

waukesha®



2ND GENERATION

Nitrogen Generator System Manual

N2-GEN-MANUAL – 4.6

Read and understand this manual prior to operation or servicing the products



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GENERAL DESCRIPTION

The N2 Nitrogen Generator is designed for use on tap changers, breakers, main tanks or any other electrical device requiring a gas-blanketed enclosure. The unit produces nitrogen by separating oxygen from compressed air by means of hollow fiberglass separation membranes. An on-board compressor supplies the compressed air and the generated nitrogen (N₂) is fed to internal storage vessels. The output concentration of the air separator (nitrogen purity) is factory pre-set. The final regulatory system maintains the gas-blanketed tank pressure between 0.5 and 5.0 psi at all times. If the tank pressure reaches a minimum of 0.5 psi, nitrogen is sent from the storage vessels through the regulator assembly to the tank. Should tank pressure rise above 5.5 psi, a relief valve will open to bleed off excess pressure to atmosphere.

IMPORTANT: Changing the output concentration may only be performed by trained and authorized service technicians.

SYSTEM PRINCIPLE OF OPERATION

Refer to figure 1 below. The nitrogen generator system is contained within a climate-controlled cabinet that closely regulates the temperature range within which the compressor system and nitrogen membrane are required to operate. When the on-board nitrogen storage tank drains to a preset level (100 psi), a compressor run cycle is initiated to refill the storage tank. Cool filtered air is drawn into the compressor and compressed to a nominal output of 145 psi. The hot compressed air is then directed through a heat exchanger that cools the compressed air below dew point for easier moisture removal. As the hot air travels through the coalescing filter, the condensed moisture collects in the filter bowl for draining at the end of the compressor cycle. The final filter removes all particulates in the compressed air stream before entering into the membrane assembly. As the air travels through the membrane, the outgoing nitrogen is regulated to a specific flow rate and pressure that defines nitrogen purity at the given membrane operating temperature. The output nitrogen of the membrane is diverted to atmosphere for a preset time, ensuring all contaminate gases are purged before diverting to the storage tank. The generator storage tank stores 3 gallons of nitrogen at 100–120 psi to supply the final regulatory system controlling the external gas space.

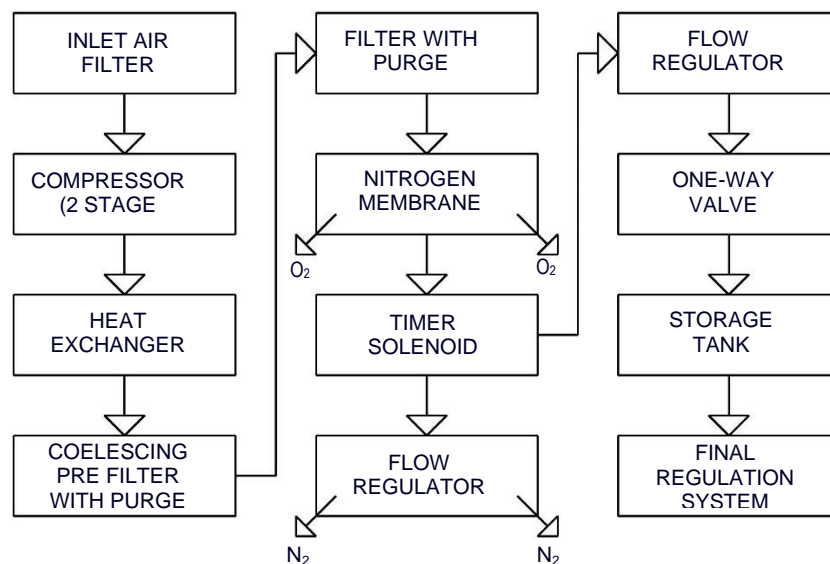


Figure 1 – Nitrogen Generator Module Functional Operation

NITROGEN MEMBRANE PRINCIPLE OF OPERATION

Refer to Figure 2 below. Compressed air flows into the hollow fiber membrane. Various air components, such as oxygen, nitrogen, carbon dioxide and water vapor pass through the membrane wall, but the rate at which this occurs differs for the various gases. Oxygen and water vapor have a high diffusion rate and diffuse rapidly through the membrane wall. Nitrogen has a low diffusion rate and penetrates the membrane wall slowly, mainly at the end of the hollow fibers. The purity of the nitrogen at the end of the fibers depends on the velocity of the gas flow. The nitrogen capacity of the membrane depends on the flow rate, operating temperature and operating pressure of the compressor.

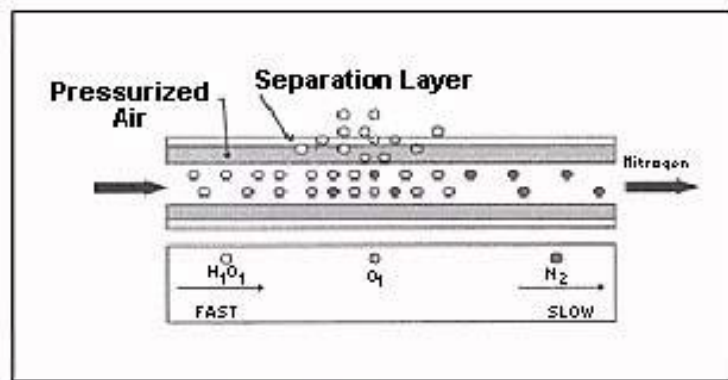


Figure 2 – Membrane and Gas Flow

SAFETY INFORMATION

Proper use of this equipment is important for your personal safety and for the trouble-free functioning of the unit. Incorrect control or attempts to perform adjustments could cause damage or lead to incorrect gas supply. Be sure to read and understand all instructions before attempting to operate the unit. The unit is designed to produce nitrogen. The nitrogen is supplied by an internal generator that produces nitrogen from ambient air through a process of separating oxygen from normal air. You must not use the unit for any other purpose than what is specified. Do not operate the unit beyond its limits (see Specifications table on page 5). In addition to the warnings and cautions in this manual, use the following safety guidelines for safe operation of the unit:

- ⚠ WARNING** The unit is an electrical appliance. Be sure that the main power supply is disconnected before you perform installation, maintenance or repair work.
- ⚠ WARNING** If you must work on the equipment with the main power supply on, be aware of electrical hazards.
- ⚠ DANGER** When working on the equipment, do not wear loose clothes, jewelry or hair. They could become entangled in the fan blades.
- ⚠ WARNING** The compressor becomes very hot when operating. Be careful when you open the cabinet after the unit has been operating for any length of time. Do not touch the compressor. Allow it to cool down before you start to perform any service on the unit. If you must work on the unit while it is hot, be sure to wear protective gloves to protect yourself from the heat.
- ⚠ CAUTION** Do not block the ventilation inlets and outlets as this could cause overheating and damage to the unit.
- ⚠ CAUTION** Do not position the AC unit other than vertical. If the AC is positioned horizontally, reposition to a vertical position for 12 hours before starting unit.
- ⚠ WARNING** In order to prevent injury or damage caused by the sudden release of compressed air, make sure that the unit and connected systems are fully depressurized before you start uncoupling parts of the system. Make sure no one tampers with the pressure-relief valve.
- ⚠ DANGER** This unit produces nitrogen and oxygen-enriched air. Nitrogen can cause suffocation. Oxygen-enriched air can lead to increased risk of fire in the event of contact with flammable products. Ensure adequate ventilation at all times.

IMPORTANT The following words and symbols appear in this manual and show important safety instructions:

- ⚠ DANGER** Indicates information important to the proper operation of the equipment. Failure to observe will result in damage to the equipment and/or severe bodily injury or death.
- ⚠ WARNING** Indicates information important to the proper operation of the equipment. Failure to observe may result in damage to the equipment and/or severe bodily injury or death.
- ⚠ CAUTION** Indicates information important to the proper operation of the equipment. Failure to observe may result in damage to the equipment.

Read all safety instructions to avoid personal injury or death and to avoid damage to the unit or property.

SPECIFICATIONS

NOMINAL PERFORMANCE	
Nitrogen (N2)*	125 psi
Purity of N2 Delivered*	99.5%
Flow rate*	~1.0 SLPM
Dew Point of N2 Delivered*	<-50°C
AVERAGE PERFORMANCE FROM -40° TO 50°C	
Purity of N2 Delivered	>99.0%
Dew Point of N2 Delivered	-40°C
Flow Rate	1.0 SLPM Continuous
Maximum Oil Volume to Blanket	30,000 gallons
FINAL OUTPUT PRESSURE	
Regulator Output Between 0 and 2.0 psi Control Range Between 0.2 and 5.5 psi	

* Nitrogen Delivery properties at nominal temperature of 25°C.

ELECTRICAL	
Voltage/Frequency	120V AC, 60 Hz
Power Consumption*	1-19A depending on ambient conditions
Start Inrush	Up To 60A (120 VAC)
Potential Free Alarm	Normally open, 1A
AMBIENT CONDITIONS	
Temperature Range	-40° to +40°C
Air Quality	Normally clean ambient air
Relative Humidity	< 90%
Altitude	0-6000 ft.
ENVIRONMENT	
Noise Level	Less than 65 dB(A)
Location	Outdoors, wall mounted
Safety Standards	CE; applicable standards

* Typical operation:
 Fan only — 1A
 Heaters (low ambient) — 10A
 AC (high ambient) — 5A
 Compressor Run (5 min) — 9A

IMPORTANT: A 30-amp breaker located at the main power supply to the system is recommended for protection of the N2 Generator.

Table 1 – Nitrogen Generator Specifications

⚠ CAUTION The nitrogen generator is designed to provide the equivalent volume of nitrogen as a standard nitrogen system consuming the standard 225 ft³ bottle every 4 days or more. *Operating the equipment beyond the rated 1 l/m continuous will result in damage to the unit and void the manufacturer’s warranty, i.e. multiple transformer application or leaking transformer with a consumption of greater than 1 l/m.* The internal compressor is rated to operate in a maximum ambient temperature of 104°F. To ensure maximum service life, a conservator circuit has been implemented to protect the N2 Generator and internal compressor.

INSTALLATION – SINGLE TRANSFORMER

⚠ CAUTION The unit must be mounted in an upright position. Do not mount unit on its side or back. The unit **MUST** be vertical for 12 hours before turning the unit on.

⚠ WARNING A crane, or similar lifting device, is required to lift and secure unit to wall mounting surface.

⚠ CAUTION Do not block the ventilation inlets and outlets as this could cause overheating and damage to the unit.

⚠ WARNING Support structure and mounting hardware must be capable of supporting the generator weight of 380 lbs. minimum. Cabinet is designed to be mounted using 1/2” hardware.

- The unit must be mounted above grade level away from heat sources.
- Do not install in an enclosed cabinet; proper ventilation is required.

⚠ WARNING Purging the head-space after maintenance or during initial transformer certification **MUST** be done with a N2 bottle system to avoid damage to the N2 Generator.

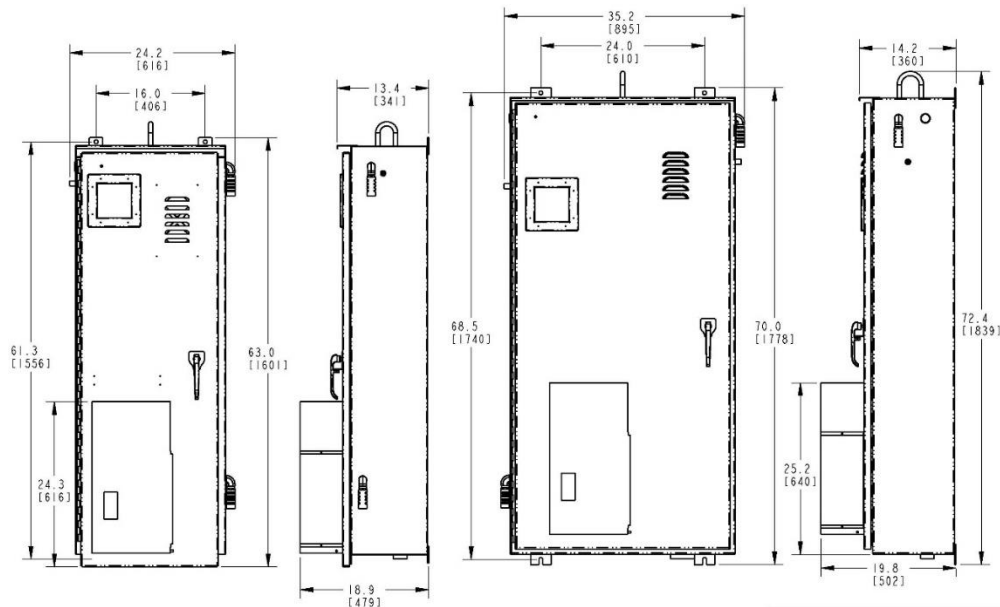


Figure 3 – Generator Mounting Dimensions: Standard Generator (left) and Generator with Bottle Back-Up (right)

1. Measure and mark the mounting holes or studs as shown by the center-to-center distances of Figure 3 above. **IMPORTANT:** Verify the bolt holes are level and high enough to support cabinet above grade.
2. Lift the unit into position with crane and top hook.
3. Secure hardware. **NOTE:** Cabinet is designed to be installed using 1/2” hardware.
4. Plumb to transformer using copper or stainless steel 1/4” or larger tubing. **NOTE:** Inlet and outlet ports of generator are female 1/4” NPT.

INSTALLATION – MULTIPLE TRANSFORMERS

- ⚠ CAUTION** The unit must be mounted in an upright position. Do not mount unit on its side or back. The unit **MUST** be vertical for 12 hours before turning the unit on.
- ⚠ WARNING** A crane or similar lifting device is required to lift and secure unit to wall mounting surface.
- ⚠ CAUTION** Do not block the ventilation inlets and outlets as this could cause overheating and damage to the unit.
- ⚠ WARNING** Support structure and mounting hardware must be capable of supporting the generator weight of 380 lbs. minimum. Cabinet is designed to be mounted using 1/2” hardware.
- ⚠ WARNING** Use of the Nitrogen Generator for multiple transformers requires evaluation of several conditions to maintain the health of each transformer. Do not proceed unless all conditions are met.

1. Calculate the required usage for each transformer to be connected to the generator. The total sum of usage cannot exceed 1 slpm. For example, 1 slpm continuous usage equates to using a single standard 225 cuft nitrogen bottle every 4 days.
2. **IMPORTANT:** Each transformer must have a final nitrogen pressure regulation system with tank alarms.
3. **IMPORTANT:** Piping for each transformer must contain a one-way valve to prevent airspace backflow to the supply line.
4. **IMPORTANT:** Piping for each transformer must contain a separate isolation valve.
5. **IMPORTANT:** Each transformer must be protected by a suitable pressure/vacuum device.

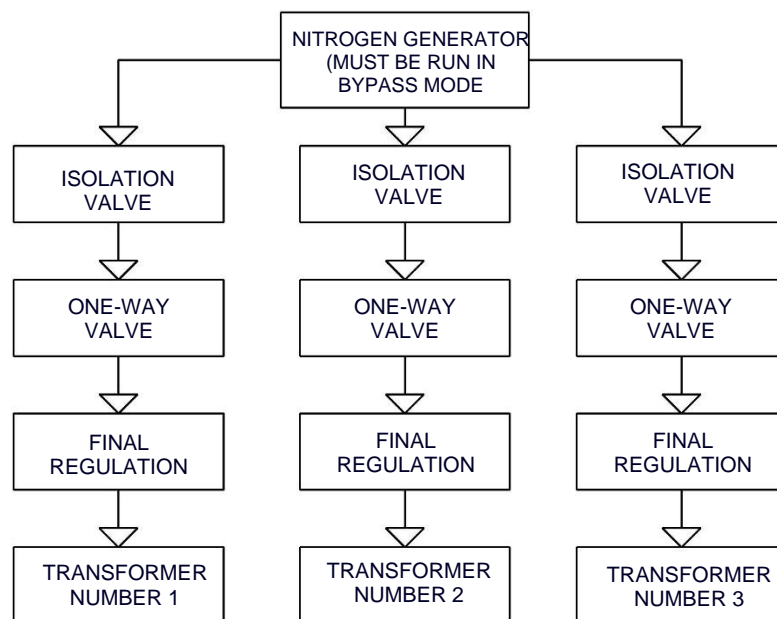


Figure 4 – Multiple Transformer Installation Flow

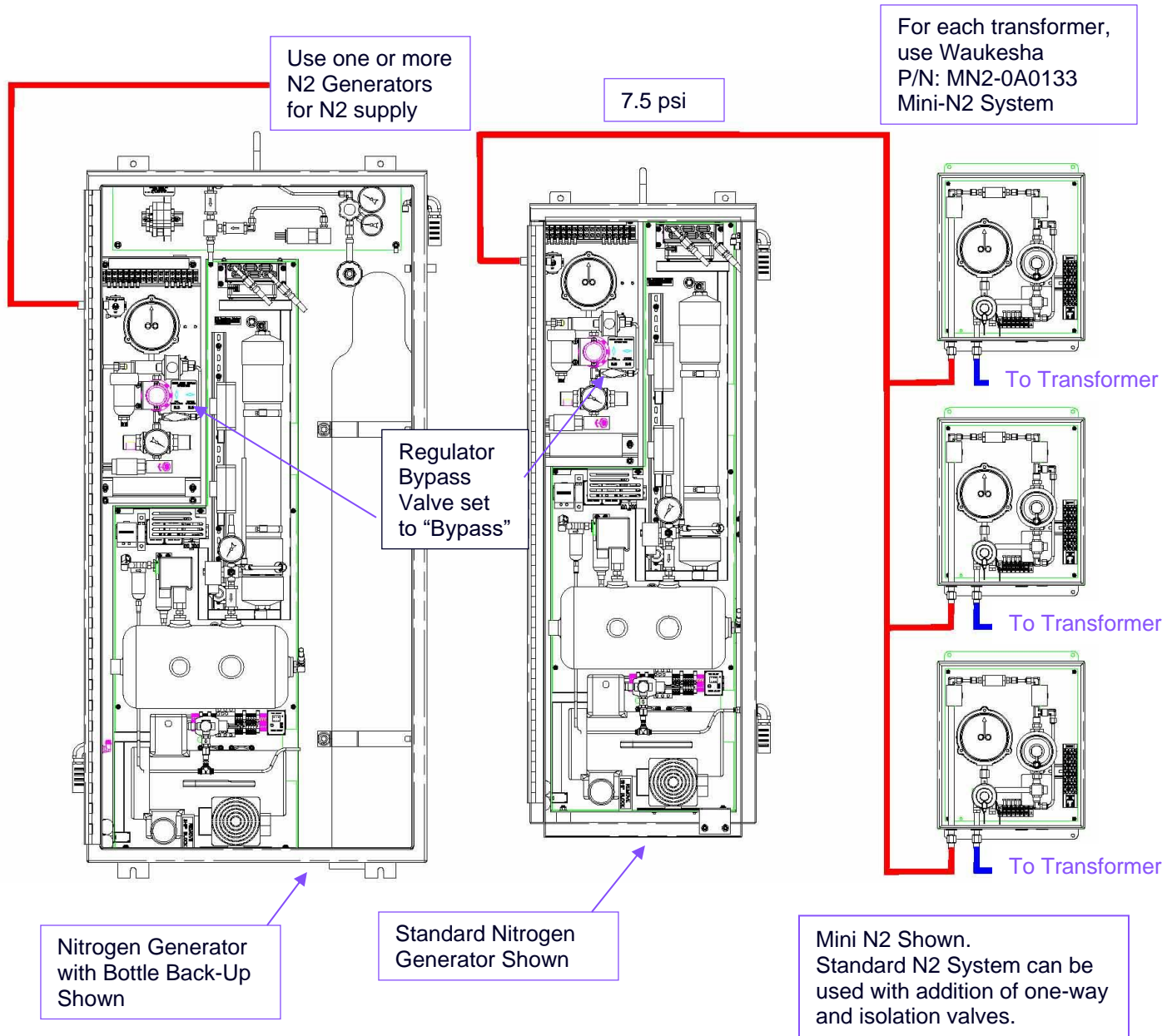


Figure 5 – Typical Example of Multiple Transformer Installation

ELECTRICAL CONNECTIONS

⚠ WARNING Electrical shock hazard. Failure to follow these instructions could result in serious injury or death.

- Electrical ground is required on this piece of equipment.
- Do not use an extension cord with this piece of equipment.
- Unit should be grounded according to local electrical codes to prevent the possibility of electrical shock. A grounded receptacle with separate electrical lines is required, protected by fuses or circuit breaker of the proper rating. *Check with a qualified electrician if you are in doubt as to whether or not the equipment is properly grounded.*

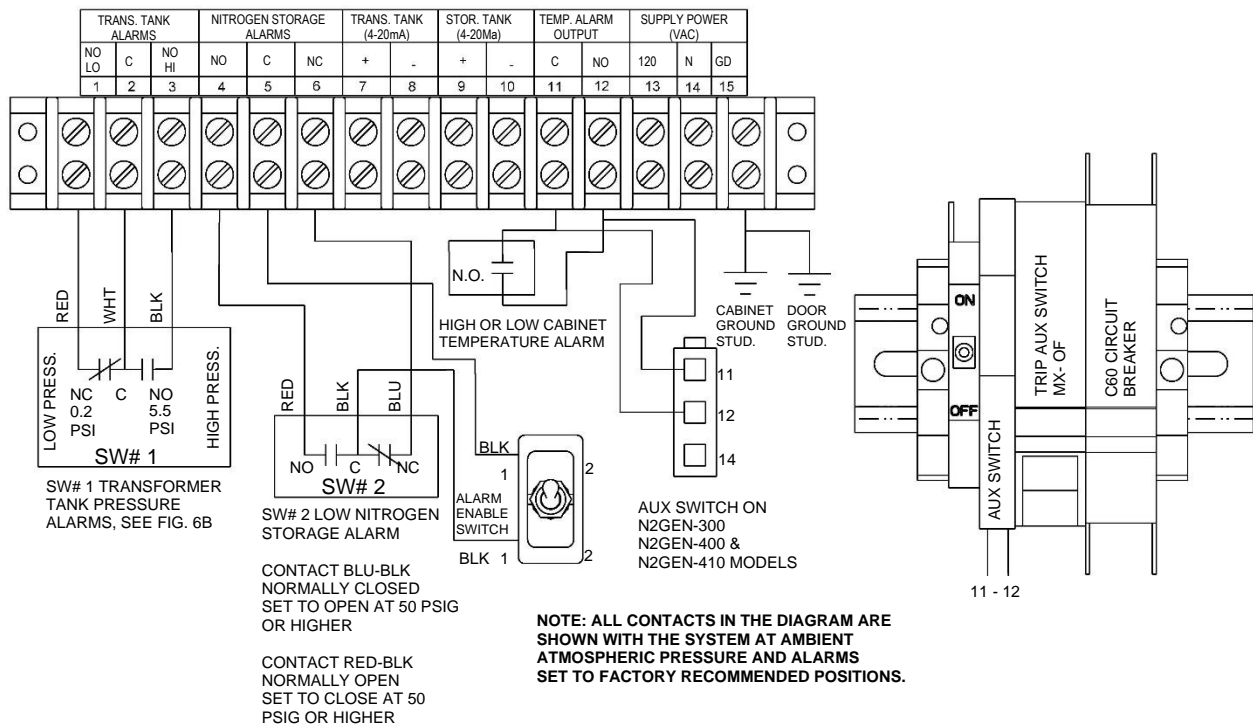


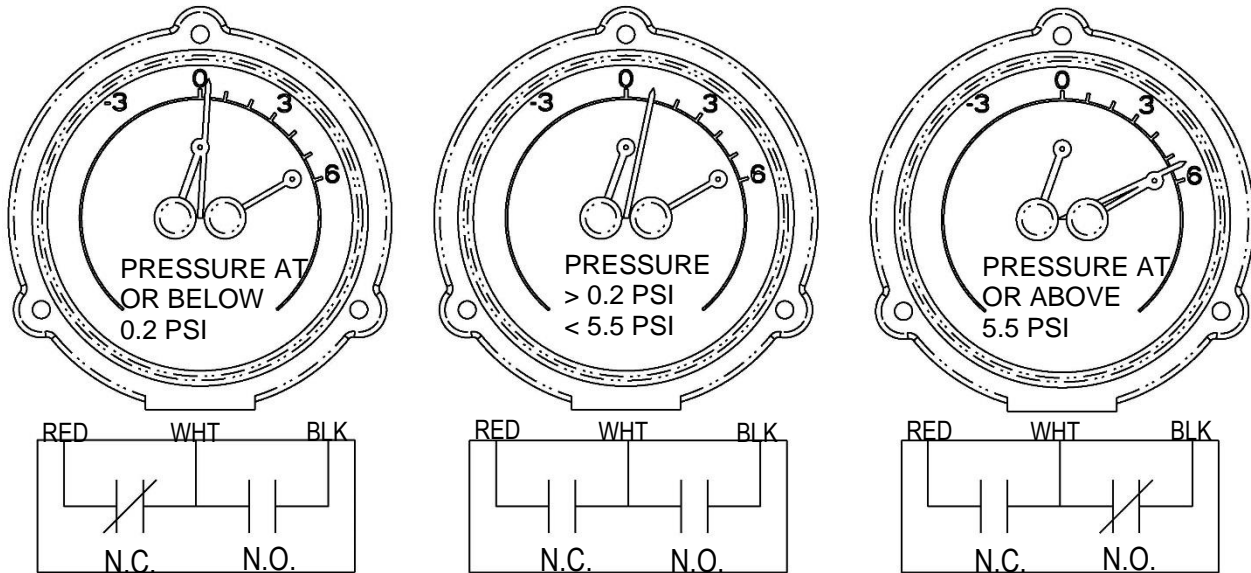
Figure 6 – Alarm and Power Connections for All N2 Generators (left) and Additional Changeover Auxiliary Alarm for Bottle Back-Up Systems (right)

1. Conduit entry points are located on both sides of the cabinet. Install conduit with sealed connectors to prevent water entry to the generator system.
2. After pulling wire, seal conduit entry with expanding foam (or similar). The generator compressor must not be allowed to draw air from conduit.
3. Locate the terminal block on the regulator module. Loosen the two thumbscrews and swing terminal panel cover out of the way to expose terminal connections.
4. Connect the wiring to the terminals as shown in Figure 6 above.
5. Alarm connections are not required for generator operation but are highly recommended.
6. Reposition the terminal panel cover and tighten thumbscrews.

N2 PANEL ALARM OPERATION:

The compound pressure gauge monitors gas pressure in the transformer tank (see Figure 7 on page 11 for location of this gauge). The gauge has a range from negative 15.0 psi to positive 15.0 psi (-15.0 psi to +15.0 psi) and is equipped with two adjustable alarm contacts. The gauge is shipped with both moveable alarms adjusted to zero to prevent shipping damage due to vibration. Before placing the unit in service, these alarm points must be adjusted to be outside of the normal regulation band. **Factory recommended settings would be 0.2 psi and 5.5 psi.**

During normal operations, the pressure on the transformer tank is expected to fluctuate between 0.5 psig and 5.0 psig, following the temperature variation in the transformer, at which both SW# 1 contacts will stay open. In the event the pressure drops to 0.2 psig or below (the low pressure alarm setting), the SW# 1 low pressure contact (Red-White) will close, sending an alarm, if monitored. If the pressure on the transformer tank increases to 5.5 psig or above (the high pressure alarm setting), the SW# 1 high pressure contact (Black-White) will close, sending an alarm, if monitored. See Figure 6B. The *Alarm Enable Switch* is used to disable alarm signals during nitrogen generator maintenance.



CONTACT RED-WHITE
RECOMMENDED FACTORY
SETTING TO CLOSE AT A
PRESSURE OF 0.2 PSIG OR
BELOW, SENDING AN
ALARM IF MONITORED

CONTACTS SHOWN WITH
TRANSFORMER TANK
PRESSURE IN VALID
RANGE ABOVE 0.2 PSIG AND
BELOW 5.5 PSIG; ALARMS
SET TO FACTORY
RECOMMENDATIONS

CONTACT BLACK-WHITE
RECOMMENDED FACTORY
SETTING TO CLOSE AT A
PRESSURE OF 5.5 PSIG OR
ABOVE, SENDING AN
ALARM IF MONITORED

Figure 6B – Typical SW# 1 Contact Operation

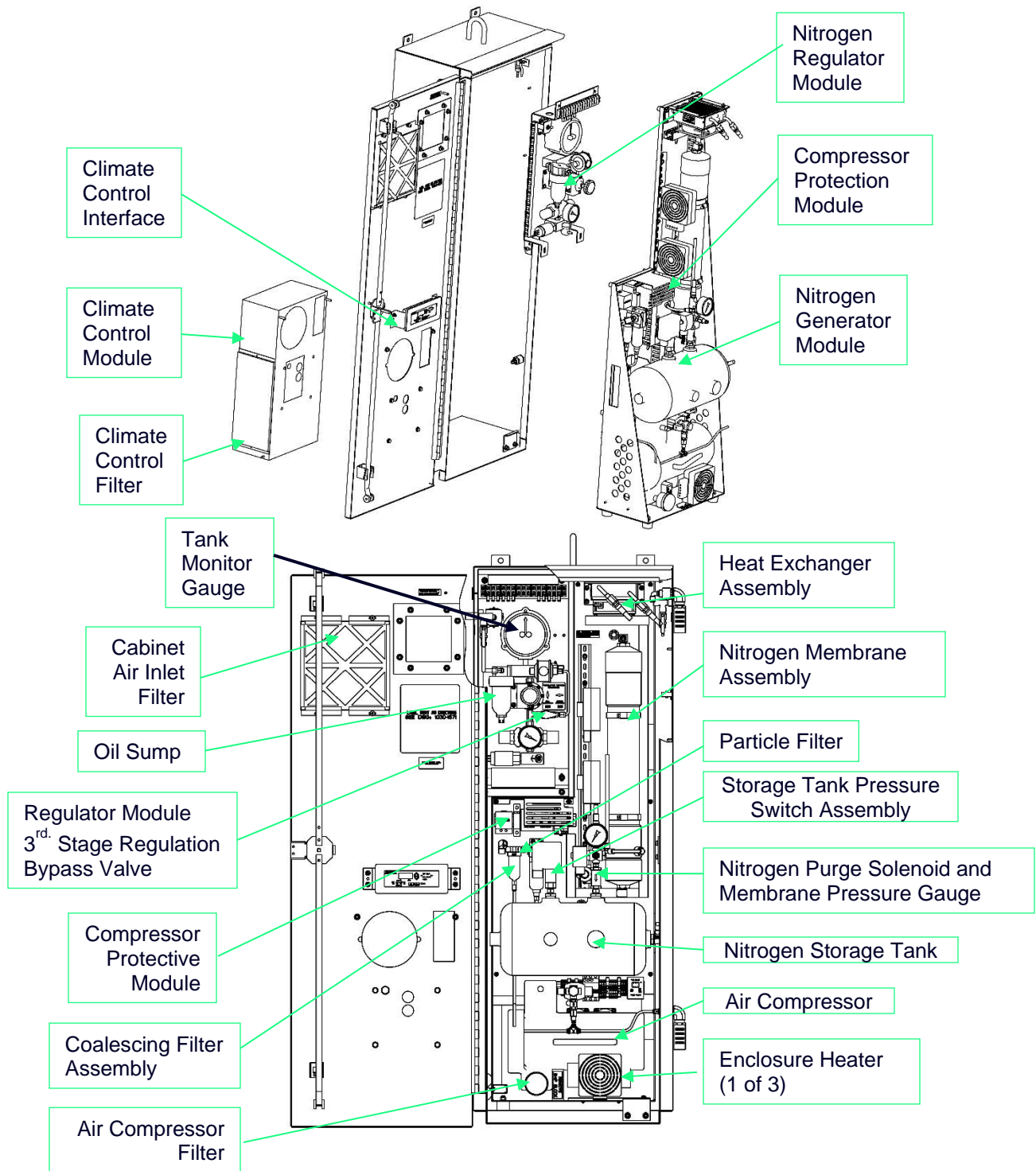


Figure 7 – Standard Nitrogen System Components Identification

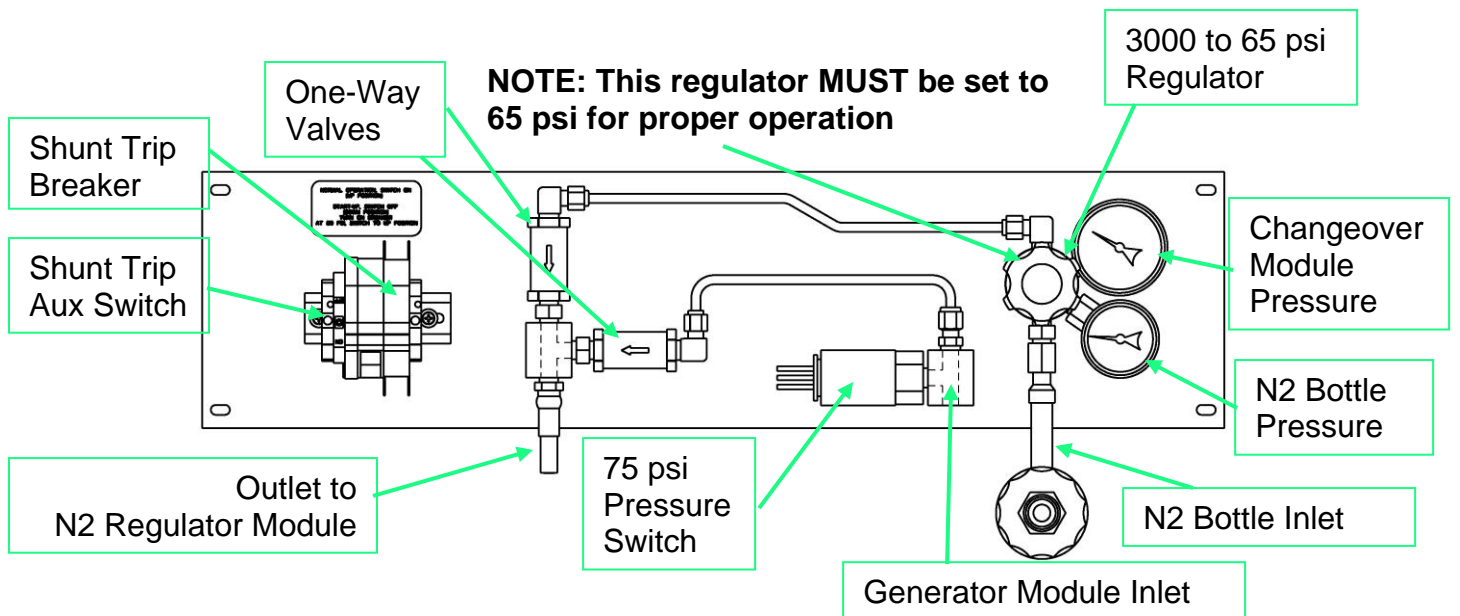
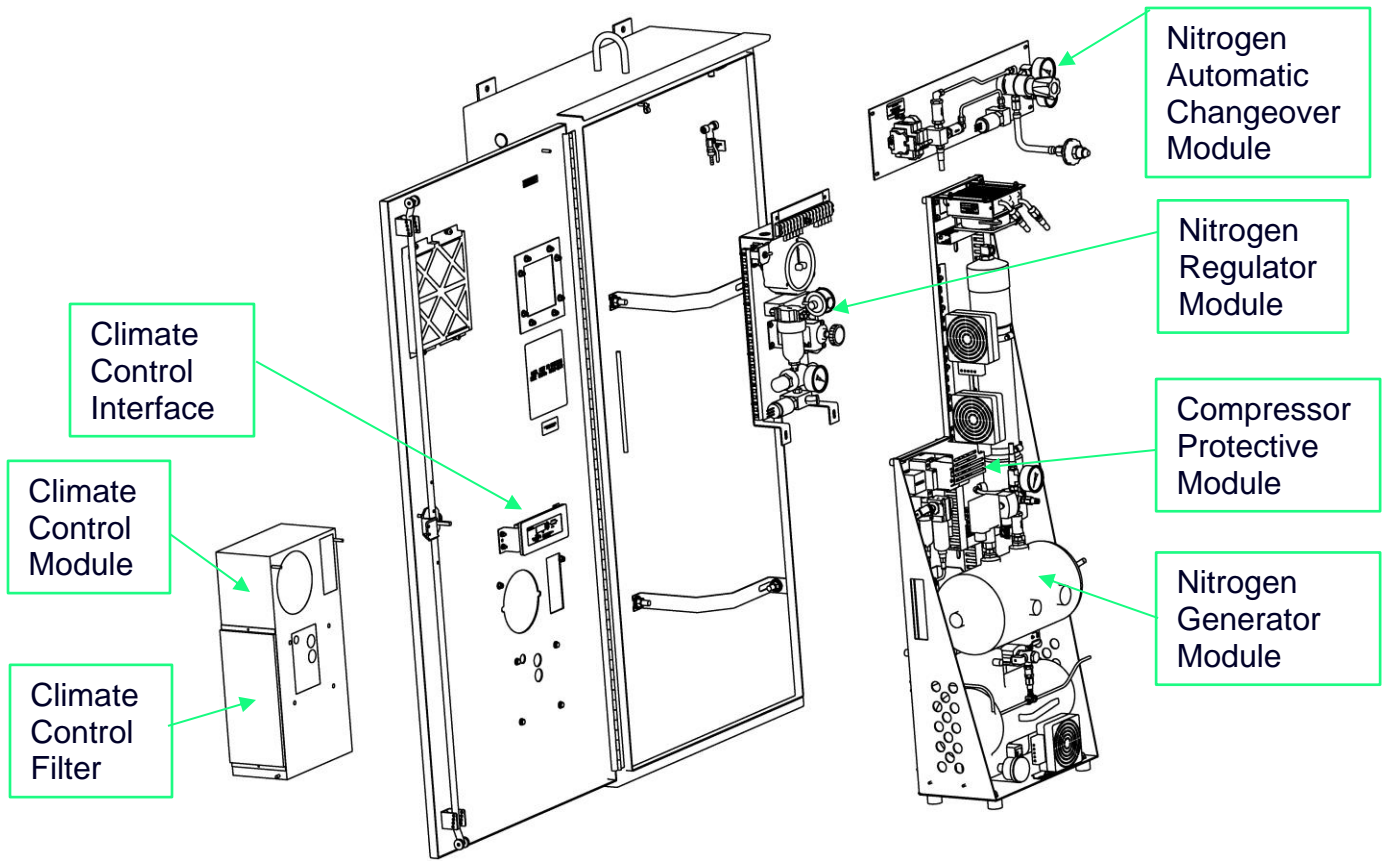


Figure 8 – Bottle Back-up Nitrogen System Component Identification with Automatic Changeover Module Sub-Components

START-UP

IMPORTANT: Make sure the unit has been properly installed according to the Installation Instructions included in this manual. The unit **MUST** be vertical for 12 hours before turning the unit on.

CAUTION When the compressor starts, the cooling fan on the heat exchanger should rotate. If fan is not rotating, turn unit off or damage to the unit could occur.

The generator system is factory set for optimum purity and no adjustments are necessary. The design of the system is such that the operating temperatures of all components must be controlled to optimize nitrogen purity. Because of this, it is necessary for the climate control system be energized for a period of 8 hours prior to releasing nitrogen from the generation system.

The climate control system is preset to cool when the enclosure air temperatures exceed 80°F and heat when the enclosure air temperature falls below 63°F. The enclosure air is continually cycled through the system to avoid temperature gradients anywhere in the system.

After all components have been brought within temperature specifications, the generator is ready for use and the gas space purge operation can begin.

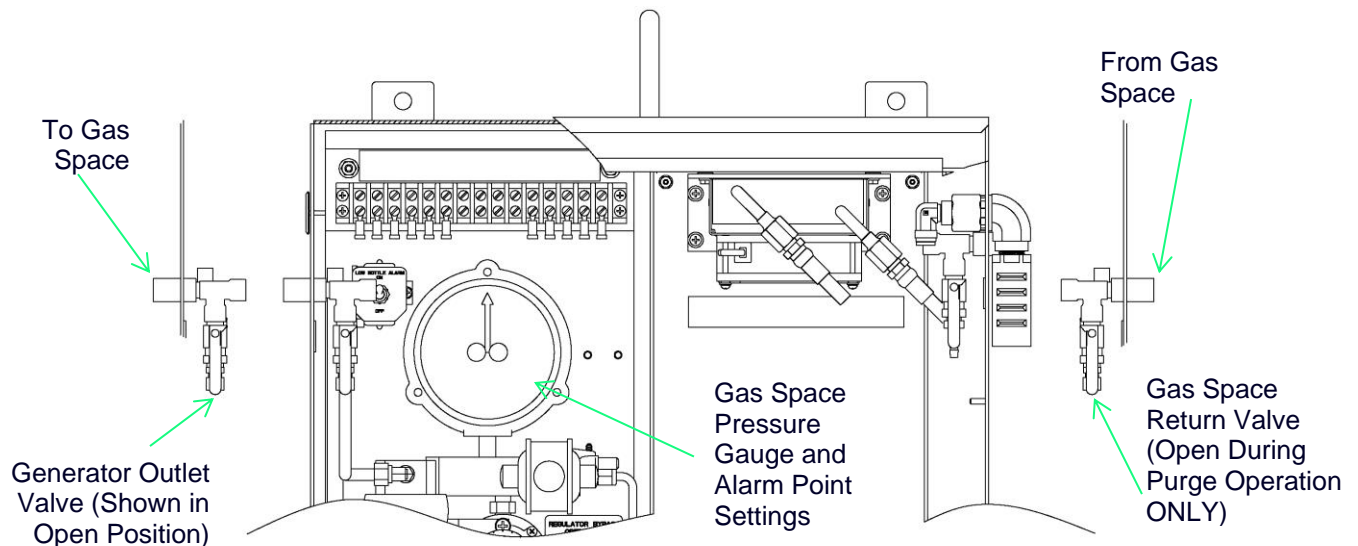


Figure 9 – Generator Inlet and Outlet Valves

1. Remove “Ship Block” under the compressor (the block provides stability during shipping).
2. Before operating, gas space pressure switch contacts must be set to allow the needle to move (alarm points protect the needle during transport).
3. Loosen clamp around the needle alarm knobs. A small screw is located on the bottom of the clamp.
4. Adjust the low-pressure contact (left knob) to 0.2 psi. Adjust the high-pressure contact (right knob) to 5.5 psi.
5. Tighten the clamp.
6. Turn on the main power feed to the generator with appropriate fuse or breaker disconnect.

START-UP (continued)

7. Verify that the climate control internal fan is working & climate control interface is energized.
8. Verify storage tank pressure. If tank is empty or below 90 psi, the air compressor should immediately start and run for approximately 5–7 minutes. NOTE: A strong hissing sound will be heard for the first 2 minutes as the nitrogen is diverted to atmosphere before being brought to full purity.
9. Close generator door and wait for enclosure temperature to be brought within specifications.
10. After compressor charges the storage tank and shuts off, perform a continuity check on the following alarms contacts:
 - a) Terminals 1 to 2 – OPEN Terminals 2 to 3 – OPEN
 - b) Terminals 4 to 5 – OPEN Terminals 5 to 6 – CLOSED
 - c) Terminals 11 to 12 – OPEN
11. Open the outlet valve. Compressor will cycle as storage tank drains to 90 psi. Compressor shut-off is 110–125 psi. Typical runtime is 5–10 minutes, depending upon altitude.
12. Rotate the regulator panel bypass valve from full regulation to bypass operation.
13. Open the return valve.
14. Close the generator door and latch.
15. Purge for the calculated amount of time based upon 5 liters per minute flow rate.
16. Close return valve.
17. Change regulator panel bypass valve from bypass mode to full regulation mode. This will maintain the gas space from 0.5 psi to 5 psi.

IMPORTANT: Check all pipes and connections for leaks using soap or leak-tracing spray. Any leakage will reduce capacity considerably.

PROPER SYSTEM OPERATION CHECKS

1. During air compressor run and with outlet valve shut, check membrane outlet gauge (on top of storage tank) and verify that the pressure rises above 130 psi. If not, leaks exist between the compressor & storage tanks or the inlet carbon filter & compressor filter may be clogged.
2. Verify that compressor turns on at 90–100 psi and turns off at 110–125 psi. If not, readjust. NOTE: In higher altitude locations, the pressures may need to be adjusted to the low side of specifications.
3. Verify that the nitrogen storage system is not leaking. With generator outlet valve shut and the air compressor off, verify that no decrease in pressure takes place on the nitrogen regulator module gauge. If a decrease is present, the one-way valve, storage tank or nitrogen regulator module may be leaking.
4. Verify during compressor run that the coalescing filter purges the collected water and reseals during the next compressor run. The oil sump drain can be used to speed the cycling of the air compressor.
5. At each compressor start, verify that the solenoid valve diverts to atmosphere. At each start, a strong hissing sound will occur for two minutes. If not, the solenoid valve may have failed. If the hissing sound is heard for less than or longer than two minutes, the solenoid timer is misadjusted. Push the corresponding buttons on timer to display 110 (seconds).

START-UP: Bottle Back-Up Systems Only

1. Install the nitrogen bottle into the cabinet and install the supplied pigtail.
2. Place the shunt bypass switch in the OFF position.
3. Place the circuit breaker in the ON position.
4. Perform the start-up and operation checks described in the previous section.
5. Place the shunt bypass switch in the ON position
6. Open bottle and verify that the bottle gauge is above 200 psi.

TO VALIDATE THAT BOTTLE BYPASS IS WORKING CORRECTLY:

1. Turn the circuit breaker to the OFF position.
2. Open the oil sump drain to bleed nitrogen from generator storage tank.
3. At 75 psi (+/- 2 psi) decreasing, the automatic changeover pressure switch contacts should change state. This would normally send a shunt trip signal to the circuit breaker.
4. At 65 psi (+/- 5 psi) decreasing, the automatic changeover bottle regulator should begin flowing nitrogen & the regulator module pressure gauge should hold steady at 65 (+/- 5 psi).
5. If bottle regulator pressure is incorrect, adjust automatic changeover panel pressure regulator by turning the knob.
6. After verification is complete, close oil sump drain and turn shunt bypass switch and circuit breaker to the ON position. Verify that the circuit breaker immediately trips. Circuit breaker should trip at any pressure below 75 psi.
7. Turn shunt bypass switch to the OFF position and turn circuit breaker to the ON position.
8. Generator will fill to maximum storage pressure.
9. Turn shunt bypass switch to the ON position.

CLIMATE CONTROL

As soon as electrical power is supplied to the Generator system, the cool air stream blower will start to operate. The blower will run continuously so that the controller can monitor the enclosure’s internal temperature. The enclosure temperature will be displayed on the face of the controller.

If the enclosure temperature is greater than the factory cooling set point of 80°F, the “Cool” status LED will flash. This indicates that the coolant compressor’s automatic off cycle timer is working. The off cycle timer is factory set at 3-1/2 minutes. At the end of 3-1/2 minutes, the coolant compressor and the condenser air blower will begin to operate. This signifies that the cooling system has begun operation to remove heat and humidity from the enclosure. This procedure may take 20 to 30 minutes before it reaches full capacity.

When the temperature inside the enclosure decreases 7°F below the “Cooling on” set point, the coolant compressor and the condenser blower will cycle off. The cool air blower will continue to operate, circulating air within the enclosure. The controller has a factory programmed temperature differential of 7°F.

Example: “Cooling on” @ 80°F; “Cooling off” @ 73°F.

The climate control system also provides power to three external heaters, which are mounted in various places within the equipment enclosure. If the enclosure temperature is below the factory heating set point of 63°F, the heat status LED will be “on”. This indicates the heat relay has been energized and is providing power to the three 400 watt heaters (no time delay exists before heating begins). When the temperature of the enclosure rises 7°F above the set point, the controller will de-energize the heat relay and cycle the heater “off”.

NOTE: There is a dead band programmed into the controller that prevents heating and cooling from operating simultaneously.

PROGRAMMING THE CONTROLLER

The controller has been programmed at the factory with typical default settings for immediate system operation. Please review the following default settings:

1. Cooling system on temperature 80° F
2. Heating system on temperature 63° F
3. High enclosure temperature alarm 105° F
4. Low enclosure temperature alarm 40° F
5. Audible and Visual alarm “ON”
6. Digital display in degrees Fahrenheit
7. Filter maintenance alarm 0 days – Disabled
8. High condenser temperature alarm 170° F

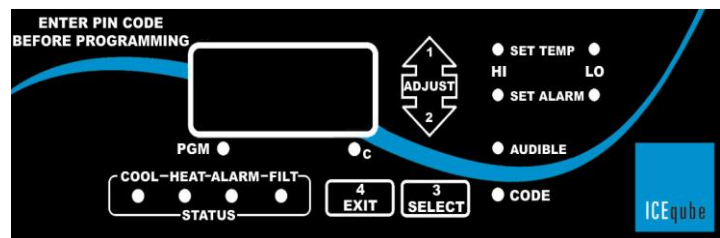


Figure 10 – Climate Control Interface

CLIMATE CONTROL (continued)

The temperature alarm settings have been preset to protect the generator system before known failure values. Changing these values is generally not recommended; however, if the above factory values have been inadvertently changed, the following programming information is provided for reference.

To change the factory default settings, enter the programming code sequence:

“1 Adjust-up” arrow

“2 Adjust-down” arrow

“3 Select”

“4 Exit”

After pressing the above sequence, the program LED should illuminate along with three alternating flashing boxes on the display face, indicating the code was accepted. If no selection is made within one minute, the system returns to the normal operating mode.

NOTE: Pressing the “4 Exit” button at any time while in the programming mode returns the controller to the normal operating mode.

Press the “3 Select” button to continue programming. The set temperature “HI” LED illuminates with the display indicating the ‘cooling on’ set point. The coolant compressor will begin operation at this temperature and will remain operating until the enclosure temperature decreases approximately seven degrees Fahrenheit (four degrees Celsius). Press the “1 Adjust-up” or “2 Adjust-down” arrow until the desired set point is displayed. The range for this adjustment is 70°F to 126°F, (21°C to 52°C). When the adjustment is complete, press the “3 Select” button to continue.

The set temperature “LO” LED is *on* with the display indicating the ‘heating on’ set point. The heating system will begin operation at this temperature and remain operating until the enclosure temperature increases approximately seven degrees Fahrenheit (four degrees Celsius). Press the “1 Adjust-up” or “2 Adjust-down” arrow until the desired set point is displayed within a range of 0°F to 63°F (–17.8°C to +17°C).

NOTE: Review alarm settings if the ‘cool on’ or ‘heat on’ set points have been changed.

Press the “3 Select” button to continue. The set alarm “HI” LED is *on* with the display indicating the high temperature alarm set point. The alarm will activate at this temperature and will automatically reset at two degrees Fahrenheit (one degree Celsius) below this temperature. Press the “1 Adjust-up” or “2 Adjust-down” arrow to change the alarm set point to a point greater than 8°F (or 4°C) above the set temperature “HI” set point, to 135°F (or 57°C).

Press the “3 Select” button to continue. The set alarm “LO” LED is *on* with the display indicating the low temperature alarm set point. The alarm will activate at this temperature and will automatically reset at two degrees Fahrenheit (or one degree Celsius) above this temperature. Press the “1 Adjust-up” or “2 Adjust-down” arrow to change the alarm set point to a point no less than 8° F (4°C) below the set temperature “LO” set point to –20°F (or –29°C).

CLIMATE CONTROL (continued)

Press the “**3 Select**” button to continue. The alarm LED will flash and the display will show “ALL”, indicating the “ALL” alarm on/off status. Press “**3 Select**” and the display will show either “ON” or “OFF”, indicating current alarm status. Press “**1 Adjust-up**” or “**2 Adjust-down**” to toggle the mode as desired. If the “OFF” mode is selected, no alarms will activate and the audible on/off select function is skipped.

Press the “**3 Select**” button to continue. The audible LED will flash and the display will show “AUD”, indicating the audible alarm on/off status. Press “**3 Select**” and the display shows “ON” or “OFF” indicating the current audible alarm status. Press “**1 Adjust-up**” or “**2 Adjust-down**” arrow to toggle the mode desired.

Press the “**3 Select**” button to continue. The “C” LED flashes and the display shows either “F” for degrees Fahrenheit or “C” for degrees Celsius. Press the “**1 Adjust-up**” arrow or “**2 Adjust-down**” arrow to toggle the mode as desired.

Press the “**3 Select**” button to continue. The code LED is on and the display shows “PIN”. To set a new user PIN code, press the “**1 Adjust-up**” button. The display will flash “4”, prompting an entry of a four button sequence using the “**1 Adjust-up**”, “**2 Adjust-down**”, “**3 Select**” and/or “**4 Exit**” buttons. Any sequence of the four buttons may be programmed as the code. As the buttons are pressed, the display will show the number of buttons that were pressed.

NOTE: After pressing a button, there will only be 5 seconds to press the next button. If the next button is not pressed within the allotted time, the system will default to no PIN code, indicated by “0” on the display. Once the sequence is entered the display will no longer flash, & will show “4”.

CAUTION Always record the selection sequence (PIN code) and store in a secure place.

Press the “**3 Select**” button to continue. The filter LED flashes and the display will show “FIL”, indicating the filter alarm DAYS selection. Press the “**3 Select**” button and the display will show the number of days that the alarm is set in one-half day increments. Example: 10.5 indicates the alarm will activate every ten and one-half days.

Press the “**1 Adjust-up**” or the “**2 Adjust-down**” arrow to vary the desired number of days. Programming 0 days will disable the alarm.

NOTE: The required number of days to set this alarm will be determined by the ambient air conditions.

ALARMS

The nitrogen generator system features non-powered alarm contacts that can be used to monitor the condition of the system externally. The following table lists each alarm and its corresponding cause, terminal condition and the maximum rating for the monitoring system.

ALARM	CONDITION	TERMINAL CONDITION	ELECTRICAL RATING
Low Gas Space Pressure	Gas space pressure has gone lower than 0.2 psi	Contact closes between terminals 1 and 2	1A, 120VAC or 2A, 30VDC
High Gas Space Pressure	Gas space pressure has exceeded 5.5 psi	Contact closes between terminals 2 and 3	1A, 120VAC or 2A, 30VDC
Low Nitrogen Storage Tank	Nitrogen storage tank pressure below 50 psi.	Contact close between terminals 4 and 5 AND contact opens between terminals 5 and 6	5A, 250VAC or 5A, 30VDC or 0.8A 125VDC
Generator Temp Alarm	Internal air space has risen above 105°F OR fallen below 40°F	Contact closes between terminals 11 and 12	40A, 125VAC
Generator Shut Down (Bottle Back-Up Systems Only)	Nitrogen generator pressure has decreased – generator has shut down and back-up bottle is in use	Contact closes on Trip-Aux switch, paralleled to terminals 11 and 12	2A, 125VAC

NOTE: All ratings listed are resistive.

Table 2 – External Alarms

SHUT DOWN

Under normal operation, the unit can be left on. The compressor will switch on/off automatically according to the storage vessel pressure (90 psi on, 125 psi off). The unit should only be switched off for maintenance work using the following procedure:

1. Disconnect the main power feed to the generator.
2. The compressor side of generator will automatically (but gradually) decompress for approximately 1 minute.
3. Nitrogen storage tank will continue to maintain pressure to regulation module unless manually drained. If necessary, close the output valve to the air space and drain storage tank with regulation panel sump drain.

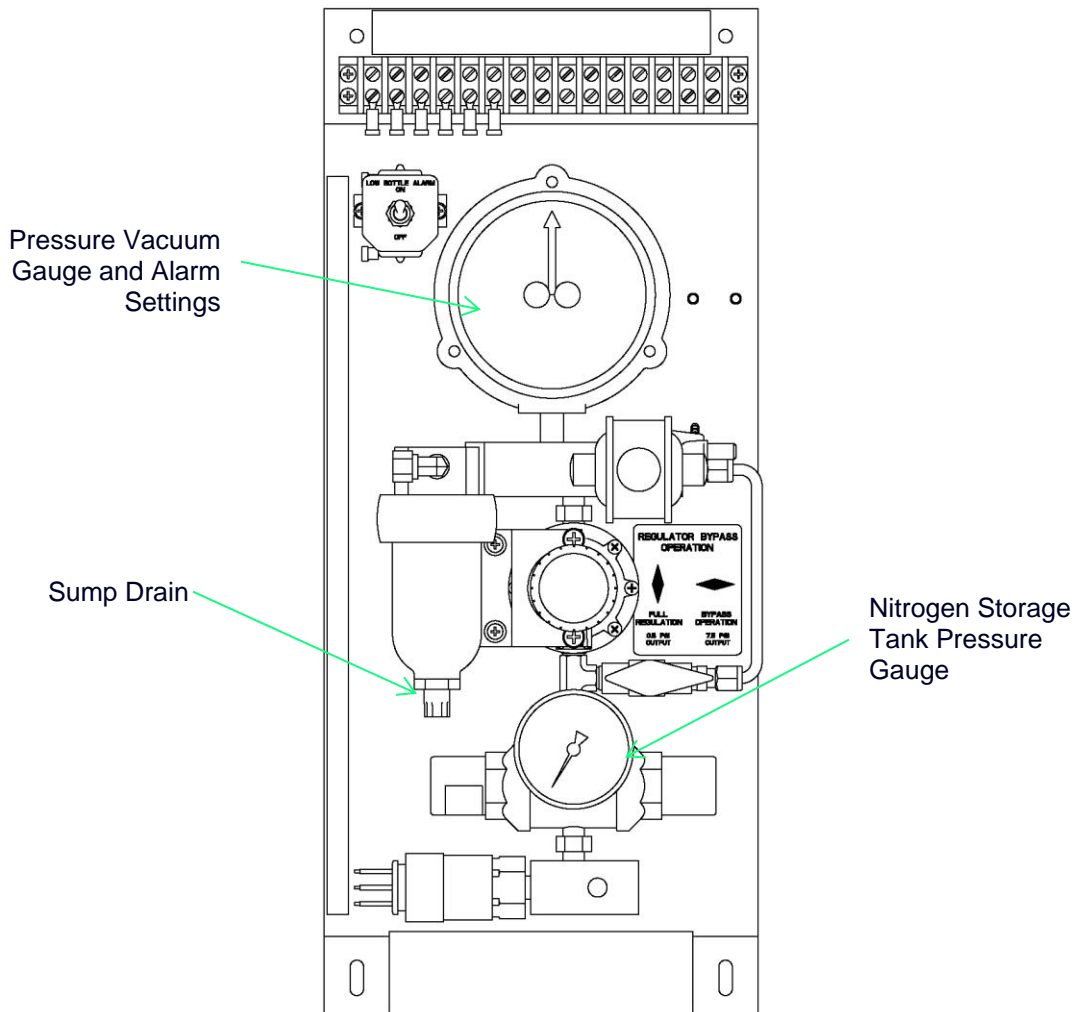


Figure 11 – Regulation Module Assembly

MAINTENANCE

NOTE: Complete filter replacement kit is available, Part No. 1030-1727K. Carbon filter MUST be changed bi-annually.

CARBON FILTER MUST BE CHANGED BI-ANNUALLY

Install a new carbon absorber/dust filter, Part No. 1030-1231:

1. Open the door to the generator unit.
2. Slide the carbon filter out of the retaining brackets.
3. Install a new filter, making note of the airflow direction.
4. Close the door to the generator unit.

AIR COMPRESSOR INLET FILTER — REPLACE BI-ANNUALLY OR EVERY 400 HOURS

Install a new filter, Part No. 1030-1301:

1. Disconnect power to the generator unit.
2. Open the door to the generator unit and unscrew the air compressor filter assembly.
3. Inspect for contamination on air compressor inlet side of the filter. If contaminated, the system has pumped contaminants through the system and the coalescing/final filter elements must be replaced.
4. Install the new air compressor filter assembly.
5. Release pressure from nitrogen storage tank using the sump valve (see figure 11 on page 19) until 95 psi remains.
6. Close the generator door and reconnect power.
7. Verify that compressor successfully charges the storage tank — this process should take approx. 10 minutes.

OIL SUMP — CLEAN BI-ANNUALLY OR EVERY 400 HOURS

The oil sump must be checked and cleaned periodically:

1. Disconnect power to the generator system.
2. Close the outlet valve to isolate the gas space from generator system.
3. Make sure unit is de-pressurized by opening the sump valve (see figure 11 on page 19).
4. If necessary, clean the oil sump with soap and warm water. The housing can be unscrewed from the mounting base for cleaning. Tighten housing securely but do not over-tighten.
5. Reconnect power and verify that the compressor successfully charges the storage tank — this process should take approx. 10 minutes.



Use only mild soap and water for cleaning. Do not use degreaser or other incompatible chemicals.

COALESCING & PARTICLE FILTER ASSEMBLIES — REPLACE BI-ANNUALLY OR EVERY 400 HOURS

Install new filters as a set, Part Nos. 1030-1300 (coalescing) and 1030-1303 (particle):

1. Disconnect power to the generator system (see Figure 7 on page 10).
2. Close the outlet valve to isolate the gas space from generator system.

MAINTENANCE (continued)

COALESCING & PARTICLE FILTER ASSEMBLIES — REPLACE BI-ANNUALLY OR EVERY 400 HOURS (continued)

3. Carefully unscrew the filter housings (retain housing O-rings for reuse) from the bodies.
4. If necessary, clean the filter housings with soap and warm water.
5. Replace coalescing and particle filters and O-rings.
6. Tighten housings securely but do not over-tighten.
7. Release pressure from nitrogen storage tank using the sump valve (see figure 11 on page 19) until 95 psi remains.
8. Reconnect power and verify that the compressor successfully charges the storage tank — this process should take approx. 10 minutes.

CLIMATE CONTROL FILTER — REPLACE BI-ANNUALLY

Install a new filter, Part No. 1030-1302:

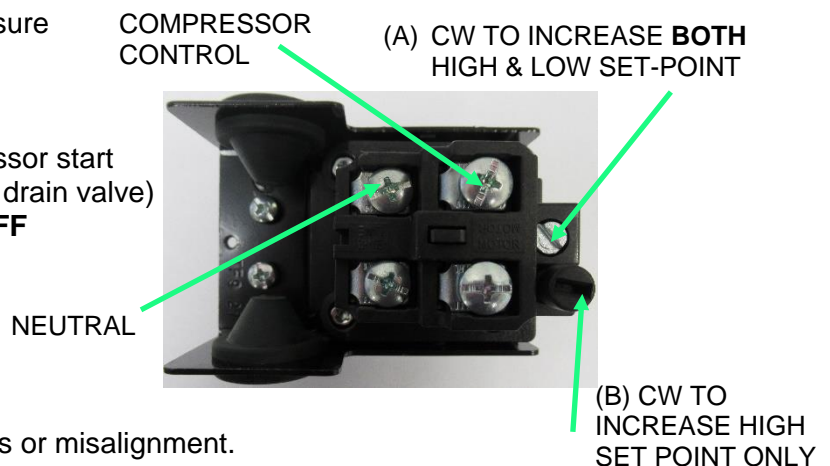
1. Replacement of the climate control filter is dependent of outside conditions such as dust or other debris.
2. Slide the climate control filter from the retaining brackets. Some units may require removal of the brackets.
3. Replace filter.

OTHER MAINTENANCE

STORAGE TANK PRESSURE SWITCH

The pressure switch setting is factory set and normally should not change. If problems are encountered during shipment or maintenance activity, the following procedure is for reference:

1. Isolate the N2 Generator from the tank.
2. Determine the compressor **START** pressure (Should be 90 ± 5 PSI, If Not)
3. Remove pressure switch cover.
4. Adjust (A) so the compressor **STARTS** At 90 ± 5 PSI. (You can force the compressor start By bleeding pressure using the oil sump drain valve)
5. Adjust (B) so the compressor **SHUTS OFF** at 120 ± 5 PSI.
6. Replace the switch cover.
7. Open the valve to the tank.



DOOR GASKET

Inspect door gasket bi-annually for rips, tears or misalignment.

ADJUSTING THE PURITY

The purity of the nitrogen is factory preset. The purity of the nitrogen gas can be set between 97% and 99.5%.

IMPORTANT: Adjusting the purity is a procedure that requires a skillful technician with knowledge of the process. If this procedure is to be done, we require service by Waukesha Transformer Solutions to prevent voiding warranty.

TROUBLESHOOTING

COMPRESSOR DOES NOT OPERATE	<ul style="list-style-type: none"> Power source is off 	<ul style="list-style-type: none"> Turn main power source on
	<ul style="list-style-type: none"> Unit is in “Standby” status 	<ul style="list-style-type: none"> Wait until pressure in storage vessel is reduced
	<ul style="list-style-type: none"> Temperature is too high or low 	<ul style="list-style-type: none"> Ambient temperature is too high (above 40°C) Climate control is not functioning properly and should be checked Call Waukesha Components
MEMBRANE PRESSURE OR DELIVERY PRESSURE TOO LOW (CONTINUOUS RUN) OR GENERATOR SHUTDOWN ON BOTTLE BACK-UP SYSTEM	<ul style="list-style-type: none"> Inlet filter is contaminated 	<ul style="list-style-type: none"> Replace the carbon filter & compressor inlet filter
	<ul style="list-style-type: none"> Leaks in the hoses or connections 	<ul style="list-style-type: none"> Seal any leaks*
	<ul style="list-style-type: none"> Excessive consumption 	<ul style="list-style-type: none"> Contact Waukesha Components to confirm appropriate application
	<ul style="list-style-type: none"> Pressure switch miss-adjusted 	<ul style="list-style-type: none"> Set pressure switch
	<ul style="list-style-type: none"> Coalescing filter(s) dirty or bowls are leaking 	<ul style="list-style-type: none"> Replace filters and check bowls for leaks*
DESIRED NITROGEN FLOW NOT ACHIEVED	<ul style="list-style-type: none"> One way valve leaking Leaks in hoses or connections Climate control not working 	<ul style="list-style-type: none"> Replace the one-way valve Seal any leaks* Call Waukesha Components

* To check for leaks, use soap solution or leak-tracing spray.

NITROGEN GENERATOR COMPRESSOR CONSERVATOR CIRCUIT

The nitrogen generator is rated to continuously supply a maximum of one liter/minute of N₂ to the protected space. The internal compressor is rated to operate in a maximum ambient temperature of 104°F. To ensure maximum service life, a conservator circuit has been implemented to protect the nitrogen generator and internal compressor when/if the maximum liter/minute N₂ capacity or cabinet internal temperature limits are exceeded. **The settings for this conservator circuit MUST NOT be altered or serious system damage may occur.**

The circuit monitors compressor run time.

- Settings
 - Serial numbers below: XXXX
 - Run Time: 6 minutes
 - Cool Down: 15 minutes
 - Serial number XXXX & above
 - Run Time: 7 minutes
 - Cool Down: 10 minutes

If the run time exceeds the above value—more than adequate time to replenish the N₂ supply when the unit is supplying the rated one liter/minute gas discharge rate—the compressor automatically shuts down and is placed in a mandatory cool down period. After this cool down period, the compressor is allowed to re-energize and continue replenishing the N₂ gas supply in the storage tank.

If the compressor is running with the protective circuit forcing a cool down period, steps **MUST** be taken to find the cause for the excess of one liter/minute gas usage. *Normally, the cause for the excessive N₂ gas usage will be a leak in the protected volume being supplied by the nitrogen generator.*

The compressor will also shut down if the air temperature within the nitrogen generator cabinet exceeds 105°F operating range. The compressor will remain shut down until the cabinet air temperature falls below 95°F.

If the compressor is being shut down due to high cabinet temperature, the user will experience a high ambient temperature alarm output. Steps **MUST** be taken to reduce the cabinet ambient temperature. *Normally, the cause for excessive cabinet temperature will be a fault with the nitrogen generator's AC cooling unit.* The user should check ALL AC filters to ensure they are not clogged and/or in need of replacement. Check the AC unit to verify it is running and producing cooling air to the cabinet. If the AC unit is not running or running and not producing cooling air to the cabinet, contact the factory at 800-338-5526.

REPLACEMENT PARTS AND SERVICE

Please contact your local sales representative or authorized distributor for replacement parts and/or service, or visit us online at www.waukeshacomponents.com.

For technical support, call us at 800-338-5526.