Scroll Medical & Laboratory Compressed Air Systems

Please read and save these instructions. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference.

Description

The Powerex Scroll Medical Compressed Air Source Systems are intended to provide Medical Air as where risk meets the Category 3 requirements in NFPA99. Medical Air is intended for use in human respiration. Standard Laboratory Compressed Air Source systems are intended for use in facilities where the risk is less than Category 3, or applications outside of the scope for NFPA99, and not intended for human respiration. The systems include intake filtration, electric motor driven compressor pumps, aftercoolers, condensate traps, air storage receiver with automatic condensate drain, dryer systems with filtration and bypass valves, dew point monitor, CO monitor if applicable, and controls to operate the system.

Safety Guidelines

A SEPARATE SAFETY BOOKLET IS PROVIDED ALONG WITH THIS MANUAL. READ AND UNDERSTAND THE SAFETY BOOKLET. This manual contains information that is very important to know and understand. This information is provided for SAFETY and to PREVENT EQUIPMENT PROBLEMS. To help recognize this information, observe the following symbols. MAKE SURE EVERYONE OPERATING OR SERVICING THE COMPRESSOR READS AND UNDERSTANDS ALL THE INFORMATION PROVIDED.

⚠ DANGER ***Danger indicates an imminently hazardous situation which, if not avoided, WILL result in death or serious injury.***

⚠ WARNING ***Warning indicates a potentially hazardous situation which, if not avoided, COULD result in death or serious injury.***

⚠ CAUTION ***Caution indicates a potentially hazardous situation which, if not avoided, MAY result in minor or moderate injury.***

NOTICE ***Notice indicates important information, that if not followed, may cause damage to equipment.***

NOTE: Note indicates information that requires special attention.

Unpacking

Immediately upon receipt of the vacuum system, inspect for any damage which may have occurred during shipment. Repair or replace damaged items before use. The name-plate should be checked to verify the correct model and voltage.

⚠ WARNING ***Do not operate unit if damaged during shipping, handling or use. Damage may result in unsafe conditions and cause injury or property damage.***



Specifications

Compressed Air Type	Oilless air meeting requirements of Type 0 Powerex Oilless Scroll compressor pumps
	Medical Systems: - Final filtration to 0.5 micron or better, regulated for 50-55 psig - Dew point alarm: High dew point at 35°F - CO Alarm: High CO at 10 ppm - Dryer purge saving control on at -15°F; off at -10°F **Laboratory Systems:** - Final filtration to 0.5 micron or better, regulated for 90-95 psig - Dew point alarm: High dew point at -20°F (Standard) - CO alarm (optional at 10 ppm) - Dryer purge saving control on at -45°F; off at –40°F
Lubrication:	Grease filled bearings, PTFE compound tip seals
Maximum System Pressure	Medical Systems: 116 psig Laboratory Systems: 145 psig
Motor Protection System	Motor protector circuit breakers
Air Receiver	ASME Code, rated 165 psig or higher
Control Panel	UL508 Compliant
Misc.	Cal. OSHA 462 (L) (2) Compliant Cal. OSHPD OSP – 0380-10

Specifications (Continued)

Compressor Performance (per basemount)

HP	Air End	Discharge Pressure (PSIG)	Air Delivery (SCFM)
3	SLAE03EB	95-115 (125-145 optional)	8.8 @ 100 PSIG 7.5 @ 145 PSIG
5	SLAE05E	95-115 (125-145 optional)	15.2 @ 100 PSIG
5	SLAE05EHP	95-115 (125-145 optional)	12.5 @ 100 PSIG

NOTE: For system electrical information, see wiring diagram shipped with unit.

For Laboratory Systems

⚠ DANGER

Breathable Air Warning

This unit is NOT equipped and should NOT be used "as is" to supply breathing quality air. For any application of air for human consumption, you must fit the air compressor/pump with suitable inline safety and alarm equipment. This additional equipment is necessary to properly filter and purify the air to meet minimal specifications for Grade D breathing as described in Compressed Gas Association Commodity Specification for air, OSHA, ANSI and/or Canadian Standards Associations (CSA).

DISCLAIMER OF WARRANTIES

IN THE EVENT THE COMPRESSOR IS USED FOR THE PURPOSE OF BREATHING AIR APPLICATION AND PROPER IN-LINE SAFETY AND ALARM EQUIPMENT IS NOT SIMULTANEOUSLY USED, EXISTING WARRANTIES ARE VOID, AND POWEREX DISCLAIMS ANY LIABILITY WHATSOEVER FOR ANY LOSS, PERSONAL INJURY OR DAMAGE.

Components

Powerex open scroll systems are designed to supply continuous oil-free air by using the most advanced scroll technology.

The Powerex scroll compressor offers a dynamically balanced air end which insures vibration-free operation. The rotary design permits a continuous 100% duty cycle. No oil separation, oil filtration, or inlet valves are required on the Powerex Scroll unit. Each compressor shall be belt driven oil-less rotary scroll single stage, air-cooled construction with absolutely no oil needed for operation. Direct drive compressors shall not be used. The rotary design shall not require any inlet or exhaust valves and shall be rated for 100% continuous duty. Systems consist of multiple compressor pumps that are automatically controlled and alternated to equalize usage and wear. Medical systems have one or more pumps designated as the reserve and their output is not utilized for normal system capacity ratings.

The Powerex oil-less rotary scroll air compressor is based on the theory of scroll compression. A scroll is a free-standing, intricate spiral bounded on one side by a solid, flat plane or base. A scroll set, the basic compression element of a scroll compressor, is made up of two identical spirals which form right and left hand parts. One of these scroll components is indexed or phased 180° with respect to the other so the scrolls can mesh. Crescent-shaped gas pockets are formed and bounded by the spirals and the base plate of both scrolls. As the moving scroll is orbited around the fixed scroll, the pockets formed by the meshed scrolls follow the spiral toward the center and diminish in size. The moving scroll is prevented from rotating during this process so that the 180° phase relationship of the scrolls is maintained. The compressor's inlet is at the outer boundary of the scrolls. The entering gas is trapped in two completely opposite gas pockets and compressed as the pockets move toward the center. The compressed gas is discharged through the outlet at the center of the fixed scroll so no valves are needed.

Compressor systems are fitted with single point connection intake manifolds. For medical systems the manifold must be connected to air intake piping located as specified in NFPA99. Lab systems may utilize room air for the intake. Particle filtration is provided by the intake filter assemblies in each branch of the compressor system. When remote intake systems take in humid warm air from outdoors, and route it through air-conditioned buildings, water will condense in the intake piping. NOTICE: Water will destroy the compressor pump if it is ingested. The air filters will not stop water. Water trapping drip legs must be designed, installed and maintained by the responsible parties. The intake system is also equipped with isolation valves allowing the line to be closed if a branch is opened for service. The ball valve handles have been removed and shipped separately to help avoid accidental closure of the valves when the system is running. NOTICE Running the pumps with the intake valve closed will damage the pumps. Powerex recommends that the system be locked out if the valve is closed.

Each compressor pump is fitted with flexible connections on the intake and exhaust side. The compressed air from each pump is monitored by a temperature switch that will work with the controls to shut down the system if the air temperature exceeds design limits.

The compressed air is then carried to the after cooler. During after cooling, condensation is formed and captured in the condensate trap downstream from the after cooler. The condensate trap collection bowl is piped to an automatic drain system. The liquid formed is condensed atmospheric water vapor and it may be allowable to drain into your local sewer system. Check local regulations for actual requirements.

The compressor pumps are driven by three phase electric motors acting through vee belt drives. The belts are carefully engineered and selected for durability and reliability. When the vee belts run, especially in the first few hundered hours of operation, dust is generated as the profile of the belt wears in to match the grooves in the drive and driven sheaves. The dust is normal and will not cause any operating problems. If the belts are not slipping, no adjustement of tension is necessary. If tension adjustement or belt replacement does become necessary, the motor mount is designed to act as a slide base tensioning systems and detailed instructions are provided in this manual.

After the condensate trap, a check valve and a ball valve is installed in each branch of the compressor system. This valve allows an unused branch to be closed off from the system. If the valve is utilized to allow service to be performed, a locking cover must be installed to meet Lock out Tag out requirements. A relief valve is installed upstream of the ball valve, so that if the ball valve is closed and the pump is started, the relief valve will open and prevent catastrophic pressure rise and damage. The relief valve is not intended to allow continuous operation of the pump with the ball valve closed.

⚠WARNING ***Compressed air systems contain electrical energy. Remove and lock out all energy sources from the system if any maintenance is being performed where the energy may cause the pump or motor to operate.***

Compressed air is collected and piped to the air receiver. The air receiver has a bypass valve manifold installed for use if necessary. The air receiver has an anti-corrosion lining. Each air receiver has an ASME safety relief valve to prevent system pressure from exceeding the design capability of the vessel. A mechanical pressure gauge allows visual verification of the system pressure. Condensation that forms after the after cooler will collect in the receiver. An automatic tank drain is installed along with a manual drain valve to remove the liquid. Since the compressors are oilless, the liquid formed is condensed atmospheric water vapor and it may be allowable to drain into your local sewer system. Check local regulations for actual requirements. A transparent tube is installed in the lower section of the air receiver to allow visual verification that the condensate is being removed from the vessel.

⚠DANGER ***Risk of Injury or death. Do not modify the air receiver or the ASME safety relief valve. Do not obstruct or restrict the outlet of the ASME safety relief valve. Do not operate the system at pressures higher than the rated pressure. Do not perform any work on the receiver or connected components while energy (compressed air) is present.***

Compressed air from the receiver is routed to the dryer section where duplex desiccant dryers remove water vapor to the specified dew point of the system. A desiccant dryer uses chemical reactions with water vapor and the surface of the desiccant material to hold water molecules when compressed air is flowing through the bed. The bed is then regenerated using some of the dry air in the “purge” mode at low pressure to reverse the chemical reaction. The dryer controls automatically cycle the beds to extract moisture from the compressed air. Each branch of the duplex desiccant dryer system is equipped with isolation valves so that one dryer can be online and in use while the other is idle. Each branch has filters and pressure regulators as needed. Dryer inlet filtration includes mechanical cyclonic water droplet separation as well as coalescing filters. Dryer outlet filtration prevents any desiccant dust from leaving the system.

After the dryers, the compressed air is connected to dew point and CO monitors. (CO monitor is optional for laboratory systems). The monitors take a small amount of sample air. The dew point monitor works with the dryer controls to minimize the amount of purge air used to regenerate the desiccant beds. The Dew Point and CO monitor go into alarm mode if allowable parameters are exceeded.

Controls

The disconnects and protection devices in the Powerex control system are for the motor branch circuits, accessory supply circuits and for the control circuit only. The controls on the Powerex Laboratory Open Scroll System do not include a service disconnect and circuit protection for the supply circuit. Selection and installation of these items must be provided in compliance to local and national codes in accordance with each facility’s need.

The PLC automatically alternates the lead designation and brings on lag pumps as needed, equalizing run time on the pumps in the system. The touch screen HMI (Human Machine Interface) panel on the front allows operation and monitoring of the system. The touch screen provides the user with displays showing the operating status and allows the user to access features of the control system. The control panel also allows communication using the BACnet® protocol.

The control panel includes Hand-Off-Auto selector switches for each pump so that a pump can be held on (or off). This can be useful if maintenance or diagnostic procedures are being performed.

The transformer is sized for the loads imposed by the Powerex factory controls and should not be utilized for any other purpose. Premium control panels utilize a backup transformer with a reserve transformer in use alarm.

Local alarms are provided for low pressure and general fault conditions. The general fault alarm includes high temperature, reserve transformer in use, motor overload and reserve pump in use (when specified). The wiring connection point for the alarms is on the terminal strip in the control panel box, with good conditions being contacts closed. (If a wire connection is lost, the result is an alarm.)

Installation

Frames or Tank Mount Structure

Powerex designed the system to bear the weight and stress of the compressor pumps, controls, and receiver tank. When lifting the system, use the designated fork lift slots or rig straps to lift the main system skid. Do not attempt to lift the system using individual component lifting hooks and eyes. Piping may need to be supported to avoid damaging the supplied flex connectors for intake and exhaust.

Operation at High Altitudes

Compressor pumps are sensitive to reduced atmospheric pressure encountered as altitude increases. Powerex will adjust the operating set points to compensate for altitude if the original order is designated for high altitude and the expected conditions provided to us.

⚠ WARNING ***Disconnect, tag and lockout power before attempting to install, service, relocate or perform any maintenance.***

⚠ CAUTION ***Do not lift or move unit without appropriately rated equipment. Be sure the unit is securely attached to lifting device used. Do not lift unit by holding onto tubes or coolers. Do not use pumps to lift other attached equipment.***

Installation Site

1. The compressor system must be located in a clean, well lit and well-ventilated area.
2. The area should be free of excessive dust, toxic or flammable gases and moisture.
3. Never install the system where the surrounding temperature is higher than 104°F or where humidity is high.
4. Clearance must allow for safe, effective inspection and maintenance.

MINIMUM CLEARANCES	
Above	24 inches
Other sides	24 inches
Control Panel side	36 inches

5. If necessary, use metal shims or leveling pads to level the system. Never use wood to shim the unit.

Ventilation

1. If the oil-less compressor system is located in a totally enclosed room, an exhaust fan with access to outside air make up air must be installed. Room temperature must remain below 104°F. Circulation must be sufficient to prevent local hot spots.
2. Never restrict the cooling fan exhaust air. Maintain a minimum of 24 in. of clearance around the entire unit (36 in. is preferred).
3. Never locate the compressor where hot exhaust air from other heat generating units may be pulled into the system.

Wiring

⚠ DANGER ***Lock out and tag out the electrical supply before servicing the equipment.***

⚠ DANGER ***Electrical shock hazard. Make sure the system is grounded in accordance with NEC and local requirements.***

All electrical hook-ups must be performed by a qualified electrician. Installations must be in accordance with local and national electric codes. Make sure power supply conductors are sized adequately for full system demand.

Use solder-less terminals to connect the electrical power source.

Piping

General Guidelines

Refer to the general product manual.

1. Make sure the piping is lined up without being strained or twisted when assembling the piping for the system.
2. Appropriate expansion loops or bends should be installed at the system to avoid stresses caused by changes in hot and cold conditions.
3. Piping supports should be anchored separately from the system to reduce noise and vibration.
4. Never use any piping smaller than the system outlet connection.
5. Use flexible hose to connect the outlet of the system to the piping so that the vibration of the system does not transfer to the piping.

NOTICE ***The intake filters supplied by Powerex will not stop ingestion of liquid water by the pumps. Liquid water going into the pumps will damage the pumps and void the warranty.***

Remote Intake Piping

Use a flexible connector to join the facility piping to the system single point intake.

Size the remote intake piping to minimize pressure loss due to flow friction. Use the following guidelines to determine the minimum pipe size. Larger size piping will reduce losses.

A compressor system intake must be located to comply with applicable regulations and should be arranged to provide the cleanest air possible for compression. Follow all requirements of NFPA 99 for location and materials.

In addition, the inlet system must be designed to avoid pressure drop or creating a significant vacuum on the intake side of the pumps and to avoid any condensation formed by cooling of humid intake air from reaching the pumps. A drip leg, or multiple drip legs may be necessary. Drain the drip legs frequently to prevent water from reaching the pumps. Water will damage the pump and void the warranty.

To determine the minimum required pipe size for a compressor system intake, calculate the equivalent straight length of the run.

The equivalent straight length is the length of all the pipe needed from the flex connector to the origin point, plus a factor for each elbow or T.

If system extends beyond 600 equivalent straight feet, use one size larger pipe.

Pipe should be smooth ID, if rough pipe is used increase by one size.

Pipe Size	Equivalent length for 90° elbow, cross, or tee	Equivalent length for 45° elbow
1.5	3.75 feet	1.8 feet
2.0	5.0 feet	2.5 feet
2.5	6.25 feet	3.1 feet
3.0	7.5 feet	3.8 feet
3.5	8.78 feet	4.4 feet
4.0	10.0 feet	5.0 feet
5.0	12.5 feet	6.25 feet

Size the piping for the maximum rated flow of the system. Medical air systems have one pump in reserve per NFPA 99.

Type	Pump intake CFM per HP
Various scroll and oilless reciprocating	3

PIPE SIZE REQUIREMENTS			
System CFM	Minimum Pipe Size for 100 feet	Minimum Pipe Size for 300 feet	Minimum Pipe Size for 600 feet
15	1.25	1.5	1.5
20	1.25	1.5	1.5
25	1.25	1.5	2
30	1.25	1.5	2
35	1.5	2	2.5
40	1.5	2	2.5
45	1.5	2	2.5
50	1.5	2	2.5
60	2	2.5	2.5
65	2	2.5	3
75	2	2.5	3
70	2	2.5	3
85	2	2.5	3
90	2	2.5	3
100	2	3	3.5
110	2.5	3	3.5
115	2.5	3	3.5
125	2.5	3	3.5
150	2.5	3	3.5
170	2.5	3.5	4
190	3	3.5	4
210	3	3.5	4
230	3	3.5	4
250	3	3.5	4
260	3.5	4	5
300	3.5	4	5
350	3.5	4	5
375	3.5	4	5
500	4	5	6

If the system extends beyond 600 equivalent straight feet, use one size larger pipe.

Safety Valves, Pressure Vessels, and Piping

1. Powerex systems are shipped with ASME safety valves sized so that the maximum system flow is less than the capacity of the valve or valves at the rated pressure. The rated pressure of the valve is equal to or less than the maximum allowable working pressure of the vessel or upstream pressure bearing parts. DO NOT MODIFY or install any valves with different specifications unless appropriate evaluations are completed. Do not modify the structure of the pressure vessel or weld on the vessel.
2. Do not install any shut off valves between the safety valve and the vessel or between the compressor pump and the first system safety valve. Doing so can result in a dangerous condition and lead to death or injury.
3. Do not install shut off valves in the system that create trapped compressed air.
4. Manually operate the safety valve every six months or 2,500 operating hours to provide assurance that the mechanism is free to operate. Replace valve if it is leaking when it is closed or if it fails to vent when actuated.
5. Any piping or pressure bearing connection hose or tubing used in the system must be rated equal to or higher than the safety valve pressure rating. Inadequate pressure rating could result in bursting.

Modular Placement

1. Unpack each frame module and discard or recycle all wood shipping materials.
2. Systems consist of multiple frame modules. The steel base platforms are intended to be bolted to the floor as shown in the design drawings and connecting hoses provided (found in the parts pack box). Systems may be placed on isolation pads if desired. Modules may be spaced farther apart without any structural problems, but electrical connections may need to be modified—additional isolation pads and longer hoses may be needed.
3. Place frame modules at location designated on build drawing. Provide sufficient clearance around system for servicing (see minimum clearance section).
4. Install frame assembly fasteners to each frame joining the frames together.
5. Lift corners of each frame assembly and install isolation pads provided.

Connecting Piping (if applicable)

1. Locate connection for piping at rear of compressor module to receiver tank module.
2. Remove plastic caps or adhesive covering on ports and connectors.
3. Connect flex line to the ports making sure each flex line is not pinched or kinked.
4. Follow steps 1 to 3 for flex line from dryer package to inlet of receiver tank (if applicable).

NOTE: All piping is provided and sealed for this portion of installation.

5. If applicable, locate and attach intake inline air filter to outside source air or header. A flex line is provided for attaching intake of compressors to air filter assemblies.
6. Connect outlet of tank/dryer module to outlet source piping.

Electrical Wiring of System Shipped In Separate Modules

⚠ CAUTION ***Provide electrical power in accordance to NEC and local codes. Connection of wiring should be performed by a qualified electrician.***

1. Systems are provided with overload protection. A main system service disconnect must be installed. Powerex recommends the main system disconnect should be placed as close as possible to the system.
2. Refer to the system wiring diagram. Temperature switches shutdown the compressor when temperature reaches above a pre-set limit. Connect dryer power cords, electric drain power cord, dew point power cord, and alarm wiring to the master control panel.
3. The system has a terminal strip in the control panel with “landing points” for the master alarm panel connections. Locate the supplied landing points and install wire connections as appropriate.
4. Wiring connections can become loose during shipping and storage. Check all connections for integrity when installing and starting unit.

For questions concerning assembling and start-up, contact Powerex at 1-888-769-7979 for technical assistance.

Operation

Before Start Up

1. Make sure all safety warnings, labels and instructions have been read and understood before continuing.
2. Remove any shipping materials, brackets, etc.
3. Confirm that the electric power source and ground have been firmly connected. Confirm supply voltage and amps match the system requirements.
4. Be sure all pressure connections are tight.
5. Check to be certain all safety relief valves, etc. are unrestricted.
6. Check that all fuses, circuit breakers, etc. are the proper size.
7. Make sure the inlet filter assembly is properly installed and all intake isolation valves are open.
8. Confirm that the tank manual drain valve is closed.
9. Once power is connected to the unit, visually check the rotation of the compressor pump. If the rotation is incorrect, have a qualified electrician correct the motor wiring.

NOTICE ***If all pumps are running in the wrong direction, change the incoming power leads to correct rotation.***

Start Up and Operation

1. Follow all procedures under "Before Start-Up" before attempting operation of the lab air system.
2. Make sure all selector switches are in the OFF position.
3. Switch on electric source.
4. Open tank connection valve or valves completely.
5. Using the selector switches on the control panel, turn on each pump—motor in the "Auto" mode until all are running.
6. Check for excessive vibration, unusual noises or leaks during operation. If problems are detected, shut down the system and make corrections or repair as needed before operating the system.
7. Pumps may be operated in "hand" mode to override the function of the automatic controls. The pumps and the system will not be damaged during "hand" mode operation is used for a short time. If hand mode if used for many hours, possible overload and overheating may result along with more rapid pump wear. The system safety valves may open if operated in "hand" mode.
8. In normal operation, leave all selector switches in the "Auto" position and allow the controls to cycle the pumps as needed based on compressor demand.

Control Operation

Systems are available with basic or premium controls. All controls utilize a PLC to control the on off cycles of the pumps. The basic controls have all the switches and indicator lights labeled. Operate the system by turning the switches from OFF to AUTO until all the circuits are active. Use the dryer selector to choose either dryer 1 or dryer 2. During switchover temporarily use "BOTH".

The system has a set of back-up pressure switches, if the pressure gets low enough the backup low pressure switch will turn on all the pumps. An alarm is triggered for "Reserve in Use" on medical systems and "Low pressure" on lab systems. Similarly there is a high pressure switch that will turn off the pumps even if the PLC fails to do so before the system pressure rises beyond allowable levels. When the system runs on the back up switches multiple motors may engage at the same time generating high inrush amp draws.

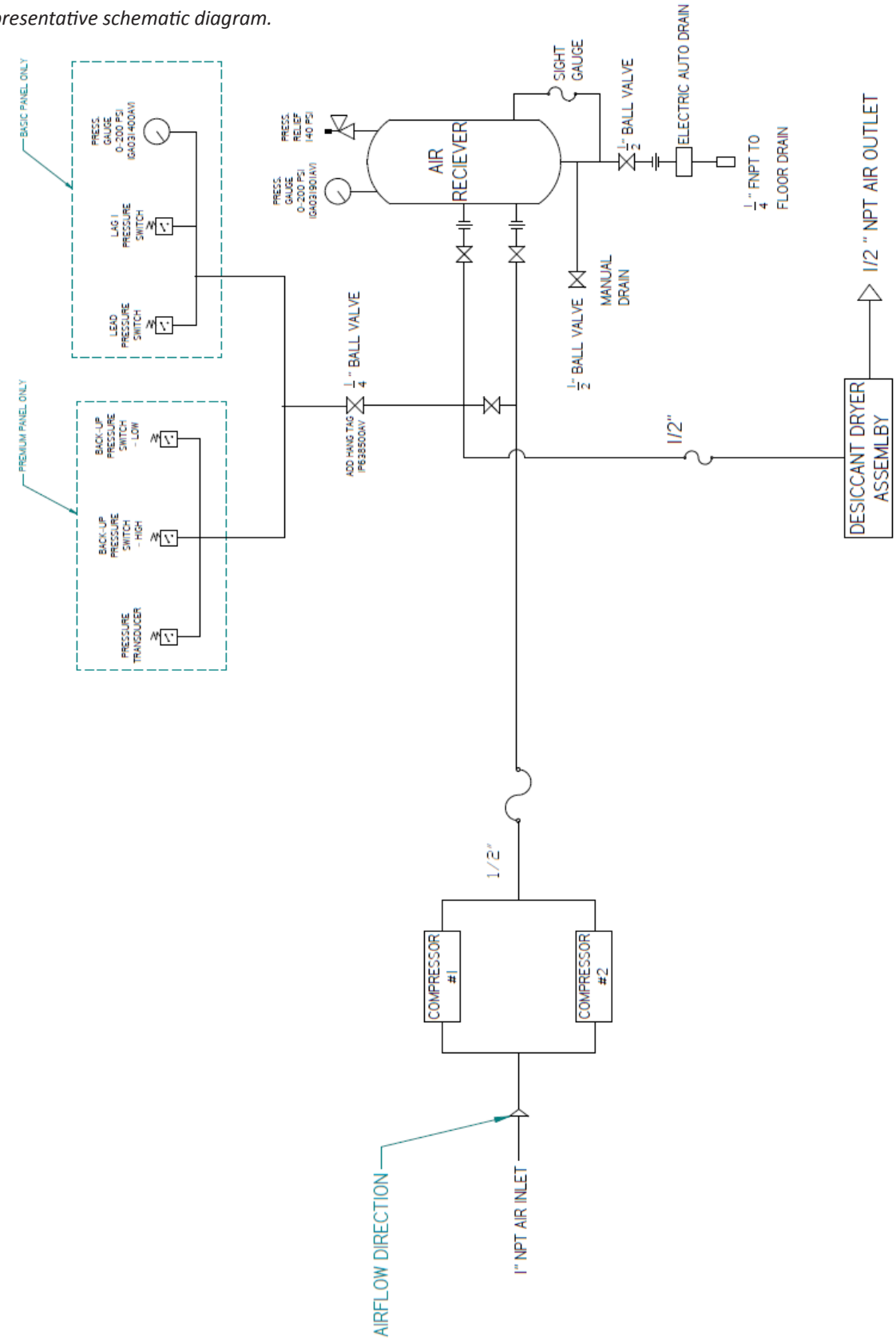
A typical Medical system schematic with basic controls is shown on page 8.

NOTE: In Medical and lab systems the Motor Protector Circuit Breakers can be used to isolate a motor branch circuit to prevent the motor from running. The fan motors and temperature switches are not controlled by the MPCB (nor is the control signal to the motor contactor) and must be depowered separately if needed.

Premium Controls utilize a touch screen display to give and receive information. This is often referred to as a Human – Machine Interface or HMI. The HMI screens and their functions and capabilities are discussed on page 14.

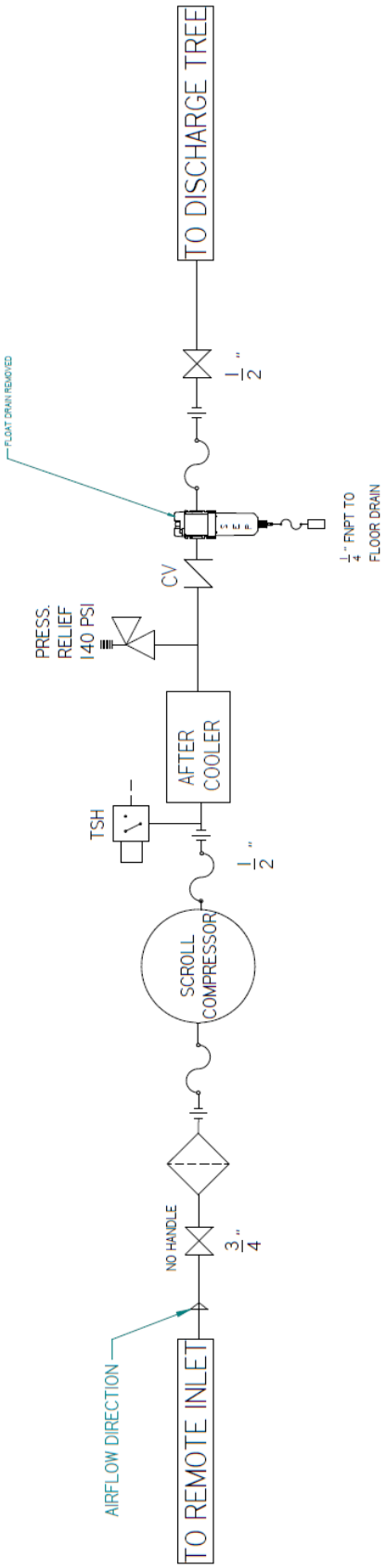
Medical System Flow Schematic

This is only a representative schematic diagram.



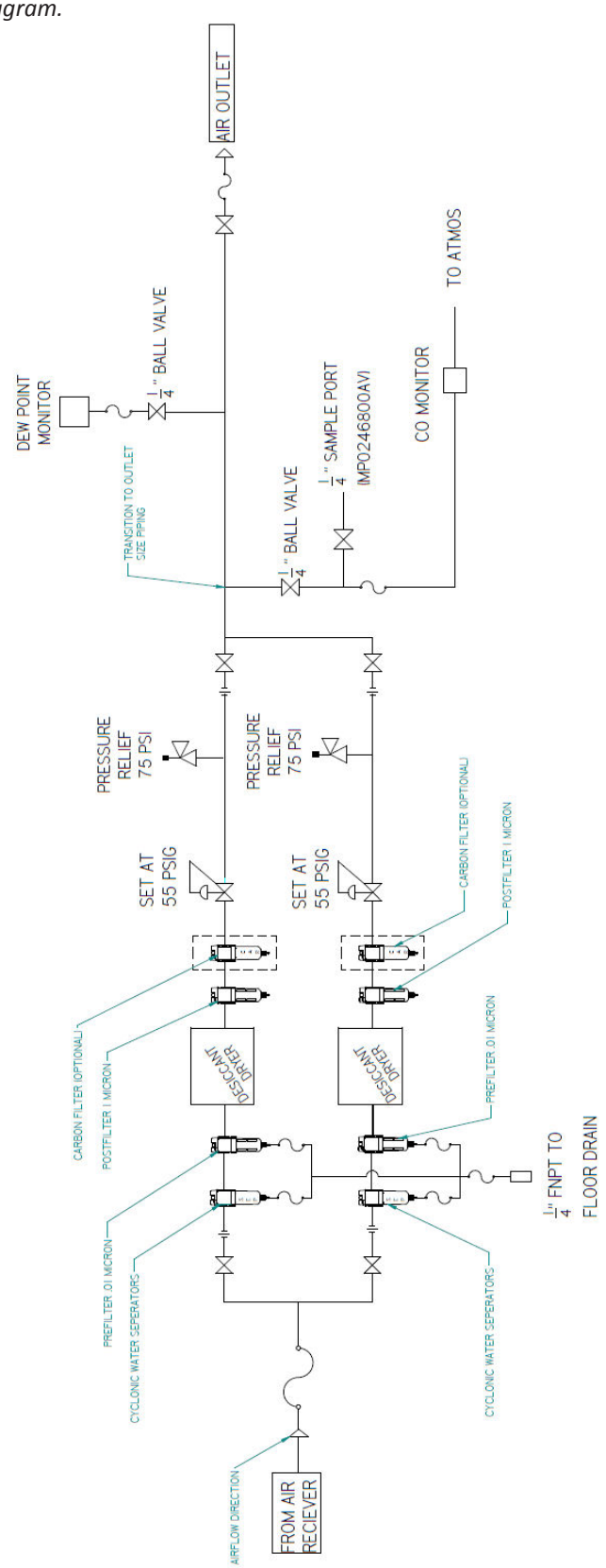
Medical Compressor Flow Schematic

This is only a representative schematic diagram.



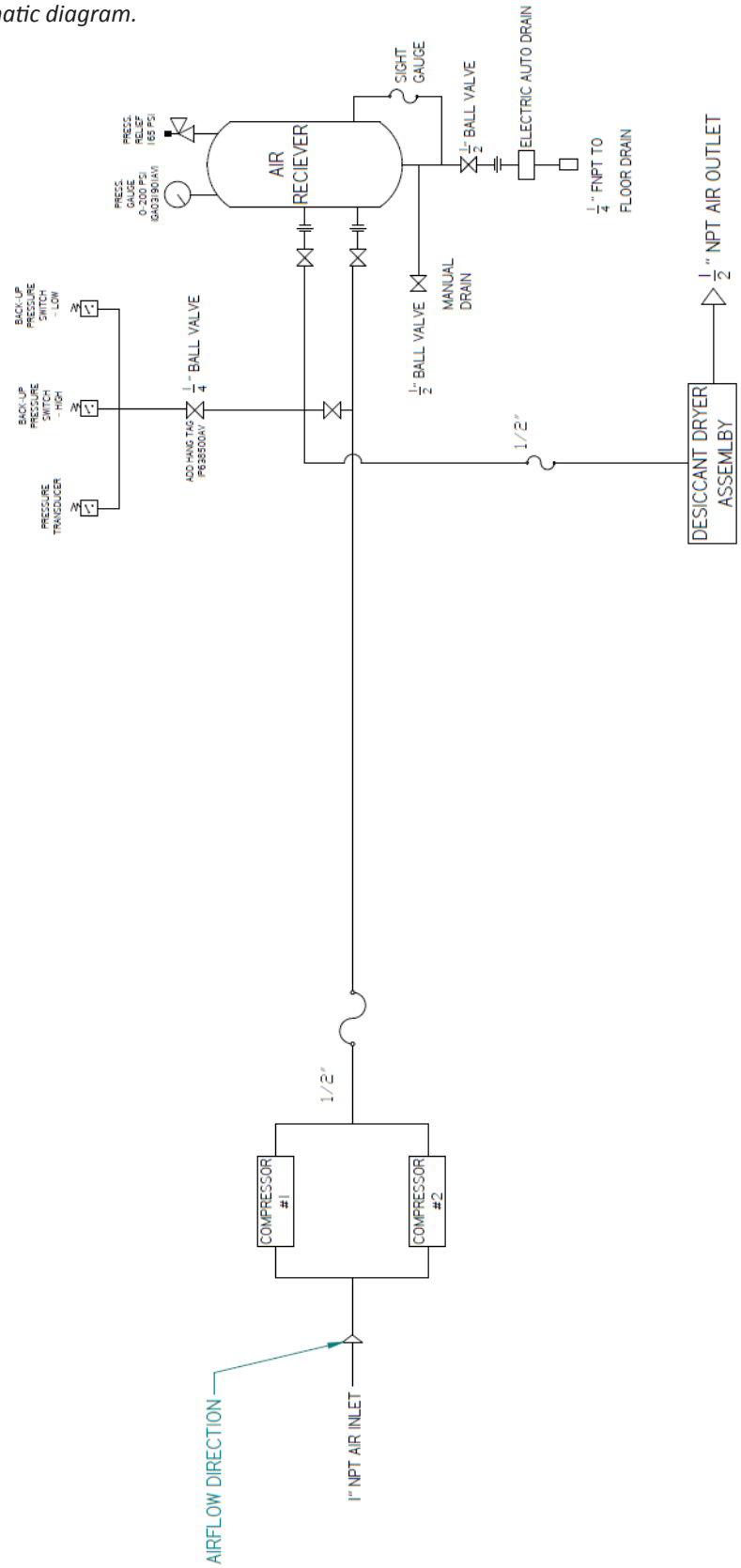
Medical Dryer Flow Schematic

This is only a representative schematic diagram.



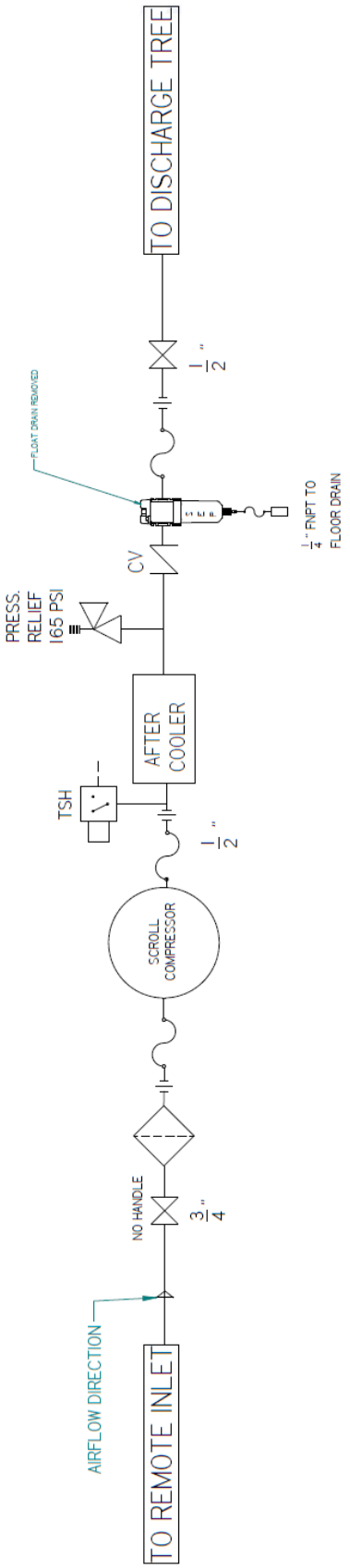
Laboratory System Flow Schematic

This is only a representative schematic diagram.



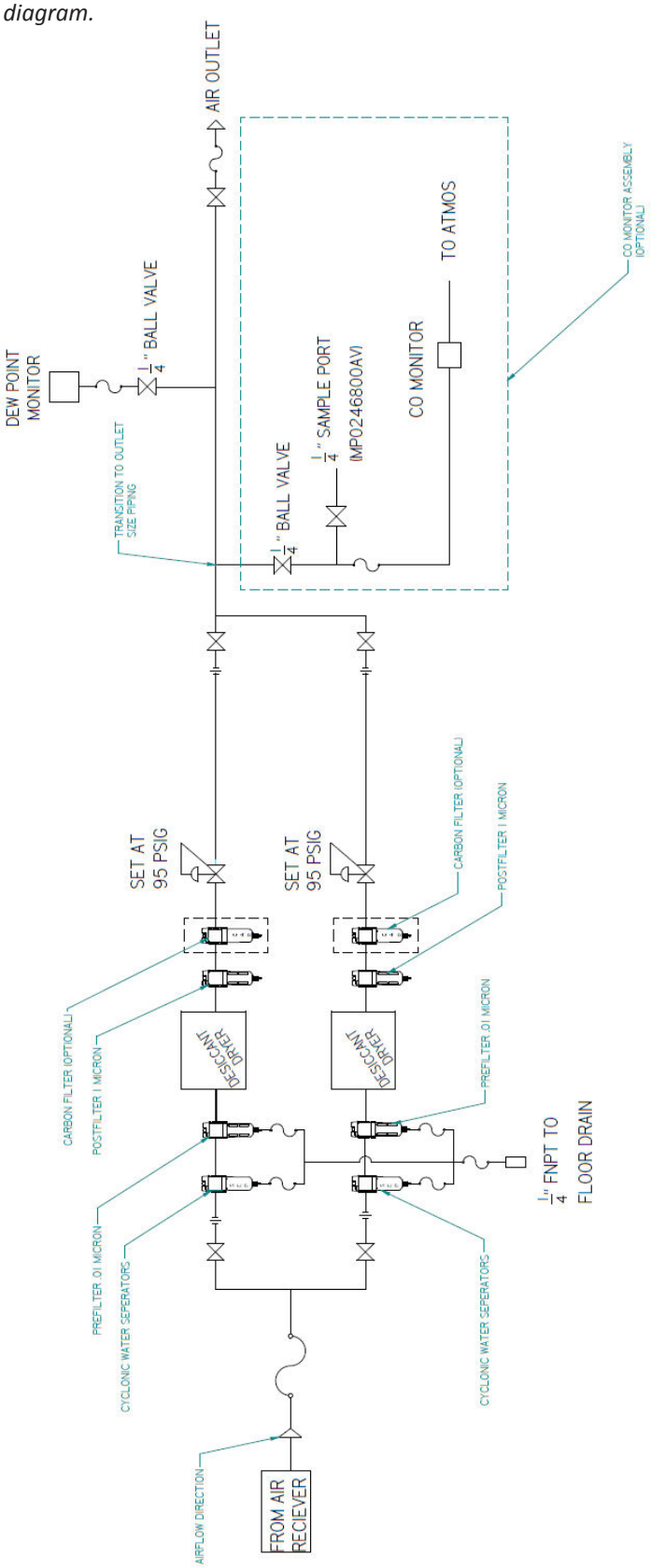
Laboratory Compressor Flow Schematic

This is only a representative schematic diagram.



Laboratory Dryer Flow Schematic

This is only a representative schematic diagram.

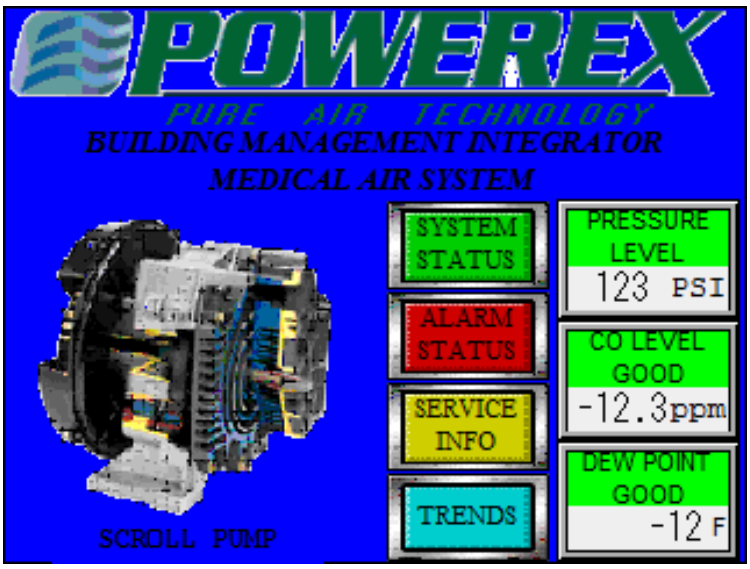


HMI Controls

The Powerex system can have basic electromechanical controls with switches and indicator lights or it can be constructed with our touch screen interface. The basic control system will operate the unit and provide indication of the status. The individual switches, indicator lights and reset buttons are labeled on the panel door.

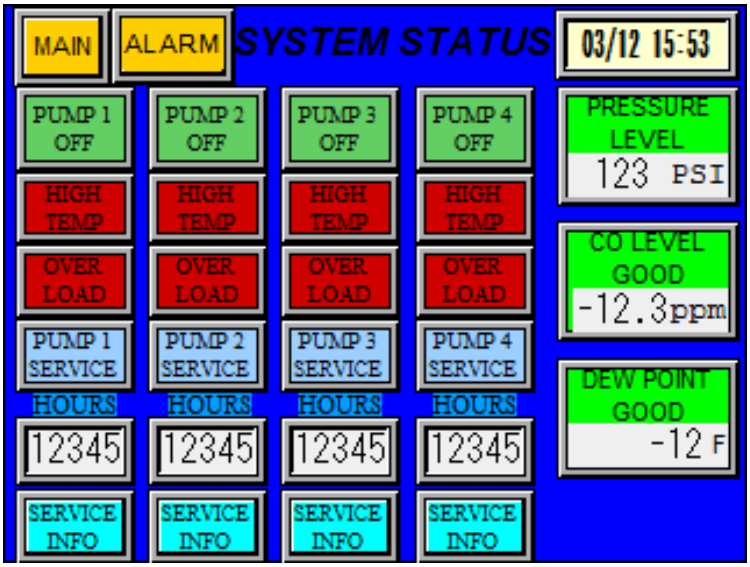
If the system has the touch screen controls, the following section will explain how the screen can be used to control and monitor the unit operation.

Main



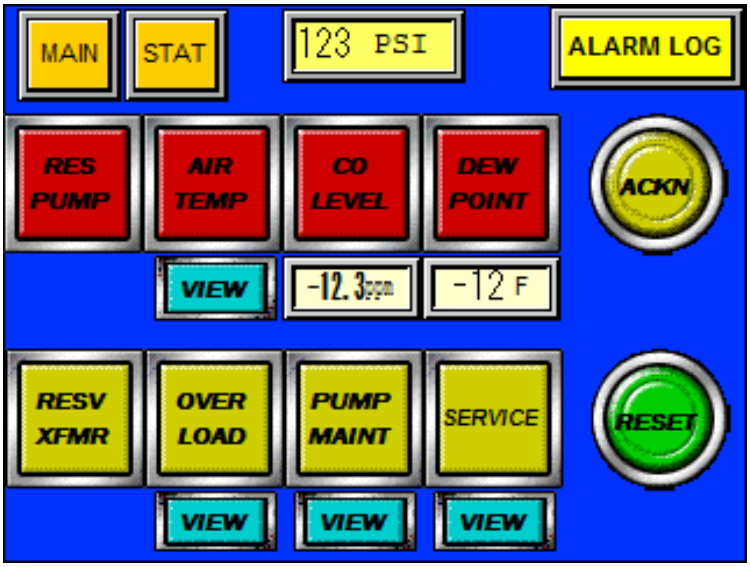
- Displays Pressure level and Dew Point level.
- Pressure level will change from green to orange when high.
- Dew Point level will change from green to orange when approaching alarm level; will change from orange to red when in alarm.
- System Status, Alarm Status, Service Info and Trends buttons will redirect to those specific pages.

System Status



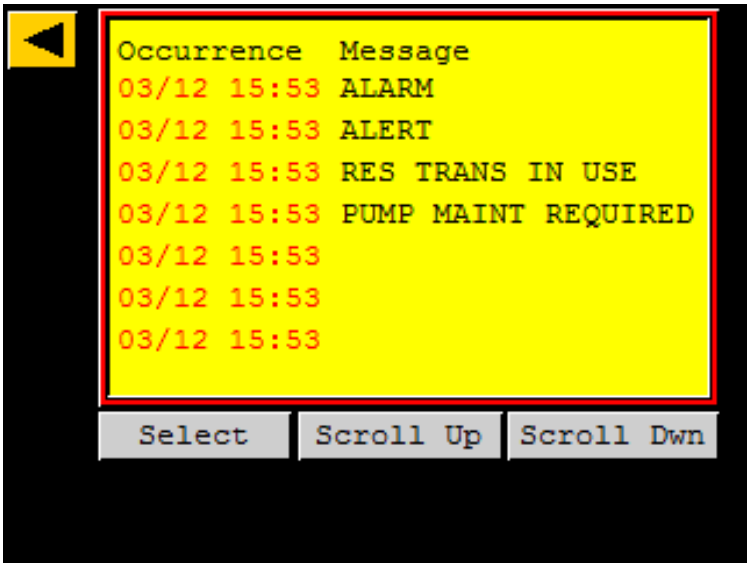
- Displays operating status, run hours, NFPA alarms, and Service alert of each pump on the system.
- Displays Pressure level, and Dew Point level and status like on MAIN page.

Alarm Status



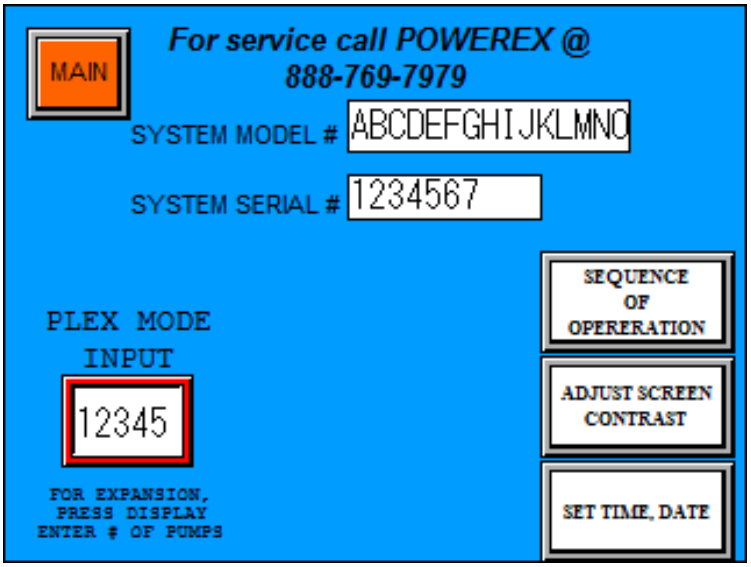
- Acknowledge and reset alarms.
- Displays Pressure level and Dew Point level.

Alarm Log



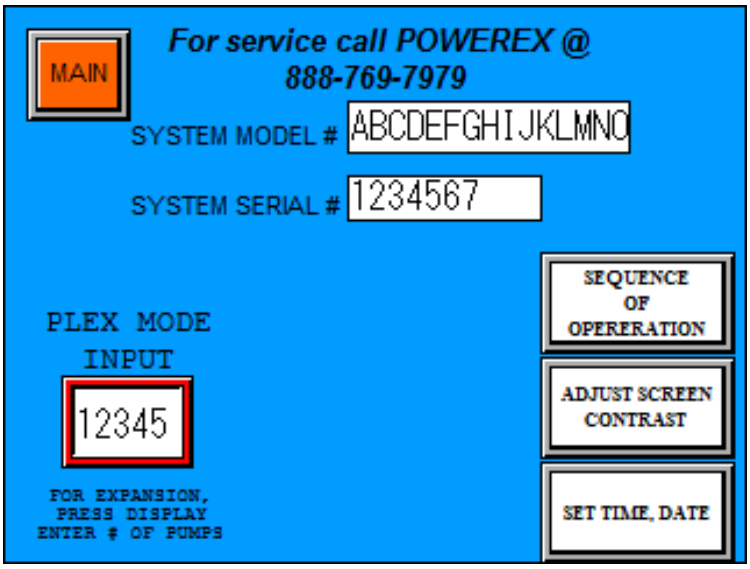
- Record of all alarms, warnings and service alerts with date and time.

To Set Time & Date



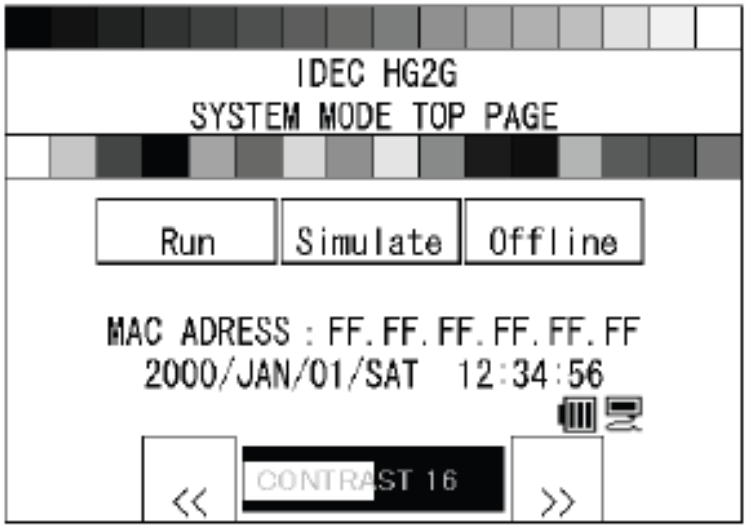
- Press Set Time, Date button

Service



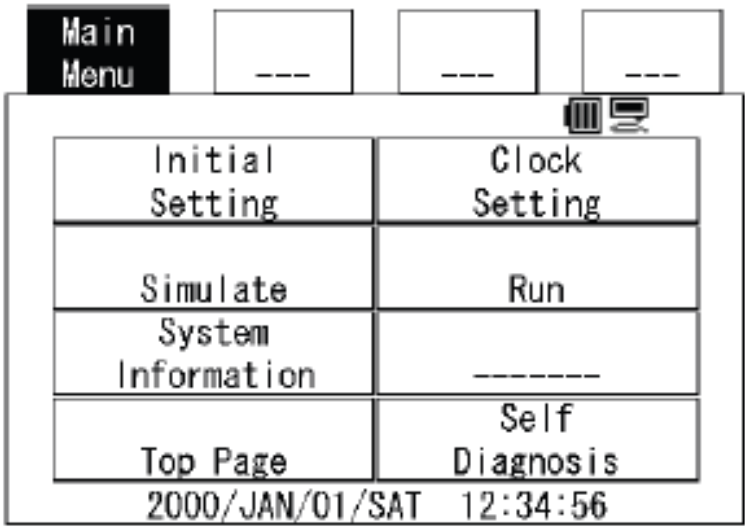
- Displays model number, serial number, service phone number
- If system is expandable, use Plex Mode Input to adjust PLC Program to additional pumps.

This Screen Will Appear



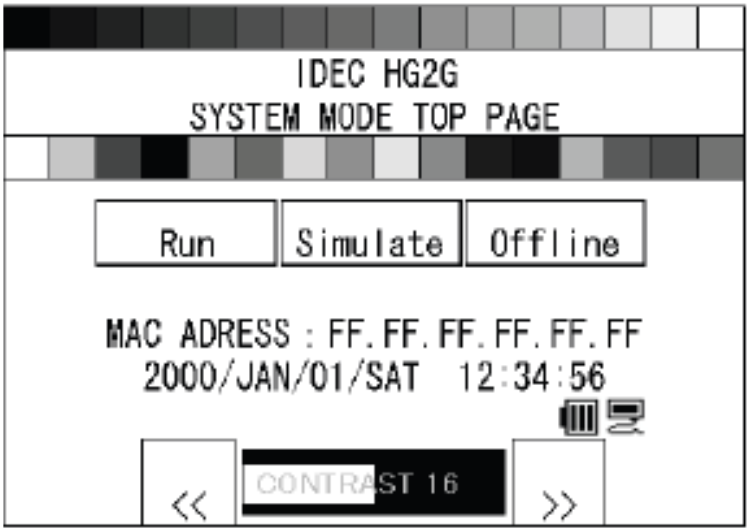
- Press Offline

This Screen Will Appear



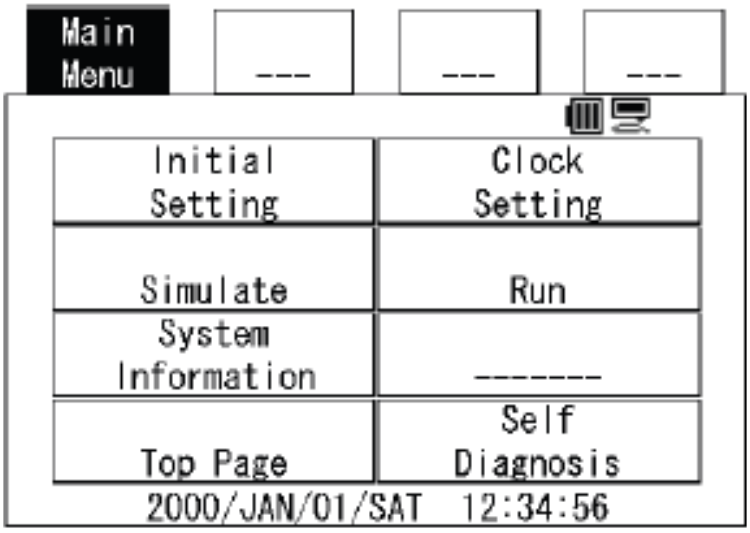
- Press Clock Setting and enter time and date

This Screen Will Appear



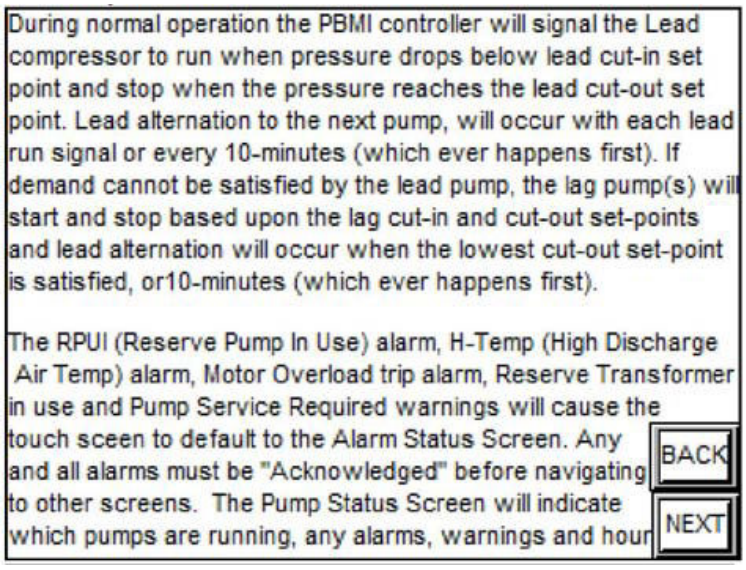
- Press Run and HMI will return to normal operation and Service screen.

To Return to Run Mode

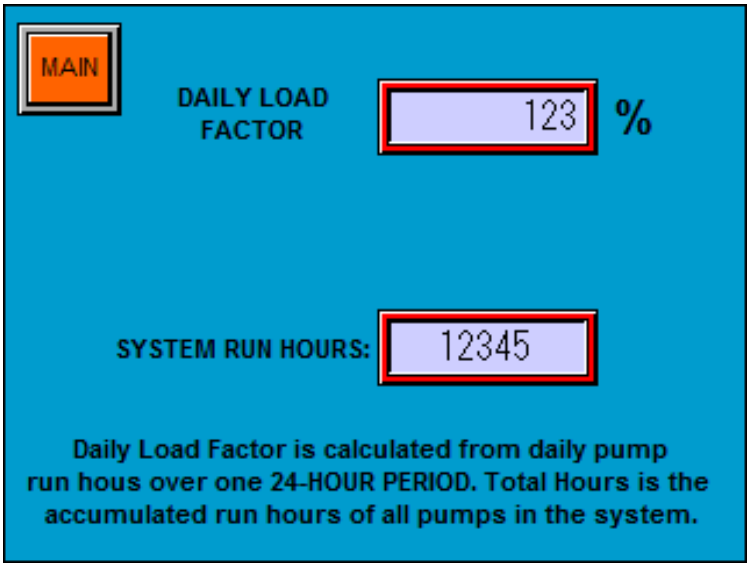


- Press Main Menu tab

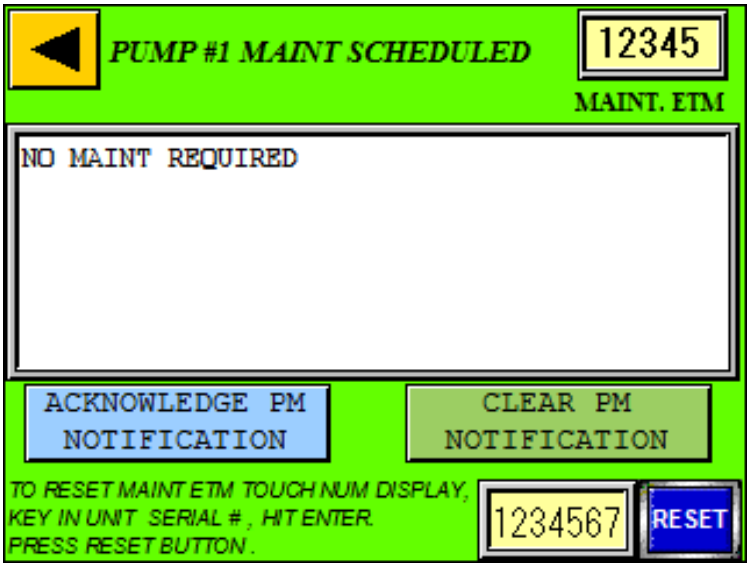
Sequence of Operation



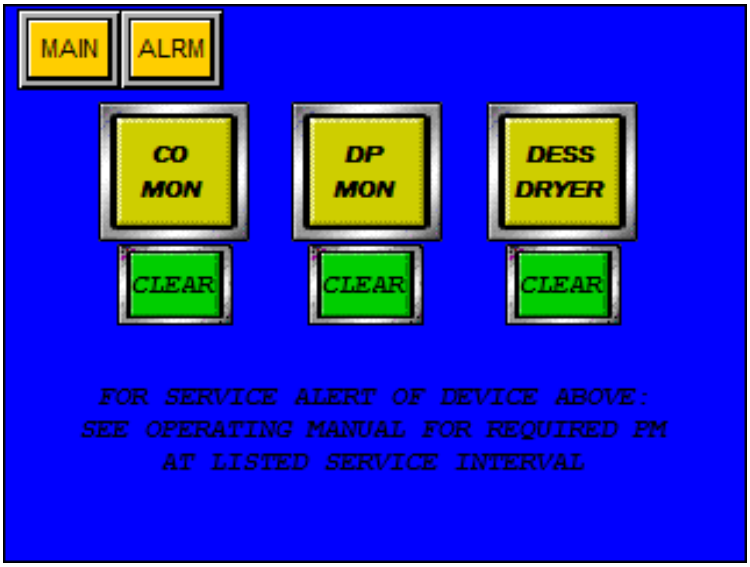
Daily Load Factor



Pump Maintenance



Service Alert



- At specific preset intervals, service alerts for the Dew Point Monitor and Dryer system will notify that maintenance is required.

Gateway Start Up

NOTE: PAGES 18-25 ARE INSTRUCTIONS FOR OPTIONAL PBMI WEBSERVER/BACNET® GATEWAY CARD. THESE INSTRUCTIONS ARE NOT APPLICABLE FOR SYSTEMS WITH HMI ONLY.

Required Tools & Data

You will need the following tools:

- The 260MX-S027 Gateway
- The provided CD-ROM
- A Working PC (Windows based)
- An Ethernet Crossover Cable
- A 12-24 VDC power source (T-strip)

Overview

The 260MX-S027 Gateway device seamlessly connects Modbus RTU Slave devices to a BACnet/IP client. By following this guide, you will be able to configure the 260MX-S027 Gateway for basic operation. You will set the device's network settings and parameters to the proper configuration for initial operation and physically place the device in the network.

Network Connections

The Gateway is shipped out with a Default IP Address of 172.16.3.159 and a Subnet of 255.255.248.0. In order to browse for the gateway's main page and begin configuring the gateway, you must change your PC to be on the same network as the gateway.

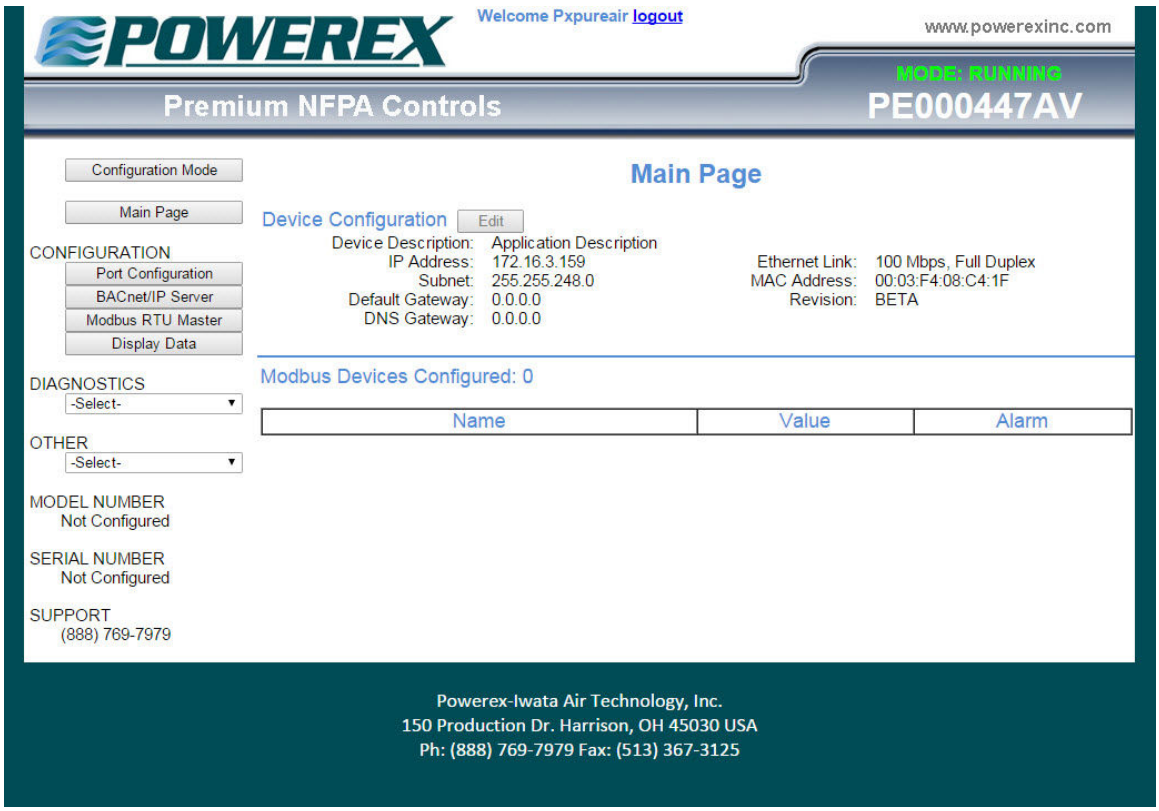
1. Change the IP Address of your PC to be 172.16.3.158
2. Change the Subnet of your PC to be 255.255.248.0
3. Open IPSetup.exe and browse for the gateway under select a unit.
4. Change the IP Address and Subnet to be on your network.
5. Click Set.
6. Change the PC's IP Address and Subnet back to its original settings.
7. Browse for the Unit using IPSetup.exe and launch the webpage.

Accessing the Main Page

Before you can configure the gateway itself, you must configure the network settings to connect the gateway. The following steps will connect the gateway properly.

1. Connect the 12-24 VDC power source to the device.
2. Using the crossover cable, connect the device to the PC.
3. Insert the provided CD-ROM.
4. Run the IPSetup program from the CD-ROM.
5. Configure the IP Settings based on your subnet.
6. Click Set.
7. Click Launch Webpage. The Main page should appear.
8. To sign in as a Guest User for the first time, use the information below:
   Username: Guest
   Password: (Password field is blank)
9. Once logged in as Guest, access the security screen using the pull down menu on the left side of the screen. In the security screen create a new Customer User and password. After creating a new Customer User log out of the Guest User and log back in as your Customer User. From this login you can change your BACnet configuration settings.
10. After the initial creation of a Customer User, the user defined user name and password should be used to log in to the system and may be updated from the Security Configuration Page.

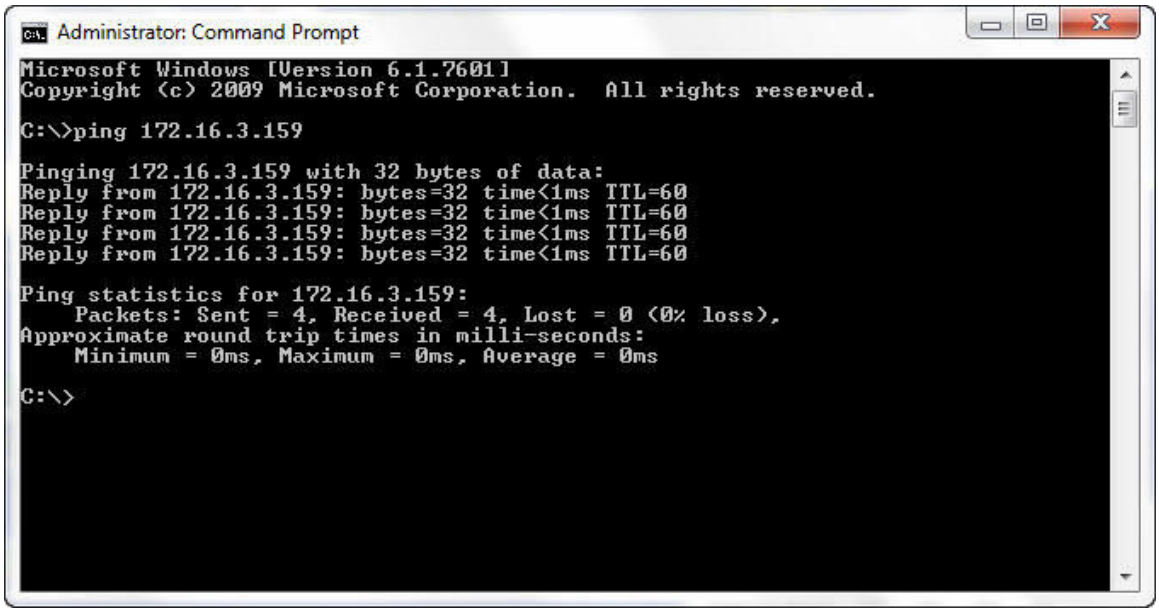
NOTE: Browser configuration is compatible with Chrome, Internet Explorer, and Firefox. Default IP address is 172.16.3.159

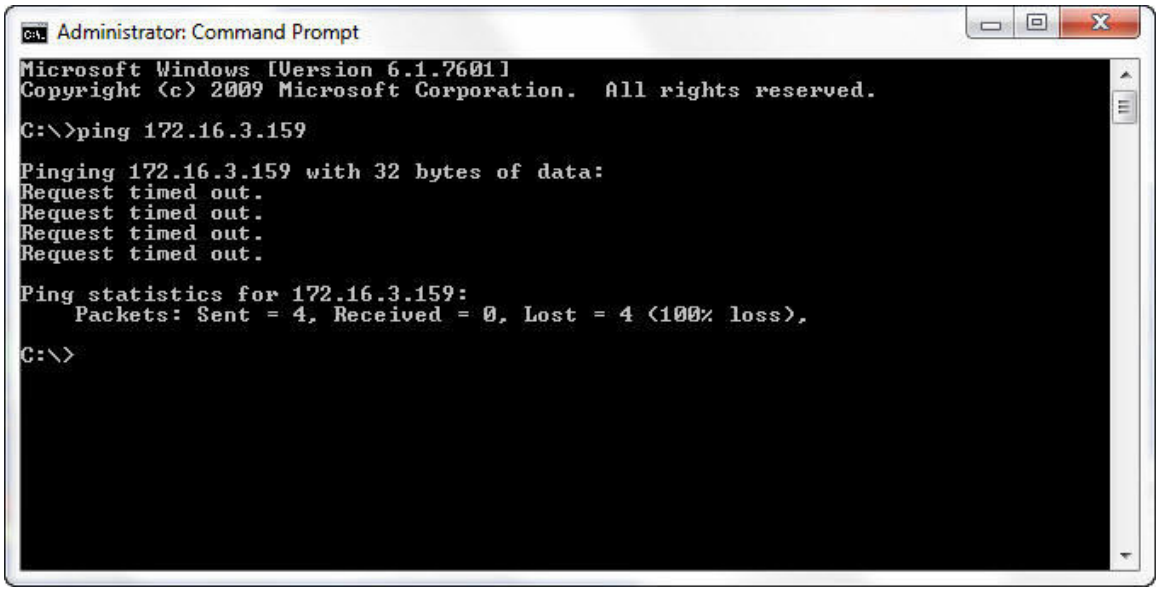


Error: Main Pain Does Not Launch

If the Main Page does not launch the IP Address is most likely incorrect. Correct the IP Address and try again. If you do not know the IP Address use the following procedure:

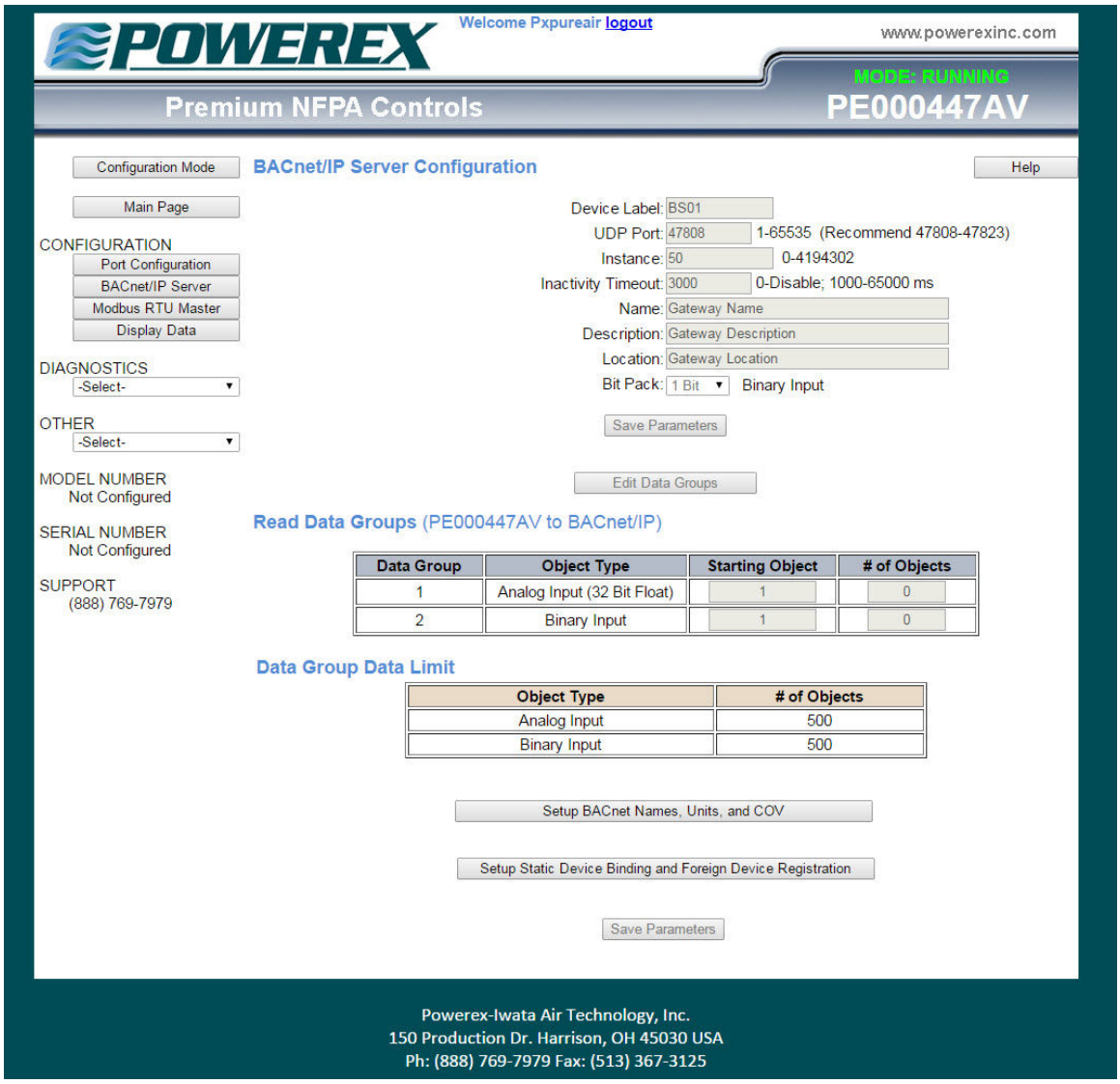
1. Open an MS-DOS Command Prompt.
2. Type ipconfig and press enter.
3. Note the IP address. (The previous example was 172.16.3.158)
4. To test the communication between the PC and the unit type ping (###.###.###.###) in the prompt and press Enter. The (###.###.###.###) is the IP address of the unit you used in step 5 of network configuration, which is 172.16.3.159 by default. If the device is connected to the network the ping will show a response. If you get no response check the crossover cable.





BACnet®/IP Server Settings

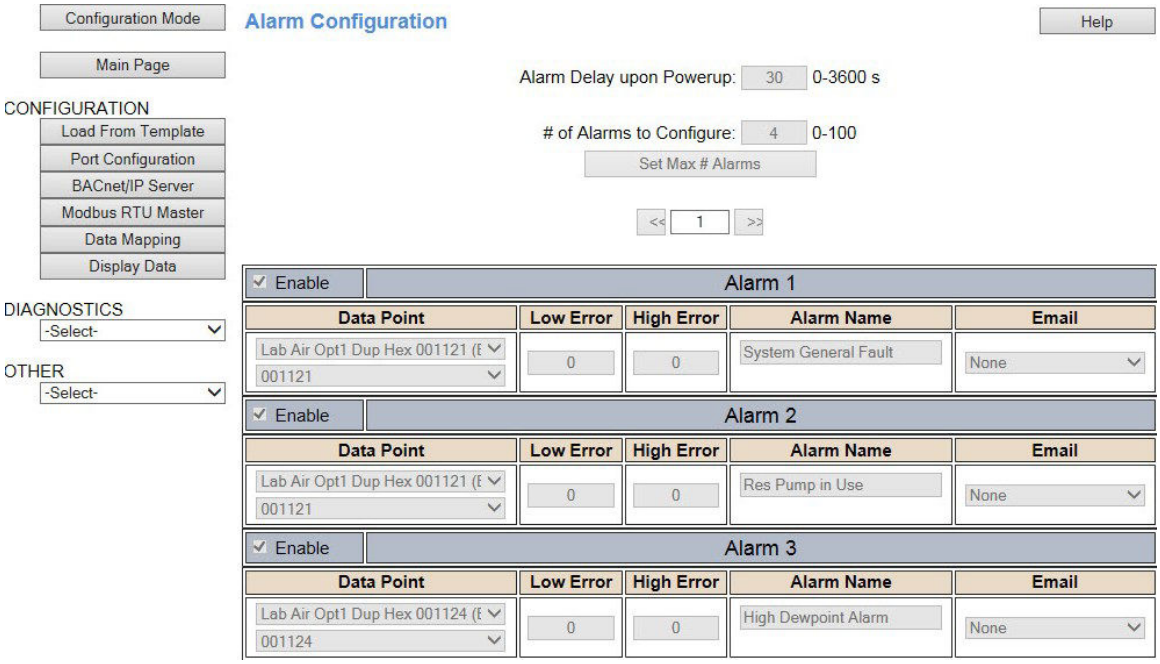
1. Click on the BACnet®/IP Server button. This will put the gateway into configuration mode so you can edit the BACnet® settings.
2. Enter the Device Instance that the 260MX-S027 will have on the BACnet®/IP Network. Note that this must be unique amongst all BACnet® devices on the network.
3. In the Name field enter a unique name for the device.
4. The Description and Location fields are optional. Filling in this information is recommended to identify the device on a network.
5. Beneath the Read Data Groups, verify the number of Analog Input (AI), Analog Output (AO), Binary Input (BI), and Binary Output (BO) objects that you will be exposing to the BACnet®/IP Client.
6. Click Save Parameters.



7. To save changes and force the gateway back to running mode, click on the Reboot Now button and after 5 seconds hit the Refresh button. You should see the gateway appear in Mode: Running.

Alarm Configuration

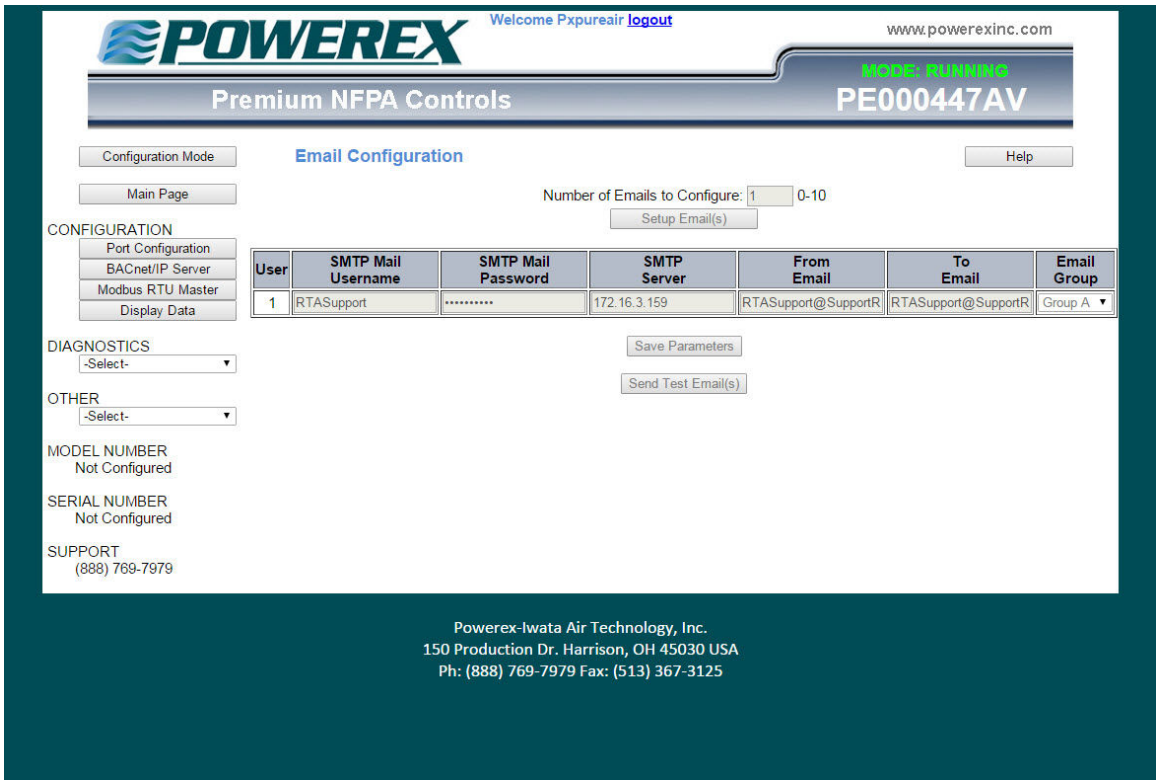
1. Click on the Other dropdown menu and select Alarm Configuration. Click on the Configuration Mode button to edit the alarm settings.
2. To enable an alarm, check the enable box.
3. If an alarm is enabled, then the Low Alarm and High Alarm must be set.
4. If the value of the point falls below the Low Alarm, the alarm is set and an email is generated if email is configured.
5. If the value of the point reaches the High Alarm, the alarm is set and an email is generated if email is configured.
6. Scroll to the bottom and Save Parameters.



7. To save changes and force the gateway back to running mode, click on the Reboot Now button and after 5 seconds hit the Refresh button. You should see the gateway appear in Mode: Running.

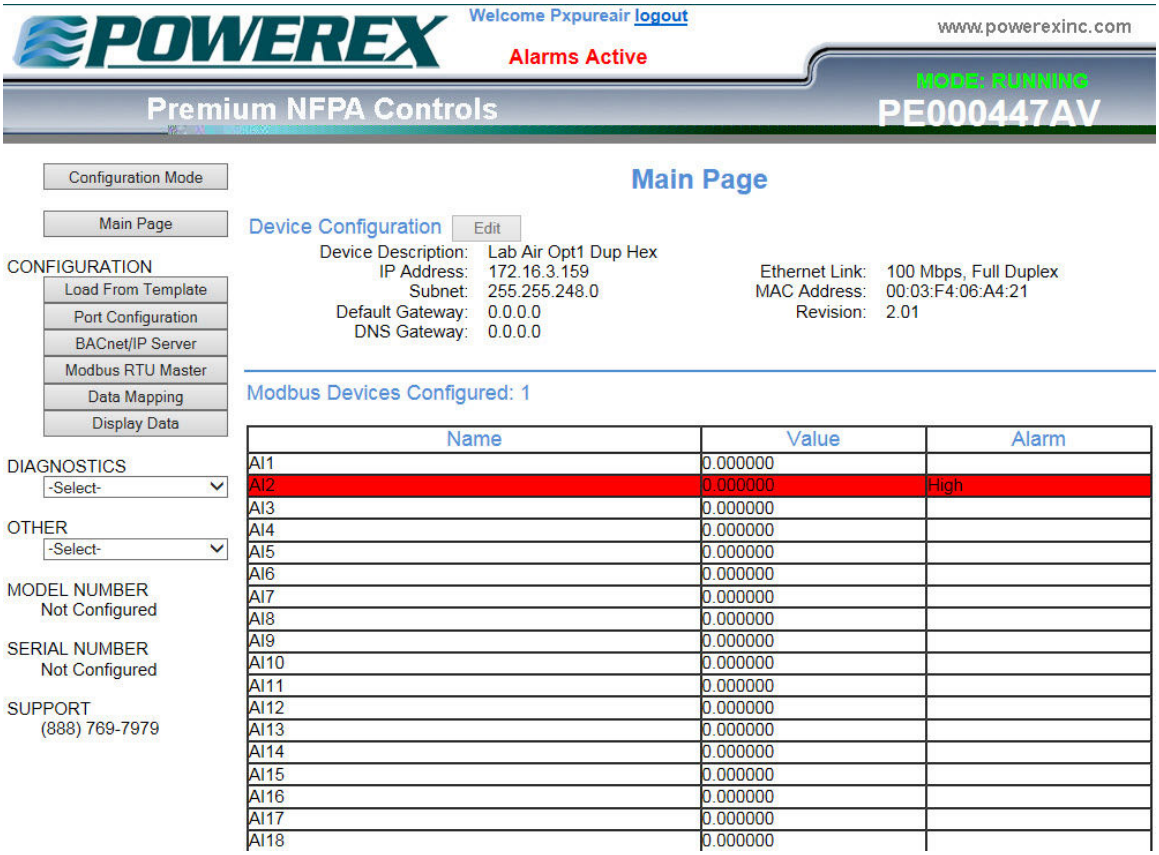
Email Configuration

1. Click on the Other dropdown menu and select Email Configuration. Click on the Configuration Mode button to edit email settings.
2. Enter in the number of emails to configure and press Setup Email(s).
3. Enter in the SMTP Username. This email must have SMTP capability set up.
4. If the SMTP device requires authentication, enter in the Password for the SMTP Mail Username.
5. Enter in the SMTP Server that is being used.
6. Enter in the Email Address of the sender. This is going to be the same field as Step 3.
7. Enter in the Email Address of the recipient.
8. Select an Email Group for the user to be a part of. Multiple users may be part of a group and can receive the same alarm message.
9. Repeat steps 3-7 for multiple recipients.
10. Click Save Parameters.
11. Click Send Test Email to verify all of the email settings are correct.
12. To save changes and force the gateway back to running mode, click on the Reboot Now button and after 5 seconds hit the Refresh button. You should see the gateway appear in Mode: Running.



System Status

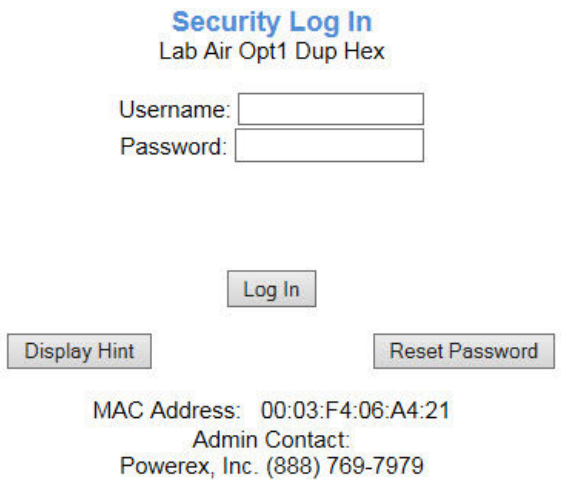
1. The main page shows the BACnet® Point, its current value, and whether an alarm is set.
2. The Value column will show the current value of the point upon a Refresh of this page.
3. If an alarm is enabled and is triggered, the point in an alarm state will be displayed in Red.



Name	Value	Alarm
AI1	0.000000	
AI2	0.000000	High
AI3	0.000000	
AI4	0.000000	
AI5	0.000000	
AI6	0.000000	
AI7	0.000000	
AI8	0.000000	
AI9	0.000000	
AI10	0.000000	
AI11	0.000000	
AI12	0.000000	
AI13	0.000000	
AI14	0.000000	
AI15	0.000000	
AI16	0.000000	
AI17	0.000000	
AI18	0.000000	

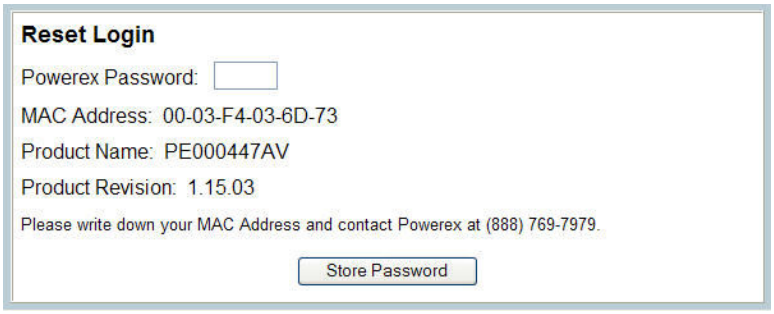
Locking the System

1. To lock the system within the network, click on the Log Out button on the top of any page.
2. If the Username and/or Password is ever forgotten, click the Reset Password.
3. Click Confirm Reset.
4. Physically cycle power on the gateway within 15 minutes to gain access to the web pages. Set up the Security Settings again.
5. To sign in as a Guest User for the first time, use the information below:
   Username: Guest
   Password: (Password field is blank)
6. Once logged in as Guest, access the security screen using the pull down menu on the left side of the screen. In the security screen create a new Customer User and password. After creating a new Customer User log out of the Guest User and log back in as your Customer User. From this login you can change your BACnet configuration settings.
7. After the initial creation of a Customer User, the user defined user name and password should be used to log in to the system and may be updated from the Security Configuration Page.



Reset the Username/Password

Please call Powerex at (888) 769-7979 with the MAC Address of the gateway. Once the correct Powerex Password is entered, you will be redirected to the Login Password and be prompted to enter in a new Username and Password.



System Operation

Initial Start-up

Normal Operation

In normal operation, no user input is required.

Periodically (usually once per month) the on-line dryer should be switched off line and the off line brought into use. The duplexed condensate trap solenoid-timer drain may also be switched.

Follow the following steps to accomplish this:

1. Use the power selector to energize both dryers.
2. Open the intake isolation valve slowly on the off line dryer..
3. Let the dryer cycle for at least one purge cycle. (NOTE: on some dryers the purge cycle can be triggered by using a control on the dryer itself that turns off purge saver. If the dryer does not have this feature, allow the automatic purge cycle to occur before proceeding).
4. Open the outlet isolation valve slowly.
5. Close the outlet isolation valve.
6. Close the inlet isolation valve.
7. Turn off power to the dryer taken off liit.

Checking the functioning of the automatic drain units:

Locate the timer-solenoid auto drains; one is tied to the after cooler condensate traps and another is installed at the tank drain. Push the test button and verify that flow is occurring. You should be able to hear the flow, or even feel it as it vibrates the connected lines or piping. There will be a change in the sound or vibration pattern if there is a transition from liquid flow to air flow. This means a significant liquid amount accumulated between drain intervals and the settings for frequency and duration of draining should be adjusted. Increase the duration, reduce the frequency or both.

Maintenance Schedule

Compressor

Item	Action Needed	Operating Hours						Remarks
		500	2,500	5,000	10,000	15,000	20,000	
Inlet air filter	Inspect Replace	●	▲					Replace both at 5,000 hours
Blower fan	Clean			●	●	●	●	
Fan duct	Clean			●	●	●	●	
Compressor fins	Clean		●					Every 2,500 hours or less
Bearings	Grease			▲	▲	▲	▲	Every 5,000 hours (145 psig scroll units) Every 10,000 hours (100 psig units)
Tip seal	Replace			▲	▲	▲	▲	Every 5,000 hours (145 psig scroll units) Every 10,000 hours (100 psig units)
Dust seal	Replace				▲		▲	
V-belt	Replace				▲		▲	See Note 3
Pressure switch/ transducer	Confirm operation				●		●	
Magnetic Starter	Inspect				●		●	Replace if contact point is deteriorated
Check valve	Replace				●		●	
Heat Insulation Pipe	Replace				●		●	

Piping System

Item	Action Needed	Operating Hours						Remarks
		500	2,500	5,000	10,000	15,000	20,000	
Safety valve	Confirm operation		●					Every 2,500 hours or less
Pressure gauge	Inspect		●					Every 2,500 hours or less
Tank	Drain moisture	Daily						Verify proper drain operation
Air leaks	Inspect		●		●		●	
Intake filter elements	Replace		▲	▲	▲	▲	▲	
Compressed Air Line Filters	Inspect	●		●		●		

Air Dryers

Item	Action Needed	Operating Hours						Remarks
		500	2,500	5,000	10,000	15,000	20,000	
Desiccant Dryer	Switch dryer online/offline	Monthly						Each month (see dryer manual for maintenance instructions)

● – Inspect
▲ – Replace

NOTES:

1. Inspect and perform maintenance periodically according to the maintenance schedule.
2. The maintenance schedule relates to the normal operating conditions. If the circumstances and load condition are adverse, shorten the cycle time and perform maintenance accordingly.
3. Belts require no attention unless slippage is detected (Chirping sound on start up or while running). Re-tension as indicated when tip seals are replaced for the first time. Proper belt tension should be 0.25 inch deflection when 6 pounds of force is applied on the center of the belt span.
4. If the pumps reach 4 years and have not yet accumulated 5,000 hours, perform the greasing operation for the bearings, with the number of pumps reduced by 25%. (See details of pump grease operation.) Tip seals do not require early replacement, but must be done before or at 5,000 hours of run time.

Integrated Dew Point Monitor Maintenance

Sensor Calibration and Adjustment

The sensor is fully calibrated as shipped from the factory (see calibration sheet included in the main system manual). With the Daily Auto-Calibration feature (listed below) the sensor may not need replacement for up to 10 years. The manufacturer recommended replacement interval is 2 years from system start-up or if sensor should malfunction.

Replacing the Filter

The sensor is protected with a stainless steel sintered filter. The filtering grade is 34 um.

The filter is recommended to be changed whenever it looks dirty or as a part of the periodical maintenance procedure. The recommended replacement interval depends heavily on the application and can vary from less than a year to several years. Dirty or corroded filter may cause increased response times. In case the sensor is used in a drying system with silica gel (or other drying agent) the dust from the dryer may collect on the sensor slowing the response but also generating a micro climate around the sensor altering the dew point at the sensor. This is easily corrected by changing or cleaning the filter.

⚠ CAUTION ***Touching the sensor may damage it. Special attention shall be paid to avoid touching the sensor when removing and replacing filters.***

Daily Auto-Calibration

The Daily Auto-Calibration feature of the sensor is an automatic procedure which greatly reduces the possible drift in the dry end of the dew point measurement. It is performed at one hour intervals, and when the power is switched on. During auto-calibration the sensor is warmed for a short period (< 1 min) and the sensor capacitance values are evaluated at the elevated temperature. The possible dry end drift is then corrected to correspond to the calibrated values. During the auto-calibration the transmitter outputs the Td value prior to the procedure. Auto-calibration is carried out only if several criteria for the measurement environment are fulfilled. This ensures the reliability of the adjustments, and maintains the excellent long term stability that the patented technology offers. These criteria include e.g. a sufficiently stable enough moisture level in the measured atmosphere. If the conditions are not fulfilled, the auto-calibration function is postponed until the satisfied conditions are reached.

Sensor Purge

Sensor purge is also an automatic procedure that minimizes the drift at the wet end readings of the dew point measurement. Sensor purge is performed once a day or when the power is switched on. The sensor is heated for several minutes which will then evaporate all excess molecules out of the sensor polymer. This, together with the auto-calibration results in a very small drift of the sensor due to the very linear behavior of the polymer technology.

Sensor Warming in High Humidity

Additionally the sensor has a warming feature which prevents the sensor and filter from becoming wet in high humidity. High humidity can be present when the dew point temperature rises close to the gas temperature. Sensor warming is switched on automatically when the humidity level in the measured gas increases to a level where dew can start to form. The advantage of sensor warming is rapid response of dew point measurement. A wet sensor and filter would otherwise result in a dew point equal to ambient temperature (i.e. RH=100%). If the sensor becomes soaked in any way, it will fully recover and return back to normal operation after it dries out.

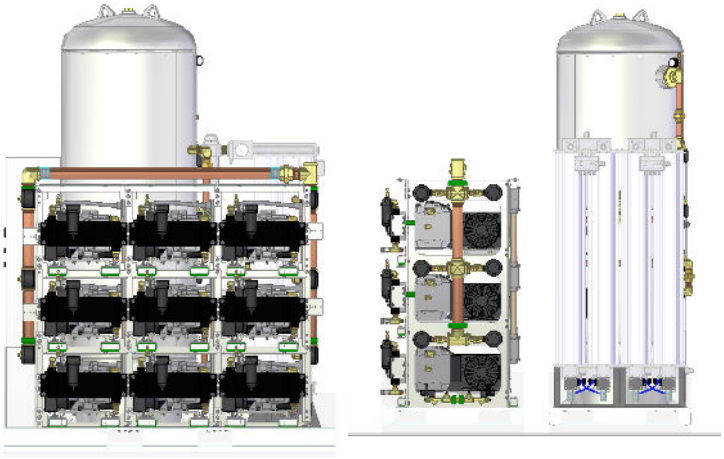
Procedures for System Maintenance

⚠WARNING ***Risk of Injury. Lock out and tag out the motor branch disconnect before performing work on the pump-motor module.***

The Powerex scroll system is designed for a small overall footprint. To provide access to the scroll pumps and motors, each bay has a slide out system for the baseplate. Review the image below to understand the general configuration of the slides. The fasteners that secure the baseplate to the slide rails should be loosened but not completely removed so that the baseplate cannot be inadvertently removed from the support frame while working. After completing work, restore the slide to the original position and tighten the fasteners.

General Procedures for utilizing the service slide rail system to access the pumps and motors.

Each pump-motor assembly is mounted to a baseplate. The baseplate is supported by slotted rails that allow the complete assembly to be pulled out of the frame for access.



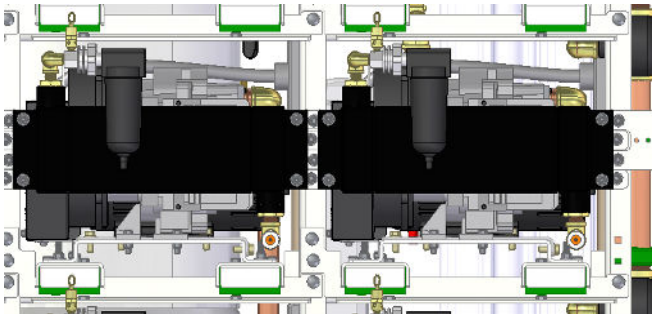
In the view above left, the pump-motor assembly will slide out after the aftercooler assembly is removed.

First select the pump motor assembly to be serviced. Use the electric panel to Lock out and tag out the Motor Protector Circuit Breaker (MPCB) for that assembly. If work is to be performed on the temperature switch for that assembly it must be disconnected from the power feed in the panel while the panel is de-energized and locked out. IN some cases multiple pumps are grouped together to operate as a 10 or 15 HP group, so make sure the affected circuits are all addressed.

Once the electric power supply is locked out, locate the handle for the intake filter isolation valve associated with that pump motor assembly. The valve may be closed at this time. NOTICE: Do not operate the unit with the intake valve closed – damage to the pump will result and will not be covered by warranty. The outlet side isolation valve can now be located and closed. Applicable codes and standards may require a locking cover or other device be placed on the valve handle.

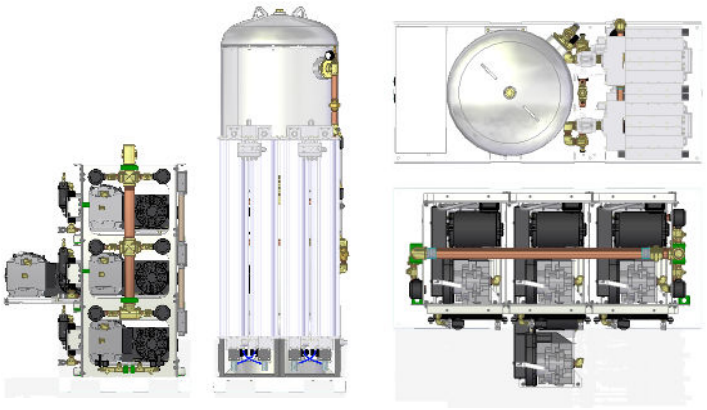
Disconnect the union fitting on the inlet flex hose. Also disconnect the fitting joining the pump outlet flex hose to the after cooler inlet. Disconnect the after cooler assembly outlet flex hose from the outlet pipe manifold assembly. Unplug the after cooler fan power supply wire and tuck it safely away. Now you can undo the bolts that hold the after cooler assembly to the frame and move the assembly out of the way of the pump.

Bolt Removal

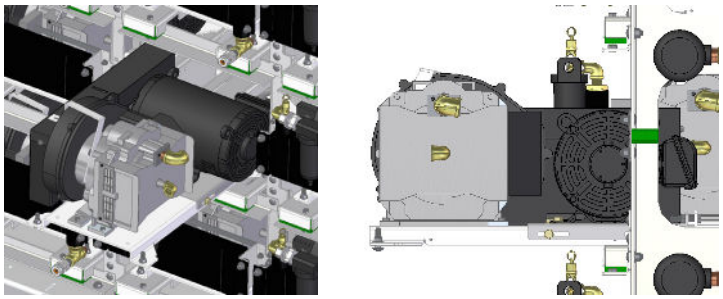


The baseplate has four L shaped brackets securing it to the rail. These brackets have carriage bolts that fit in the rail slots and elastic insert nuts. Using an appropriate wrench, loosen the nuts a few turns, but do not remove the nuts completely. Just generate enough clearance to allow the bracket to slide on the rail. Once all are loose, remove the two bolts on the pump side all the way. You can now carefully slide the assembly outward. Pay attention and disconnect any ties on the temperature sensor wires or on the motor conduits as you go. The motor conduit and inlet flex hose may need to be eased out of their normal positions to facilitate the outward sliding. The two motor side L bracket bolts will prevent the assembly from sliding all the way out of the rack. Be careful if you loosened them too much as the baseplate may now want to sag down.

Slide Out



The figure below shows the baseplate pulled out giving access for pump maintenance. The pump may be removed if necessary, or the motor may be unbolted and removed as well. Removing the motor or the pump will require the belt guard to be removed first.



After the required work is performed, reverse the steps used for disassembly. Be sure to open the intake isolation valve before turning the power on.

Belt Tension Checking and Adjustment

The Powerex scroll compressor system uses premium vee-belts to transfer power from the motor to the pump. The precision machined drive pulley and pump sheave are aligned and tension is set during initial construction to achieve optimum belt life. The belt construction is referred to as raw edge belts, and rubber dust from the edge of the belt may be deposited near the belt guard. This is normal and not a cause for concern. The rate of dust shedding will diminish as the belts break in to their long term optimum tension.

The most obvious sign that belts need attention is squeak or chirp that is heard at start up when the motor is applying higher than normal torque to the pump. The belt guard has a slot in the top surface so a spring scale type tension gauge can be used without removing it. A value of 20 pounds tension can be used as the minimum before tightening the belt. (Deflection force of 3.75 pounds at 0.2 inches)

The motor slide base is provided to facilitate tensioning. Loosen the clamping bolts on the side of the slide base underneath the back of the motor and the bolts just behind the belt guard just enough to allow sliding to occur. THE tension bolt can be used to pull the base and motor away from the pump. Tighten the clamp bolts when the desired tension is achieved.

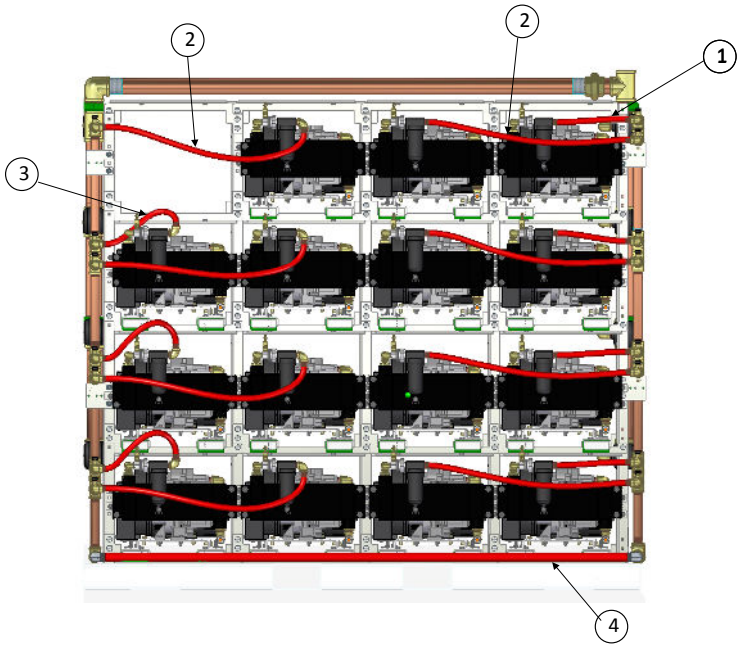
For retightening of an existing belt set, use 30 to 35 in-lbf torque on the tension bolt.

When installing new belts use 45 to 50 in-lbf torque. Note: if a belt tension gauge is used, do not be concerned about the torque value.

Replacement Parts

Discharge Flexhoses

Ref #	Description	Part #
	Pump Discharge to Aftercooler (1/2" X 12")	SM008112AV
1	Aftercooler to Discharge Tree 1 (1/2" X 12")	SM008112AV
2	Aftercooler to Discharge Tree 2 (1/2" X 18")	SM008113AV
3	Aftercooler to Discharge Tree 3 (1/2" X 32")	SM008117AV
4	9 & 12 Discharge Tree Connection (1" X 60")	ST187160AJ
4	15 Pump Discharge Tree Connection (1" X 84")	ST187162AJ



Remote Inlet Flexhoses

Description	Part #
Remote Inlet Tree to Close Pump (3/4" X 20")	SM008118AV
Remote Inlet Tree to Far Pump 1 (3/4" X 36")	SM008119AV
Remote Inlet Tree to Far Pump 2 (3/4" X 46")	SM008120AV

Discharge Tree to Tank Flexhoses

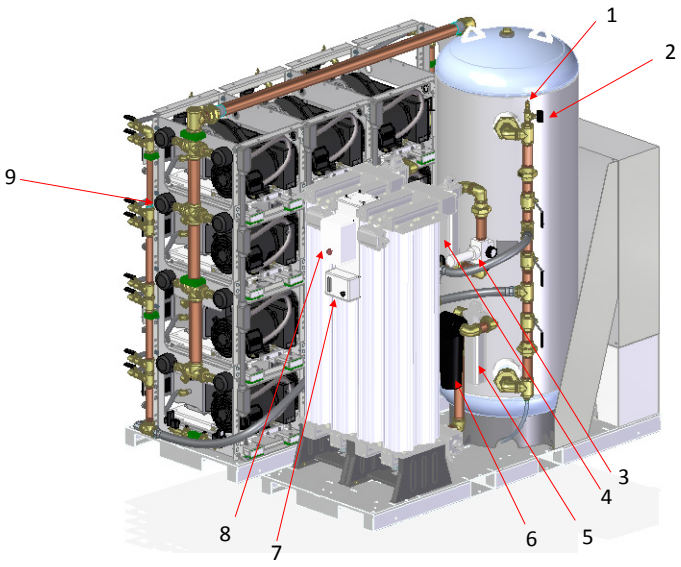
Description	Part #
Discharge Tree to Tank 2 Pump (1/2" X 30")	ST187103AJ
Discharge Tree to Tank 3 Pump (1/2" X 48")	ST187106AJ
Discharge Tree to Tank 4 Pump - Medical (1/2" X 48")	ST187106AJ
Discharge Tree to Tank 4 Pump - Lab (1" X 48")	ST187122AJ
Discharge Tree to Tank 6-8 Pump (1" X 60")	ST187160AJ
2X Discharge Tree to Tank 9 Pump (1" X 60")	ST187160AJ
2X Discharge Tree to Tank 12 Pump (1-1/4" X 60")	ST187170AJ
2X Discharge Tree to Tank 15 Pump (1-1/4" X 60")	ST187170AJ
Discharge Tree to Discharge tree 18 Pump (1" X 54")	ST187123AJ
Discharge Tree to Tank 18 Pump (1-1/4" X 72")	ST187171AJ

Tank to Dryer Flexhoses

Description	Part #
Tank to Dryers 2 Pump (1/2" X 36")	ST187104AJ
Tank To Dryers 3 Pump (1/2" X 48")	ST187106AJ
Tank To Dryers 4 Pump - Medical (1/2" X 48")	ST187106AJ
Tank To Dryers 4 Pump - Lab (1" X 48")	ST187122AJ
Tank to Dryers 6-8 Pump (1" X 60")	ST187160AJ
Tank to Dryers 9 Pump (1" X 36")	ST087120AJ
Tank to Dryers 12 Pump (1-1/4" X 30")	ST187127AJ
Tank to Dryers 15 Pump (1-1/4" X 30")	ST187127AJ
Tank to Dryers 18 Pump (1-1/4" X 30")	ST187127AJ

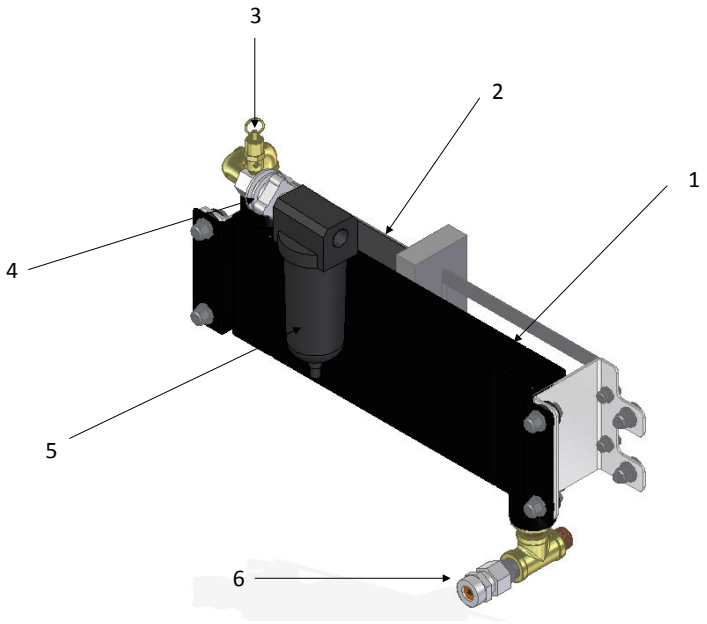
System Parts

Ref #	Description	Part #
1	1/4" NPT 140 PSI Safety Valve (Lab Systems)	V-215400AV
1	1/4" NPT 165 PSI Safety Valve (Medical Systems)	V-215401AV
2	Pressure Gage (Bottom Mount)	GA031900AV
2	Pressure Gage (Back Mount)	GA031901AV
3	1/2" NPT Air Pressure Regulator	ST178409AV
3	1" NPT Air Pressure Regulator	ST178411AV
3	1-1/2" NPT Air Pressure Regulator	ST178405AV
6	Cyclonic Water Seperator - 1/2" NPT	ST178515AV
6	Cyclonic Water Seperator - 1" NPT	ST178502AV
6	Cyclonic Water Seperator - 1-1/2" NPT	ST178503AV
7	CO Monitor	ACO600105AJ
8	Dewpoint Sensor with Housing	PDPM1001AJ
9	Filter Housing	VP000542AV
9	Filter Element	VP000543AV
	Pressure Gage (4.5 IN Diameter Bottom Mount)	GA031400AV
	1/2 IN NPT Electric Drain Drain with Wye Strainer	SL300701AV
	3/8" Clear PTFE Tubing (Sight Glass)	PS001800AV
	1/4" Water Separator Connection Tubing	PS010300AV



Aftercooler Assembly

Ref #	Description	Part #	QTY
1	Aftercooler	SL060000AV	1
2	Aftercooler Fan	SM001301AV	1
3	1/8" NPT 140 PSI Safety Valve (Medical Systems)	V-215411AV	1
3	1/8" NPT 165 PSI Safety Valve (Lab Systems)	V-215412AV	1
4	Check Vlave	IP087700AV	1
5	Cyclonic Water Seperator - 1/2" NPT	ST178515AV	1
6	Temperature Switch (Medical Systems)	AM003033AV	1
6	Temperature Switch (Lab Systems)	AM003034AV	1



Maintenance Items

Description	Part #	QTY
2 HP Belt (Standard and High Pressure)	BT009001AV	2/basemount
3 HP Belt (Standard Pressure)	BT012001AV	2/basemount
3 HP Belt (High Pressure)	BT012300AV	2/basemount
5 HP Belt (Standard and High Pressure)	BT012001AV	2/basemount
2 HP Tip Seal Set (Standard and High Pressure)	92834090	1/basemount
3 HP Tip Seal Set (Standard and High Pressure)	92834090	1/basemount
5 HP Tip Seal Set (Standard Pressure)	92832070	1/basemount
5 HP Tip Seal Set (High Pressure)	92832080	1/basemount
Grease (80g)	IP600000AV	
Grease Gun	IP616100AV	
Grease Gun Kit	IP616200AJ	
Grease Gun Nozzle	92583130	
Grease Gun With Fittings	IP616101AJ	
Grease Gun With Cartridge	IP616201AJ	
Grease Fun Nozzle	HSP-3	

Control Panel Components

Description	Part Number	QTY
Pressure Transducer	PE000454AV	1/System
Pressure transducer cable	PE000451AV	1/System
Dewpoint Sensor (Lab & Premium Medical Systems)	ACO500108	1/System
Dewpoint Sensor with Housing (Basic Medical Systems)	PDPM1001AJ	1/System

1 Pump/Plex Motor Protectors & Contactors	Motor Protector	QTY
2 HP 208 V - Premium	PE001805AV	1/motor
2 HP 208 V - Basic	PE000305AV	1/motor
2 HP 230 V - Premium	PE001805AV	1/motor
2 HP 230 V - Basic	PE000305AV	1/motor
2 HP 460 V - Premium	PE001803AV	1/motor
2 HP 460 V - Basic	PE000303AV	1/motor
3 HP 208 V - Premium	PE001805AV	1/motor
3 HP 208 V - Basic	PE000306AV	1/motor
3 HP 230 V - Premium	PE001805AV	1/motor
3 HP 230 V - Basic	PE000305AV	1/motor
3 HP 460 V - Premium	PE001804AV	1/motor
3 HP 460 V - Basic	PE000304AV	1/motor
5 HP 208 V - Premium	PE001807AV	1/motor
5 HP 208 V - Basic	PE000307AV	1/motor
5 HP 230 V - Premium	PE001806AV	1/motor
5 HP 230 V - Basic	PE000307AV	1/motor
5 HP 460 V - Premium	PE001805AV	1/motor
5 HP 460 V - Basic	PE000305AV	1/motor

Multiple Pumps/Plex (10 HP = 2x 5 HP; 15 HP = 3x 5 HP)	Motor Protector	QTY
10 HP 208 V - Premium	PE000308AV	1/motor
10 HP 208 V - Basic	PE000307AV	1/motor
10 HP 230 V - Premium	PE000307AV	1/motor
10 HP 230 V - Basic	PE000307AV	1/motor
10 HP 460 V - Premium	PE000305AV	1/motor
10 HP 460 V - Basic	PE000305AV	1/motor
15 HP 208 V - Premium	PE000307AV	1/motor
15 HP 208 V - Basic	PE000307AV	1/motor
15 HP 230 V - Premium	PE000307AV	1/motor
15 HP 230 V - Basic	PE000307AV	1/motor
15 HP 460 V - Premium	PE000305AV	1/motor
15 HP 460 V - Basic	PE000305AV	1/motor

Dryer Filters & Elements

Dryer Model	Pre-Filter	Pre-Filter Element	After Filter	After Filter Element	Carbon Filter	Carbon Filter element
Dryspell Plus 10	ST940401AV	ST940405AV	ST940411AV	ST940415AV	ST940421AV	ST9404205AV
Dryspell Plus 20	ST940401AV	ST940405AV	ST940411AV	ST940415AV	ST940421AV	ST9404205AV
Dryspell Plus 30	ST940401AV	ST940405AV	ST940411AV	ST940415AV	ST940421AV	ST9404205AV
Dryspell Plus 45	ST940401AV	ST940405AV	ST940411AV	ST940415AV	ST940421AV	ST9404205AV
Dryspell Plus 60	ST940402AV	ST940406AV	ST940412AV	ST940416AV	ST940422AV	ST9404206AV
Dryspell Plus 100	ST940402AV	ST940406AV	ST940412AV	ST940416AV	ST940422AV	ST9404206AV
Dryspell Plus 125	ST940402AV	ST940406AV	ST940412AV	ST940416AV	ST940422AV	ST9404206AV
Dryspell Plus 200	ST940403AV	ST940407AV	ST940413AV	ST940417AV	ST940423AV	ST9404207AV
Dryspell Plus 250	ST940403AV	ST940407AV	ST940413AV	ST940417AV	ST940423AV	ST9404207AV
Dryspell Plus 300	ST940404AV	ST940408AV	ST940414AV	ST940418AV	ST940424AV	ST9404208AV
Dryspell Plus 375	ST940404AV	ST940408AV	ST940414AV	ST940418AV	ST940424AV	ST9404208AV

Dryer Part Kits

Dryer Model	Seal Kit	Exhaust Valve Kit	Seal Kit with Desiccant	Shuttle Valve Assembly Spare Kit	Inlet Valve Assembly Spare Kit	Pilot Opperated Valve Assembly Spare Kit
Dryspell Plus 10	ST940500AV	ST940510AV	ST940530AV	N/A	N/A	N/A
Dryspell Plus 20	ST940501AV	ST940511AV	ST940531AV	N/A	N/A	N/A
Dryspell Plus 30	ST940502AV	ST940511AV	ST940532AV	N/A	N/A	N/A
Dryspell Plus 45	ST940503AV	ST940511AV	ST940533AV	N/A	N/A	N/A
Dryspell Plus 60	ST940504AV	ST940511AV	ST940534AV	N/A	N/A	N/A
Dryspell Plus 100	ST940505AV	ST940512AV	ST940535AV	ST940550AV	ST940570AV	N/A
Dryspell Plus 125	ST940505AV	ST940512AV	ST940536AV	ST940551AV	ST940570AV	N/A
Dryspell Plus 200	ST940506AV	ST940512AV	ST940537AV	ST940552AV	ST940571AV	N/A
Dryspell Plus 250	ST940506AV	ST940512AV	ST940538AV	ST940553AV	ST940571AV	N/A
Dryspell Plus 300	ST940507AV	ST940512AV	ST940539AV	ST940554AV	N/A	ST940590AV
Dryspell Plus 375	ST940507AV	ST940512AV	ST940540AV	ST940555AV	N/A	ST940590AV

Notes

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Powerex Limited Warranty – Applicable to Non-OEM Customers in the U.S. & Canada Only

Warranty and Remedies.

(a) General. Powerex warrants each Compressor System, Vacuum System, Vacuum Pump, Compressor Air-End, or Powerex branded Accessory (collectively "Products", individually each a "Product") to be free from defects in material and workmanship ("Defects") at the date of shipment. This warranty shall apply only to Products that are purchased and used in the United States of America and in Canada. EXCEPT AS SET FORTH BELOW, NO OTHER WARRANTY, WHETHER EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, SHALL EXIST IN CONNECTION WITH THE SALE OR USE OF SUCH PRODUCTS. TO THE EXTENT PERMITTED BY LAW, ANY AND ALL IMPLIED WARRANTIES ARE EXCLUDED. All warranty claims must be made in writing and delivered to Powerex in accordance with the procedures set forth on its website (www.powerexinc.com), or such claim shall be barred. Upon timely receipt of a warranty claim, Powerex shall inspect the Product claimed to have a Defect, and Powerex shall repair, or, at its option, replace, free of charge, any Product which it determines to have had a Defect; provided, however, that if circumstances are such as to preclude the remedying of Defect by repair or replacement, Powerex shall, upon return of the Product, refund to buyer any part of the purchase price of such Products paid to Powerex. Freight for returning Products to Powerex for inspection shall be paid by buyer. The warranties and remedies herein are the sole and exclusive remedy for any breach of warranty or for any other claim based on any Defect, or non-performance of the Products, whether based upon contract, warranty or negligence.

(b) (i) Standard Period of Warranty – Parts and Labor. The purchase of any system includes our standard warranty. Powerex warrants and represents all Products shall be free from Defects for the first eighteen (18) months from the date of shipment by Powerex, or twelve (12) months from the documented date of startup, or five thousand (5,000) hours of use, whichever occurs first. During such warranty period, Powerex shall be fully liable for all Defects in the Products (the "Product Defects"), i.e., all costs of repair or replacement, which may include "in and out" charges, so long as the Products are located in the United States or Canada, and the Products are reasonably located and accessible by service personnel for removal. "In and out" charges include the costs of removing a Product from buyer's equipment for repair or replacement.

(ii) Premium Period of Warranty – Parts and Labor. In order to be eligible for premium warranty coverage, a premium warranty for each system must be purchased when order is placed. Powerex warrants and represents all Products shall be free from Defects for the first thirty (30) months from the date of shipment by Powerex, or twenty-four (24) months from the documented date of startup, or seven thousand five hundred (7,500) hours of use, whichever occurs first. During such warranty period, Powerex shall be fully liable for all Defects in the Products (the "Product Defects"), i.e., all costs of repair or replacement, which may include "in and out" charges, so long as the Products are located in the United States or Canada, and the Products are reasonably located and accessible by service personnel for removal. "In and out" charges include the costs of removing a Product from buyer's equipment for repair or replacement.

(c) Additional Period of Warranty – Parts Only (No Labor). In addition to the above, Powerex warrants each Powerex branded Compressor Air- End and Vacuum Pump shall be free of Defects for a period of forty-two (42) months from the date of shipment by Powerex, or thirty-six (36) months from the documented date of startup, or ten thousand (10,000) hours of use, whichever occurs first. Supplier's repair or replacement of any Product shall not extend the period of any warranty of any Product. This warranty applies to the exchange of part(s) found to be defective by an Authorized Powerex Service Representative only.

(d) Replacement Pumps – Parts Only (No Labor). For any replacement Air-End or Vacuum Pumps installed on a Powerex manufactured system or unit after any initial warranty period has expired or where another warranty does not apply for any reason, Powerex warrants that the Air-End or Vacuum Pumps shall be free of Defects for a period of thirty-six (36) months from the date of shipment by Powerex or ten thousand (10,000) hours of use, whichever comes first. For any replacement Air-End or Vacuum Pumps installed on a system that was not manufactured by Powerex after any initial warranty period has expired or where another warranty does not apply for any reason, Powerex warrants that the Air-End or Vacuum Pumps shall be free of Defects for the first twelve (12) months from the date of shipment by Powerex. Supplier's repair or replacement of any Product shall not extend the period of any warranty of any Product. This warranty applies to the exchange of part(s) found to be defective by an Authorized Powerex Service Representative only.

(e) Replacement Motors – Parts Only (No Labor). For any replacement motor installed on a Powerex manufactured system or unit after any initial warranty period has expired or where another warranty does not apply for any reason, Powerex warrants that the replacement motor shall be free of Defects for the first twelve (12) months from the date of shipment by Powerex. For any replacement motor installed on a system or unit that was not manufactured by Powerex after any initial warranty period has expired or where another warranty does not apply for any reason, Powerex warrants that the replacement motor shall be free of Defects for the first ninety (90) days from the date of shipment by Powerex. Supplier's repair or replacement of any Product shall not extend the period of any warranty of any Product. This warranty applies to the exchange of part(s) found to be defective by an Authorized Powerex Service Representative only.

(f) Replacement Parts – Parts Only (No Labor). For other replacement parts besides motors, Air-End or Vacuum Pumps installed on a Powerex manufactured system or unit after any initial warranty period has expired or where another warranty does not apply for any reason, Powerex

warrants that such replacement parts will be free from Defects for the first twelve (12) months from the date of shipment by Powerex. For other replacement parts besides motors, Air-End or Vacuum Pumps installed on a system or unit that was not manufactured by Powerex after any initial warranty period has expired or where another warranty does not apply for any reason, Powerex warrants that such replacement parts will be free from Defects for the first twelve (12) months from the date of shipment by Powerex. For other replacement parts besides motors, Air-End or Vacuum Pumps installed on a system or unit that was not manufactured by Powerex after any initial warranty period has expired or where another warranty does not apply for any reason, Powerex makes no warranties. Supplier's repair or replacement of any Product shall not extend the period of any warranty of any Product. This warranty applies to the exchange of part(s) found to be defective by an Authorized Powerex Service Representative only.

(g) Coverage. The warranty provided herein applies to Powerex manufactured units or systems only.

(h) Exceptions. Notwithstanding anything to the contrary herein, Powerex shall have no warranty obligations with respect to Products:

(i) That have not been installed in accordance with Powerex's written specifications and instructions;

(ii) That have not been maintained in accordance with Powerex's written instructions;

(iii) That have been materially modified without the prior written approval of Powerex; or

(iv) That experience failures resulting from operation, either intentional or otherwise, in excess of rated capacities or in an otherwise improper manner.

The warranty provided herein shall not apply to: **(i)** any defects arising from corrosion, abrasion, use of insoluble lubricants, or negligent attendance to or faulty operation of the Products; **(ii)** ordinary wear and tear of the Products; or **(iii)** defects arising from abnormal conditions of temperature, dirt or corrosive matter; **(iv)** any OEM component which is shipped by Powerex with the original manufacturer's warranty, which shall be the sole applicable warranty for such component.

Limitation of Liability. NOTWITHSTANDING ANYTHING TO THE CONTRARY HEREIN, TO THE EXTENT ALLOWABLE UNDER APPLICABLE LAW, UNDER NO CIRCUMSTANCES SHALL POWEREX BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTAL, PUNITIVE, SPECULATIVE OR INDIRECT LOSSES OR DAMAGES WHATSOEVER ARISING OUT OF OR IN ANY WAY RELATED TO ANY OF THE PRODUCTS OR GOODS SOLD OR AGREED TO BE SOLD BY POWEREX TO BUYER. TO THE EXTENT ALLOWABLE UNDER APPLICABLE LAW, POWEREX'S LIABILITY IN ALL EVENTS IS LIMITED TO, AND SHALL NOT EXCEED, THE PURCHASE PRICE PAID.

Warranty Disclaimer. Powerex has made a diligent effort to illustrate and describe the Products in its literature, including its Price Book, accurately; however, such illustrations and descriptions are for the sole purpose of identification, and do not express or imply a warranty that the Products are merchantable, or fit for a particular purpose, or that the Products will necessarily conform to the illustrations or descriptions.

Product Suitability. Many jurisdictions have codes and regulations governing sales, construction, installation, and/or use of Products for certain purposes, which may vary from those in neighboring areas. While Powerex attempts to assure that its Products comply with such codes, it cannot guarantee compliance, and cannot be responsible for how the product is installed or used. Before purchase and use of a Product, please review the Product applications, and national and local codes and regulations, and be sure that the Product, installation, and use will comply with them.

Claims. Any non-warranty claims pertaining to the Products must be filed with Powerex within 6 months of the invoice date, or they will not be honored. Prices, discounts, and terms are subject to change without notice or as stipulated in specific Product quotations. Powerex shall not be liable for any delay or failure arising out of acts of the public enemy, fire, flood, or any disaster, labor trouble, riot or disorder, delay in the supply of materials or any other cause, whether similar or dissimilar, beyond the control of Company. All shipments are carefully inspected and counted before leaving the factory. Please inspect carefully any receipt of Products noting any discrepancy or damage on the carrier's freight bill at the time of delivery. Discrepancies or damage which obviously occurred in transit are the carrier's responsibility and related claims should be made promptly directly to the carrier. Returned Products will not be accepted without prior written authorization by Powerex and deductions from invoices for shortage or damage claims will not be allowed. **UNLESS OTHERWISE AGREED TO IN WRITING, THE TERMS AND CONDITIONS CONTAINED IN THIS LIMITED WARRANTY WILL CONTROL IN ANY TRANSACTION WITH POWEREX.** Any different or conflicting terms as may appear on any order form now or later submitted by the buyer will not control. All orders are subject to acceptance by Powerex.