

Nitrogen Generator User Guide

For all “N” Model Nitrogen Generators

Customer: Customer Name
Model: N-XX (XX SCFH @ 99.XXX%)
Serial Number: XXXX
Manufacturing Date: XX/XX/XX
Air Inlet: XXX PSI
Nitrogen Outlet: XX PSI
Electrical: 115 V, 60 Hz, 1 PH

- ✓ **STARTUP**
- ✓ **SAFE USE**
- ✓ **TIPS FOR TROUBLE-FREE
OPERATION**
- ✓ **MAINTENANCE**
- ✓ **REPLACEMENT FILTERS**

*Keep this guide
in a convenient location
for future use.*

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Introduction

Congratulations on purchasing an On Site Gas Systems nitrogen generator. Your new nitrogen generator provides you with a simple, cost-effective means for onsite generation of nitrogen.

Using the latest pressure swing adsorption and carbon molecular sieve technologies, your nitrogen generator separates nitrogen from the other gases in air, producing a nitrogen product stream and an ambient oxygen-enriched waste stream.

Before shipment, On Site Gas Systems pretests and tunes your nitrogen generator to meet your specified nitrogen flow rate and purity.

The system uses only a few moving parts and therefore requires minimal maintenance. However, you must complete the recommended maintenance to ensure proper performance and long service life. If you follow the recommended maintenance procedures, your nitrogen generator will provide you with many years of reliable service.

About On Site Gas Systems

On Site Gas Systems, founded in 1987, is a world leader in the design and manufacturing of oxygen and nitrogen generating systems. Our capabilities include conceptual and detailed engineering design, procurement, fabrication, supply, and installation of generators. We serve scores of industries worldwide. For additional information, contact us at the address below.

Where to Get Help

For assistance with the safe and proper use of your nitrogen generator, contact customer service at:

On Site Gas Systems, Inc.
35 Budney Road
Budney Industrial Park
Newington, CT 06111 USA

Telephone: 860-667-8888
Toll free: 800-559-8403
Fax: 860-667-2222

E-mail: info@onsitegas.com
Web site: www.onsitegas.com

Important Safety Information



WARNING! *Read all instructions in this user guide before installing and using your nitrogen generator.*



WARNING! *The compressed air receiving tank, nitrogen generator, and nitrogen receiving tank can contain pressurized gas. Pressurized gas may cause injury or death if you use or handle it inappropriately. Read and follow the safety instructions below.*

If you do not understand any part of the safety warnings or operating instructions, call On Site Gas Systems for assistance. You can reach a customer service representative at 860-667-8888.

- Read and keep this user guide in a convenient location for future use. Make this user guide available to all operators of the nitrogen generator.
- Direct nitrogen vented from the nitrogen receiving tank to the outside of your facility to prevent the nitrogen from displacing air in the room and causing suffocation and death.
- Operators must employ federal, state, local, and your plant's safe working practices and rules when operating the nitrogen generator.
- The owner is responsible for maintaining the unit in a safe operating condition.
- Materials that you use to maintain, assemble, and connect the nitrogen generator to supporting equipment should be rated and approved for use at the pressures generated by the nitrogen generator.
- The generator remains pressurized after shutdown. Before performing maintenance, filter changes, or opening piping, you must depressurize the system. Depressurizing the system prevents the uncontrolled escape of high-pressure gas and possible injury or death. You must wear eye and hearing protection during the depressurizing process to avoid possible injury.
- Follow your plant's lockout program before performing maintenance on the nitrogen generator.
- Only trained maintenance technicians who are familiar with high-pressure air systems and who have read this user guide should perform maintenance on the nitrogen generator.
- Wear safety glasses anytime the cabinet door is open while the machine is operating. Only open doors while the machine is off or in standby mode if exhaust is internal to the cabinet.
- Never allow high-pressure gas to exhaust from an unsecured hose. An unsecured hose may exhibit a whipping action, which can cause serious injury. If a hose should burst during use, immediately close all isolation valves.
- Never disable or bypass any safety relief valves on the air or nitrogen receiving tanks.
- Ensure the nitrogen generator is unplugged prior to performing any electrical work.

NOTE—If any statement or specification within this user guide (especially with regard to safety) does not agree with legislation or standard industry practices, the more demanding directive shall apply.

Unpacking Your Nitrogen Generator

On Site Gas Systems normally ships your nitrogen generator in a single crate or skid. We crate optional air and nitrogen receiving tanks separately. Upon delivery:

1. Inspect the crates for damage. If “Tip-N-Tells” are on the crate, verify they have not been triggered. If triggered, notify the carrier immediately.
2. Uncrate the equipment and inspect it for damage that may have occurred during transit. If you observed damage, notify the carrier immediately.
3. Check the components against the packing list. If components are missing, contact your local distributor or On Site Gas Systems, providing the model number and the serial number of your unit.

Save the crate and packing supplies for some time period in the event you must return the unit.

What’s in the Crate

Your shipment should contain the following items.

Standard Equipment

- “N” Model nitrogen generator

Documentation

- Nitrogen Generator User Guide: For all “N” Model Nitrogen Generators
- Quick Start Guide—“N” Model Nitrogen Generators
- Technical Reference Sheet—“N” Model Nitrogen Generators
- Manuals for third party equipment supplied by On Site Gas Systems

Optional Equipment (If Ordered)

If you ordered the following optional equipment, it should be included in your order:

- Air compressor
- Air dryer
- Compressed air receiving tank
- Nitrogen receiving tank
- Annual maintenance program kit (filter kit)

Selecting a Location

Install your nitrogen generator following the recommendations below to ensure optimum performance, safe operation, and warranty coverage.

Select an indoor area where the ambient air temperature remains above 33°F (0.5°C) and below 100°F (38°C). Allow sufficient space around the generator for: (1) accessing controls during operation, (2) performing maintenance, and (3) installing air and nitrogen receiving tanks.

Utility Requirements

Utilities should meet the requirements below to ensure optimum performance, safe operation, and warranty coverage.

Compressed Air Supply Requirements

The temperature of compressed air supplied to the generator must be between 33 and 100°F (0.5 to 38°C). The dew point of compressed air supplied to the generator must be 40°F (5°C) or lower.

Compressed air not meeting these requirements can damage the generator and will void the warranty benefits. Air at temperatures higher or lower than this may cause damage not covered by warranty.

Note—A compressed air receiving tank may be necessary to provide a reserve of compressed air to meet the fluctuating demands of the nitrogen generator.

Note—Use of a correctly sized air dryer can ensure that the compressed air supply meets the dew point requirements.

Inlet Air Pressure and Volume Requirements

The inlet air pressure requirement varies by model. You can find the inlet air pressure requirement for your model noted on the equipment label, which is attached to the documentation sleeve inside or outside the cabinet. If the pressure of the inlet air does not meet the required pressure, nitrogen production may be above or below the system's design capability.

The inlet air volume requirement varies by model. In addition, a given model can consume more or less compressed air depending upon the desired nitrogen purity. Consult the technical support team at On Site Gas Systems for details.

Adjustment for Altitude

Add 1% to the feed air consumption requirement for every 300 feet above sea level.

Adjustment for Length of Air Supply Piping

The air supply piping must supply the required volume of feed air at the required pressure as measured at the nitrogen generator's inlet connection. If the supply piping from the compressed air receiving tank to the generator is greater than 50 feet, increase the air supply line one standard NPT size larger than the nitrogen generator inlet air nozzle size (Table 1).

Table 1. Standard NPT Pipe Sizes

| NPT Pipe Sizes (inches) | | | | | | | | | | | |
|-------------------------|-----|-----|-----|-----|----|----|-----|----|-----|-----|-----|
| 1/4 | 3/8 | 1/2 | 3/4 | 1.0 | 1¼ | 1½ | 2.0 | 2½ | 3.0 | 4.0 | 6.0 |

Nitrogen Output Piping Requirements

Nitrogen output piping should be the same size as the nitrogen output piping supplied with the generator. If the length of the output piping from the generator is greater than 50 feet, use an output line one standard NPT size larger than the generator output line (Table 1).

Exhaust Piping Requirements

The exhaust piping from the nitrogen generator may be vented outside. You should use vent piping that is the same size (or larger) as the exhaust piping supplied with the nitrogen generator.

Exhaust piping should not have any restrictions or valves. It should be as short as possible. If the exhaust piping length from the generator is longer than 50 feet, size the piping one standard NPT size larger than the generator exhaust line size (Table 1).

Electrical Supply Requirements

The electrical power supply must meet the electrical requirements as labeled on the nitrogen generator. Power consumption is less than 150 watts.

Installing the Nitrogen Generator



WARNING! *Materials that you use to maintain, assemble, and connect the nitrogen generator to supporting equipment should be rated and approved for use at the pressures generated by the nitrogen generator.*

Follow these steps to assemble the nitrogen generator with optional equipment including air and nitrogen receiving tanks:

1. Position the nitrogen generator in the selected area (see *Selecting a Location*). Lift the nitrogen generator carefully to avoid damaging piping or the control system. Nitrogen generators with cabinets are typically designed for lifting with a tow motor. Move Pro Series and Tire Fill units on pallets using a tow motor. Move large nitrogen generators using the lifting lugs on the top of the sieve beds.

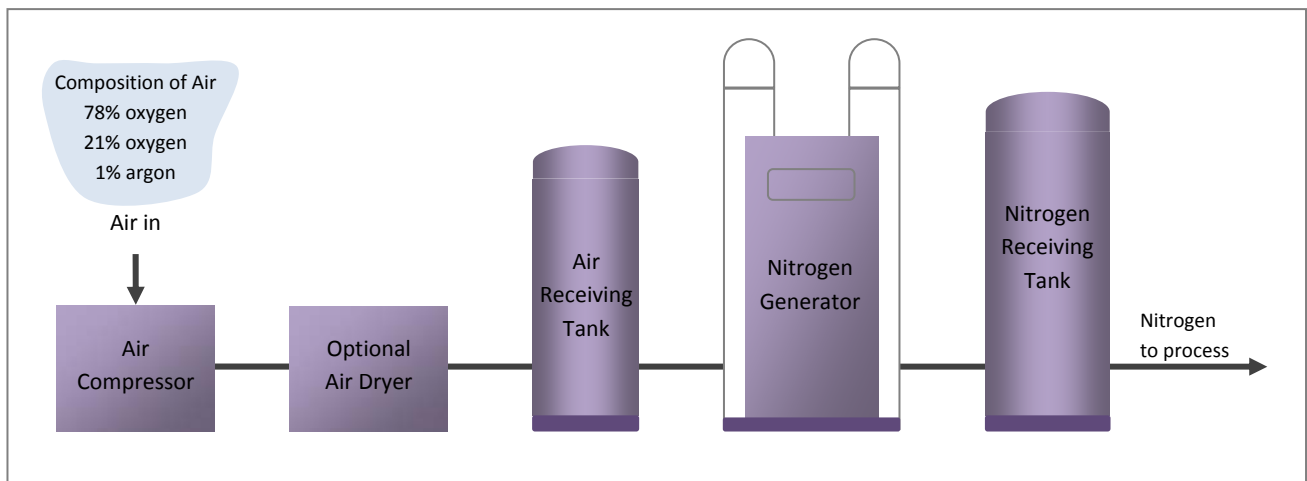
NOTE—Attach lifting devices and rigging to prevent contact and damage to piping and valves during lifting.

2. Carefully lift the air receiving tank and nitrogen receiving tank (if supplied) and position them next to the nitrogen generator. The tanks should be located as close as possible to the generator. Anchor the air and nitrogen receiving tanks to the floor.

NOTE—PRO Series and Tire Fill units have an integrated nitrogen receiving tank incorporated into the generator.

3. Install the air compressor and air dryer (if supplied) in accordance with the manufacturer's instructions (Figure 1).

Figure 1. General arrangement of a typical nitrogen generator system



4. Have a qualified pipefitter install suitable piping or hoses from:
 - a. the compressor to the dryer
 - b. from the dryer to the air receiving tank
 - c. from the air receiving tank to the nitrogen generator
 - d. from the nitrogen generator to the nitrogen receiving tank

NOTE—Use of piping sizes smaller than the recommended size will significantly decrease system performance and void the warranty.

5. If you supply your own air and nitrogen receiving tanks, install pressure safety valves on both tanks.
6. Have a qualified electrician install the electrical supply and make electrical connections.
7. Ensure the main power switch (located near the power cord) on the nitrogen generator is off. Plug the power cable of the nitrogen generator into an approved outlet of the correct voltage and frequency.
8. Connect the air compressor and optional dryer to electrical power supplies following the manufacturers' instructions.

Learning How the Nitrogen Generator Works

The composition of air is approximately 78% nitrogen, 21% oxygen, and about 1% argon. Depending upon the model, On Site Gas nitrogen generators can produce purities up to 99.9995%.

Process Flow

The following description provides a simplified view of how a nitrogen generator works. For detailed process flow information, see *Appendix 2—Process and Instrumentation Drawing*.

1—Compressing and Conditioning the Air

First, air is compressed with an air compressor and stored in an air receiving tank (Figure 2). Some systems use an optional air dryer between the compressor and receiving tank to lower the dew point of the air. From the compressed air receiving tank, the air flows through a series of filters to remove contaminants and oil. Leaving the filters, the air flows through a pressure regulator that reduces the pressure of the compressed air to a specified pressure. The air is now properly conditioned and ready for the separation process.

2—Separating the Nitrogen from the Conditioned Air

The conditioned air flows into the bottom of one of two sieve beds. The sieve beds are packed with a carbon molecular sieve. As the air flows up through a sieve bed, the carbon molecular sieve physically captures the oxygen molecules, while allowing the nitrogen molecules to pass. The nitrogen molecules flow through the sieve and out of the top of the sieve bed.

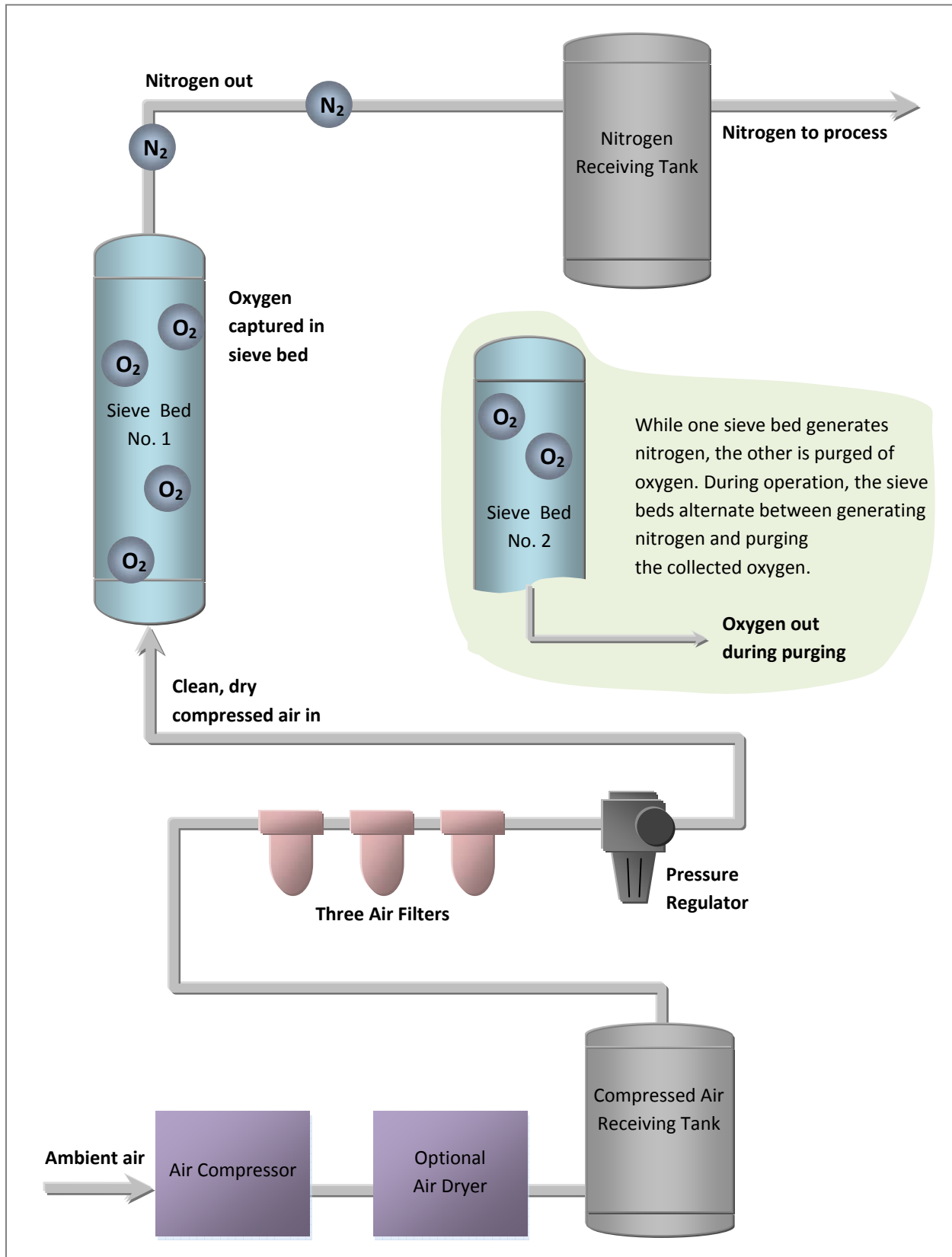
3—Storing the Nitrogen for Use

As the nitrogen exits the sieve bed, it flows into a tank for storage and use. Instruments on the tank monitor the purity and pressure of the nitrogen in the receiving tank. The control system uses the pressure information to start and stop the nitrogen generator, maintaining the desired pressure (amount of nitrogen) in the tank.

4—Removing Oxygen from the Sieve Bed

After a short time, the carbon molecular sieve in the sieve bed becomes saturated with oxygen, and it can no longer remove a sufficient amount of oxygen from the air. At this point, the control system directs the flow of incoming air to the second sieve bed so that nitrogen generation can continue. While the second sieve bed generates nitrogen, the system purges the oxygen from the first sieve bed.

Figure 2. Simplified process flow in a nitrogen generator (See *Appendix 2—Process and Instrumentation Drawing* for detailed process flow information)



Description of Controls and Equipment

Your new nitrogen generator offers the benefits of pressure swing absorption technology (PSA). With PSA technology, your nitrogen generator is:

- Compact and relatively light weight
- Easy to operate and quick to start up
- Safe and reliable
- Simple to maintain

Equipment Not Supplied by On Site Gas Systems

To learn about the system equipment (air compressor, air receiving tank, etc,) not manufactured by On Site Gas Systems, consult the user guides provided by the manufacturers of the equipment.

Description of Control Panel Hardware

Main Power Switch—The main power switch is located near the power cord. This switch connects and disconnects power to the nitrogen generator. Moving this switch to the **On** position, powers up the controller and illuminates the touch screen monitor. Moving this switch to the **Off** position, cuts power to the nitrogen generator and stops its operation.

Closing the compressed air inlet valve stops the generation of nitrogen, but the generator's electrical circuits remain energized.

Description of the Touch Screen Monitor

The touch screen monitor provides the interface for you to monitor and control the nitrogen generator. For example, the touch screen monitor's screens enable you to view the nitrogen receiving tank pressure and purity, receive and acknowledge maintenance tasks, view alarm messages, calibrate equipment, and determine valve positions.

Process Instrumentation, Controls, and Hardware

See *Appendix 2—Process and Instrumentation Drawing* for information about the system's instrumentation, controls, and hardware.

Programmable Logic Controller

A programmable logic controller (PLC) controls the nitrogen generator. This control system is setup at the factory and keeps the system running at peak performance.

NOTE—Do not attempt to alter the PLC program. Changing the PLC program will alter the performance specifications and will void the warranty benefits.

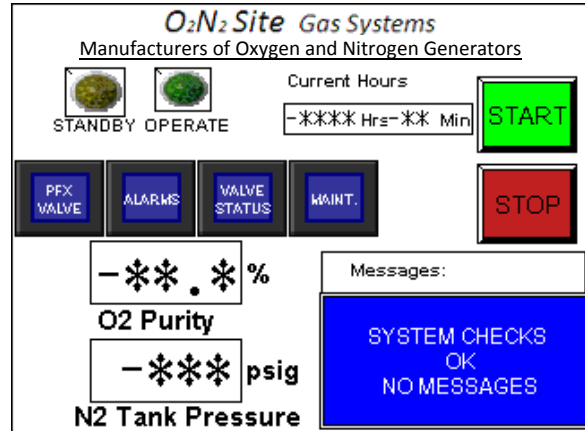
Learning about the Operating Screens

Main Operating Screen

The main operating screen is the default screen for monitoring the nitrogen generating process.

What the Screen Does

- Provides nitrogen generator **Start** and **Stop** buttons
- Indicates operating status with indicator lights (**Standby** and **Operate**)
- Indicates oxygen purity and nitrogen tank pressure
- Shows alarm and maintenance messages
- Enables you to navigate to other screens by pressing the navigation buttons



How to Use It

Start and Stop Buttons—Pressing the **Start** button starts the nitrogen generating process. Pressing the **Stop** button stops the nitrogen generating process.

Standby and Operating Indicator Lights—When the green **Operate** light is illuminated, the generator is producing nitrogen. When the amber **Standby** light is illuminated, the generator is in standby mode and is not generating nitrogen.

Current Hours Display—The **Current Hours** display indicates the total operating time of the nitrogen generator. The time does not include the time the generator is in standby mode.

Messages—The **Messages** window displays alarms and maintenance messages generated by the control system.

O₂ Purity Display—The **O₂ Purity** display indicates the amount of oxygen, in percent or PPM, in the nitrogen receiving tank. When displayed in percent, the purity of nitrogen in the tank is 100 minus the percent oxygen.

N₂ Tank Pressure Display—The **N₂ Tank Pressure** display indicates the pressure in the nitrogen receiving tank in pounds per square inch gauge (psig).

Blue Navigation Buttons—The blue navigation buttons (**PFX Valve, Alarms, Valve Status, Maint.**) enable you to open other control system screens. Press a button to display the screen.

PFX Valve – Purity and Flow Selection Screen

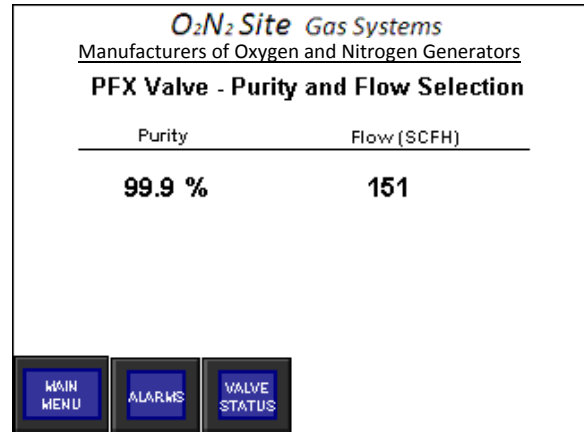
What the Screen Does

- Displays the nitrogen purity and flow rate design capabilities of your generator
- On some machines, enables the selection of different purity and flow rates

How to Use It

Observe the purity and flow values.

On machines with selectable purity, pressing the purity selection button will change the performance of the generator to meet the selected purity.



Blue Navigation Buttons—The blue navigation buttons (**Main Menu, Alarms, Valve Status**) enable you to navigate to display other control screens. Press a button to navigate to the selected screen.

Alarm Screen

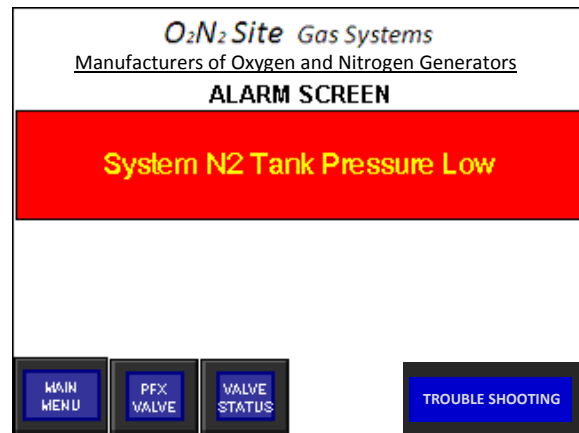
What the Screen Does

- Displays alarm messages
- Provides access to troubleshooting tables

How to Use It

Observe the alarm message and perform troubleshooting steps.

Pressing the **Troubleshooting** button opens a screen that provides solutions to operating problems.



Blue Navigation Buttons—The blue navigation buttons (**Main Menu, PFX Valve, Valve Status**) enable you to display other control screens. Press a button to navigate to the selected screen.

NOTE—The alarm system only functions when the generator is operating. The system does not display alarms when the generator is in standby mode.

Valve Status Screen

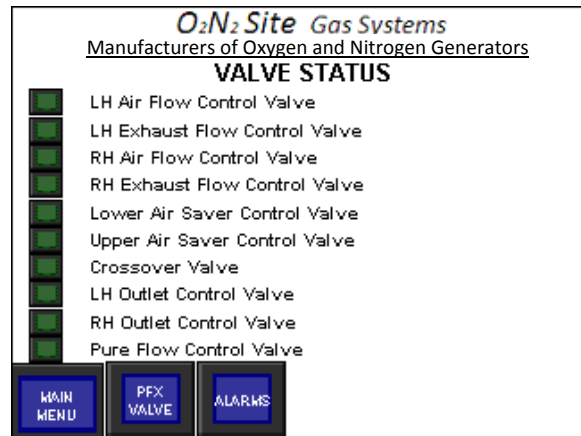
What the Screen Does

- Indicates the position of process valves

How to Use It

When a valve is open, the green light next to the valve name is illuminated. When a valve is closed, the green light next to the valve name is not illuminated.

Blue Navigation Buttons—The blue navigation buttons (**Main Menu, PFX Valve, Alarms**) enable you to display other control screens. Press a button to navigate to the selected screen.



Maintenance Schedule Screen

What the Screen Does

- Indicates total operating hours (standby hours not included)
- Displays maintenance messages when maintenance tasks are due
- Enables you to acknowledge the completion of maintenance tasks

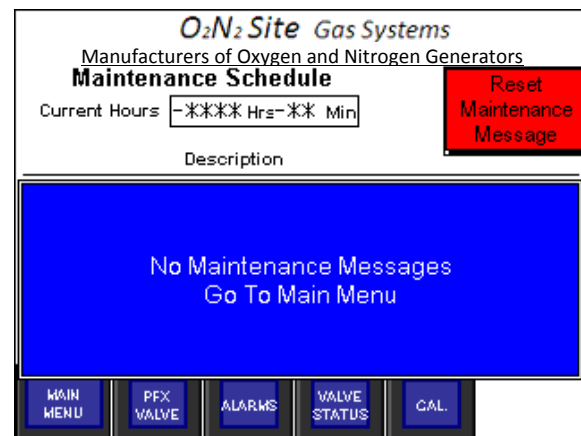
How to Use It

Current Hours Display—The **Current Hours** display indicates the total operating time of the nitrogen generator. The hours do not include time in standby mode.

Reset Maintenance Message Button—The **Reset Maintenance Message** button enables you to acknowledge and clear the maintenance message after completing the required maintenance.

Description—The **Description** window displays maintenance activities that you must complete to maintain the performance and warranty benefits of your nitrogen generator.

Blue Navigation Buttons—The blue navigation buttons (**Main Menu, PFX Valve, Alarms, Valve Status, Cal.**) enable you to display other control screens. Press a button to navigate to the selected screen.



Calibration Screen

What the Screen Does

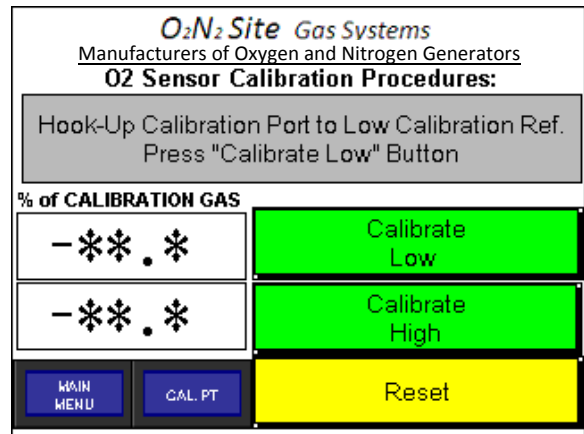
- Walks you through the calibration of the oxygen sensor

How to Use It

See the *Calibrating the Oxygen Sensor* section (page 27) to learn the procedure for calibrating the oxygen sensor.

Blue Navigation Buttons—The blue navigation buttons (**Main Menu**, **CAL PT**) enable you to open other screens. Press a button to display the screen.

The **CAL. PT** button opens the Setpoint screen below.



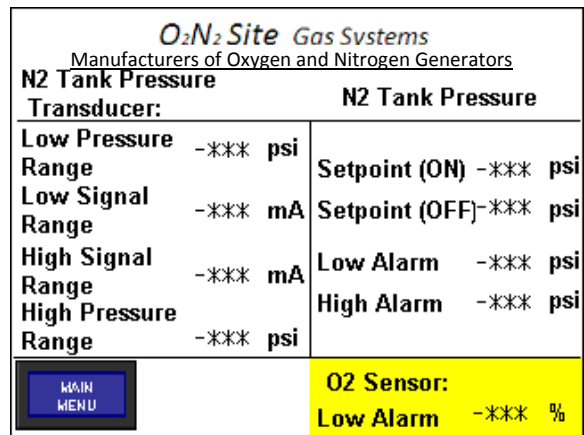
Setpoint Screen

What the Screen Does

- Enables you to view process set points

How to Use It

Blue Navigation Buttons—The blue navigation button (**Main Menu**) enables you to navigate back to the **Main Menu** screen. Press the button to display the screen.



Startup and Shutdown Procedures

This section describes how to start, operate, and stop the nitrogen generator.

NOTE—Good practice requires you to notify personnel in the area that you are starting the oxygen generator to ensure the start-up will not interfere with other operations.

NOTE—When power is restored after a power failure, the nitrogen generator automatically resumes operation.

Decide Which Start-Up Procedure to Use

This section describes the two ways to start the nitrogen generator:

- 1) Use the *Initial Start-Up* procedure below when starting the nitrogen generator for the first time or when restarting after major maintenance that required the emptying of the nitrogen receiving tank.
- 2) Use the *Routine Start-Up* procedure on page 22 when the nitrogen generator is in steady state use. For example, starting the nitrogen generator at the beginning of a shift or after a weekend shutdown.

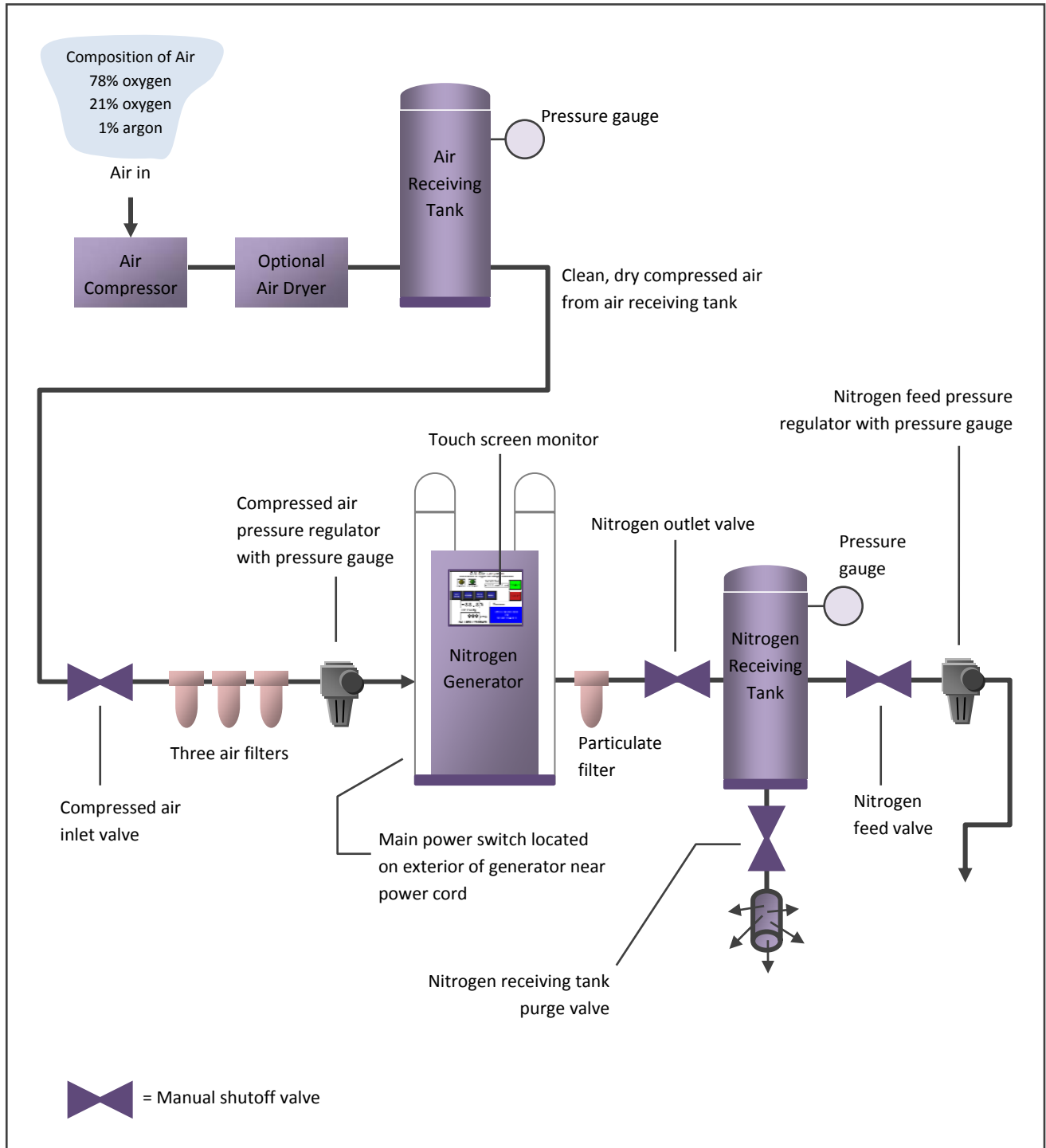
Initial Start-Up

Follow the steps (A through E) below to complete an initial startup of the oxygen generator.

A. Connect the Power Supply

1. Ensure the main power switch on the nitrogen generator is in the **Off** position. The main power switch is located near the power cord (Figure 3).
2. Close the compressed air inlet valve. This valve is located upstream from air filters.
3. Close the nitrogen outlet valve. This valve is located on the outlet piping of the nitrogen generator.
4. Close the nitrogen feed valve. This valve is located downstream from the nitrogen receiving tank and feeds your process.
5. Ensure your power supply matches the generator's power requirements as labeled on the nitrogen generator.
6. Plug the generator's power cord into the power supply.

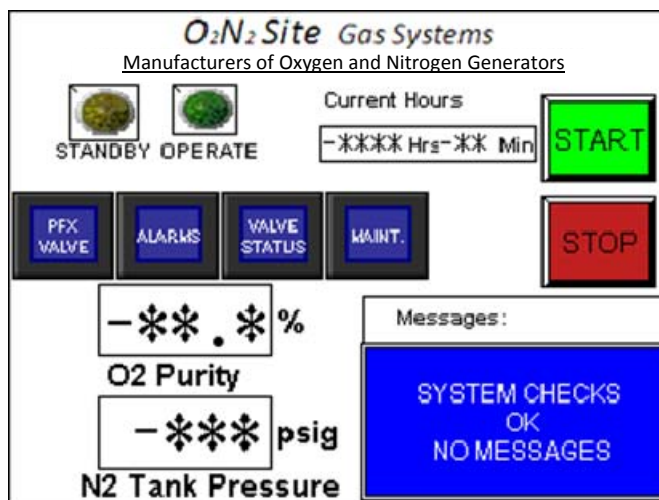
Figure 3. Location and terminology for some process components



B. Start the Nitrogen Generator

1. Move the power switch on the nitrogen generator to the **On** position. The main operating screen appears on the touch screen monitor.
2. Start the air compressor and the air dryer (if equipped) using the manufacturers' instructions.
3. Wait for the air pressure in the compressed air receiving tank to reach the tank's design pressure.
4. Open the compressed air inlet valve.
5. Press the **Start** button on the touch screen monitor (Figure 4). The green **Operate** light illuminates and the generator starts producing nitrogen.
6. Wait until the system goes into standby mode. (Yellow **Standby** light illuminates.)

Figure 4. Main operating screen on the touch screen monitor



C. Open the Nitrogen Valve

Open the nitrogen outlet valve.

Nitrogen flows into the nitrogen receiving tank. The nitrogen generator starts automatically and continues to fill the receiving tank with nitrogen. When the nitrogen receiving tank reaches the generator's nitrogen outlet pressure, the generator enters standby mode. (See the generator's equipment label to learn its nitrogen outlet pressure.)

D. Determine and Adjust Nitrogen Purity

The nitrogen receiving tank now contains pressurized nitrogen, but the nitrogen is diluted by the air originally in the tank. Hence, the nitrogen purity may not meet your requirements.

Check the nitrogen purity on the main operating screen of the touch screen monitor.

If you need to increase the purity of the nitrogen in the receiving tank before sending the nitrogen to your process, follow these steps:

1. Release nitrogen from the receiving tank by opening the tank's drain valve until the pressure in the receiving tank drops in half. Then close the drain valve.



WARNING! *Direct nitrogen vented from the nitrogen receiving tank to the outside of your facility to prevent the nitrogen from displacing air in the room and causing suffocation and death.*

2. The nitrogen generator will start. Wait until the pressure in the nitrogen receiving tank reaches the generator's design pressure and the generator enters standby mode.
3. Check the nitrogen purity again.
4. Repeat Steps 1 through 3 if needed to obtain the design nitrogen purity.

Once you reach the design nitrogen purity, the generator will maintain that purity.

E. Start Nitrogen Flow to Your Process

1. Ensure your process is ready to receive nitrogen.
2. Set the nitrogen feed pressure regulator to the desired pressure.
3. Open the nitrogen feed valve on the downstream side of the nitrogen receiving tank.
4. Check the nitrogen piping for leaks using a liquid leak detector.

Routine Shutdown

Follow these steps to shut down your nitrogen generator:

1. Press the **Stop** button on the main operating screen of the touch screen monitor.
2. Move the main power switch near the power cord to the **Off** position.
3. Close the oxygen analyzer sample line valve on the nitrogen receiving tank.
4. You may choose to close the nitrogen feed valve downstream from the nitrogen receiving tank to prevent nitrogen loss due to downstream leaks.



WARNING! *The generator remains pressurized after shutdown. Before performing maintenance, filter changes, or opening piping, you must depressurize the system. Depressurizing the system prevents the uncontrolled escape of high-pressure gas and possible injury or death.*

Routine Start-Up

Follow these steps to start up the nitrogen generator under steady state conditions:

1. Confirm that the compressed air inlet valve is open.
2. Move the main power switch near the power cord to the **On** position.
3. Press the **Start** button on the main menu of the touch screen monitor.
4. If closed during shutdown, open the nitrogen feed valve to your process.

Depressurizing the System



WARNING! *You must wear eye and hearing protection during the depressurizing process to avoid possible injury.*

Follow these steps to depressurize the nitrogen generating system for maintenance or other purposes:

1. Press the **Stop** button on the main operating screen of the touch screen monitor.
2. Unplug the power cord from the power supply.
3. Close compressed air inlet and the nitrogen outlet valves.
4. Put on safety glasses and hearing protectors.
5. Confirm air input and nitrogen output valves are FULLY closed.
6. Open the cabinet door if needed, and pull the ring on the pressure safety valve until the pressure has been released from the system and the pressure gauges read 0 psig.

Equipment Maintenance Schedule



WARNING! *Only trained maintenance technicians who are familiar with high-pressure air systems and who have read this user guide should perform maintenance on the nitrogen generator. The generator remains pressurized after shutdown. Before performing maintenance, filter changes, or opening piping, you must depressurize the system. Depressurizing the system prevents the uncontrolled escape of high-pressure gas and possible injury or death. You must wear eye and hearing protection during the depressurizing process to avoid possible injury.*

Automatic Display of Maintenance Requirements

The control system (touch screen monitor) displays maintenance activities you must complete to keep your nitrogen generator operating at peak performance (Table 2). The control system displays these maintenance activity notifications based on actual operating hours.

Operator-Initiated Maintenance Requirements

In addition to the maintenance activities automatically displayed by the control system, you must complete additional, operator-initiated maintenance tasks (Table 3).

Important Maintenance Notes

Consider these important notes about maintaining your nitrogen generator:

- To ensure peak performance from your nitrogen generator, you must also maintain its ancillary equipment—air compressor, air dryer, air receiving tank—according to the manufacturers' recommendations.
- Where any component manufacturer's specifications are different from those of On Site Gas Systems, adopt the more demanding schedule.
- The maintenance time intervals in Table 3 are based on eight hours of operation per day. If you operate your nitrogen generator more than eight hours per day, adjust the time intervals accordingly.
- You may need to shorten the recommended filter replacement interval depending upon air quality, operational schedule, and other maintenance or operational variables.

Table 2. Time intervals for maintenance activities displayed by the control system

| Maintenance Activity | Time Interval (hours) | | | |
|--|-----------------------|-----|------|------|
| | 40 | 520 | 1040 | 2080 |
| Verify filter drains work | X | | | |
| Manually operate compressed air receiving tank drain | X | | | |
| Change inlet particulate air filter element | | X | | |
| Operate safety valves | | X | | |
| Operate manual valves | | X | | |
| Change inlet coalescing filter element | | | X | |
| Change inlet charcoal filter element | | | | X |
| Change or calibrate oxygen sensor | | | | X |

Table 3. Time intervals for operator-initiated maintenance activities

| Maintenance Activity | Calendar Time Interval (based on eight hours of operation per day) | |
|--|--|-----------|
| | Daily | 12 Months |
| Check for air and nitrogen leaks | X | |
| Check for instrument air pressure | X | |
| Visually check control panel | X | |
| Record flow/ pressure/ purity | X | |
| Inspect manual valves. Repair if needed | | X |
| Inspect air-operated valves. Repair if needed | | X |
| Change outlet particulate filter on nitrogen receiving tank outlet | When pressure drop is greater than 3 psig, or if equipped with a tattle tell pressure drop indicator, when the indicator shows red | |

Maintenance Procedures



WARNING! *Only trained maintenance technicians who are familiar with high-pressure air systems and who have read this user guide should perform maintenance on the nitrogen generator. The generator remains pressurized after shutdown. Before performing maintenance, filter changes, or opening piping, you must depressurize the system. Depressurizing the system prevents the uncontrolled escape of high-pressure gas and possible injury or death. You must wear eye and hearing protection during the depressurizing process to avoid possible injury.*

Depressurizing the System

Follow these steps to depressurize the system for maintenance or other purposes:

1. Press the **Stop** button on the main operating screen of the touch screen monitor.
2. Unplug the power cord from the power supply.
3. Close the compressed air inlet and nitrogen output valves on the generator.
4. Put on safety glasses and hearing protectors.
5. Confirm air input and nitrogen output valves are FULLY closed on generator.
6. Open the cabinet door if needed and pull the ring on the pressure safety valve until the pressure has been released and the pressure gauges read 0 psig.

Inlet Filter Inspection and Replacement

The filters remove particulates as well as water and oil. The inlet particulate filter removes particles down to 5 microns in size. The inlet coalescing filter removes particles down to 0.01 microns in size.

The life of the coalescing filter is dependent on how well the particulate filter performs. The coalescing filter typically lasts six months when you regularly maintain the particulate filter.

The activated carbon filter element removes oil vapor down to about 0.003 ppm. The life of the activated carbon filter element is dependent upon the amount of oil in the feed air. An activated carbon tower will typically last for 12 months when you regularly maintain the upstream filters.



WARNING! *The generator remains pressurized after shutdown. Before performing maintenance, filter changes, or opening piping, you must depressurize the system. Depressurizing the system prevents the uncontrolled escape of high-pressure gas and possible injury or death. You must wear eye and hearing protection during the depressurizing process to avoid possible injury.*

Follow these steps to change a filter:

1. Depressurize the nitrogen generating system following the instruction in the *Depressurizing the System* section above.
2. If applicable, disconnect drain tubing from the bottom of the bowls.
3. To remove the bowls, push the bowl latch down and rotate the bowl while pulling down. (Large filters may require you remove a fastener such as Allen bolts to remove the bowls)
4. Inspect the bowls. If the drain system is working properly, the bowls should be empty.
5. Replace any filter element per the maintenance schedule or sooner if the filter element appears damaged or excessively dirty.

NOTE—A plugged drain system on a filter will cause water and oil to carry over into the sieve beds, which will CAUSE PERMANENT DAMAGE to the adsorbent. On Site Gas Systems' warranty does not cover such damage. Use of filters other than those specified by On Site Gas Systems could result in damages not covered by the warranty.

6. The bowls must be visually clean. Wipe out the bowls, or if necessary, wash the bowls in soapy water, and rinse and dry thoroughly.
7. Reinstall the bowls.
8. If applicable, reconnect the drain tubing. Make sure the bowl latches are securely locked in place. Be careful to avoid damaging the O-rings during reassembly.
9. Slowly open the air inlet valve to pressurize the bowls. Examine for leaks and tighten if needed.

Calibrating the Oxygen Sensor

1. Obtain Proper Calibration Gas

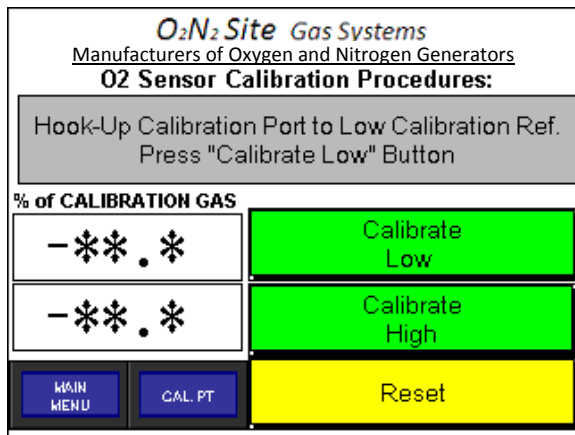
To calibrate the nitrogen generator, you must have a supply of calibration gas with a lower percentage of oxygen than the design performance of the machine. For example, if your generator produces a nitrogen purity of 99.9 percent, your calibration gas purity must be equal to or purer than 99.9 percent nitrogen (less than 1000 PPM of oxygen).

You must supply the calibration gas to the calibrator port at 80 psig.

2. Navigate to the Calibration Screen

From the main menu on the touch screen monitor, press the **MAINT.** button to open the **Maintenance Schedule** screen and then press the **CAL** button to open the **O₂ Sensor Calibration Procedures** screen (Figure 5).

Figure 5. O₂ Sensor Calibration Procedures Screen

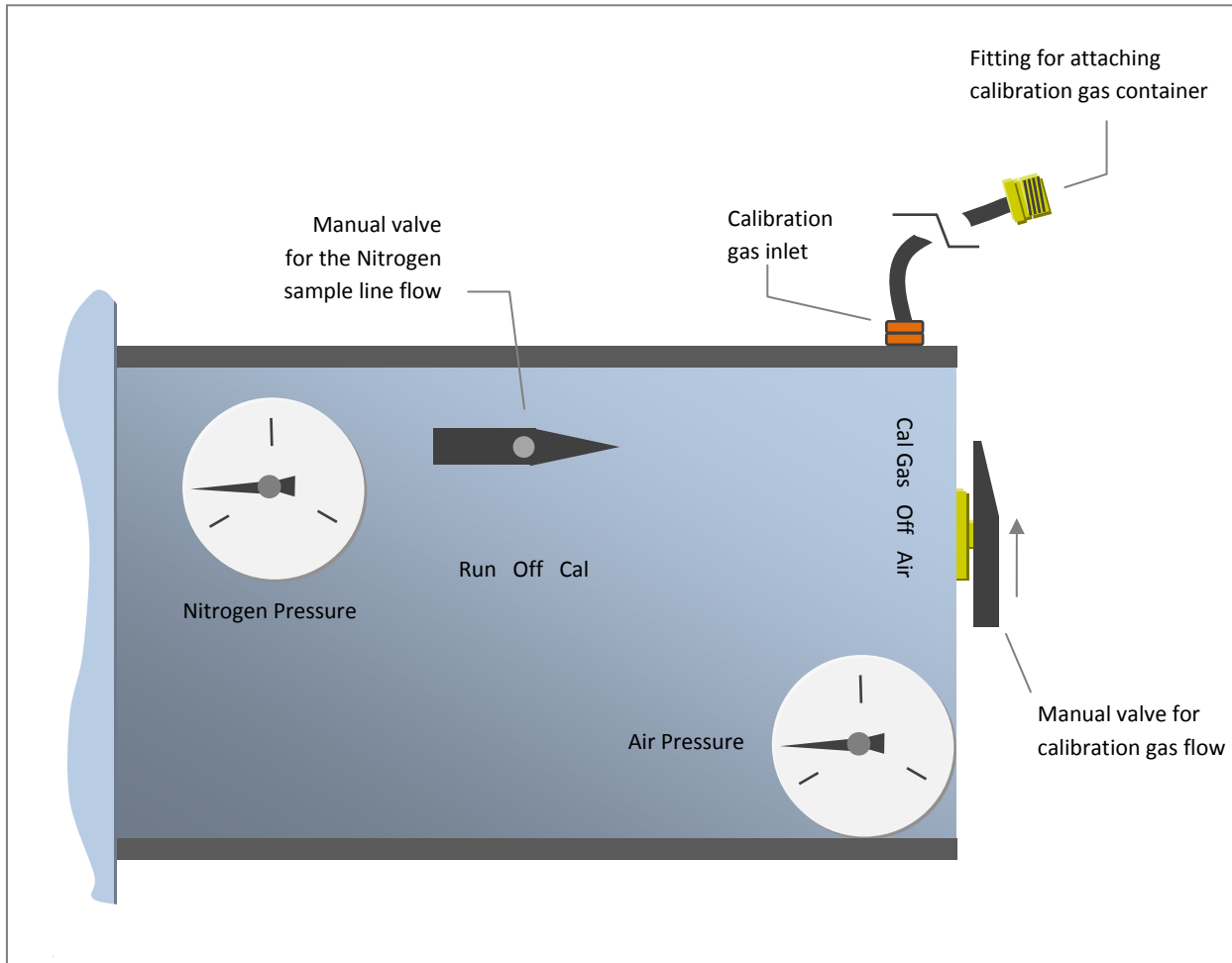


3. Calibrate the Low Side of the Scale

Follow these steps to calibrate the low side of the oxygen analyzer scale:

1. Connect the calibration gas to the calibration gas inlet fitting (Figure 6).
2. Enter the percentage of oxygen in the calibration gas into the **% of Calibration Gas** text box (left of the **Calibrate Low** button) by pressing the text box and using the popup keypad to enter the percent oxygen.
3. Move the valve for the nitrogen sample line flow to the calibrate (Cal) position.
4. Move the valve for the calibration gas flow to the **Cal Gas** position.
5. Press the **Calibrate Low** button on the touch screen monitor and follow the steps as displayed in the window. This calibration step can take up to five minutes to complete.

Figure 6. Oxygen sensor calibration panel



4. Calibrate the High Side of the Scale

1. Move the manual valve for the calibration gas flow to the **Air** position.
2. Press the **Calibrate High** button on the touch screen monitor and follow the steps displayed in the window. This calibration step can take up to five minutes to complete.

5. Close the Valves and Accept the Calibration Values

Follow these steps to finish the calibration process:

1. After calibrating the low and high sides of the scale, press the yellow **Reset** button to enter the new values into the analyzer.
2. Move the valve for the calibration gas flow to the **Off** position.
3. Close the shutoff valve on your calibration gas container. Disconnect the calibration gas container from the calibration gas inlet if desired.
4. Move the valve for the nitrogen sample line flow to the **Run** position.
5. Press the **Main Menu** button to return to the main operating screen.

Additional Maintenance Procedures

The two key maintenance procedures—filter replacement and oxygen sensor calibration—were described above. The text below describes the other maintenance procedures you must complete to keep your nitrogen generator running to its design capabilities.

Verify Filters are Dry and Drains Work

Some filters include drains at the bottom of the bowls. There are two types of drains. On filters with a rubber nipple, bend the rubber nipple to the side for a few seconds to open the valve and drain any fluid from the bowl. On filters with a cap drain, unscrew the cap a few turns to drain fluid from the bowl. Tighten the cap after draining.

Manually Operate the Air and Nitrogen Receiving Tank Drains

Wear hearing protection and eye protection. Slowly open the drain valves at the bottom of the compressed air and nitrogen receiving tanks for a few seconds and then close the valves. This prevents the valve from freezing and keeps it operating smoothly.

Operate Pressure Safety Valves

Wear hearing and eye protection. There can be several pressure safety valves on the system. Check each pressure safety valve by pulling down on its ring and then pushing it back into position. The valves should pull down freely and you should hear gas escaping. If the valve does not operate or gas does not escape, replace the valve.

Operate Manual Shutoff Valves

When the system is in standby mode, operate all the manual valves to prevent them from freezing and keep them operating smoothly.

Check for Air and Nitrogen Leaks

Check all connections and valves for leaks using a liquid leak detector.

Check for Instrument Air Pressure

Verify the pressure of the pilot air to the air-operated flow control valves is between 70 to 100 psig. See the attached process and instrument drawing to locate the pilot air pressure gauge.

Record Flow, Pressure, Purity

Keep an operational log, recording: inlet air pressure, nitrogen receiving tank pressure, percent oxygen purity, and the oxygen analyzer calibration date.

Appendix 3—Operating Log includes an operating log you can use to record this information.

Inspect Manual Valves

Check manual valves for leaks and smooth operation. Rebuild the valves if required.

Inspect Air-Operated Valves

Inspect air-operated valves for leaks and smooth operation. Rebuild the valves if required.

Change Particulate Filter Element on Nitrogen Receiving Tank Outlet

Close shut-off valves on both sides of the nitrogen receiving tank outlet filter. Bleed off the pressure in the filter using the bowl drain. Remove the bowl and replace the filter and gasket following the manufacturer's instructions.

Verify Peak Pressure

You can find the peak pressure gauge next to the crossover valve. Peak pressure readings are used for diagnostic purposes. Your On Site Gas customer service representative may request peak pressure readings for troubleshooting purposes.

Replacement Filters

On Site Gas Systems can supply you with air filter kits. The kits include filters that provide a year’s worth of filter change outs based on eight hours of running time per day (Table 4). These high-quality filters ensure trouble-free service and maintain your warranty benefits.

To order a filter kit, obtain the model and serial number of your generator from the machine label inside the cabinet. Then call our Customer Service Department at +1-860-667-8888.

Table 4. Air filter ordering information

| Nitrogen Generator Model Number | Order Kit Number | Kit Description |
|---|----------------------|--|
| N-1 to N-15, Pro N-1 to Pro N-15, NM-1 to NM-15, Pro NM-1 to Pro NM-15 | 6N | 4 particulate filters 2 coalescing filters 1 charcoal filter |
| N-22TF, N-54TF | Call for Information | |
| N-20, NM-20 | 7N | |
| N-25 to N-60, NM-25 to NM-60 | 8N | |
| N-70 to N-100, NM-70 to NM-100 | 9N | |
| N-125 to N-150, NM-125 to NM-150 | 10N | |
| N-160 to N-275, NM-160 to NM-275 | 11N | |
| N-300 to N-450, NM-300 to NM-450 | 12N | |
| N-500 to N-600, NM-500 to NM-600 | 13N | |
| N-650 to N-1200, NM-600 to NM-1200 | 14N | |
| N-1250 to N-1700, NM-1250 to NM-1700 | 15N | |
| N-1800 | 16N | |

Troubleshooting Problems

Normally, a simple adjustment or corrective action can solve most operating problems. If your nitrogen generator does not perform as expected, follow the provided troubleshooting steps (Table 5). If you still experience problems, contact your local distributor or customer support at On Site Gas Systems.

Table 5. Troubleshooting steps to follow before calling customer service

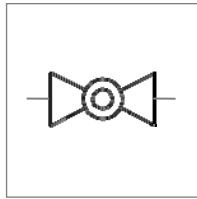
| Symptom | Possible Cause | Corrective Action |
|--|--|--|
| Nitrogen generator not cycling | <i>Low voltage or low amperage</i> | Check electrical source |
| | <i>Circuit breaker tripped</i> | Reset circuit breaker |
| | <i>Fuse blown</i> | Replace fuses inside control enclosure |
| | <i>Main Power is Off</i> | Turn nitrogen generator power switch ON |
| | <i>Low operating air pressure</i> | Increase air regulator pressure |
| Nitrogen generator runs continuously—amber light Off | <i>Defective N₂ pressure sensor</i> | Replace sensor |
| | <i>Excessive nitrogen usage</i> | Reduce nitrogen consumption |
| | <i>Leak in nitrogen line</i> | Repair leak |
| | <i>Cycle pressure too low</i> | Increase air regulator pressure |
| | <i>Defective wiring</i> | Check wiring connections |
| Low product flow | <i>Feed air flow rate is too low</i> | Adjust air supply pressure and flow |
| Low product purity | <i>Feed air flow rate is too low</i> | Adjust air supply pressure and flow |
| | <i>Product flow too high</i> | Decrease product flow |
| | <i>Feed air pressure too low</i> | Increase operating pressure of flow |
| | <i>Muffler plugged</i> | Clean muffler |
| | <i>Oil or water in unit</i> | Contact On Site Gas Systems |
| Filter drain remains open | <i>Drain valve dirty</i> | Clean valve |
| Filter drain does not open | <i>Drain valve plugged</i> | Clean valve |
| | <i>Tubing plugged or pinched</i> | Replace tubing |

Required Information for Customer Support

To resolve operating problem fast, collect the following information before calling customer service: model number, serial number, operating log with historical and current data, current peak pressure readings, maintenance information, and a description of the operating problem.

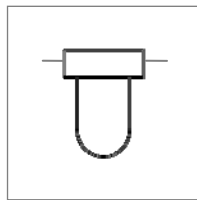
Appendix 1—Description of Components

This appendix provides descriptions of the main process components in a nitrogen generator, and it shows how the components are illustrated in the process and instrumentation drawing in Appendix 2.



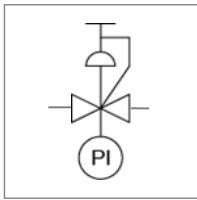
Manual Shutoff Valve

A manual shutoff valve enables you to stop and start the flow of air and nitrogen in the nitrogen generator. For example, the compressed air inlet valve stops and starts the flow of compressed air into the generator.



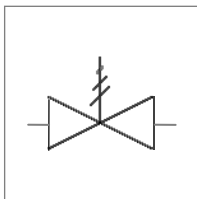
Filters

Particulate Filter—A particulate filter removes particles down to 5 microns in size from gas. **Coalescing Filter**—A coalescing filter removes particle down to 0.01 microns in size from gas. **Carbon Filter**—A carbon filter uses activated carbon to remove oil vapor down to 0.003 parts per million from gas.



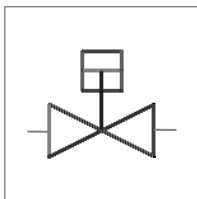
Pressure Regulators with Pressure Gauge

Pressure regulators enable you to adjust the pressure of compressed gas entering a system. The pressure gauge on the regulator indicates the pressure of the gas leaving the regulator after being adjusted.



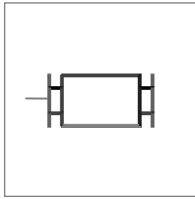
Pressure Safety Valve

Pressure safety valves are safety valves that automatically open at a preset high-limit pressure, releasing excessively high pressure from a pressurized system. Pressure safety valves prevent high-pressure buildup that could cause equipment failure and injury.



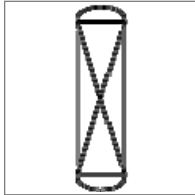
Flow Control Valve

A flow control valve regulates the flow of gas in the generator. Flow control valves use compressed air or a solenoid to open and close the valve. The compressed air is supplied by pilot control valves, which in turn are controlled by the control system. Flow control valves automatically open and close without warning when the generator is running.



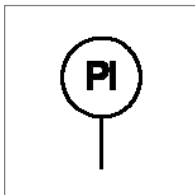
Exhaust Muffler

Exhaust mufflers allow high pressure gas to escape a system while attenuating the noise and lowering the velocity of the escaping gas for safety purposes



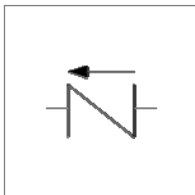
Sieve Bed

A sieve bed is a high-pressure vessel filled with a carbon material that physically captures oxygen while allowing nitrogen to pass.



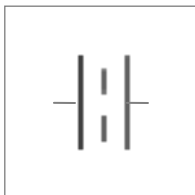
Analog Pressure Gauge

Analog pressure gauges indicate the pressure in a pipe, tank, or tubing.



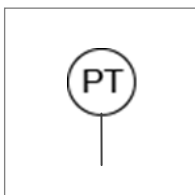
Check Valve

A check valve allows gas to flow only in one direction, preventing gas from flowing backwards in a pipe.



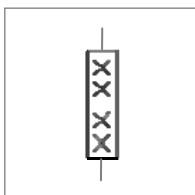
Flow Orifice

A flow orifice is a plate or short section of pipe with a precisely shaped inside diameter that is usually smaller than the surrounding piping. The smaller opening helps regulate and reduce the flow rate through the pipe.



Pressure Transducer

A pressure transducer measures the pressure in a pipe or tank and sends the pressure reading to a control system.



Inline Filter

An inline particulate filter removes particles from a gas stream. An inline filter is often used downstream from a sieve bed on small generators to capture carbon particles that may be carried out of the bed.

Appendix 2—Process and Instrumentation Drawing

See attached drawing, *Generic P&ID—Nitrogen Systems*

Warranty

Limits of Liability

Buyer's exclusive remedy for all claims shall be for damages, and seller's total liability for any and all losses and damages arising out of any cause whatsoever including, without limitation, defects in or defective performance of the system, (whether such claim be based in contract, negligence, strictly liability, other tort or otherwise) shall in no event exceed the purchase price of the system in respect of which such cause arises or, at seller's option, the repair or replacement of such; and in no event shall seller be liable for incidental, consequential or punitive damages resulting from any such cause.

Seller shall not be liable for, and Buyer assumes all liability for, the suitability and the results of using Nitrogen by itself or in any manufacturing or other industrial process or procedure, all personal injury and property damages connected with the possession, operation, maintenance, other use, or resale of the System. Transportation charges for the return of the System shall not be paid unless authorized in advance by Seller.

NOTE—Any modifications made by the customer without the consent of On Site Gas Systems will negatively affect the product purity and output specifications, and subsequently void the warranty.

Warranty

The nitrogen generator, excluding air supply system, is warranted against defects in materials and workmanship, under normal use within the purity and flow parameters as per the quote and operation, as applicable on the warranty listed below. All compressors and dryers are covered by the original equipment manufacturer's warranty.

The On Site Gas Systems Warranty includes the following:

Free repair or replacement of component parts where defects occur within the first twelve (12) months of operation or twelve (12) months from the date of invoice whichever comes first applies.

These warranties shall be null, void, inoperative, and not binding upon On Site Gas Systems, Inc. if a defect or malfunction occurs in the product or any part thereof from any feed air malfunction, or improper filter element maintenance, or repair, attempted repair, adjustment or servicing by anyone other than an authorized representative of On Site Gas Systems, or external causes. Said warranty shall extend and apply to the nitrogen generator only while said system is owned and used exclusively by the original purchaser.

NOTE—There are no express warranties by On Site Gas Systems inc, other than those specified here. No warranty of title as provided in the uniform commercial code shall be implied or otherwise created under the uniform commercial code, including but not limited to warranty of merchantability and warranty of fitness for a particular purpose.

Service Return Policy

If it is necessary to return a system for service, follow the procedure given below. This procedure must be followed when returning a system for service.

If the system cannot be repaired at the site, then the owner must obtain a written Return Material Authorization (RMA) number, which references the model and serial number, from On Site Gas Systems Inc. No items will be accepted for service or credit unless prior written authorization has been issued by On Site Gas Systems Inc.

All items are to be returned with the original packaging material if possible. Make sure that all items are packaged for safe return to On Site Gas Systems Inc. On Site Gas Systems Inc. will not be responsible for damages, which may occur in transit. Any damage that occurs to the system because of failure to adhere to this procedure will be the sole responsibility of the customer. Contact On Site Gas Systems, Inc. for a return shipping address.

Shipping charges must be prepaid on all returns.

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