement face seal o-rings in the manifold and intermediate block.
20. Install the intermediate block by first fastening the cap screws that attached the block to the manifold from the right side.

NOTE: Apply Loctite 242 or equivalent to intermediate block fasteners before installing.

21. To fasten the intermediate block to the pump head, use the flat head taper screw located in the middle to align the intermediate block and pump head. Fasten the remaining two cap screws.
22. Torque cap screws items 930 and 940 to 5.4 ft-lbs (0.61 Nm)
23. Torque cap screws items 920 and 923 to 2.3 ft-lbs (0.26 Nm).
24. Ensure the oil drain valve is closed and refill the injection pump with oil.
25. Follow the maintenance instructions in this manual to prime the system for normal operation and follow the oil fill startup procedures to ensure all air is worked out of the pump prior to resuming normal operation.
26. Disconnect the pressure switch tubing in the lower cabinet below the check valve and allow mineral oil to begin purging from the line while the injection pump is running. After the mineral oil begins purging, reconnect the tubing fitting. See Figure 63 Pressure Switch Line Fitting for reference.



Figure 60 Pump Head Prepared for Assembly with Diaphragm Retaining Tool Installed



Figure 61 Pump Head Prepared for Assembly while Injecting Mineral Oil



Figure 62 Pressure Switch Line Fitting

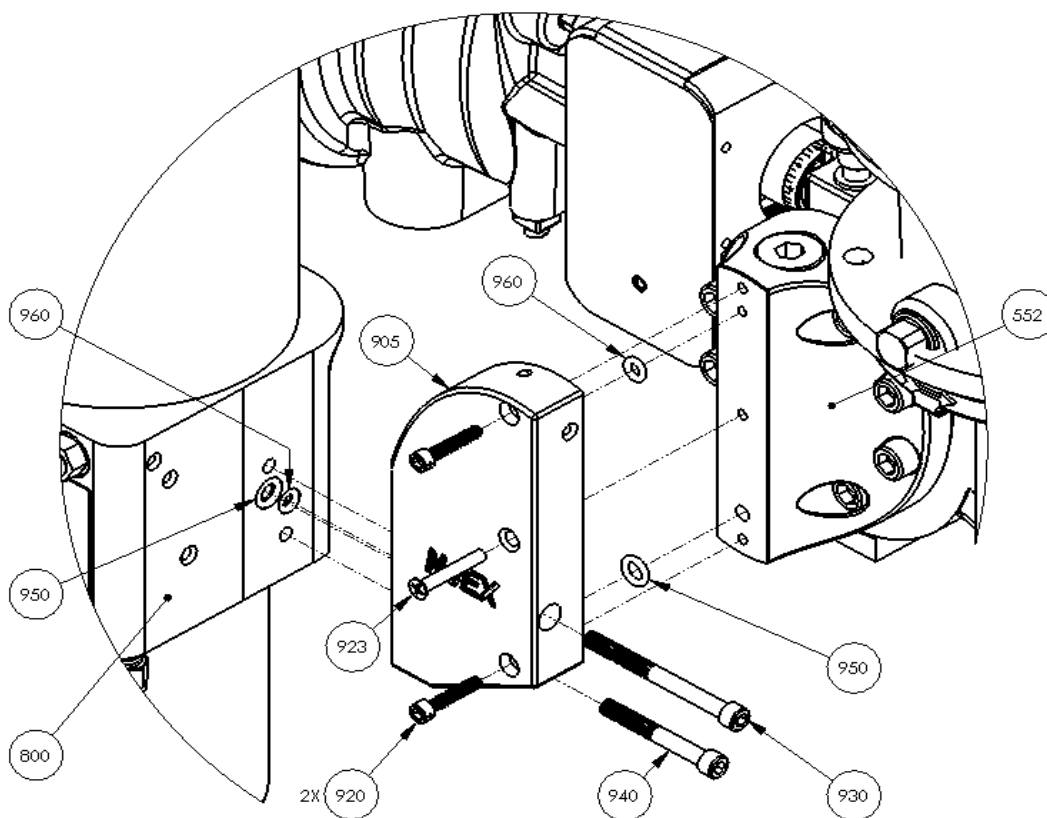


Figure 63 Intermediate Block Assembly

Item Number	Description	QTY
552	Pump Head	1
800	Manifold Assembly	1
905	Intermediate Block	1
920	10"-32 x 1.0" SHCS, Stainless Steel	2
923	10"-32 x 1.25" HDFHS Stainless Steel 82deg Countersink	1
930	1/4"-28 x 2.75" SHCS, Stainless Steel	1
940	1/4"-28 x 2.00" SHCS, Stainless Steel	1
950	O-Ring -109 Nitrile	2
960	O-Ring -107 Nitrile	2

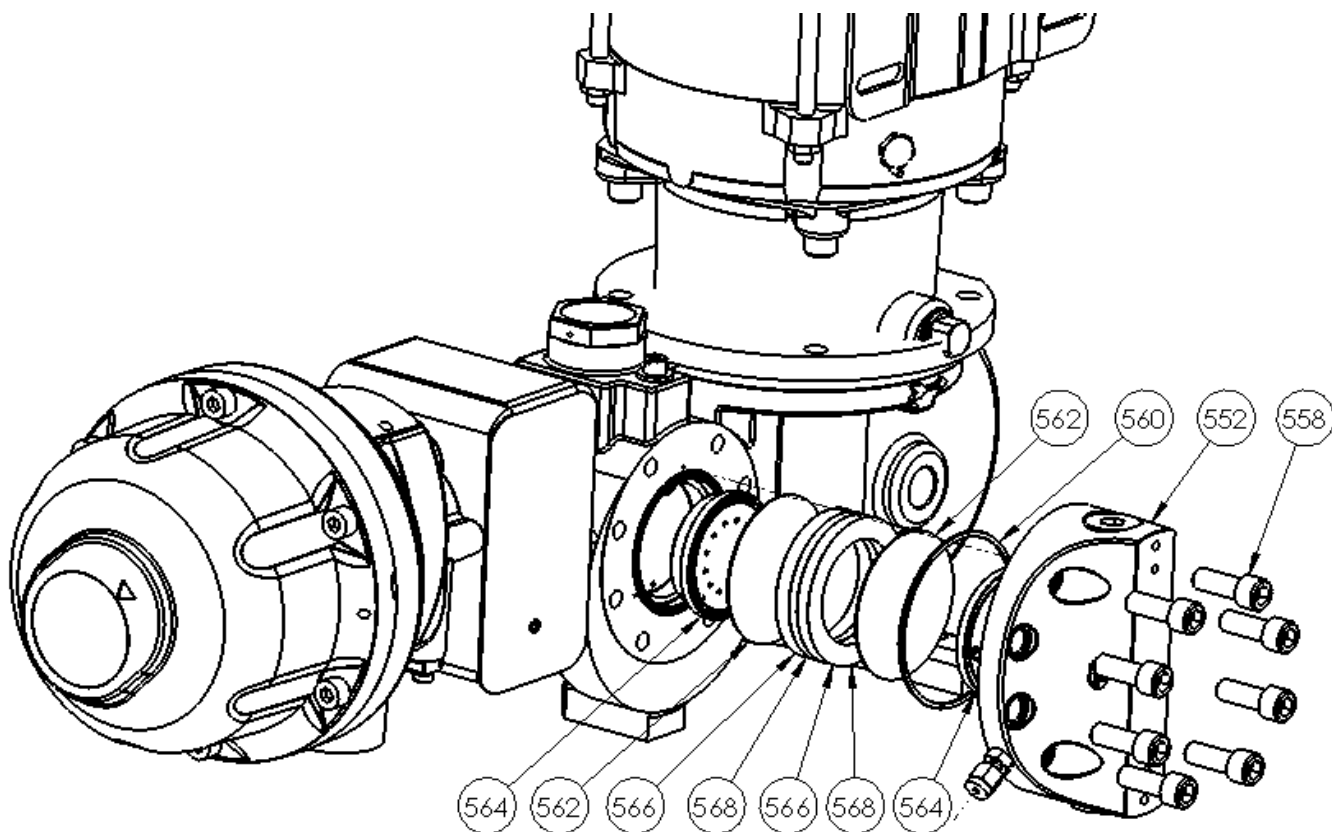


Figure 64 Injection Pump Liquid End Assembly

Item Number	Description	QTY
552	Pump Head	1
558	3/8"-16 x 1.0 SHCS, Stainless Steel	8
560	Pump Head O-Ring 2-041 Viton	1
562	Diaphragm	2
564	Contour Plate	2
566	Shim 1	2
568	Shim 2	2