

Installation, Operation and Maintenance Instructions



Scroll Laboratory Air Compressor System (-10°C Dew Point)

Part number 4107 9006 25

Revision 11

September 15, 2020



BEACONMEDÆS

Part of the Atlas Copco Group



BEACONMEDÆS[®]

Installation, Operation and Maintenance Manual **2-15 Hp “Oil-Less” Scroll Laboratory Air Systems**

This unit is purchased from: _____

Date purchased: _____

Model number: _____

Serial number: _____

Option(s) included: _____

Any information, service or spare parts requests should include the machine serial number and be directed to:

BeaconMedæs
1059 Paragon Way
Rock Hill, SC 29730

Telephone: (888) 463-3427
Fax: (803) 817-5750

BeaconMedæs reserves the right to make changes and improvements to update products sold previously without notice or obligation.

Part number 4107 9006 25
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Safety Precautions

Pressurized air from the system may cause personnel injury or property damage if the unit is improperly operated or maintained.

Operator should have carefully read and become familiar with the contents of this manual before installing, wiring, starting, operating, adjusting and maintaining the system.

Operator is expected to use common sense safety precautions, good workmanship practices and follow any related local safety precautions.

In addition:

- **Before starting any installation or maintenance procedures, disconnect all power to the package.**
- All electrical procedures must be in compliance with all national, state, and local codes and requirements.
- A certified electrician should connect all wiring.
- Refer to the electrical wiring diagram provided with the unit before starting any installation or maintenance work.
- Release all pressure from the package before removing, loosening, or servicing any covers, guards, fittings, connections, or other devices.
- Notify appropriate hospital personnel if repairs or maintenance will affect available compressed air levels.
- This is a high speed, rotating piece of machinery. Do not attempt to service any part while machine is in operation.
- To prevent automatic starting, disconnect all electrical power before performing any maintenance.
- Do not operate unit without belt guards, shields or screens in place.
- Make sure that all loose articles, packing material, and tools are clear of the package.
- Check all safety devices periodically for proper operation.
- Never operate a compressor with its isolation (shutoff) valve closed or without its relief valve in place. Damage to the compressor may occur.
- **Do not add lubricating oil of any kind to the compressor.** Absolutely no oil is required for proper operation.
- The “Manual” mode of operation should only be used for emergencies such as a master printed circuit board malfunction and should not be used for normal operation.
- Electrical service must be the same as specified on the control panel nameplate or damage to the equipment may occur.
- Vibration during shipment can loosen electrical terminals, fuse inserts, and mechanical connections. Tighten as necessary.

“Oil-Less” Scroll Laboratory Air

1.0 General Information

1.1 Component Description

NOTE: The features listed in this section are standard for laboratory air systems. In the case of special system configurations, these features may or may not be included with the system.

System Design

The Scroll Laboratory Air SPC (Single Point Connection) system consists of a single point connection, base mounted design including the following:

- Oil-less scroll compressors and motors
- Duplexed desiccant drying system with purge control
- Duplexed line filters and regulators
- Dew Point transmitter
- Integral, pre-wired, U.L. labeled control panel
- Corrosion resistant air receiver

The complete package is pre-wired, pre-piped, and assembled on one common base with single point connections for electrical, intake air, discharge air, and condensation drain. Each system includes valving to allow complete air receiver bypass, as well as air sampling port.

Compressor Module

The compressor is a continuous duty rated scroll type compressor. The design is single stage, air-cooled, consisting of one fixed and one orbiting scroll sealed with PTFE tip seals between the scroll halves and rated for 120 psig discharge pressure. The scrolls are protected from dust or contamination with a two part face seal. Orbiting bearings for scrolls are grease filled which require grease lubrication. See Section 5 for recommended compressor maintenance. The drive bearing is grease filled and lip sealed for its maintenance interval. The scroll case is constructed of diecast aluminum. Maximum heat dissipation is achieved through an integral cooling fan and air ducting.

Compressor Drive and Motor

The compressor is v-belt driven and protected by an OSHA approved totally enclosed beltguard. A sliding motor mounting base that is fully adjustable with two adjusting screws is incorporated to achieve belt tensioning. The motor is a NEMA rated, open dripproof, with 1.15 service factor suitable for 208 or 230/460V electrical service.

Intake

Each compressor has one inlet air filter. The inlet filter removes dust from the incoming air through cyclonic action and through an element.

Discharge Piping

Each compressor is equipped with an integral air-cooled aftercooler designed for a maximum approach temperature of 15° F complete with automatic solenoid drain valve. Each compressor is equipped with a wired high discharge air temperature shutdown RTD. The compressor discharge line includes a flex connector, safety relief valve, isolation valve and check valve. The discharge piping of each compressor incorporates an integral valve to provide load-less starting and rapid air evacuation between the check valve and scroll discharge at shutdown to minimize reverse rotation of the scroll. The discharge air piping is made of brass and/or stainless steel. The discharge flex connector is braided, 304 stainless steel, brass, or bronze.

Isolation System

The compressor and motor shall be fully isolated from the system base by means of a four-point, heavy duty, isolation system for a minimum of 95% isolation efficiency. Seismic isolation is optional.

Dryer

Each desiccant dryer is individually sized for peak calculated demand and capable of producing a 10°F (-12°C) pressure dew point. Dryer purge flow is minimized through a demand-based purge saving control system that includes a 441™ transfer valve utilizing two ceramic slide plates. The inlet to each dryer includes a mounted prefilter with automatic drain and element change indicator.

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1.0 General Information

Control System

The mounted and wired control system is U.L. labeled. This control system provides automatic lead/lag sequencing with circuit breaker disconnects for each motor with external operators. The control panel also includes full voltage motor starters with overload protection, redundant 24V DC control circuit power supplies, visual and audible reserve unit alarm with isolated contacts for remote alarm, and touch screen display. Automatic alternation of compressors based on a first-on/first-off principle with provisions for simultaneous operation if required, visual and audible alarm indication for high discharge air temperature shutdown with isolated contacts for remote alarm are included.

Final Line Filters and Regulators

Fully duplexed final line filters rated for 1 micron with element change indicators, along with duplexed final line regulators, are factory mounted and piped.

Dew Point Hygrometer

The factory mounted, piped and wired, dew point hygrometer includes remote alarm contact. The dew point sensor is a ceramic type with system accuracy of $\pm 2^{\circ}$ F. The dew point alarm is factory set at 36° F (2° C) per NFPA 99. High dew point condition is indicated with visual and audible alarm. Transmitters disconnected from control system will activate an alarm. See Appendix A for detailed information.

Air Receiver

The vertical air receiver is corrosion resistant, ASME Coded, National Board Certified, and rated for a minimum 150 PSIG design pressure. The tank piping includes a liquid level gauge glass, safety relief valve, manual drain valve, and a zero loss automatic solenoid drain valve.

1.0 General Information

1.2 Electromagnetic Immunity

1.2.1 EN 61000-6-2

Medical Electrical Equipment needs special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided in this manual.

Portable and mobile RF communications equipment can affect Medical Electrical Equipment.

The use of accessories, transducers, and cables other than those specified by the manufacturer, may result in decreased immunity of the TotalAlert Embedded control system.

The TotalAlert Embedded control system should not be used adjacent to other equipment. If adjacent use is necessary, the TotalAlert Embedded control system should be observed to verify normal operation in the configuration in which it will be used.


1.0 General Information

1.2.1 EN 61000-6-2 (Cont.)

Guidance and manufacturer's declaration - electromagnetic immunity			
The TotalAlert Embedded control system is intended for use in the electromagnetic environment specified below. The customer or the user of the TotalAlert Embedded control system should assure that it is used in such an environment.			
Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
Electrostatic Discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	±6 kV contact ±8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30 %.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/output lines	±2 kV for power supply lines ±1 kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±1 kV differential mode ±2 kV common mode	±1 kV differential mode ±2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment
Voltage dips, short Interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5 % U_T (>95 % dip in U_T) for 0,5 cycle <40 % U_T (>60 % dip in U_T) for 5 cycles <70 % U_T (>30 % dip in U_T) for 25 cycles <5 % U_T (>95 % dip in U_T) for 5 sec	<5 % U_T (>95 % dip in U_T) for 0,5 cycle <40 % U_T (>60 % dip in U_T) for 5 cycles <70 % U_T (>30 % dip in U_T) for 25 cycles <5 % U_T (>95 % dip in U_T) for 5 sec	Mains power quality should be that of a typical commercial or hospital environment. If the user of the TotalAlert 2 requires continued operation during power mains interruptions, it is recommended that the TotalAlert 2 be powered from an uninterruptible power supply or battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE: U_T is the a.c. mains voltage prior to application of the test level.			

1.0 General Information

1.2.1 EN 61000-6-2 (Cont.)

Guidance and manufacturer's declaration - electromagnetic immunity			
The TotalAlert Embedded control system is intended for use in the electromagnetic environment specified below. The customer or the user of the TotalAlert Embedded control system should assure that it is used in such an environment.			
Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	3 Vrms	<p>Portable and mobile RF communications equipment should be used no closer to any part of the TotalAlert Embedded control system, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.</p> <p>Recommended separation distance</p> $d = 1,2\sqrt{P}$ $d = 1,2\sqrt{P} \quad 80 \text{ MHz to } 800 \text{ MHz}$ $d = 2,3\sqrt{P} \quad 800 \text{ MHz to } 2,5 \text{ GHz}$ <p>where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in metres (m).</p>
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2,5 GHz	3 V/m	<p>Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,^a should be less than the compliance level in each frequency range.^b</p> <p>Interference may occur in the vicinity of equipment marked with the following symbol:</p> 
NOTE 1 At 80 MHz and 800 MHz, the higher frequency range applies.			
NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			
<p>^a Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the TotalAlert Embedded control system is used exceeds the applicable RF compliance level above, the TotalAlert Embedded control system should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the TotalAlert Embedded control system.</p> <p>^b Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.</p>			

“Oil-Less” Scroll Laboratory Air

2.0 Installation

2.1 Inspection Upon Receiving

The condition of the Scroll Laboratory Air system should be carefully inspected upon delivery. Any indication of damage by the carrier should be noted on the delivery receipt, especially if the system will not be immediately uncrated and installed. Scroll systems may remain in their shipping containers until ready for installation. If Scroll systems are to be stored prior to installation, they must be protected from the elements to prevent rust and deterioration.

DO NOT REMOVE the protective covers from the inlet and discharge connection ports of the unit until they are ready for connecting to the hospital's pipeline distribution system.

2.2 Handling

WARNING:

USE APPROPRIATE LOAD RATED LIFTING EQUIPMENT AND OBSERVE SAFE LIFTING PROCEDURES DURING ALL MOVES.

The compressor package can be moved with either a forklift or dollies. Be sure that the orange spacers used to prevent the compressor and motor assemblies from floating are in place, as well as the dryer spacer on 2 - 7.5 hp systems. These spacers will prevent unnecessary movement while moving and mounting the unit. Keep all packing in place during installation to minimize damage. Walk along the route the unit must travel and note dimensions of doorways and low ceilings. Scroll 2 - 7.5 hp systems are designed to go through 36" doorways. Scroll 10 hp systems must be separated to go through 36" doorways.

If the system must be separated, carefully label all electrical connections that are removed for easier re-assembling at the final destination. Place units to ensure high visibility of indicators and gauges and for performing maintenance on the system.

2.3 Location

The Scroll Laboratory Air system should be installed indoors in a clean, well-ventilated environment. Areas of excessive dust, dirt or other air-borne particulate should be avoided.

Secure the package to a flat, level surface capable of supporting the weight and forces of the unit. Make sure that the main base is not bowed, twisted, or uneven. Because of the internal flexible hose connections and spring isolators, no special foundation is required. However, the unit base must be securely bolted using all mounting holes provided in the base. If a raised concrete pad is used, the base must not overhang the concrete pad. A method to drain away moisture is necessary. If a gravity drain is not available, a connection to a drain is necessary. After securing the unit to the floor, remove the orange spacers from under the compressor/motor structure.

The area should have an average ambient temperature of 70°F (21°C) with a minimum ambient temperature of 40°F (4.4°C) and a maximum ambient temperature of 105°F (37.8°C). (Note: At temperatures below 32°F the bare compressor will not be adversely affected, but freezing of the condensate can occur which could affect operation.)

Sound levels of 65 to 80 dbA are to be anticipated depending on the size of the package (duplex, triplex, quad). Though the sound levels are not excessive, they should be considered when locating the system.

“Oil-Less” Scroll Laboratory Air

2.0 Installation

2.4 Space Requirements

Scroll Laboratory Air systems should be placed to ensure easy access to perform maintenance and high visibility of indicators and gauges. It is recommended that a minimum space of 24” be allowed on all sides of the compressor system for ventilation and maintenance. A minimum space of 36” in front of the control panel is required by NEC code. A vertical distance of 36” is required above the unit for ventilation and maintenance.

2.5 Piping

2.5.1 Discharge Piping

Table 2.1 Minimum Discharge Pipe Size¹

LifeLine Units	Pipe Size
Duplex 2 Hp	¾
Duplex 3 Hp	¾
Duplex 5 Hp	¾
Duplex 7.5 Hp	¾
Duplex 10 Hp	1
Duplex 15 Hp	1
Triplex 5 Hp	1
Triplex 7.5 Hp	1
Triplex 10 Hp	1
Triplex 15 Hp	1¼
Quad 5 Hp	1
Quad 7.5 Hp	1¼
Quad 10 Hp	1¼
Quad 15 Hp	1½
Pentaplex 10 Hp	1½
Pentaplex 15 Hp	1½
Hexaplex 10 Hp	1½
Hexaplex 15 Hp	1½

¹ A larger discharge pipe size may be required depending on the length of distribution piping in the facility. However, the distribution pipe size should not be less than the minimum pipe size shown above.

For discharge pipe sizing, refer to standard pressure drop tables. Total pressure drop in piping should not exceed 5 psi.

2.6 Wiring

WARNING:

BE SURE TO DISCONNECT ALL ELECTRICAL POWER FROM THE COMPRESSOR BEFORE PERFORMING ANY ELECTRICAL PROCEDURES.

Refer to the electrical diagram provided with the unit before starting any installation or maintenance work.

Do not operate compressor on a voltage other than the voltage specified on the compressor nameplate.

All customer wiring should be in compliance with the National Electrical Code and any other applicable state or local codes.

CAUTION: In the Duplex configuration, all voltages will be disconnected from the compressor modules using the circuit breaker. Opening the appropriate fused knife-switch disconnects control power. Turning off the appropriate motor circuit breaker disconnects motor power.

Refer to the wiring diagram(s) that came with the compressor system for pertinent wiring connections.

Check the control voltage, phase, and amp ratings before starting the electrical installation, and make sure the voltage supplied by the facility is the same. The wire size should be able to handle peak motor amp load of all operating units, refer to the full load and compressor system amperes on the wiring diagram.

Check all electrical connections within the air system that may have loosened during shipment.

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2.0 Installation

Qualified electricians only should make power connections to the control panel and any interconnecting wiring. The control panel has openings for electrical and alarm/data connections. **Do not drill additional holes in the control panel as this may void the system warranty.** See Figure 2.1 for opening locations.

Ensure that the emergency generation system electrical supply is consistent with the air system’s requirements.

Three-phase power supplied from emergency generator(s) must match that of the normal supply to allow for correct direction of the motor rotation at all times.



Figure 2.1 Electrical/Alarm/Data Openings

3.0 System Operation

3.1 Prestart-up

The contractor should notify **BeaconMedaes** two weeks prior to start-up date to schedule an appointment for an authorized technician to review the installation prior to start-up.

CAUTION: Failure to install the unit properly and have an authorized technician from **BeaconMedaes** start-up the system can void the manufacturer’s warranties.

Prestart-up and start-up procedures should be performed for a new installation or when major maintenance has been performed.

WARNING:

Have more than one person on hand during prestart-up and start-up procedures to ensure safety and to facilitate certain checks.

The main power source to the control panel should be OFF for the duration of the visual inspection.

Ensure that the equipment is installed on a solid level surface. Walk around the system to ensure that there is enough clearance on all sides to perform operational checks/actions and maintenance. The temperature of the area containing the modules should be approximately 70°F (21.1°C) with a minimum ambient temperature of 40°F (4.4°C) and a maximum ambient temperature of 105°F (40°C).

Check all piping system joints that might have come loose during shipment and installation to ensure they are tight.

Check the air receiver, dryers, controls, and compressors for damage.

Check the drain valves on the air receiver and compressor modules.

Check all valves for full open and full close travel.

Ensure that the system’s valves are positioned for proper operation. (Refer to labeling on valve handles) **Remove all packing material from the unit including the orange shipping blocks under the compressor module(s) and dryer tower (2-7.5 Hp Dpx).**

Check the electrical connections to the control cabinet.

Verify electrical service. Before starting the system, check to see that voltage, amperage, and wire size are appropriate.

CAUTION: Electrical service must be as specified or damage to equipment may occur.

WARNING:

To prevent electrical shock, ensure that ALL electrical power to the system is OFF, including the disconnect switches and Automatic-Manual-Off touch screens on the control panel. The facility’s supply circuit breaker should also be locked out.

Open the electrical cabinet by loosening the fasteners on the front.

CAUTION: Vibration during shipment and installation can loosen electrical terminals, fuse inserts, and mechanical connections. Tighten as necessary.

Check the electrical cabinet for any broken components.

Check that all motor starter connections are tight and that there are no loose objects such as terminal lugs, screws, nuts, etc., in the cabinet.

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3.0 System Operation

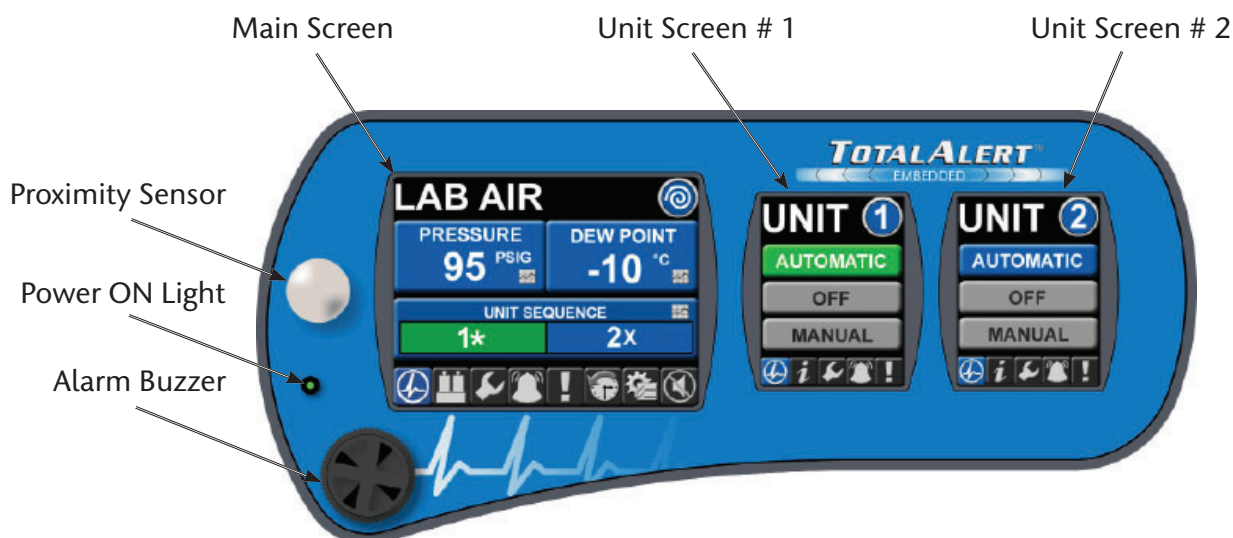


Figure 3.1 Touchscreen Controls

3.2 Initial Start-up

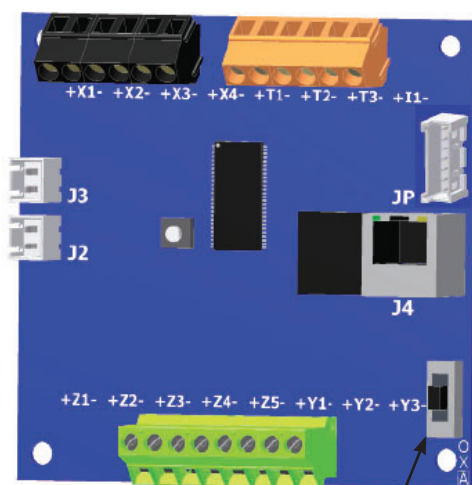
CAUTION: Complete the prestart-up procedure before continuing with the initial start-up procedure.

WARNING:

To prevent electrical shock, ensure that **ALL** electrical power to the system is **OFF**, including the disconnect switches and Automatic-Manual-Off touch screens on the control panel. The facility’s supply circuit breaker should also be locked out.

NOTE: DO NOT ADD OIL TO THE COMPRESSOR. The design of the Scroll compressor is totally oil-less. It is not necessary to fill the crankcases with oil.

Inside the control panel, make sure that all unit printed circuit boards are set to the manual override “Off” position. This is indicated by the middle position “X” on the three-position sliding switch as shown in Figure 3.2.



Manual Override Switch

O - On Manual

X - Off

A - Automatic

Figure 3.2 Unit PCB Override Switch

3.0 System Operation

Check all voltages supplied to the Scroll system to ensure they are the required value and phases needed by the control panel.

Open the outlet isolation valve on each compressor.

Open the receiver isolation valves.

Close the receiver bypass valve.

Close the DP sensor isolation valve.

Close the inlet and outlet valves on **both** dryer/filter/regulator assemblies.

Close the outlet isolation valve.

Apply power to the system and turn the disconnect switches to “On”.

Inside the control cabinet, switch one of the unit printed circuit boards from the manual override “Off” position to the bottom position, the default “Automatic” mode. Make sure the Pump Mode on the Unit touchscreens are in the Off position, see Figure 3.3.



Figure 3.3 Unit Screen - Off Position

Check for correct direction of rotation of each compressor by pressing the “Rotation” button on touchscreen display (found in the Service section of the Unit touchscreens - See Section D.3.7 for additional information) and observing rotation. See Figure 3.4. The Pump Mode for each compressor must be in the Off Position for the Rotation to function.

WARNING:

DO NOT RUN THE COMPRESSOR BACKWARDS!

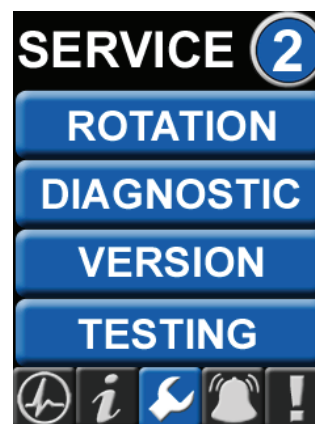


Figure 3.4 Unit Screen - Service: Rotation

Rotation direction arrows are located on the belt guard (rotation is counter clockwise, facing the compressor pulley). Correct the rotation, if required, by switching the motor leads at the starter.

REMOVE POWER BEFORE WORKING ON ANY ELECTRICAL CONNECTIONS.

Repeat the process of switching the Unit printed circuit boards from the manual override “Off” position to the default “Automatic” position and testing rotation.

Start each compressor by pressing “Automatic” on the touchscreen. See Figure 3.5. Allow each compressor module to operate for a short time (15 to 30 seconds) and check for any unusual noises

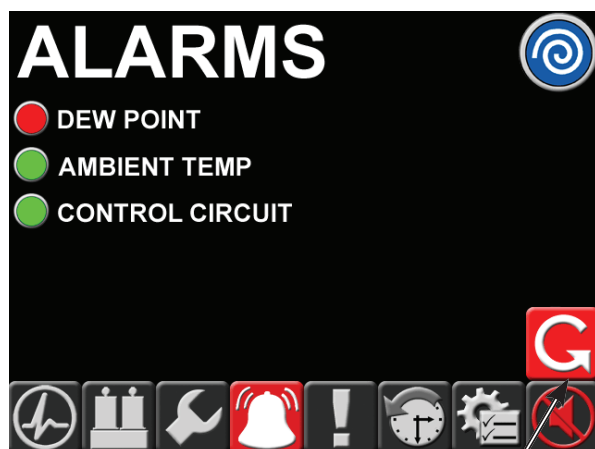
3.0 System Operation

or vibrations. Switch the compressor back to the “Off” position on the touchscreen.



Figure 3.5 Unit Screen - Automatic Mode

After testing each compressor, if everything appears normal, put each compressor into the “Automatic” mode and allow each compressor to run until pressure builds in the air receiver. The lag compressor should stop first when the pressure reaches its set point on the controller. Pushing the reset button on the control panel can now reset the lag alarm. See Figure 3.6. The lead compressor should stop when the pressure reaches 140 psig. Check for any leaks in the piping up to the inlet isolation valves of the dryers. Repair leaks, if needed.



Reset Button

Figure 3.6 Main Screen - Reset Button

Open the inlet isolation valve on one of the dryers. The pressure reading on one of the gauges should be the same as the panel. The other gauge will normally read 0 psig, and airflow will be coming from the dryer purge exhaust muffler. It is possible, but unlikely, that the outlet dew point may be low enough to activate the purge saving feature at start-up. If the purge saving feature is activated, then both dryer pressure gauges will be at the same pressure as the control panel and there will be no flow from the dryer purge exhaust muffler.

Check for air leaks.

Adjust the pressure regulator to the desired pressure setting.

Open the outlet isolation valve of the dryer/filter/regulator group. Check for air leaks.

Open the Dew Point sensor isolation valve.

Slowly open the outlet isolation valve to allow air to flow out to the facility.

Adjust the pressure regulator setting if necessary.

If everything appears normal, open the inlet isolation valve of the other dryer/filter/regulator assembly. If the dryer pressures appear as expected, open the dryer/filter/regulator outlet isolation valve. Close the other dryer/filter/regulator inlet and outlet isolation valves.

CAUTION: Only one dryer/filter/regulator group should be on line at a time.

Adjust the pressure regulator to the desired pressure.

Adjust the pressure regulator setting, if necessary.

The dryer should purge until the dew point monitor reading is below minus 10°C. If dew point is below minus 10°C; both pressure gauges of the on-line dryer will read the same.

Observe the system for normal operation.

“Oil-Less” Scroll Laboratory Air

3.0 System Operation

3.3 Normal Start-up

Facility shutoff valve - CLOSED.

Receiver bypass valve - CLOSED.

One air dryer off line with valves CLOSED; the other air dryer on-line with the valves OPEN.

Main electrical power - ON.

Disconnect switches - ON.

Pump mode to “Automatic” on touchscreen display.

Pressure increasing to 140 psi.

Check that each compressor shuts down as it reaches its off-limit pressure.

Check that the mainline regulator is set for the desired output pressure and adjust if necessary.

Slowly OPEN the facility shutoff valve.

NOTE: Opening the facility valve may cause a pressure demand that brings the lag compressors back on-line. This is a normal sequence.

NOTE: The Laboratory Air system is now on-line and in the Normal Operating Mode (lead/lag operation).

To verify dryer operation, refer to Appendix A for desiccant dryers.

3.4 Normal Operation

3.4.1 Controls

During normal operation, all pumps should be in “Automatic” mode to effectively control the system. The controls monitor the system pressure condition (see the table 3-1), starts and stops the compressors depending on changing pressure conditions, and automatically alternates the lead position between compressor units.

In a typical **duplex** system, the control will signal the lead compressor to start at 130 psig with falling system pressure. If the one compressor can carry the load, then the system pressure will rise to 140 psig. At this point, the control will turn off the lead compressor. When the system pressure drops again to 130 psig, the control will automatically sequence the lead role to the other compressor and will start it. This is known as “first on/first off” instead of the more traditional “last on/first off”. With the “first on/first off” sequencing technique, starts and stops on the compressor are minimized. If the lead compressor runs continuously in lead for more than 17 minutes, the control will automatically sequence the compressor attempting to evenly distribute the run time among all available compressors. In a **triplex** or **quadruplex** system, the operation is very similar to the duplex operation described above.

NOTE: For a compressor to be considered available to the system, its pump must be in the “Automatic” position.

Table 3.1 System Pressure Factory Settings

System Pressure Settings	Start (Close)	Stop (Open)
Lead	Varies	140 psig
Lag	120 psig	Varies
Backup Switch	110 psig	135 psig

NOTE: Factory settings may vary depending on system size and configuration.

For maintenance or other reasons, compressors can operate in “Manual” position. The compressor(s) in the “Manual” mode will start and stop depending on backup pressure switch conditions.

NOTE: Any compressor in the “Manual” mode will start and stop depending on backup pressure switch condition.

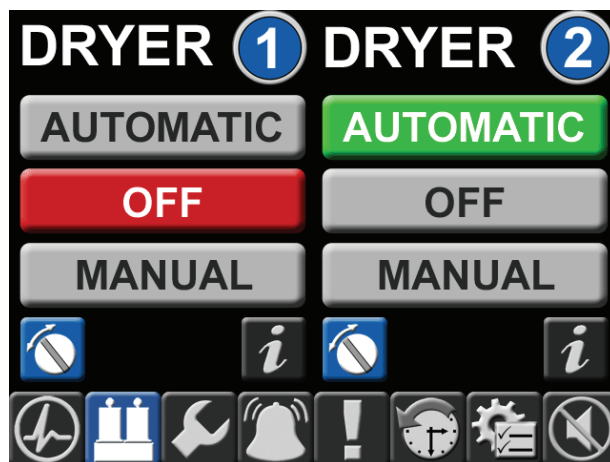
3.0 System Operation

3.4.2 Dryers

This fully automatic, heat-less type dryer alternately cycles the compressed process gas flow through two desiccant charged vessels where the gas' vaporous moisture content is adsorbed. One desiccant vessel is always on-line in a **drying cycle** throughout normal dryer operation. The opposite, off-line vessel is in a **regeneration cycle** for removal of the previously adsorbed moisture content, or in a purge saving cycle at line pressure.

When the dryer is in the “Manual” mode, the dryer will shift towers every 30 seconds. At normal operating conditions, one tower is approximately 100 psig and the other tower is at 0 psig. Any condition other than this is not normal and will cause a high dew point condition. During tower changeover, the online chamber will exhaust, and the chamber that is regenerating (purging) will come to line pressure. There is a 5 second repressurization cycle. If the dryer is in the “Manual” mode, the dryer will use 15% of the system capacity to purge the dryer.

When the dryer is in the “Automatic” mode, the dew point monitor controls the dryer purge, and purging depends on the dew point condition. See Figure 3.7. When the dew point reading is above the setpoint of -10°C (14°F), the dryer will function normally (one tower at system pressure, one tower at 0 psig). When the dew point is below the setpoint of -10°C (14°F), the purge valve will close. In this condition, both towers will be approximately 100 psig (dependent upon tank pressure) and the dryer will not shift towers until the dew point is above -10°C (14°F).



Dryer 2 is in Automatic mode, Dryer 1 is in Off position

Figure 3.7 Main Screen - Dryer Operation

3.5 Normal Shutdown

Dryer in Automatic Mode

Disconnect switches-OFF

Main power source-OFF

Facility shutoff valve-CLOSED

Air receiver manual tank drain-OPEN

Pressure gauge decreasing to 0 psi (0 kPa)

Close air receiver manual tank drain when pressure decreases to 0 psi (0 kPa)

3.0 System Operation

3.6 Emergency Shutdown / Alarms

The following conditions may arise during operation.

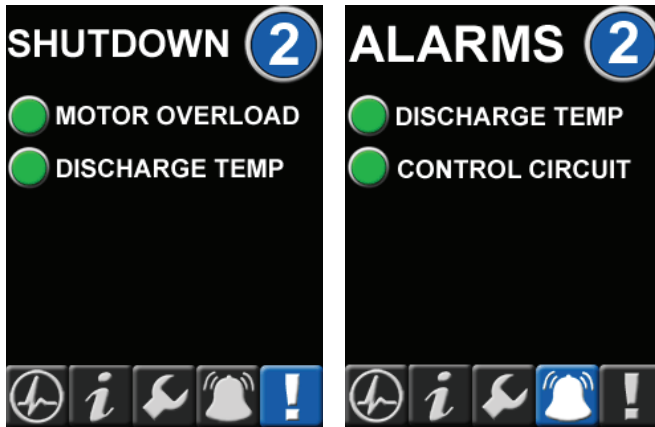


Figure 3.8 Unit Screens - Shutdown and Alarms

Motor Overload Shutdown - This will shut down the compressor in question and will not re-start until the reset button on the starter inside the main control cabinet is reset and the appropriate reset button is pressed on the control panel display. See “Motor overheating” in the Troubleshooting Section 4.0.

High Air Temperature Shutdown - This will shut down the compressor in question and will not re-start until the appropriate button is pressed on the control panel. Before allowing the unit to re-start, the condition should be checked (see “Compressor shuts off unexpectedly” in the Troubleshooting Section 4.0). Even after resetting the alarm and putting the compressor in “Automatic” mode, the unit may not re-start, depending on system sequencing and system pressure.

High Air Temperature Alarm - This will not shut down the compressor in question but instead is a warning that a shutdown is likely to occur. The condition should be checked immediately (see “High temperature alarm” in the Troubleshooting Section 4.0) to avoid a compressor shutdown.

Control Circuit Alarm - This will not shut down the compressor in question but instead is a notification that there is a loss of communication between printed circuit boards within the control panel. See Appendix D on Control System for troubleshooting.

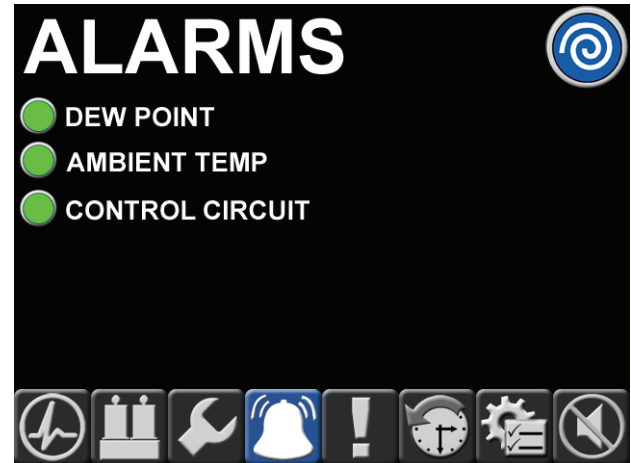


Figure 3.9 Main Screen - Alarms

Dew Point Alarm - This alarm will activate if the dew point exceeds the alarm setting. To silence the alarm, press the horn silence button. If the situation does not correct itself through normal dryer use, see Appendix B, section B.7 Troubleshooting for possible causes and solutions. The alarm remains latched until the alarm condition is reset by the operator.

Ambient Temperature Alarm - This alarm will activate when the temperature in the room exceeds the set point. The audible alarm will not sound but a touchscreen will show an active alarm and record it in the event log. The alarm remains latched until the alarm condition is reset by the operator.

3.0 System Operation

Dryer Tower Switching Failure Alarm (Optional)

For units with this feature, there is one pressure switch that senses pressure inside each dryer tower for a total of two pressure switches for each dryer. If the pressure in both towers of the same dryer fall below 50 psig, the “Dryer # Switch” on the alarm screen will change from Green to Red and the remote dryer fault contacts (one for each dryer) will change condition (refer to the wiring diagram that came with the unit for terminal numbers). A short time delay (1.5 seconds) is started when both pressure switches fall below 50 psig to eliminate false alarms during normal tower switching. To eliminate alarms during periods when the dryer is turned “off” for maintenance or other reasons, the dryer tower switching failure alarm is bypassed for that dryer.

Low Dryer Outlet Pressure Alarm (Optional)

For units with this feature, there is an adjustable pressure switch located upstream of the dryer check valve that will alarm if the pressure in that line drops below the 75 psig factory setpoint. In the event of an alarm, the “Dryer # Pressure” on the alarm screen will change from Green to Red and a remote set of contacts will change condition (refer to the wiring diagram that came with the unit for terminal numbers).

4.0 Trouble Shooting

Problem	Possible Causes	Solution
Failure to start	Main power disconnected	Turn on main power
		Change power supply phase on incoming power
	Power failure	Restore power
	Main fuse blown	Replace fuse
	Fuse blown in control circuit	Replace fuse
	Overload tripped on starter	Reset & check for system overload
	High temperature sensor activated	Allow unit to cool; reset alarm & check for over temperature condition
	Pressure sensor open	Adjust or replace sensor
	Loose or faulty connection	Check & tighten all wire connections
Power failure	Main fuse blown	Replace fuse
	Fuse blown in control circuit	Replace fuse
Compressor shuts off unexpectedly	Overload tripped on starter	Reset & check for system overload
	Pressure sensor failure	Replace
	Clogged inlet filter	Check for dirty/clogged inlet filter
		Replace inlet filter
	High temperature sensor activated	Allow unit to cool; reset alarm & check for over temperature condition
High temperature alarm	High temperature sensor activated	Allow unit to cool; reset alarm & check for over temperature condition
Motor overheating	Low voltage	Check for proper supply voltage
	V-belt too tight	Adjust belt tension
	Defective motor	Contact BeaconMedaes

4.0 Trouble Shooting

Problem	Possible Causes	Solution
Low discharge pressure	System piping leaks Defective pressure sensor Aftercooler drain solenoid stuck open Belts slipping Intake filter clogged	Repair leaks Replace sensor Check electrical connections Adjust tension Clean or replace
Compressor cycles too often	System undersized Faulty pressure sensor System piping leaks Check valve or line to receiver is leaking or plugged Both dryers on line Water in air receiver	Contact BeaconMedaes Replace sensor Repair leaks Replace if necessary Valve off one dryer Drain air receiver
Compressor won't shut off	Pressure sensor faulty	Adjust or replace
Excessive belt wear	Belt tension Belt alignment	Adjust tension Realign compressor & motor sheaves
Abnormal noise	Mounting bolts loose Belt tension	Tighten bolts Adjust tensions

NOTE: For air dryer trouble shooting, see Appendix A.

5.0 Maintenance

5.1 Maintenance Schedule

WARNING:

BEFORE STARTING ANY MAINTENANCE PROCEDURES, DISCONNECT ALL POWER TO THE PACKAGE.

Release all pressure from the package before removing, loosening, or servicing any covers, guards, fittings, connections, or other devices.

Never perform any maintenance functions while the unit is in operation.

Maintenance Schedule

Item	Frequency	Action
Check condensate in tank	Daily	Open manual drain valve, check auto drain
Check operation of safety valve	Weekly	Manually release pressure
Check inlet air filter(s)	Weekly	Inspect and clean or replace
Check nuts, bolts, fittings, etc.	Monthly	Inspect and tighten
Check belt tension	Monthly	Inspect and tighten or replace
Check flow through orifice of dew point sensor	Every 6 Months	Check for flow blockage
Check dew point sensor accuracy	Yearly	Verify dew point sensor accuracy (contact BeaconMedaes)
Replace compressor inlet filters, v-belts and dryer pre-filters & afterfilters	Yearly	Purchase <i>1-Year System Basic Service Kit</i> Purchase <i>1-Year Unit Basic Service Kit</i> (1 per unit)
Zero-loss Drain Valve	Yearly	Rebuild the zero-loss drain valve. Kit is included in the System Basic Service Kit. (see Section 5.2.9)
Lubricate motor	Yearly	See Section 6.3
Replace DP transmitter	Every 2 years	Purchase <i>2-Year System Sensor Kits</i> See Appendix B
Replace dryer desiccant	Every 3 years	Purchase <i>3-Year Dryer Extended Service Kit</i> See Appendix A
Orbiting & drive bearing lubrication* and clean compressor	Varies depending on Hp and ambient temperature conditions	Contact BeaconMedaes Technical Support department.
Replace compressor tip seals and grease pin crank bearings*		

* An authorized BeaconMedaes Service Technician should perform compressor lubrication and tip seals replacement. Please contact BeaconMedaes Customer Service department at 1-800-463-3427 prior to the maintenance interval.

5.0 Maintenance

5.2 Service Kits

Note: The service kits listed in this section are standard for laboratory air systems. In the case of special system configurations, locate service kit part numbers in the Maintenance section of the Main Screen on the panel controls. See Appendix C Controls.

5.2.1 1-Year System Basic Service Kits

KIT NUMBER	WHERE USED	DESCRIPTION	QTY	CONTENTS
4107 4000 29	2 - 7.5 Hp Duplex	KIT - Scroll Basic Size A	1	(2) Dryer inlet filters (2) Dryer discharge filters
4107 4000 30	5 Hp Triplex	KIT - Scroll Basic Size B	1	(2) Inlet filter float drains (2) Purge mufflers (1) Sight glass tube
4107 4000 31	5 Hp Quadruplex 7.5 Hp Triplex 7.5 Hp Quadruplex 10 Hp Duplex 10 Hp Triplex 15 Hp Duplex	KIT - Scroll Basic Size C	1	(1) 3/8" Polypropylene ball (1) 3/8" In-line check valve (1) 1/2" MNPT inline filter 90 micron, sight glass
4107 4000 33	15 Hp Triplex 10-15 Hp Quadruplex 10-15 Hp Pentaplex 10-15 Hp Hexaplex	KIT - Scroll Basic Size E	1	(1) Zero Loss Drain Valve Service Kit

Note: 1-Year Unit Basic Service Kits required in addition to the above 1-Year System Basic Service Kit.

“Oil-Less” Scroll Laboratory Air

5.0 Maintenance

5.2.2 1-Year Unit 10 BAR Basic Service Kits

For Systems without Piped Inlet

KIT NUMBER	WHERE USED	DESCRIPTION	QTY	CONTENTS
4107 4002 44	2 Hp 60 Hz	2 Hp Scroll Basic Compressor Unit Kit	1 per unit	(1) Main air inlet filter (1) Compressor v-belts
4107 4002 50	2 Hp 50 Hz			
4107 4002 45	3 Hp 60 Hz	3 Hp Scroll Basic Compressor Unit Kit	1 per unit	
4107 4002 51	3 Hp 50 Hz			
4107 4018 46	5 Hp 60 Hz	5 Hp Scroll Basic Compressor Unit Kit	1 per unit	(1) Main air inlet filter (2) Compressor v-belts
4107 4018 48	5 Hp 50 Hz			
4107 4002 47	7.5 Hp 60 Hz	7.5 Hp Scroll Basic Compressor Unit Kit	1 per unit	(1) Main air inlet filter (2) Compressor v-belts
4107 4002 53	7.5 Hp 50 Hz			
4107 4018 47	10 Hp 60 Hz	10 Hp Scroll Basic Compressor Unit Kit	1 per unit	(2) Main air inlet filters (4) Compressor v-belts
4107 4018 49	10 Hp 50 Hz			
4107 4002 49	15 Hp 60 Hz	15 Hp Scroll Basic Compressor Unit Kit	1 per unit	(2) Main air inlet filters (4) Compressor v-belts
4107 4002 55	15 Hp 50 Hz			

Note: 1-Year System Basic Service Kit required in addition to the above 1-Year Unit 10 BAR Basic Service Kits. (1) Unit Kit is required for each compressor unit.

For Systems with Piped Inlet

KIT NUMBER	WHERE USED	DESCRIPTION	QTY	CONTENTS
4107 4003 29	2 Hp 60 Hz	2 Hp Scroll Basic Compressor Unit Kit	1 per unit	(1) Main air inlet filter (1) Compressor v-belts
4107 4019 07	2 Hp 50 Hz			
4107 4000 41	3 Hp 60 Hz	3 Hp Scroll Basic Compressor Unit Kit	1 per unit	
4107 4000 47	3 Hp 50 Hz			
4107 4018 50	5 Hp 60 Hz	5 Hp Scroll Basic Compressor Unit Kit	1 per unit	(1) Main air inlet filter (2) Compressor v-belts
4107 4018 52	5 Hp 50 Hz			
4107 4015 89	7.5 Hp 60 Hz	7.5 Hp Scroll Basic Compressor Unit Kit	1 per unit	(1) Main air inlet filter (2) Compressor v-belts
4107 4015 90	7.5 Hp 50 Hz			
4107 4018 51	10 Hp 60 Hz	10 Hp Scroll Basic Compressor Unit Kit	1 per unit	(2) Main air inlet filters (4) Compressor v-belts
4107 4018 53	10 Hp 50 Hz			
4107 4015 87	15 Hp 60 Hz	15 Hp Scroll Basic Compressor Unit Kit	1 per unit	(2) Main air inlet filters (4) Compressor v-belts
4107 4015 88	15 Hp 50 Hz			

Note: 1-Year System Basic Service Kit required in addition to the above 1-Year Unit Basic Service Kits. (1) Unit Kit is required for each compressor unit.

5.2.3 2-Year System Sensor Kits

KIT NUMBER	WHERE USED	DESCRIPTION	QTY	CONTENTS
4107 4002 58	All Systems	Dew Point Sensor	1	(1) Dew Point sensor

5.0 Maintenance

5.2.4 3-Year System 10 BAR Extended Service Kits

KIT NUMBER	WHERE USED	DESCRIPTION	QTY	CONTENTS
4107 4000 34	2 - 7.5 Hp Duplex	KIT - System Scroll 10 BAR Extended Size A	1	(2) 6 lb. bags desiccant (2) ISO2 dryer service kit
4107 4000 35	5 Hp Triplex	KIT - System Scroll 10 BAR Extended Size B	1	(3) 6 lb. bags desiccant (2) ISO2 dryer service kit
4107 4000 36	5 Hp Quadruplex 7.5 Hp Triplex 7.5 Hp Quadruplex 10 Hp Duplex 10 Hp Triplex 15 Hp Duplex	KIT - System Scroll 10 BAR Extended Size C	1	(4) 6 lb. bags desiccant (2) ISO3 dryer service kit
4107 4000 38	15 Hp Triplex 10-15 Hp Quadruplex 10-15 Hp Pentaplex 10-15 Hp Hexaplex	KIT - System Scroll 10 BAR Extended Size D	1	(9) 6 lb. bags desiccant (2) ISO4 dryer service kit

Note: Each dryer service kit contains: (2) O-Rings for canister bases, (2) O-Rings for tower mounting flanges, (2) check valves for dryer manifold block, and (2) O-Rings for check valves.

5.2.5 3-Year Unit 10 BAR Extended Service Kits

KIT NUMBER	WHERE USED	DESCRIPTION	QTY	CONTENTS
4107 4001 77	2 - 7.5 Hp Units	KIT - Unit Scroll 10 BAR Extended Compressor Unit Kit	1 per unit	(1) 1/8" Pressure relief valve (1) Check valve (aftercooler inlet) (1) O-ring
4107 4001 78	10-15 Hp Units	KIT - Unit Scroll 10 BAR Extended Compressor Unit Kit	1 per unit	(2) 1/8" Pressure relief valves (2) Check valves (aftercooler inlet) (1) Check valve (discharge block) (1) O-ring (1) 1/4" Inline filter

Note: 3-Year Unit Extended Service Kits do not include 1-Year System Basic Service Kit or 1-Year Unit Basic Service Kits. These must be purchased in addition to the 3-Year Dryer Extended Service Kit and the 3-Year Unit Extended Service Kit.

5.0 Maintenance

5.2.6 2 - 3 Hp Service Intervals² OR with Tip Seal Kits used to support all systems

IMPORTANT NOTE:

Greasing of the bearings of the compressor element must be done with special grease and grease gun sold by BeaconMedaes below, and according to a specific procedure. Contact BeaconMedaes for service.

KIT NUMBER	WHERE USED	DESCRIPTION	QTY	CONTENTS
2903 0139 00	All Systems	Grease Pump Kit	1	Grease gun Adaptors
2892 6100 20	All Systems	Grease Cartridge	1	Grease cartridge
1630 0311 00	7.5 Hp Units 15 Hp Units	Extension Nozzle for grease pump ¹	1	Extension nozzle

Notes:

1. The Grease Pump Kit does not include the Grease Cartridge or the extension nozzle for 7.5 Hp and 15 Hp units. These items must be ordered separately.
2. 2 - 3 Hp Service intervals: are 5,000 hours **OR** every two (2) years, whichever comes first, for the orbiting bearings compressor lubrication and 10,000 hours **OR** every four (4) years, whichever comes first, for the pin crank bearings.
3. In high ambient conditions, the bearings must be greased more frequently: for every 9°F increase above 86°F, the maintenance interval should be reduced by 30%.

5.2.7 2 - 3 Hp Only: 10,000 Hours or Every Four (4) Years Compressor Tip Seal Kits¹

KIT NUMBER	WHERE USED	DESCRIPTION	QTY	CONTENTS
4107 4000 54	2 - 3 Hp Units	Kit - Tip seal 2 - 3 Hp	1 per unit	Each kit contains: (2) Sets of element seals (1) Dust seal (1) Round tube backer seal (1) Outlet pipe

Notes:

1. Service interval is 5,000 hours or every two years, whichever comes first.
2. An authorized BeaconMedaes Service Technician should perform compressor lubrication and tip seals replacement. Please contact BeaconMedaes Customer Service Department at 1-800-463-3427 prior to the maintenance interval to schedule the maintenance.

5.0 Maintenance

5.2.8 5 & 10 Hp Only Service Intervals

PART / KIT NUMBER	QTY	ACTION	AT EACH 5,000 RUNNING HOURS OR EVERY 2-YEARS
5 Hp 4107 4018 81	1 per unit	Tip Seal Kit	Replace
		Orbit bearing	Regrease: 3.9 cm ³ (6 strokes**)
		Pincrank bearing rotor side	Regrease: 2 cm ³ (3 strokes**)
10 Hp 4107 4018 82	1 per unit	Cooling duct system	Clean
		Rotor fins	Clean
		Stator fins	Clean

* **Intervals:** Cleaning of the parts guiding the cooling air and replacement of the tipseals should be performed during every service interval.

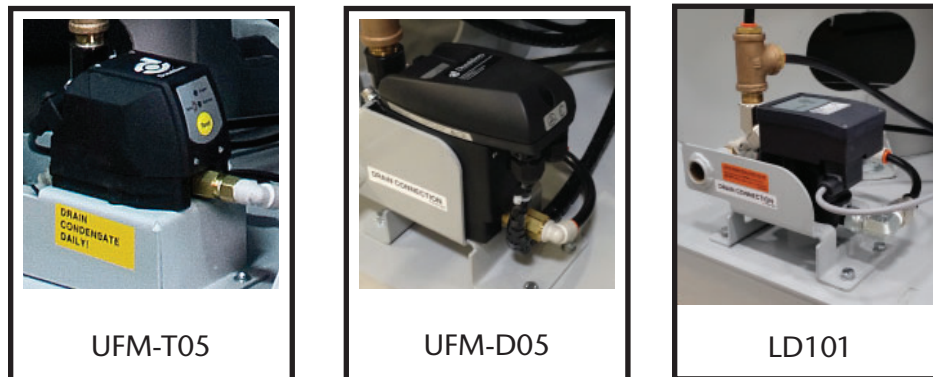
5.2.9 7.5 & 15 Hp Only Service Intervals

PART / KIT NUMBER	QTY	ACTION	AT EACH 5,000 RUNNING HOURS OR EVERY 2-YEARS
7.5 Hp 4107 4000 56	1 per unit	Tip Seal Kit	Replace
		Orbit bearing	Regrease: 3.9 cm ³ (6 strokes**)
		Pincrank bearing rotor side	Regrease: 2 cm ³ (3 strokes**)
15 Hp 4107 4000 58	1 per unit	Cooling duct system	Clean
		Rotor fins	Clean
		Stator fins	Clean

** **Strokes:** Number of strokes valid with recommended purchased grease pump from Grease Pump Kit 2903 0139 00 and Grease Cartridge 2892 6100 20

“Oil-Less” Scroll Laboratory Air

5.2.10 Zero Loss Drain



There are three different automatic drains in use with the Scroll Medical Air Systems. The UFM-T05 (4107 6526 26) and UFM-D05 (4107 6532 49) are no longer available, but service kits are available for routine maintenance. The LD101 (4107 6563 42) is the replacement model. If the medical air system has the UFM-T05 or UFM-D05 drain assembly on it and the drain needs to be replaced completely, it is necessary to purchase the Replacement Drain Valve Kit with the new model drain

KIT NUMBER	DESCRIPTION	QTY	WHERE USED	CONTENTS
4107 6525 11	Kit - Zero Loss Drain Valve Service Kit - UFM-T05	1	Systems with UFM-T05 Drain	(1) Diaphragm (1) Anchor Plate (2) Springs (3) O-rings
4107 4017 85	Zero Loss Drain Valve Service Kit for UFM-D05 (included in System Basic Service Kit)	1	Systems with UFM-D05 Drain	(1) UFM-D05 Drain Valve Service Module
4107 4019 65	Zero Loss Drain Valve Service Kit - LD101 Compact	1	Systems with LD101 Compact Drain Valve	(1) Filter cap (1) Filter cap O-ring (1) Double mesh metallic filter (1) Valve assembly O-ring (1) Solenoid valve spring (1) Solenoid valve pilot (1) Diaphragm (1) Flow limiter (1) Flow limiter plastic ring

Note: For service instructions on the LD101 Compact Zero-loss Drain Valve, see Section 6.5.

5.2.12 Replacement and Retrofit Pump Service Kits

KIT NUMBER	DESCRIPTION	WHERE USED
2902 0222 11	Individual Pump Replacement (Pump element part number is 1616 8336 82 but must use kit 2902 0222 11 to replace)	5 Hp 10 BAR
4107 4018 43	Retrofit Pump Kit	5 Hp 10 BAR 60 Hz
4107 4018 45	Retrofit Pump Kit	10 Hp 10 BAR 60 Hz

6.0 Inspection/Replacement Procedures

6.1 V-Belts

Narrow type V-belts are used for this unit. Refer to Table 6-1a & 6-1b for the correct size.

6.1.1 Tension Check

Table 6-1A Belt Size and Tension (for new belts) on systems operating at 60 Hz

Hp	Belt Part Number	No. of Belts	Tensioning		
			Defl. (in)	Force New (lbs)	Force Norm (lbs)
2	4107 6524 39	1	1/4"	6	5
3	4107 6562 18	1	1/4"	6	5
5	4107 6524 41	2	7/32"	6	5
7.5	4107 6540 93	2	1/4"	6	5
10	4107 6544 20	4	9/32"	6	5
15	4107 6544 20	4	9/32"	6	5

Table 6-1B Belt Size and Tension (for new belts) on systems operating at 50 Hz

Hp	Belt Part Number	No. of Belts	Tensioning		
			Defl. (in)	Force New (lbs)	Force Norm (lbs)
2	4107 6524 41	1	1/4"	6	5
3	4107 6524 41	1	1/4"	6	5
5	4107 6524 42	2	7/32"	6	5
7.5	4107 6562 19	2	1/4"	6	5
10	4107 6544 20	4	9/32"	6	5
15	4107 6505 47	4	9/32"	6	5

WARNING:

Before starting any maintenance procedures, disconnect all power to the package.

Never perform any maintenance functions while the unit is in operation.

Release all pressure from the package before removing, loosening, or servicing any covers, guards, fittings, connections, or other devices.

Check the belt tension monthly. Disconnect the main power and remove the beltguard. As shown in the illustration below, Figure 6.1, deflect each V-belt at the center of the drive span with a spring balance or tension meter at the tension force of Table 6-1. Then check that the average deflections at the proper tension force are approximately the same values as shown in Table 6-1.

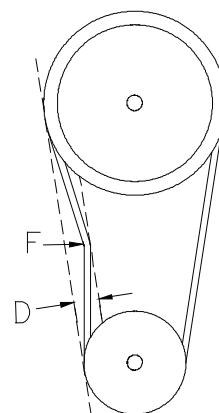


Figure 6.1 Belt Tension

6.1.2 V-Belt Tension Adjustment

If necessary, adjust the V-belts until the average deflections are within the values shown in Table 6-1.

6.0 Inspection/Replacement Procedures

To tighten the V-belts:

1. Remove the beltguard.
2. Loosen 4 bolts holding motor.
3. Adjust the two belt tensioning adjustment rods on the sliding motor base until the proper tension and alignment is obtained. To check for correct alignment, place a straight edge on the faces of the two sheaves. Proper alignment is obtained when all the gaps between the straight edge and the sheaves are minimized and less than 1/8".
4. Check the belt tension again and make sure the tension is similar to the values listed in Table 6-1.
5. Replace the beltguard **before** operating the machine.

CAUTION: IF THE COMPRESSOR IS OPERATED WITH LOOSE V-BELTS OR IMPROPER SHEAVE ALIGNMENT, THE LIFE OF THE V-BELTS IS SHORTENED. EXCESSIVE TENSION CAN BREAK THE SHAFT OR REDUCE BEARING LIFE. BE SURE TO MAINTAIN PROPER V-BELT TENSION AND ALIGNMENT.

6.1.3 Changing the V-Belts

V-belts should be changed yearly under normal operating conditions. If any damage is found, V-belts should be replaced at once. To change the V-belts call the nearest **Lifeline®** distributor or follow the procedures described below:

To change the belts:

Remove the old belts:

1. Remove the beltguard.
2. Loosen the locking bolts securing the motor base.
3. Adjust the belt tensioning adjustment rods on the motor base to loosen tension on belts.
4. Remove the old belt(s).

Check and clean:

1. Check and clean all of the grooves of both the motor and compressor sheaves.
2. Check the tightness of bolts on the sheave bushings.

Installation of new belts:

1. Confirm the belt type and length.
2. Place the belt(s) into the grooves of both sheaves.
3. Adjust the belt tensioning adjusting rods on the motor base until the proper tension and alignment is obtained. To check for correct alignment, place a straight edge on the faces of the two sheaves. Proper alignment is obtained when all the gaps between the straight edge and the sheaves are minimized and less than 1/8".
4. Check the belt tension again and make sure the tension is similar to the values listed in Table 6-1.
5. Replace the beltguards **before** operating the machine.

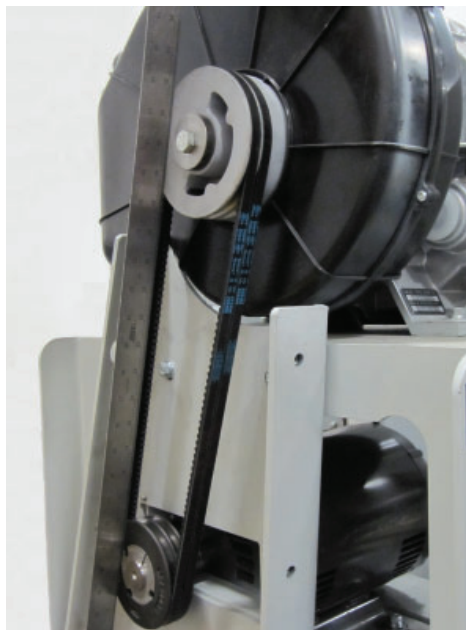


Figure 6.2 Belt Alignment - Straight Edge

6.0 Inspection/Replacement Procedures

6.2 Air Intake Filter

WARNING:

Before starting any maintenance procedures, disconnect all power to the package.

Release all pressure from the package before removing, loosening, or servicing any covers, guards, fittings, connections, or other devices.

Never perform any maintenance functions while the unit is in operation.

The air intake filter element should be changed annually under normal operating conditions. To change the filter:

1. Turn off the compressor being serviced and lock open the appropriate disconnect switches.
2. Remove the filter cover by lifting gently on the three tabs.
3. Remove the element.
4. Clean inside of housing
5. Insert a new element.
6. Replace filter cover and secure by pushing the cover onto the housing until three audible snaps are heard.
7. Turn on the compressor.

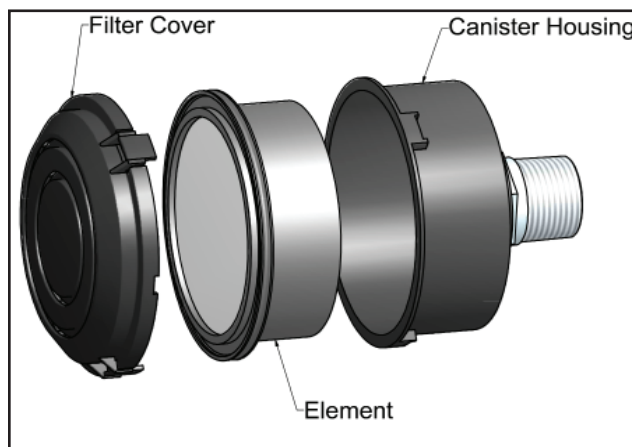


Figure 6.3A Air Intake Filter (Without Piped Inlet)

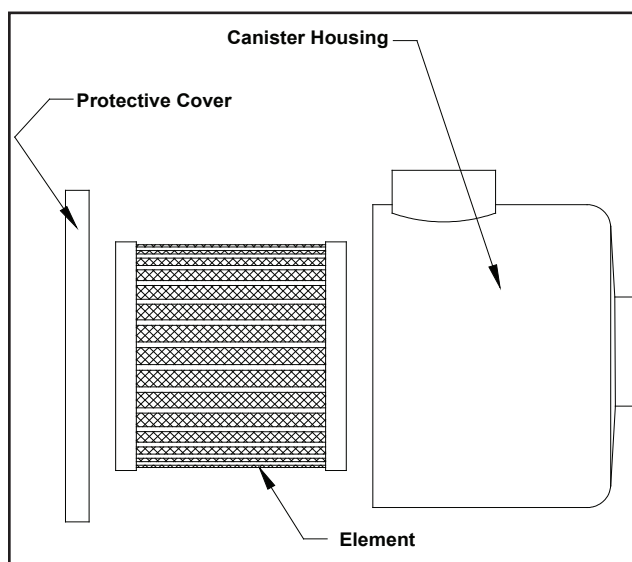


Figure 6.3B Air Intake Filter (With Piped Inlet)

6.0 Inspection/Replacement Procedures

6.3 Motor Lubrication

6.3.1 Lubrication Information

This is a ball or roller bearing motor. The bearings have been lubricated at the factory. Motors are pregreased. New motors that have been stored for a year or more should be relubricated.

Table 6-3 Motor Lubrication Information

Hp	Weight of Grease per Bearing, Ounce (Grams)	Total Grease Weight	Volume of Grease (in ³)	Interval (Hours)
2	.3 (8.4)	0.6	0.6	Yearly
3	.3 (8.4)	0.6	0.6	Yearly
5	.3 (8.4)	0.6	0.6	Yearly
7.5	.3 (8.4)	0.6	0.6	Yearly
10	.61 (17.4)	1.2	1.22	Yearly
15	.61 (17.4)	1.2	1.22	Yearly

Note: Exxon Mobile Polyrex or equivalent grease to be used.

6.3.2 Lubrication Procedure

WARNING:

Before starting any maintenance procedures, disconnect all power to the package.

WARNING:

Surface temperatures of motor enclosures may reach temperatures which can cause discomfort or injury. Protection should be used to protect against accidental contact with hot surfaces. Failure to observe this precaution could result in bodily injury.

Never perform any maintenance functions while the unit is in operation.

Keep grease clean. Mixing dissimilar grease is not recommended.

1. Relubrication with the shaft stationary and a warm motor is recommended (at less than 80°C).
2. Remove all dirt and wipe clean the the grease fittings and drains.
3. Apply grease gun to fitting. Too much grease or injecting grease too quickly can cause premature bearing failure. Slowly apply the recommended amount of grease, taking 1 minute or so to apply (See Table 6-3).

6.4 Liquid Level Sight Glass

The sight glass is located lower than the receiver tank and it will show approximately 1/2 full when the receiver is empty. This is a normal condition. See Figure 6.4.



Figure 6.4 Sight Glass

6.5 Zero Loss Electronic Drain

6.5.1 Isolation of Zero Loss Electronic Drain

Before servicing the Zero Loss Electronic Drain, the drain must be isolated in three locations. The following valves must be closed in the following sequence:

1. Receiver drain valve
 2. Top knob on manual drain sight glass
 3. Valve after the manual drain sight glass
- See Figure 6.5 for valve locations.

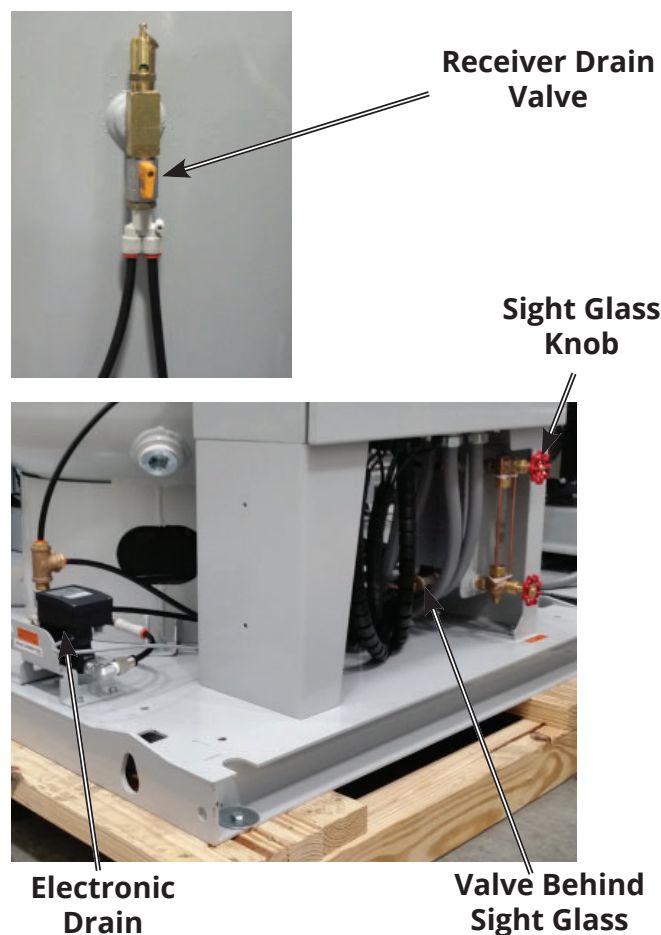


Figure 6.5 Electronic Drain Isolation Valves

To bring the electronic drain back into operation, open each of the valves in the following sequence:

1. Valve after the manual drain sight glass
2. Top knob on manual drain sight glass
3. Receiver drain valve

6.5.2 Recommended Maintenance

Component	Maintenance activity	Every day	Every 12 months. (*)
Condensate Drain	Visual check and function verification.	X	
Integrated filter	Cleaning and/or substitution of the filter.	Periodically. At least once a month.	
Condensate Drain	Replace worn out components, subject to wear and tear, and clean condensate drain.		X
(*) = in the event of applications that are particularly heavy, dirty, and poorly ventilated, it should also be foreseen that this frequency is doubled.			

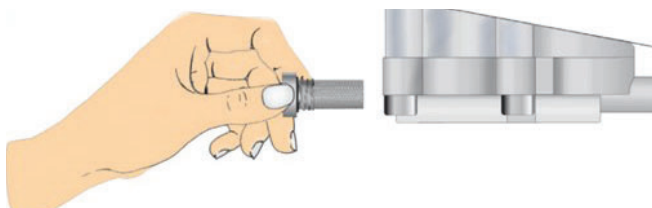
Visual check and function verification:

- Inspect the condensate drain for external damages and leaks.
- Check the operating state of the condensate drain by means of the LED displays on the control panel.
- Push the TEST button in order to verify the operating status of the discharge and the correct operation of the valve.

“Oil-Less” Scroll Laboratory Air

Cleaning and/or substitution of the filter:

- Unscrew the cap by means of a 17 mm wrench.
- Clean the filter, if necessary, replace it.
- First replace the cleaned filter back in its seat on the cap.
- Screw in the lockable cap with the filter paying attention to not damage the plastic threading of the valve body.



Replace worn out components, subject to wear and tear, and clean the condensate drain:

- Open the condensate drain, unscrewing the 4 M6x25 screws (pos. 12) as well as the M3x10 screws (pos. 13) and remove the valve assembly (pos. 11).
- Unscrew the filter cap (pos. 04) and extract the double mesh metallic filter (pos. 06).
- Remove the O-Ring gasket of the filter cap (pos. 05), O-Ring gasket of the valve assembly (pos. 07), the solenoid valve spring (pos. 08), the solenoid valve pilot (pos. 09) and the diaphragm (pos. 10).
- Clean the internal housing of the valve assembly and the aluminum tank.
- If necessary, clean the level sensor rod and its float, paying however particular attention to not damage it. Do not bend it and do not use it as a lever. It contains electronic material. Mechanical stresses, including moderate ones, can give rise to irreparable malfunctions.

- Insert the new O-Ring of the filter cap, place the new filter on the cap and close on the valve assembly paying attention to correctly screw it.
- Insert the new valve assembly O-Ring.
- Insert the valve components in the following order: spring and pilot in its spool, first insert the spring (insert the side without plastic of the pilot inside the spring) and lastly the diaphragm with its plastic guide. Ensure that diaphragm is correctly positioned.
- Screw the valve assembly onto the condensate drain, tightening the 8 screws present with the following tightening torque values: M6 = 8 Nm $\pm 2/-1$ Nm, M3 = 0,4 Nm $\pm 15\%$.
- Replace the flow limiter (pos. 14) and flow limiter plastic ring (pos. 15).
- The container chamber of the electronic board is sealed with a sealing gasket and must not be opened. All of the required connections can be accessed from the outside by electrical connectors.

NOTE:

See exploded view in this section for components corresponding to pos. #'s.

Maintenance kit:

- Drain maintenance kit (Kit_001) includes:
 - (1) Filter cap
 - (1) Filter cap O-Ring
 - (1) Double mesh metallic filter
 - (1) Valve assembly O-Ring
 - (1) Solenoid valve spring
 - (1) Solenoid valve pilot
 - (1) Diaphragm
 - (1) Flow limiter
 - (1) Flow limiter plastic ring

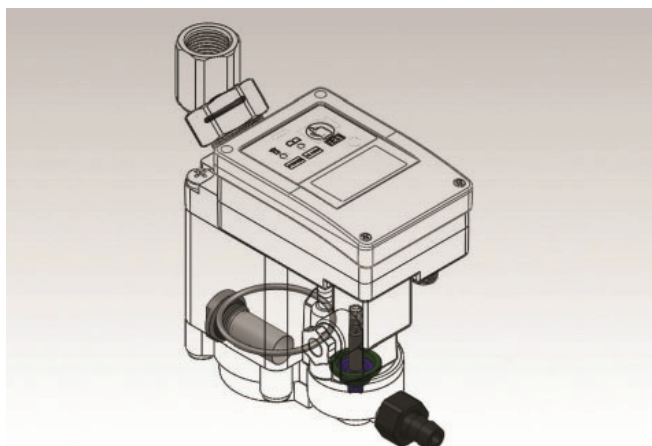
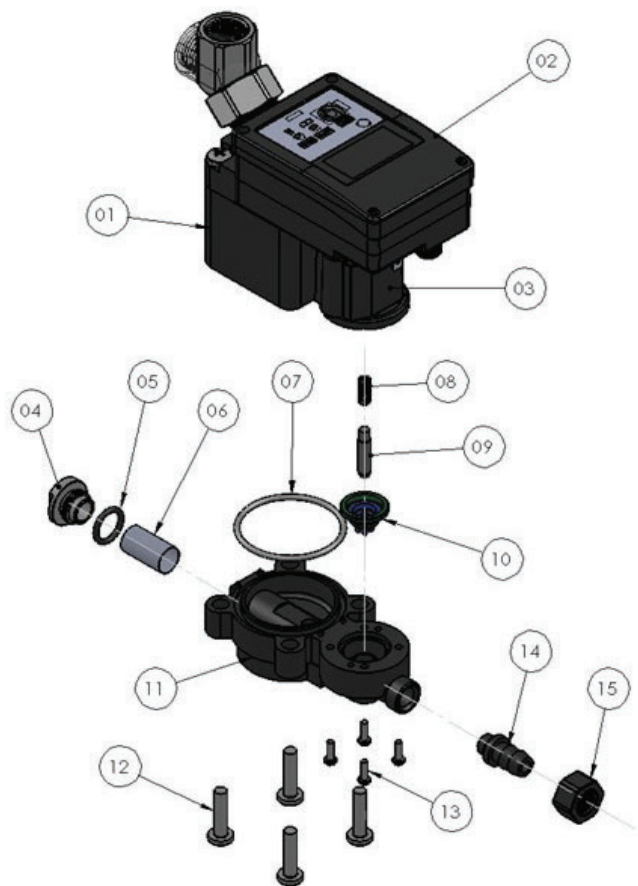


Figure 6.6 Kit_001

Exploded view:



POS	Description	Qty
01	Tank and level sensor	-
02	Electronic board	-
03	Solenoid valve	-
04	Filter cap	1
05	Filter cap O-Ring	1
06	Double mesh metallic filter	1
07	Valve assembly O-Ring	1
08	Solenoid valve spring	1
09	Solenoid valve pilot	1
10	Diaphragm	1
11	Valve assembly	1
12	M6x25 screws	4
13	M3x10 screws	4
14	Flow limiter	1
15	Flow limiter plastic ring	1

6.6 Backup Pressure Switch Set Point Adjustments

The backup switch is set at the factory to the operating point(s) as stated on the wiring diagram supplied with the unit. It is good practice to cycle the switch to determine actual operating points before proceeding with readjustment.

⚠ CAUTION:

- ALWAYS change pressure setting gradually.
- ALWAYS check switch setting before making any adjustments.
- DO NOT force slotted adjustment screw when it becomes difficult to turn.
- ALWAYS isolate the pressure transducer before making any adjustments to the backup pressure switch.

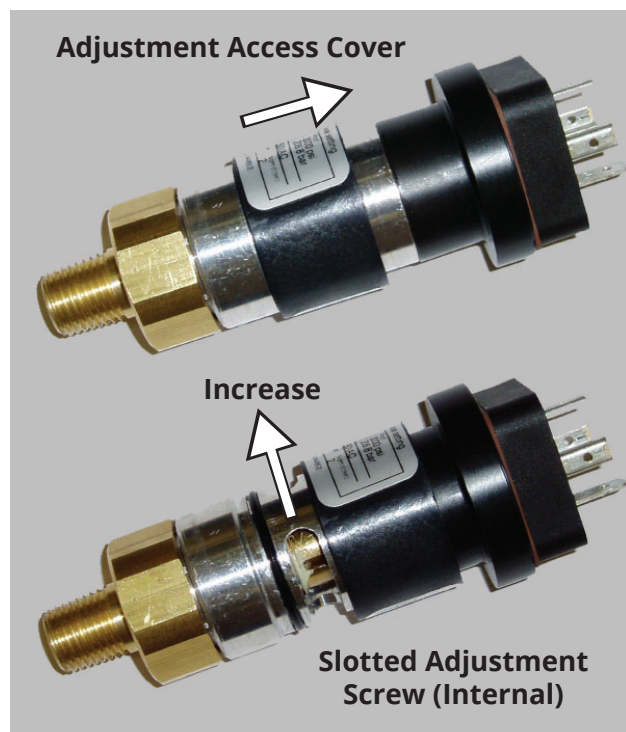


Figure 6.5 Backup Pressure Switch

Adjusting Instructions

1. To locate the adjuster, slide the adjustment access cover to reveal a slotted adjustment screw.
2. Turn the screw inward (clockwise) to increase the setpoint and outward (counter-clockwise) to decrease the setpoint. The backup pressure switch should always be set with falling pressure level starting at a pressure level higher than the setpoint.
3. Using the pressure gage, determine the actuation point of the switch.
4. If the actuation point is above the desired value, turn the slotted adjustment screw counter-clockwise to decrease the

actuation point, and if it is below, turn the slotted adjustment screw clockwise to increase it.

5. For exact pressure setting, cycle pressure switch and make fine adjustments by repeating steps 2 through 4 (trial and error process) until the desired setting is obtained.
6. Slide the adjustment access cover back into place over the slotted adjustment screw.

6.7 General Inspections

6.7.1 Monthly Inspection

A general inspection should be performed on a regular basis (monthly) for safety items. Items to inspect include all wiring, flex hoses, and other items. If a damaged item is viewed, call your local BeaconMedaes service technician for a thorough inspection and report of findings.

6.7.2 Every Six Months

A thorough inspection of the compressor cooling-air discharge grating and the aftercooler coils should be performed at least every six months or more frequently if conditions require. If a dust/dirt buildup is visible, clean the grating or coils to remove the buildup. Excess dust/dirt buildup in

7.0 Replacement Parts

Any information, service or spare parts requests should include the machine serial number and be directed to:

BEACONMEDÆS

1800 Overview Drive

Rock Hill, SC 29730

Telephone: (888) 4-MEDGAS
(888) 463-3427

Fax: (803) 817-5750

A Parts List is available as a supplement to this Operation and Maintenance Manual. Please contact BeaconMedaes to have the Parts List sent to you or download an electronic version from the website at www.beaconmedaes.com.

“Oil-Less” Scroll Laboratory Air

8.0 Specifications

8.1 Duplex Base Mount Scroll SPC Laboratory Air System

Model Hp	2	3	5	7.5	10	15
Package Hp	4	6	10	15	20	30
Max. Pressure (PSI)	140	140	140	140	140	140
Delivery (CFM) 100 psi - compressor	4.4	7.2	11.8	17.0	23.6	34.0
Delivery (CFM) 100 psi - package	8.8	14.4	23.6	34.0	47.2	68.0
RPM	2200	3200	3150	2685	3150	2685
Tank Size (min)	80 Gal	80 Gal	80 Gal	80 Gal	200 Gal	200 Gal
Discharge Pipe Size	3/4"	3/4"	3/4"	3/4"	1-1/4"	1-1/4"
Safety Valve Setting (psi) pump	160	160	160	160	170	170
Max. Ambient Temperature	105°F	105°F	105°F	105°F	105°F	105°F
Dimensions (inches)						
Length	47.50	47.50	47.50	47.50	66.00	66.00
Width	34.50	34.50	34.50	34.50	62.00	62.00
Height	74.00	74.00	74.00	74.00	85.10	85.10
Weight (lbs)	1134	1143	1212	1330	2288	2400

8.2 Triplex Base Mount Scroll SPC Laboratory Air System

Model Hp	5	7.5	10	15
Package Hp	15	22.5	30	45
Max. Pressure (PSI)	140	140	140	140
Delivery (CFM) 100 psi - compressor	11.8	17.0	23.6	34.0
Delivery (CFM) 100 psi - package	35.4	51.0	70.8	102
RPM	3150	2685	3150	2685
Tank Size (min)	120 Gal	120 Gal	200 Gal	200 Gal
Discharge Pipe Size	1"	1-1/4"	1-1/4"	1-1/2"
Safety Valve Setting (psi) pump	160	160	170	170
Max. Ambient Temperature	105°F	105°F	105°F	105°F
Dimensions (inches)				
Length	66.00	66.00	72.00	72.00
Width	62.00	62.00	99.50	99.50
Height	81.90	81.90	85.10	85.10
Weight (lbs)	2101	2217	3052	3392

“Oil-Less” Scroll Laboratory Air

8.0 Specifications

8.3 Quadruplex Base Mount Scroll SPC Laboratory Air System

Model Hp	5	7.5	10	15
Package Hp	20	30	40	60
Max. Pressure (PSI)	140	140	140	140
Delivery (CFM) 100 psi - compressor	11.8	17	23.6	34
Delivery (CFM) 100 psi - package	47.2	68	94.4	136
RPM	3150	2685	3150	2685
Tank Size (min)	200 Gal	200 Gal	200 Gal	200 Gal
Discharge Pipe Size	1"	1-1/4"	1-1/4"	1-1/2"
Safety Valve Setting (psi) pump	160	160	170	170
Max. Ambient Temperature	105°F	105°F	105°F	105°F
Dimensions (inches)				
Length	66.00	66.00	72.00	72.00
Width	62.00	62.00	99.50	99.50
Height	85.10	85.10	85.10	85.10
Weight (lbs)	2432	2602	3654	3966

8.4 Pentaplex / Hexaplex Base Mount Scroll SPC Laboratory Air System

	Pentaplex		Hexaplex	
Model Hp	10	15	10	15
Package Hp	50	75	60	90
Max. Pressure (PSI)	140	140	140	140
Delivery (CFM) 100 psi - compressor	23.6	34.0	23.6	34.0
Delivery (CFM) 100 psi - package	118	170	141.6	204
RPM	3150	2685	3150	2685
Tank Size (min)	200 Gal	200 Gal	200 Gal	200 Gal
Discharge Pipe Size	1-1/2"	1-1/2"	1-1/2"	1-1/2"
Safety Valve Setting (psi) pump	170	170	170	170
Max. Ambient Temperature	105°F	105°F	105°F	105°F
Dimensions (inches)				
Length	72.00	72.0	72.00	72
Width	138.00	138.00	138.00	138.00
Height	85.10	85.10	85.10	85.10
Weight (lbs)	4410	4838	4905	5445

9.0 Maintenance Record

Model Number _____

Serial Number _____

Installation Date _____

Date of Service								
Hours								
Load								
Ambient Temp.								
Inlet Filter								
Belt Tension								
Misc.								
Serviced By								

Notes:

9.0 Maintenance Record

Model Number _____

Serial Number _____

Installation Date _____

Date of Service								
Hours								
Load								
Ambient Temp.								
Inlet Filter								
Belt Tension								
Misc.								
Serviced By								

Notes:

Appendix A: Desiccant Dryer

A.1 General Information

CAUTION: This manual is designed to serve as the operation and maintenance guide for your dryer, if equipped. The contents of this manual should be carefully read BEFORE attempting any phase of operation or maintenance. Failure to follow the operating and maintenance procedures of the instruction manual could result in personal injury or property damage.

All information, specifications and illustrations within this manual are those in effect at the time of printing. The manufacturer reserves the right to change or make improvements without notice and without incurring any obligation to make changes or add improvements to products previously sold.

When requesting information, service, ordering of spare parts, etc., please reference all information supplied on the serial number plate located on the side of the control panel.

To facilitate maintenance, recommended spare parts for your specific dryer model are available. Failure to maintain recommended spare parts and filter cartridges might result in expensive and unnecessary downtime for which the manufacturer cannot be responsible. To request a quotation of, or place an order for, recommended or emergency spare parts, please contact **BeaconMedaes Service** at 1-888-4MEDGAS.

A.1.1 Drying Cycles

This fully automatic, heatless type dryer alternately cycles the compressed, process gas flow through two desiccant charged towers where the entrained, vaporous moisture content of the gas is adsorbed. One desiccant tower is always on-line in a drying cycle throughout normal dryer operation. The opposite, off-line tower is in a regeneration cycle for removal of the previously adsorbed moisture content or in a purge saving cycle at line pressure.

Manual Mode

When the dryer is in the “Manual” mode, the dryer will shift towers every 30 seconds. At normal operating conditions, one tower is at system pressure and the other tower is at 0 p.s.i. Any condition other than this is not normal and will cause a high dew point condition. During tower changeover, the online chamber will exhaust, and the chamber that is regenerating (purging) will come to line pressure. There is a five second re-pressurization cycle. If the dryer is in the continuous purge cycle (Manual Mode), the dryer will use 15% of the system capacity to purge the dryer.

Automatic Mode

When the dryer is in the “Automatic” mode, the dew point monitor controls the dryer purge, and purging depends on the dew point condition. When the dew point reading is above the setpoint of -10°C (14°F), the dryer will function normally (one tower at system pressure, one tower at 0 p.s.i.). When the dew point is below the setpoint of -10°C (14°F), the purge valve will close. In this condition both towers will be approximately 100 p.s.i. and the dryer will not shift towers until the dew point is above -10°C (14°F).

A.1.2 Pre-filter

As the first line of defense against water contaminants, a coalescing pre-filter with an automatic drain is installed. The coalescing pre-filter removes water aerosols from the gas stream before the gas enters the dryer. Liquids collected by the assembly’s filter cartridge(s) fall to the housing sump and are drained by a float drain. Installer should pipe these drain connections to a common drain point.

Appendix A: Desiccant Dryer

A.2 Operation

A.2.1 Initial Start-Up

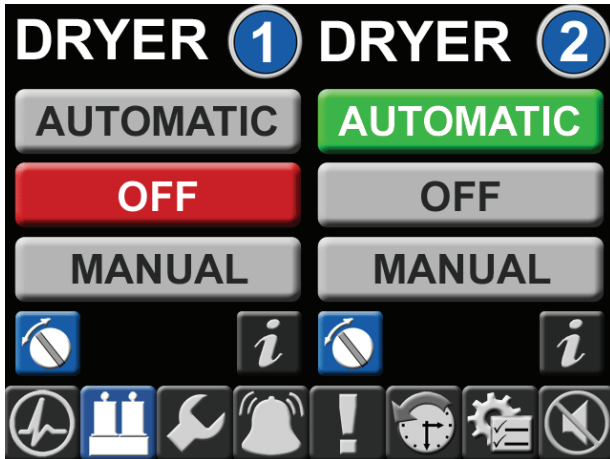


Figure A.1 Main Screen - Dryer Operation

1. Switch on the electrical supply to the dryer.
2. CLOSE the dryer isolation valves.
3. Check that the compressed air supply is on. Let the system come up to pressure
4. Slowly OPEN the dryer inlet isolation valve.
5. Press "Manual" on the dryer display screen to begin operation. The dryer will now begin to cycle.
6. Check that purge air is flowing from the purge muffler.
7. Slowly OPEN the dryer outlet isolation valve.
8. Open the dew point and CO sensor (if supplied) isolation valves.
9. Check for airflow at the dew point sensor orifice.
10. Operate the dryer for five to ten minutes with the source isolation valve closed.

11. During the conditioning run test all joints to locate any leaks using leak detector spray or a suitable alternative. Tighten or repair any leaks and retest.

NOTE: Any small leaks on the dryer outlet side will cause a deterioration of the dew point.

12. Press "Automatic" on the dryer display screen to begin operation in Automatic mode.
13. On the completion of the conditioning run, **slowly open** the source isolation valve. The dryer will now be fully operational.

A.2.2 Procedure to Switch Off Dryer

1. Put second dryer on line by repeating steps 4 thru 7 above.
2. CLOSE the dryer outlet isolation valve.
3. Press "OFF" on the dryer display screen.
4. CLOSE the dryer inlet isolation valve. Dryer should de-pressurize.

WARNING:

Wait at least 2 minutes for pressure in the dryer to decay before performing any service to the dryer.

A.2.3 Normal Start-up

This procedure is to be followed when the dryer has been shut down for a short period during which time the desiccant has not been exposed to wet gas.

1. Start up the compressor if shut down.
2. Set the appropriate dryer to Automatic mode.
3. Slowly OPEN the dryer inlet isolation valve.
4. Slowly OPEN the dryer outlet isolation valve.
5. Check operation of the dryer.

Appendix A: Desiccant Dryer

A.2.4 Maintenance Shut Down

1. CLOSE the dryer outlet isolation valve.
2. CLOSE the dryer inlet isolation valve.
3. Allow the dryer to continue to cycle until the purge exhaust fully depressurizes both chambers.
4. Switch off electrical power to the dryer by removing the fuse.

WARNING:

Display prominent notices indicating that maintenance is being carried out.

A.3 Trouble Shooting

WARNING:

Always notify the appropriate facility staff before performing any maintenance or service procedures on the air system. Compressed air levels may be affected during maintenance or service procedures.

WARNING:

Some of the following trouble-shooting checks are conducted while the dryer's electrical power supply is energized. THEREFORE, A POTENTIAL ELECTRICAL SHOCK HAZARD EXISTS. A qualified electrical technician should conduct these checks. The dryer's electrical power supply must be de-energized before any electrical maintenance or repair work is conducted.

WARNING:

Ensure that the dryer and associated pre-filter(s) and afterfilter(s) are valve isolated and fully depressurized before attempting to remove or disassemble any subassemblies or components. Failure to do so may result in serious personal injury and/or equipment damage.

CAUTION: Each component has been selected to compliment the performance of the other components of the system. Therefore, use of unauthorized parts or improper operation will degrade system performance.

IMPORTANT: Water molecules can diffuse through a pinhole size leak even though pressure inside the piping is several hundred PSIG. It is not at all uncommon to have a minute pinhole leak in a gas line cause an increase in dew point from -40°F to -10°F at a distance of forty or more feet downstream of the leak.

WARNING:

Compressed air can be dangerous unless safety precautions are observed in the use of compressed air and compressed air equipment. Completely vent the internal air pressure to the atmosphere before disassembling any subassemblies or components and before doing any work on compressed air equipment. To vent internal air pressure, follow the maintenance shutdown instructions.

Appendix A: Desiccant Dryer

A.3 Troubleshooting

Problem	Possible Causes	Solution
Dryer not cycling	Main power disconnected	Turn on main power
	Power failure	Restore power
	Main fuse blown	Replace fuse
	Fuse blown in control circuit	Replace fuse
	Dryer circuit board failure	Check and replace if defective
	Dryer operation in Off position	Select Automatic or Manual mode
	Loose or faulty connection	Check & tighten all wire connections
	Switching valve failure	Replace switching valve
Dew point degradation	Incorrect purge air flow	Check purge orifice for blockage. Clean and replace as required
	Excessive system flow rate	Reduce inlet flow rate and/or increase operating pressure
	Inlet air temperature is above the dryer's design inlet working temperature	Check the compressor aftercooler and cooling system. Adjust as necessary to bring the dryer inlet temperature to less than the maximum design working temperature of 43°C (110°F)
	Liquids entering the dryer inlet	Isolate and depressurize the pre-filter assembly. Inspect pre-filter cartridges and end seals for loosening and/or damage. Tighten or replace as necessary. Inspect the pre-filter automatic drain valve. Ensure that it is not clogged and is draining properly. Repair or replace as necessary, if a problem is noted.
	Purge muffler restricted	Replace muffler.

Appendix A: Desiccant Dryer

A.3 Troubleshooting

Problem	Possible Causes	Solution
Dew point degradation	Desiccant is contaminated. The “white” desiccant beads may appear discolored and dirty if contamination has occurred.	Shutdown and depressurize the dryer. Inspect the desiccant and replace if fouled. Inspect any existing pre-filter if fouling is noted.
	Union or other piping/ component leaks at dryer outlet manifold or downstream of dryer outlet.	Soap test the dryer outlet manifold and piping downstream of dryer. Repair all leaks noted.
Back pressure on a desiccant chamber during the regeneration cycle.	Dirty or fouled purge muffler	Switch off power and remove purge muffler and clean using an air nozzle, or replace.
	Outlet check valve leaking	Repair check valve

NOTE: The presence of backpressure will result in insufficient regeneration followed by dew point degradation. An off-line chamber’s pressure **MUST be less than 3 psig** throughout all regeneration cycles.

Appendix A: Desiccant Dryer

A.4 Maintenance

WARNING:

Always notify the appropriate facility staff before performing any maintenance or service procedures on the air system. Compressed air levels may be affected during maintenance or service procedures.

WARNING:

Compressed air can be dangerous unless safety precautions are observed in the use of compressed air and compressed air equipment. Completely vent the internal air pressure to the atmosphere before disassembling any subassemblies or components and before doing any work on compressed air equipment. To vent internal air pressure, follow the maintenance shutdown instructions.

A compressed air dryer should give long and trouble free operation if the recommended preventative maintenance program is carried out.

The following is a recommended schedule:

1. **Quarterly procedure** - Clean the auto drain in the coalescing filter. Monitor the backpressure on the purging tower. If the gauge reads more than 0 psig (when purging), check the purge muffler for blockage and replace if necessary.
2. **Annual procedure** - Replace all filter cartridges and purge muffler(s). Check the automatic drain function in the coalescing filter. Refer to chart located in Section A.4.1 for correct system size and part numbers. Contact BeaconMedaes Service at 1-888-4MEDGAS for parts.
3. **Three-year procedure** - Change all annual parts. Change desiccant, check valves, and purge valve(s). See chart in Section A.4.1 for correct system size and part numbers.

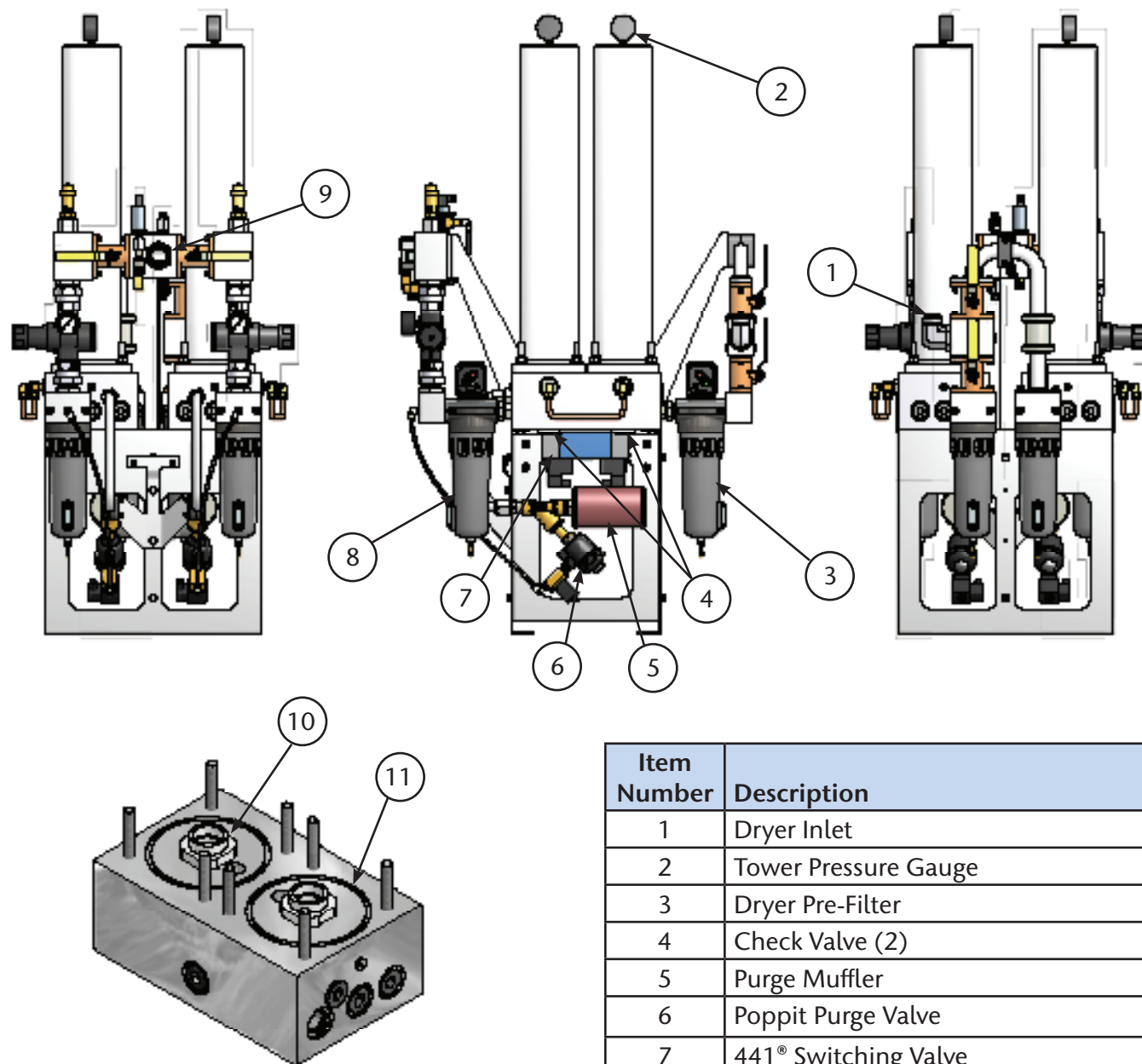
A.4.1 Maintenance Interval

Service Interval	Description
Every year	Pre-filter
Every year	After-filter
Every year	Purge muffler
Every 3 years	Desiccant
Every 3 years	Check valve
Every 3 years	Tower o-ring
Every 3 years	Canister o-ring
As needed	Switching valve
As needed	Tower pressure gauge
As needed	Purge Poppit Valve

Note: All service components are listed as parts within the service repair kits in Section 5.2

Appendix A: Desiccant Dryer

Figure A.2 Desiccant Dryer Components



Item Number	Description
1	Dryer Inlet
2	Tower Pressure Gauge
3	Dryer Pre-Filter
4	Check Valve (2)
5	Purge Muffer
6	Poppit Purge Valve
7	441® Switching Valve
8	Dryer After-Filter
9	Air System Outlet
10	Canister O-Ring
11	Tower O-Ring

Appendix A: Desiccant Dryer

A.5 Replace/Repair

WARNING:

Ensure that the dryer and associated pre-filter(s) and afterfilter(s) are valve isolated and fully depressurized before attempting to remove or disassemble any subassemblies or components. Failure to do so may result in serious personal injury and/or equipment damage.

A.5.1 Desiccant Replacement Procedure

WARNING:

Used desiccant material must be handled with special care. Desiccant is an adsorbent material. Used desiccant may contain chemicals and/or gases that are hazardous, toxic and/or flammable. It is recommended that all used desiccants be analyzed to determine content before disposal. Exercise proper care and procedures during handling and storage of used materials. All containers must be properly labeled and disposed of in accordance with local, state and federal regulations.

1. Shut down dryer – close the inlet and outlet isolation valves and turn off electrical power to the dryer.

WARNING:

Desiccant towers contain springs which may release potential energy upon dismantle.

2. Remove hex nuts, washers and towers from manifold assembly.
3. Remove spring and perforated screen from top of canister.

4. Remove canister from manifold assembly, being careful not to spill any desiccant.
5. Dispose of used desiccant into suitable containers.
6. Remove any blockage that may have lodged in the perforated screens.
7. Replace canister O-rings. Set canister onto manifold assembly.
8. Install the perforated screen into the bottom of the canister.
9. Fill canisters with desiccant to one inch (1") from the top of canister. Install perforated screen.

CAUTION: DO NOT OVERFILL

10. Set spring retainer on top of perforated screen. Install tower over the canister. Install plain washers and hex nuts. Tighten nuts in an X-pattern until chambers are snug against the manifold. Torque to 35 ft-lbs.

A.5.2 Check Valve Replacement Procedure

1. Remove the caps/plugs from the underside of the dryer block. See Figure A.3.
2. Using a 1 1/8 deep well socket, remove the check valves.
3. Replace check valve and cap/plug in dryer block.

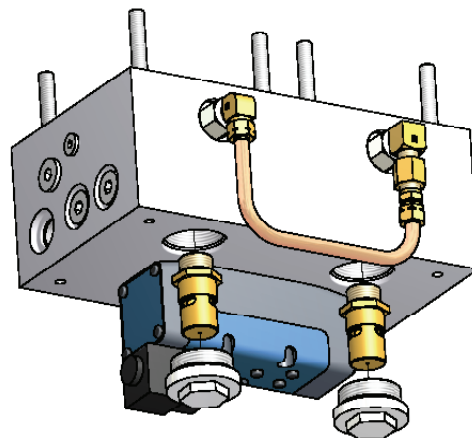


Figure A.3 Dryer Block Check Valves

Appendix A: Desiccant Dryer

A.6 Dryer Specifications

Type:	Desiccant Heatless
Design Pressure:	105 psig
Operating Pressure:	60 psig minimum, 125 psig maximum
Maximum Inlet Air Temperature:	43°C (110°F)
Ambient Temperature:	4.4°C (40°F) minimum, 40.5°C (105°F) maximum
Pressure Dew Point Capability @ 100 psig:	-12°C (10°F)
Normal DP Operating Range:	-8°C (17.6°F) to -12°C (10°F)
Differential Pressure @ 100 psig and 37.8°C (100°F):	2 to 8 psig
Desiccant:	Activated Alumina
Control:	Fully automatic solid-state electric
Power:	24VDC Power

Appendix B: Dew Point Transmitter

B.1 General Information

CAUTION: This manual is designed to serve as the operation and maintenance guide for your Dew Point Transmitter, if equipped. The contents of this manual should be carefully read BEFORE attempting any phase of operation or maintenance. Failure to follow the operating and maintenance procedures of the instruction manual could result in personal injury or property damage.

WARNING:

Before starting any installation, maintenance or service procedure, disconnect ALL power to the system to prevent electrical shock.

Before making or breaking any gas line connections, make sure the system is depressurized in order to avoid personal injury.

Before removing the dew point transmitter, verify that the source of line pressure has been closed and the line pressure reduced to atmospheric pressure.

An alarm condition on dew point indicates a dew point level exceeding the maximum set point, or a faulty dew point transmitter. Immediate action should be taken to reduce the possibility of high dew point in the Laboratory Air line.

If the dew point transmitter flowmeter becomes clogged, dew point readings may be inaccurate, allowing moisture to accumulate undetected.

B.2 Introduction

The dew point transmitter is a continuous, on-line instrument that measures the absolute moisture content in the final air line. The transmitter measures dew point with excellent long term stability. The Advanced Ceramic Moisture sensor is durable and has been designed for ruggedness and simplicity. The transmitter is fully calibrated at the factory prior to shipment.

B.3 Specifications

1. Dew point Temperature: -100° to 20°C (-148° to 68°F)
2. Operating Temperature: 0° to 60°C (32° to 140°F)
3. Dew point accuracy: $\pm 2^{\circ}\text{C}$ ($\pm 3.6^{\circ}\text{F}$)
4. Air Consumption: 0.75 LPM (1.6 SCFH)

B.3.1 Output

Analog output: 4 - 20 mA

B.3.2 General

1. Operation Voltage: 12 - 28 VDC
2. Probe material: Stainless Steel (316)
3. Sensor protection: Ceramic

B.4 Operation

Although the correct operation of the transmitter is not sample flow dependent, it is important that flow velocity through the sample source to the sample block is high enough to avoid long lead time lags in response to changes in moisture at the sample source.

Appendix B: Dew Point Transmitter

B.5 Alarms

Dew points that exceed set points shall cause an alarm condition at the control panel. When the dew point exceeds the alarm set point, the alarm contacts are de-energized. The alarm remains de-energized until the alarm condition is cleared by the operator. A high dewpoint alarm will activate if the transmitter loses power or is disconnected from the control system.

WARNING:

Respond to alarm conditions immediately. An alarm condition on the dew point indicates a dew point level exceeding the maximum set point. Immediate action to correct the problem should be taken. Prolonged exposure to condensing moisture can damage the Laboratory Air equipment.

WARNING:

Electrical shock hazard

No repair should ever be attempted by anyone not having experience in the repair of devices of this nature. Failure to follow proper repair procedures can result in serious injury.

CAUTION: No maintenance and testing should ever be undertaken or attempted by anyone not having general experience in the repair of devices of this nature. Also, to avoid damaging the unit or any of its components, no maintenance and testing should be undertaken by qualified individuals who are not familiar with the procedures in this manual.

Replace damaged parts with components from **BeaconMedaes**. Test the unit after installation of replacement parts to make certain that it complies with the published specifications.

B.6 Maintenance

B.6.1 Repair Policy

Do not use a unit that is not functioning properly until all necessary repairs have been made and the unit has been tested to determine that it is functioning in accordance with the manufacturer's published specifications. Contact **BeaconMedaes Technical Services** department at 1-888-4MEDGAS (888-463-3427) for assistance.

NOTE: To ensure full reliability, have all maintenance and testing done by a qualified technician. If this cannot be done, maintenance and testing of those parts discussed in this manual may be undertaken by a competent, trained individual having experience in the repair of devices of this nature.

B.6.2 Maintenance Schedule

Maintenance	Frequency	Action
Check flow through orifice	Weekly	Check for proper flow
Check transmitter accuracy	Yearly	Verify dew point sensor accuracy (contact BeaconMedaes)
Replace Sensor	Every 2 years	See Section B.9

Appendix B: Dew Point Transmitter

B.7 Troubleshooting

WARNING:

Before removing the dew point transmitter, verify that line pressure has been valved off or reduced to atmospheric pressure.

Before servicing the dew point transmitter, do the following:

1. Close dew point transmitter isolation valve
2. Allow transmitter piping to depressurize through the flowmeter until it reduces to atmospheric pressure.
3. Disconnect sensor cable and remove transmitter from piping.

NOTE: Remote alarms will be activated

Problem	Possible Cause	Solution
Slow system response	Insufficient flow through dew point sensor	Check flow
No power	No incoming power	Verify line power is being supplied
Erratic display	Unit defect	Contact BeaconMedaes
High dew point	Air is not being dried	Verify that the online dryer (valve open) is in the “Automatic” position on the control panel and that the off-line dryer (valve closed) is in the “Off” position on the control panel. Check flow
	Faulty sensor	Replace sensor

Appendix B: Dew Point Transmitter

B.8 Dew Point Sensor Calibration

The dew point sensor is shipped to you pre-calibrated, no user calibration is required. Contact **BeaconMedaes** to check accuracy if required.

B.9 Dew Point Sensor Replacement

Check the response time of the sensor by removing it from the sensor chamber and covering the probe with your hand. The dew point reading should rise rapidly. If the dew point does not rise or is slow to respond, it is time to replace the sensor. To replace, disconnect the power to the instrument, unplug and remove the sensor from the dew point sensor chamber, replace sensor and reassemble.

Description	Part No.	Qty Required
Sensor	4107 6554 19	1
Cable	4107 6510 89	1

NOTE: The Dew Point Sensor is included in the 2-Year System Sensor Kits as shown in section 5.2.4. If ordering the 2-Year System Sensor Kits, there is no need to order the above Sensor as well.

Appendix C: TotalAlert Embedded Control System

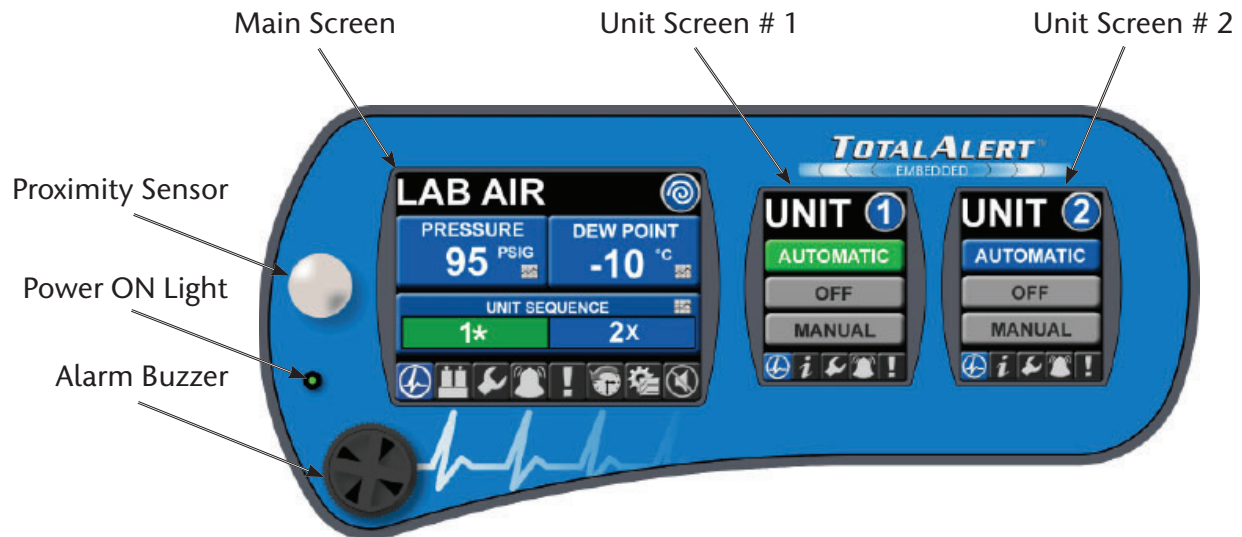


Figure C.1 Touchscreen Controls

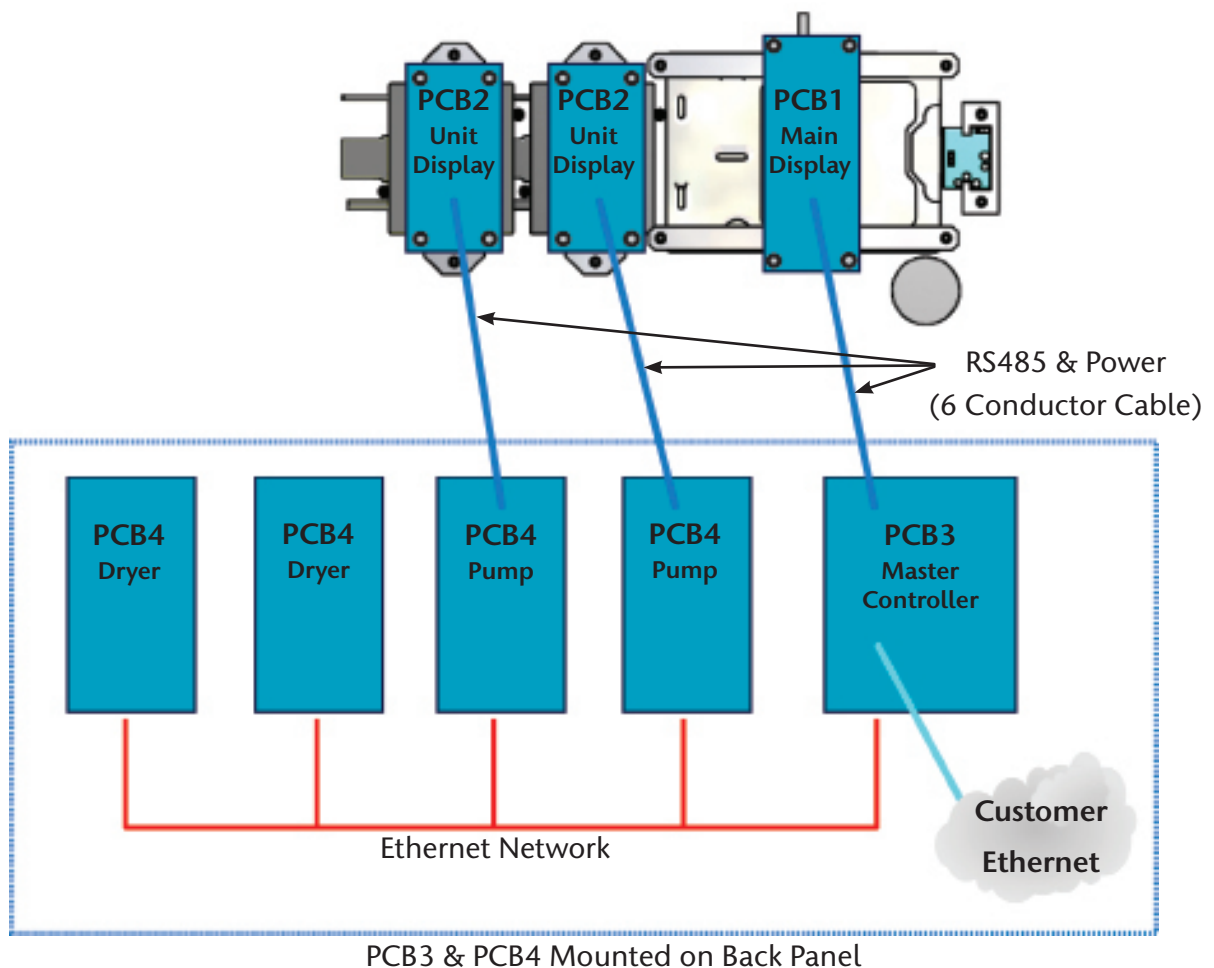


Figure C.2 Duplex Medical Air Configuration - Printed Circuit Boards

Appendix C: TotalAlert Embedded Control System

C.1 Board Configurations

The source control system is comprised of four (4) different printed circuit boards (PCBs) with interconnecting wiring (RS485 or Ethernet) for internal communications between the boards. See Figure C.2.

1. PCB1: Display Board for 5.7” Touch Screen Display
2. PCB2: Display Board for 3.5” Touch Screen Display
3. PCB3: Master Source Controller Board
4. PCB4: Pump Controller Board or Dryer Controller Board

In a standard laboratory air duplex system, the PCB configuration consists of the following quantities and types of boards:

- PCB1 – (1) One for the Main 5.7” display
- PCB2 – (2) One for each of the Unit 3.5” displays
- PCB3 – (1) Master Controller
- PCB4 – (4) One for each compressor (2) and one for each dryer (2)

In a standard laboratory air quadruplex system, the PCB configuration consists of the following quantities and types of boards:

- PCB1 – (1) One for the Main 5.7” display
- PCB2 – (4) One for each of the Unit 3.5” displays
- PCB3 – (1) Master Controller
- PCB4 – (6) One for each compressor (4) and one for each dryer (2)

C.2 PCB1 (5.7” Display Controller)

C.2.1 Basic Software Architecture

The primary purpose of PCB1 is to drive the LCD display for the 5.7” Master screen. Its other functions include the following:

1. Communicate to the Master Controller Board (PCB3) via a RS-485 bus to relay commands from the touch screen interface and display messages from the master controller.
2. Interface to the 5.7” Display touch screen to interpret the user interaction.
3. Drive the 24VDC local alarm horn when signaled by the master controller via the RS485 bus.
4. Read the input from the motion detector at the front panel and relay the status to the master controller so it can distribute the information to the other pump controllers and then to their corresponding 3.5” display boards (PCB2).
5. Accept new firmware via the Ethernet jack when connected to a PC configured with genuine BeaconMedaes software for reprogramming.

Appendix C: TotalAlert Embedded Control System

C.2.2 5.7” User Interface for Source Systems

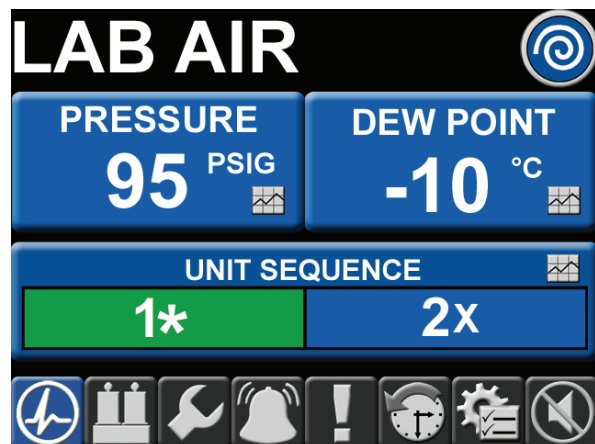


Figure C.3 Main Screen

The primary master screen user interface is displayed on a 5.7” 640 x 480 pixel display as shown in Figure C.3. The interface is designed such that any information can be accessed with a minimal amount of touches by the user.

The 5.7” screen is divided into two main areas – the top portion above the toolbar which changes depending on the icon selected on the toolbar and bottom portion which contains the toolbar (Figure C.4) and is available on most screens.



Figure C.4 5.7” Screen Toolbar

From left to right, the toolbar icons represent the following:



Main Screen (default) ** If No Dryers (Image is 2x wide and Dryer Image is not shown).



** Dryer Information (Medical Air with Dryers Only)



Service



Alarms (no Shutdown)



Shutdown



Event History Log



System Configuration Settings



Horn Silence

C.2.3 5.7” Boot/Communication Screen

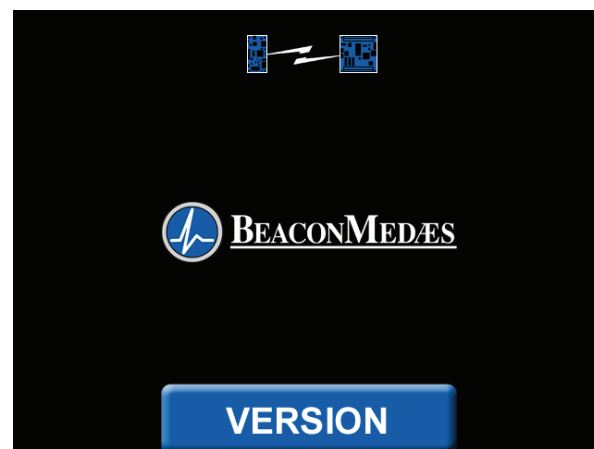


Figure C.5 Boot/Communication Screen

The boot/communication screen (Figure C.5) shows at boot time and will change to the default main screen once communication and compatibility are confirmed:

- If a RS485 link failure is detected the link icon at the top of the screen will appear and the bottom version button will appear to allow the user to check display board (PCB1) version information.

Appendix C: TotalAlert Embedded Control System

- If the connecting board is incompatible with the display board (for example, board not properly connected), only the bottom version button will appear with a red button background.
- If a unit is unavailable because it is in Manual mode and it is running, that color bar shows green and the adjoining symbol shows “X”.
- If the unit is unavailable because the unit is an expandable unit, that color bar shows dark grey and the adjoining symbol shows “E”.
- If the unit is unavailable because the unit cannot be reached via ethernet, that color bar shows dark grey and the adjoining symbol shows “?”.

C.2.4 5.7” Main Screen

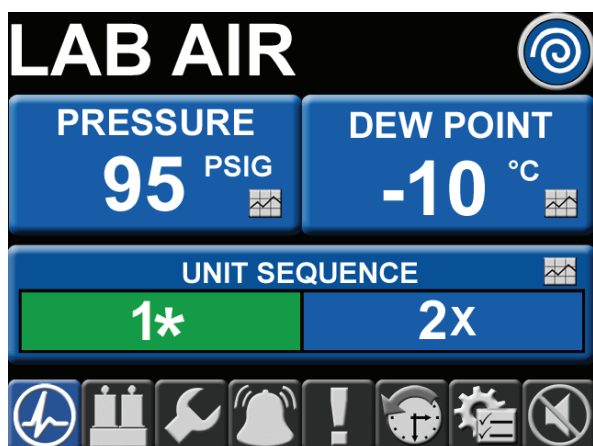


Figure C.6 Main Screen

The main (default) screen (Figure C.6) shows the pertinent system measurements as well as unit sequence information.

The pertinent system measurements include: Pressure and Dew Point. Pressing pertinent system data buttons shows Trend information for that value.

Unit Sequence information shows all system units.

- If the unit is running, that color bar shows green and the adjoining symbol shows “*” for across the line (full speed).
- If a unit is available and not running, that color bar shows blue and the adjoining symbol shows “+” if that unit is next to start.
- If a unit is stopped, that color bar shows red and the adjoining symbol shows “!” if stopped for a shutdown.
- If the unit is unavailable and not running, that color bar shows dark grey and the adjoining symbol shows “X”.

C.2.5 5.7” Trend Screen

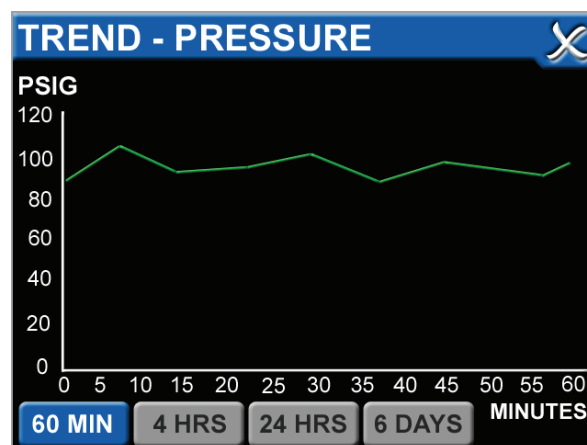


Figure C.7 Trend Screen

The trend screen (Figure C.7) shows the measured value over a specific time period:

- The default time period when opening the window is the last 60 minutes. For a given period, the maximum amount of data stored will only be for the most recent time period and the older data will be removed from view and memory.
- Another time period is selected by pressing the buttons at the bottom of the window. These periods are 60 minutes (240 data points – 0.25 min resolution), 4 hours (240 data points – 1 min resolution), 24 hours (240 data points – 6 min resolution) and 6 days (240 data points – 0.6 hour resolution).

Appendix C: TotalAlert Embedded Control System

C.2.6 5.7” Dryer Screen (If Equipped)



Figure C.8 Dryer Screen

The dryer screen (Figure C.8) shows the operation mode of the dryer(s) and which tower is online if the “Status” mode is selected:

- The default view when the dryer screen is selected shows both dryer operation modes. If only one dryer is installed on the system, only the left “Dryer 1” is visible.
- The operation modes for the dryer: Automatic (Green and dew point purge controlled), Off (Red and not running), Manual (Green and timer controlled).
- If there are no dryers on the system, this screen is not available.
- When the Status button “i” is selected, the view on the dryer section changes to an image depicting the dryer. The arrows on the tower and the purge muffer indicate which tower is online (green arrow pointing down) and which tower is offline (no arrow or blue arrow pointing up). The blue arrow pointing up on the tower indicates that tower is purging. The two blue arrows on the purge muffer also indicate the dryer is purging. Once the purge cycle is complete and the dryer is ready to switch (based on dewpoint in automatic mode), the blue arrows are not visible.

C.2.7 5.7” Service Screen



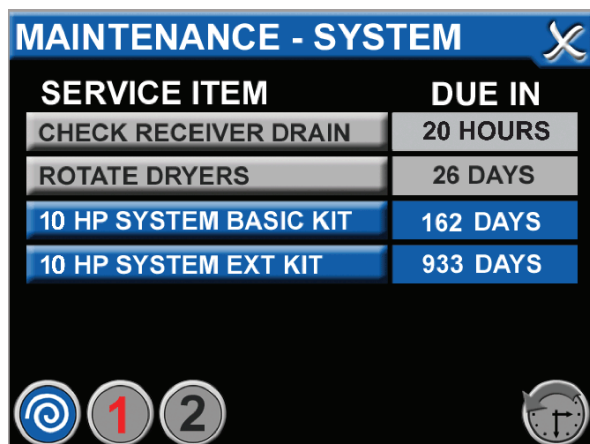
Figure C.9 Service Screen

The service screen (Figure C.9) allows the selection of various sub screens along with the current ambient temperature at the system:

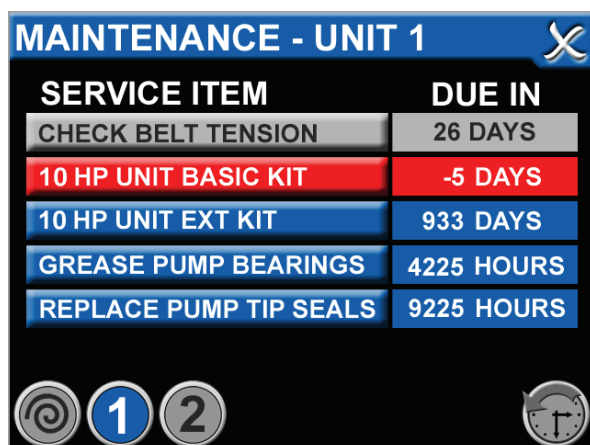
- Maintenance – Additional multiple screens depicting suggested and required maintenance items with resettable timers. When maintenance is due, both the maintenance button and the service icon on the tool bar turn red instead of blue.
- Diagnostic - Depicts the I/O status of the connecting unit controller board. For example, the digital inputs (X1-X7 as 0 or 1), the analog readings (T1-T2, I1-I4, P1-P2 and V1-V2 with A/D values), the 24VDC powered digital outputs (Z1-Z2 as 0 or 1) and the dry contacts (Y1-Y12 as 0 or 1).
- Version – Displays the RS485 communication version, firmware versions for the 5.7 display board and the connecting controller board.
- Testing – Allows for test mode of all alarm events. See Section C.5 for more information.
- Temperatures – Display the current ambient temperature and the current cabinet temperature (optional). When the button is pressed, the trend information is available for these temperatures.

Appendix C: TotalAlert Embedded Control System

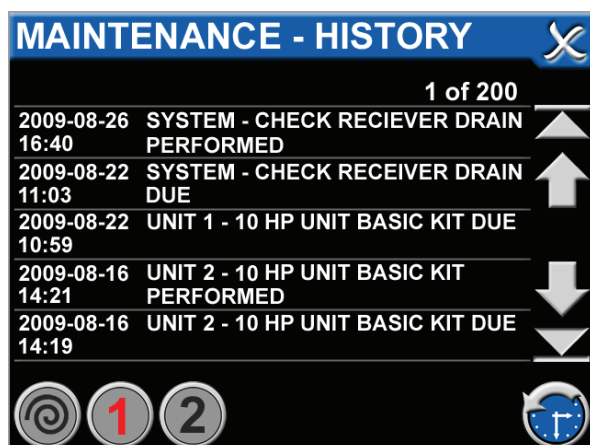
C.2.8 5.7” Maintenance Screen



System Maintenance Screen



Unit Maintenance Screen



Maintenance History Screen

Figure C.10 Maintenance Screens

The maintenance screens (Figure C.10) are accessed via the service screen:

- Additional multiple screens depicting suggested and required maintenance items with resettable timers. If an item is past due the button color changes from blue to red if the item is a required maintenance versus a suggested maintenance.
- The first (default) screen shows as the System maintenance. Items that are suggested are shown as a grey button and indicators are not visible or flagged for these items. When the user resets the timer, the action is logged in the service history.
- Other screens (Unit and History) are accessed by pressing the bottom round icons. Note that only unit icons are shown if the unit is physically installed and not an expansion unit.

C.2.9 5.7” Alarms Screen

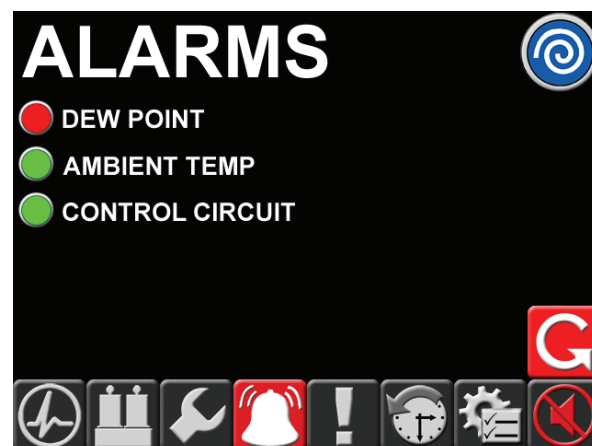


Figure C.11 Alarms Screen

The alarms screen (Figure C.11) shows all of the system alarm information. An alarm is classified as an event of significance that does not shut the system down. These alarms are latched and are not cleared until a user presses the reset button on the alarms screen. This reset button will reset all alarms for that given system.

Appendix C: TotalAlert Embedded Control System

- Green alarm condition indicates a normal status for that condition.
- Red alarm condition indicates an abnormal status for that condition.
- The horn silence button at the bottom right will show Red if the horn is on and not reset yet. Once the horn is silenced, the button will return back to the gray condition.

C.2.10 5.7” Shutdown Screen

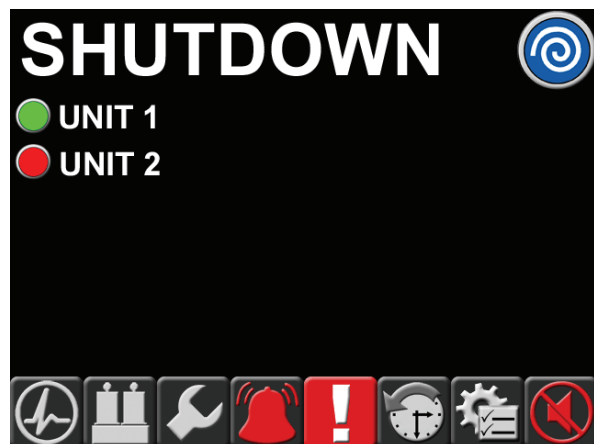


Figure C.12 Shutdown Screen

The shutdown screen (Figure C.12) shows all of the system shutdown event information. A shutdown is classified as an event of significance that does shut the unit or system down. Only certain system shutdown events are latched and are not cleared until a user presses the reset button on the shutdown screen. Unit “X” shutdown events are not latched on this screen. They are instead latched at the individual unit screen and reset at that screen. The system reset button will reset all system shutdown events for that given system (not Unit “X”).

- Green shutdown condition indicates a normal status for that condition.
- Red alarm shutdown indicates an abnormal status for that condition.

C.2.11 5.7” History Screen

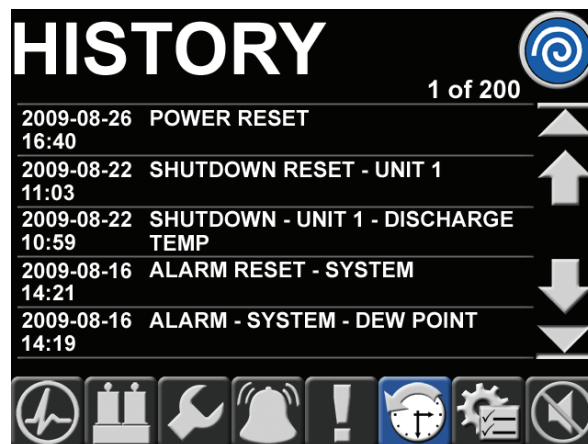


Figure C.13 History Screen

The history screen (Figure C.13) shows all of the system event history excluding service maintenance history.

- Most recent events are shown on the first (default) page and are shown in descending date/time order. Located at the top right are the page number and the total number of pages. The maximum number of pages is 200 (1000 events divided by 5 events per page).
- Page up and Page down arrows change the view 5 events up or down at a time and are only visible if subsequent event information is available. The Home button changes the view to the top or most recent events and the End button changes to the bottom or the oldest events.
- A maximum of 1000 most recent events are stored for the system.

Appendix C: TotalAlert Embedded Control System

C.2.12 5.7” Settings Screen

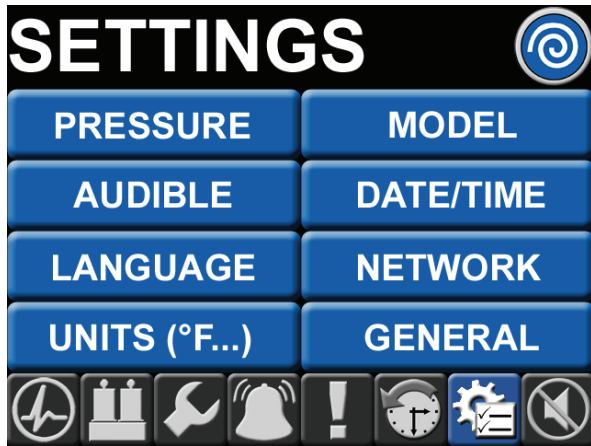


Figure C.14 Settings Screen

The settings screen (Figure C.14) allows the selection of various sub screens that pertain to system configuration data. All value/adjustment changes are password protected.

- Pressure/Vacuum – Allows the adjustment of system pressure or vacuum operating range.
- Audible – Allows the horn to re-initiate if an alarm or shutdown event has not cleared, but the horn was silenced. The allowable values for re-initiate time are never, 15 min, 30 min, 1 hour, 8 hours, and 24 hours.
- Language – Allows the choice of pre-defined display language.
- Units – Allows the display units to be displayed and changed.
- Model – Displays the pertinent system model information.
- Date/Time – Allows the date/time to be displayed and changed.
- Network – Allows the network (IP address, etc) to be displayed and changed.
- General – Allows the miscellaneous general information to be displayed and changed.

C.3 PCB2 (3.5” Display Controller)

C.3.1 Basic Software Architecture

The primary purpose of PCB2 is to drive the LCD display for the 3.5” Unit screen. Its other functions include the following.

1. Communicate to the Pump Controller Board (PCB4) via a RS-485 bus to relay commands from the touch screen interface and display messages from the pump controller.
2. Interface to the 3.5” Display touch screen to interpret the user interaction.
3. Accept new firmware via the Ethernet jack when connected to a PC configured with genuine BeaconMedaes software for reprogramming.

C.3.2 3.5” User Interface for Source Systems



Figure C.15 Unit Screen

The primary unit screen user interface (Figure C.15) is displayed on a 3.5” 240 x 320 pixel display. The interface is designed such that any information can be accessed with a minimal amount of touches by the user.






The 3.5” screen is divided into two main areas – the top portion above the toolbar which changes depending on the icon selected on the toolbar and bottom portion which contains the toolbar (Figure C.16) and is visible on most screens.

Appendix C: TotalAlert Embedded Control System



Figure C.16 3.5” Screen Toolbar

From left to right, the toolbar icons represent the following:

	Main Screen (default)
	Status/Information (Hourmeter)
	Service
	Alarms (no Shutdown)
	Shutdown

C.3.3 3.5” Boot/Communication Screen



Figure C.17 Boot/Communication Screen

The boot/communication screen (Figure C.17) shows at boot time and changes to the default main screen once communication and compatibility are confirmed:

- If a RS485 link failure is detected the link icon at the top of the screen appears and the version button appears to allow the user to check display board (PCB2) version information.

- If the connecting board is incompatible with the display board (for example, the boards are not properly connected), only the bottom version button appears with a red button background.

C.3.4 3.5” Main Screen



Figure C.18 3.5” Main Screen

The main (default) screen (Figure C.18) shows the operation mode of the unit along with its automatic versus manual mode setting:

- Automatic (Blue = Standby, Grey = Unselected, Green = Unit Running)
- Off (Red = Selected, Grey = Unselected)
- Manual (Blue = Standby – Backup Pressure Switch is not closed, Grey = Unselected, Green = Unit Running)

C.3.5 3.5” Main Screen: Manual Override

During the system startup, the manual override, located on the printed circuit board (PCB4), switch is utilized to ensure the compressor is in the Off position. The manual override switch on PCB4 is a safety measure as well, for emergency situations to ensure the compressor unit produces medical air.

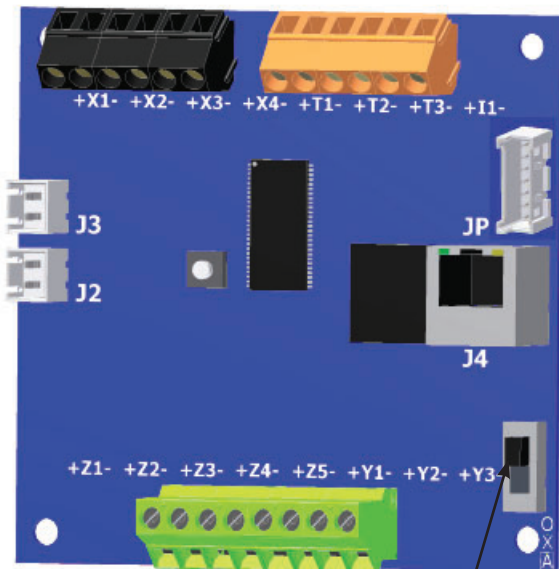
In the event of an emergency and the control system is not operating effectively, the manual override switch can be moved from the Automatic position

Appendix C: TotalAlert Embedded Control System

to the Manual position. See Figure C.19. Moving to this position forces the compressor to operate against the backup pressure switch, starting and stopping according to the switch settings.



3.5" Unit screen with Manual Override selected



Manual Override
Switch

O - On Manual
X - Off
A - Automatic

PCB4 with Manual Override switch On

Figure C.19 Manual Override

If the switch is in Manual or Off position on PCB4, the touchscreen controls no longer control the compressor. Moving the switch back to the Automatic position puts the unit under the control of the TotalAlert Embedded control system.

CAUTION: The “Manual Override” mode of operation should only be used for emergencies such as a loss of unit display board or loss of display touchscreen and should not be used for normal operation.

C.3.6 3.5" Status Screen

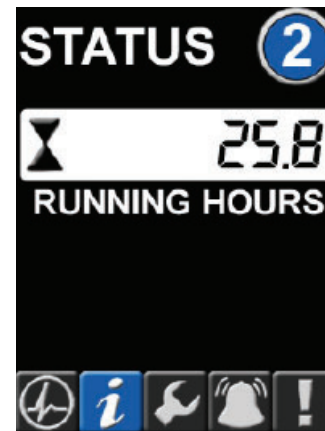


Figure C.20 3.5" Status Screen

The status screen (Figure C.20) shows the running hour meter values.

C.3.7 3.5" Service Screen

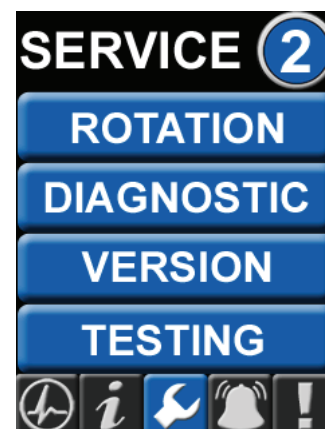


Figure C.21 3.5" Service Screen

Appendix C: TotalAlert Embedded Control System

The service screen (Figure C.21) allows access to the unit “jog” feature, diagnostic screen and version screen:

- **Rotation** – Allows the unit to run for a short period to check rotation. When pressed, the unit will either begin the “jog” sequence or show a screen instructing you to place the unit in “OFF” mode first (the unit must be in “OFF” mode before it can check rotation). When “jog” mode is started, the unit will first delay for 5 seconds to allow the user to get in position to check the rotation, then run the unit for a brief period.
- **Diagnostic** – Depicts the I/O status of the connecting unit controller board. For example, the digital inputs (X1-X4 as 0 or 1), the analog readings (T1-T3 and I1 with A/D values), the 24VDC powered digital outputs (Z1-Z5 as 0 or 1) and the dry contacts (Y1-Y3 as 0 or 1).
- **Version** – Displays the RS485 communication version, the firmware versions for the 3.5 display board and the connecting controller board.
- **Testing** – Allows for test mode of all shutdown events. See Section C.5 for more information.

C.3.8 3.5” Alarms Screen



Figure C.22 3.5” Alarms Screen

The alarms screen (Figure C.22) shows all of the unit alarm information. An alarm is classified as an event of significance that does not shut the unit down. These alarms are latched and are not cleared until a user presses the reset button on the alarms screen. This reset button will reset all alarms for that given unit.

- **Green alarm condition** indicates a normal status for that condition.
- **Red alarm condition** indicates an abnormal status for that condition.

C.3.9 3.5” Shutdown Screen

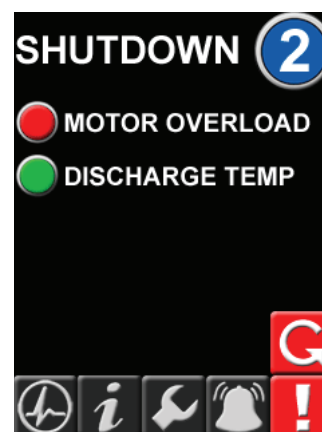


Figure C.23 3.5” Shutdown Screen

The shutdown screen (Figure C.23) shows all of the unit shutdown event information. A shutdown is classified as an event of significance that does shut the unit down. These shutdown events are latched and are not cleared until a user presses the reset button on the shutdown screen. This reset button will reset all shutdown events for that given unit.

- **Green shutdown condition** indicates a normal status for that condition.
- **Red alarm shutdown** indicates an abnormal status for that condition.

Appendix C: TotalAlert Embedded Control System

C.4 Password Access

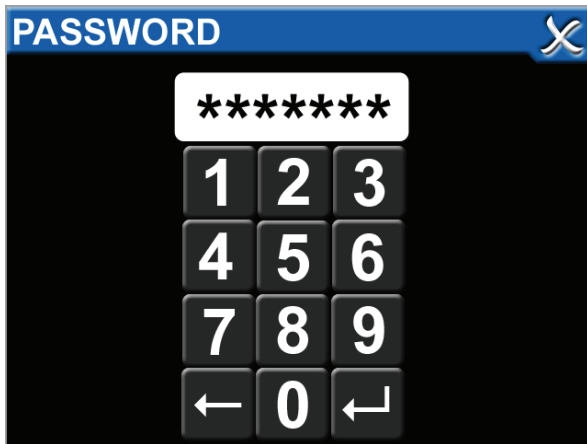


Figure C.24 Password Screen

The TotalAlert Embedded control system contains items that can be changed or adjusted. Before making any changes on the system or unit screens, a password prompt appears. A proper password must be entered before adjusting the control system. See Figure C.24.

The password for the Scroll Laboratory Air System is “121212”. After entering the password, the password remains valid for approximately ten minutes or until the unit resets itself to the default display screens. Reentering the password after “timing out” allows the user to continue making system adjustments.

C.4.1 Main Screen Password Items

On the 5.7” main screen, several screens allow adjustments with the proper password.

- **Maintenance - Resetting a Service Activity:** A service notification activates when a service item is past due. Upon completion of the past due service activity, reset the service due counter by pressing the item on the service screen, selecting update, and entering the password when prompted.

- **Maintenance - Testing the System Alarms:** The Testing button allows the operator to create an Alarm or Shutdown condition to test the complete alarm network. See section C.5 for additional information.
- **Settings - Pressure:** Adjust system “Max” and “Min” operating pressure settings within a factory-set range of pressures.
- **Settings - Horn:** An option is available to reinitiate the horn during an alarm/shutdown event. The operator can elect to have the horn reinitiate after a set period of time after the silencing of the horn.
- **Settings - Language:** The operator can select from the language options available on the system.
- **Settings - Display Units:** The operator can select preferences for the display of pressure, dew point, and other temperatures.
- **Settings - Date and Time:** Ensure the correct date and time for the system, as this impacts history log reporting.
- **Settings - Network Configuration:** Configure how the system operates remotely within the existing facility network.
- **Settings - General Options:** Select method for displaying alarms/shutdowns. Operator can change the timer setting for sleep mode on the screens.

C.4.2 Unit Screen Password Items

In the Service section of the Unit screens, the operator can create alarm or shutdown conditions to test the complete alarm network. See section C.5 for additional information.

Appendix C: TotalAlert Embedded Control System

C.5 Testing Alarms

In the Service section of the Main screen and Unit screens, the operator is enabled to test each alarm and shutdown event. When an alarm/shutdown event is selected to test, the actual alarm/shutdown event is latched. At this point, the system responds as if an actual alarm/shutdown has occurred.

CAUTION: If testing a shutdown event, the compressor being tested will shut down.

For an alarm/shutdown event, the following will occur (in addition to the compressor shutting down for a shutdown event):

- The horn will initiate.
- All appropriate control screens will show the alarm/shutdown condition.
- An alarm/shutdown signal will be sent to the Master alarms.
- The operator must respond and relatch the alarm/shutdown signal by pressing the “reset” button on the appropriate main screen or unit screen.
- A History item will be created that shows the “Test” alarm/shutdown event and a subsequent event for the correction of the “Test” item.

C.6 Maintenance

C.6.1 Maintenance Screens

The TotalAlert Embedded touchscreen displays all of the necessary information to plan service activities and order the correct service kits to perform the maintenance.

To view the service schedule, press the Service icon on the 5.7” main screen (Figure C.9), then select Maintenance from the list of headings.

When the Scroll icon located in the bottom left is blue, this indicates that the service items and service due times pertain to the general medical air system (Figure C.10). By selecting the numbers next to the Scroll icon in the bottom left, the service activities for the individual units (compressors) are displayed.

To see details on an individual service activity, press that service on the touchscreen and details of the activity appear, with a description of the service kit required to perform the service.

C.6.2 Maintenance Alerts

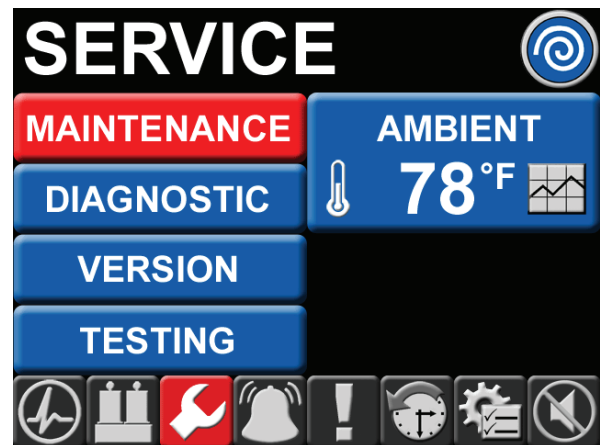


Figure C.25 Maintenance Alert

When a maintenance activity is due, a notification appears on the main 5.7” screen (Figure C.25). The Service icon appears in Red. There is not an audible horn activated to alert to the service activity, just the colored icon.

To view the alert, press the Service icon on the toolbar, then select the Maintenance choice from the menu. This is highlighted in Red.

Within the Maintenance screen, if one of the Service Items on the list appears in red, the overdue Service Activity is a System maintenance item. If one of the Unit numbers in the bottom right corner appears in red, the overdue service activity is related to the particular unit. Press the Unit number to move to the service screen for that unit to find the overdue activity.

Appendix C: TotalAlert Embedded Control System

By selecting the activity that is overdue (in red), the detail screen appears for that service item and provides the necessary information for the service activity: part number, description.

C.6.3 Resetting a Service Activity



Figure C.26 Resetting a Service Activity

After a service activity is performed, to reset the schedule, do the following:

- Select the service activity on the touchscreen (Figure C.26).
- Press the Reset button.
- Enter the password (as explained in Section C.4).

C.7 Remote Monitoring

CAUTION: The information systems personnel should be notified before changing any of the network settings. Changing the settings could keep the equipment from working properly.

C.7.1 Set Up: Equipment Required

- PC with an Ethernet connection
- PC with a web browser, such as Microsoft Internet Explorer
- Cat5 or better Ethernet cable

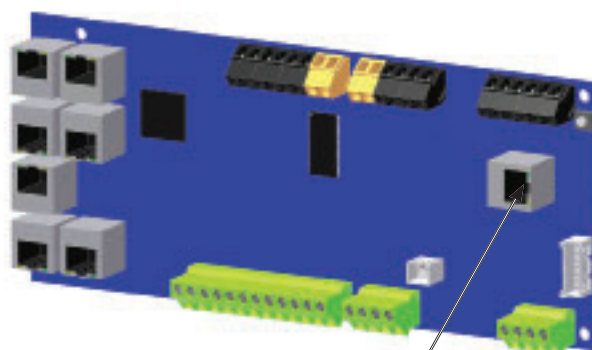
C.7.2 Set Up: Physical Connection

WARNING:

ONLY CONNECT THE CUSTOMER NETWORK TO THE CUSTOMER ETHERNET CONNECTION AS SHOWN IN FIGURE C.27.

DO NOT UNPLUG EXISTING ETHERNET CABLES USED FOR THE INTERNAL CONNECTIONS. DO NOT ATTEMPT TO REMOVE ETHERNET SECURITY PROTECTORS TO USE FOR CUSTOMER ETHERNET CONNECTION.

IF THE CUSTOMER ETHERNET IS PLACED IN AN INTERNAL ETHERNET CONNECTION, THE INTERNAL ETHERNET FUNCTIONALITY WILL NOT PERFORM AS DESIGNED.



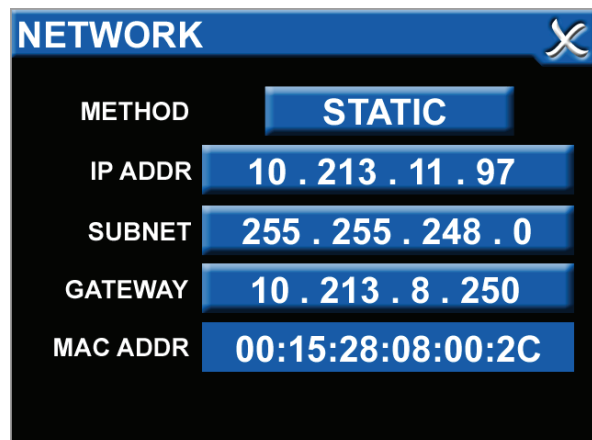
Customer Ethernet Connection
on PCB3 Master

Figure C.27 Connecting the cable

1. Using a Cat5 Ethernet cable, connect the medical air system to an Ethernet switch or hub. Connect the cable to the Customer Ethernet Connection (Figure C.27) on PCB3 Master board.
2. Verify the green LINK LED on the printed circuit board illuminates.

Appendix C: TotalAlert Embedded Control System

C.7.3 Set Up: Network Configuration



NETWORK	
METHOD	STATIC
IP ADDR	10 . 213 . 11 . 97
SUBNET	255 . 255 . 248 . 0
GATEWAY	10 . 213 . 8 . 250
MAC ADDR	00:15:28:08:00:2C

(Network screen is found in Settings section from Main toolbar)

Figure C.28 System IP Address

1. **IP Address using DHCP method:** Upon power-up of the system, the device will search for a DHCP server. If a DHCP server is found, IP Address, subnet mask and gateway are automatically obtained. If not found, the device will check for a DHCP server every 30 seconds. When found, the IP Address, subnet mask and gateway are automatically obtained.
2. **IP Address using Static method:** Upon power-up of the system, the device will immediately begin using the fixed IP configuration.

C.7.4 Set Up: Connecting to the Embedded Website of the Air System

1. Start a web browser such as Microsoft Internet Explorer.
2. Enter the system's IP address in the browser's address bar.

Example: <http://10.213.11.97>

Note: To learn the IP address of the air system, go to the 5.7" main touchscreen, press the Settings icon, press Network from the listing and the IP address will appear in the second line underneath the method. See Figure C.28.

Appendix C: TotalAlert Embedded Control System

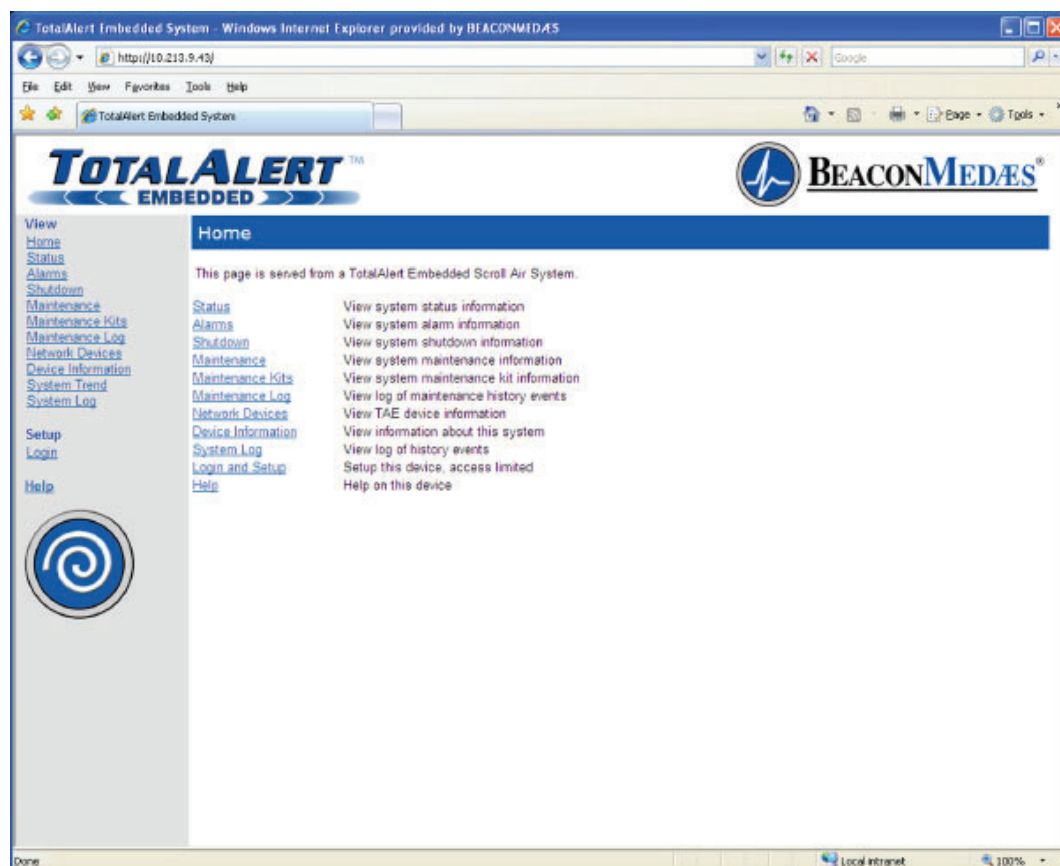


Figure C.29 Typical Laboratory Air System home page

C.7.5 Login to Setup Pages

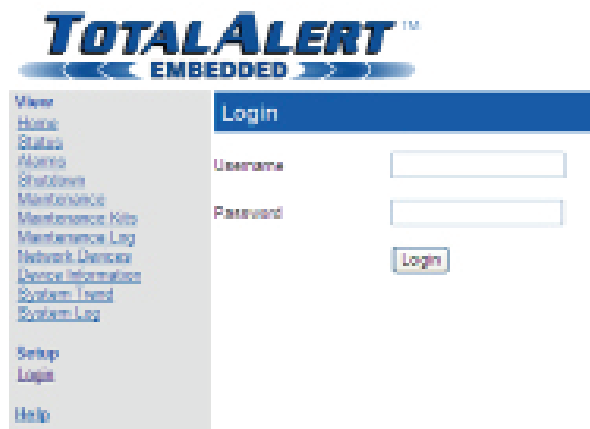


Figure C.30 Login for Setup Pages

1. Once connected to the TotalAlert Embedded control system, your browser will display the typical home page (Figure C.29).
2. Click “Login” on the menu bar in the left pane. The web browser will request a username and password (Figure C.30).
3. The factory defaults are:

Username: new
 Password: new
4. The left sidebar will now contain the setup links (Figure C.31).

Appendix C: TotalAlert Embedded Control System

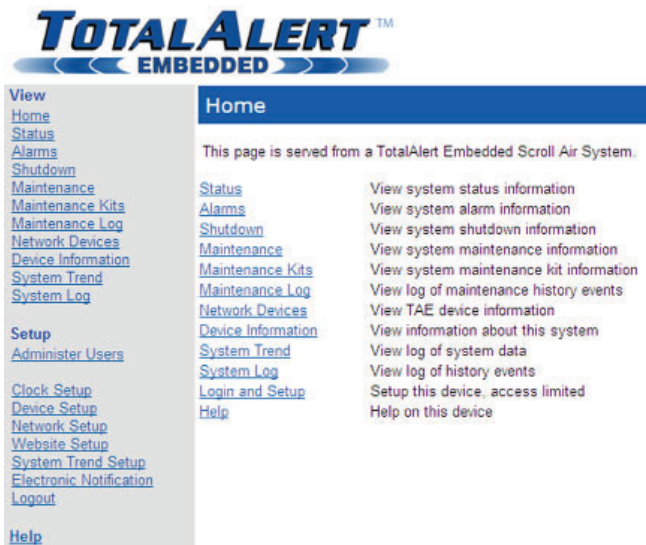


Figure C.31 Setup Menu

C.7.6 Device Setup

This Device Setup page (Figure C.32) is used to configure the medical air system name, location, facility name, and contact information.

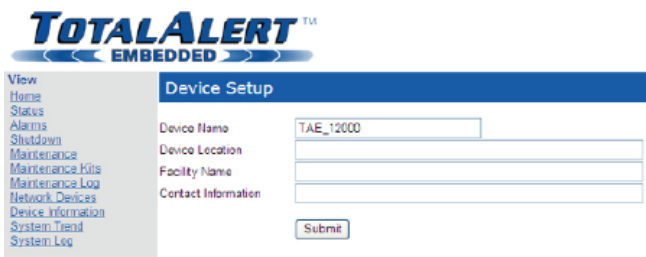


Figure C.32 Device Setup

1. Click Device Setup to access the Device Setup page.
2. Enter the new device name.
3. Enter the location
4. Enter the facility description.
5. Enter the contact information.
6. Click the Submit button.

C.7.7 Network Setup

This Network Setup page (Figure C.33) is used to configure the facility network information and e-mail server configuration.

NOTE: Obtain the IP Address and DNS Name from the facility's Information Systems department.

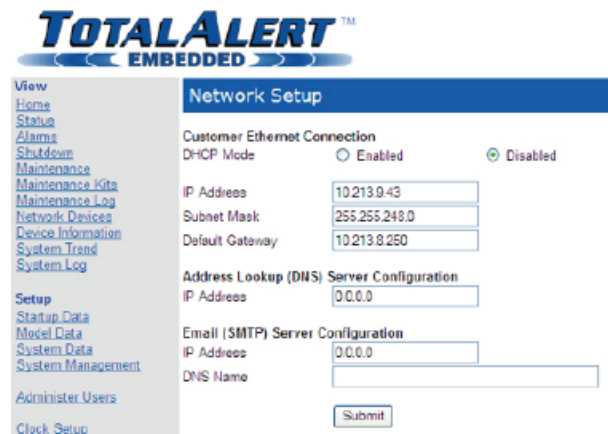


Figure C.33 Network Setup

1. Click Network Setup to access the Network Setup page.
2. Select Enable or Disable for the DHCP Mode.
3. Enter the IP Address for the DNS server configuration.
4. Enter the IP Address and DNS name for the e-mail SMTP server configuration.
5. Click the Submit button.

C.7.8 Website Setup

This Website Setup page (Figure C.34) is used to configure the automatic refresh interval for the website. By selecting an auto-refresh interval, the web page will be refreshed automatically, keeping all information current during a viewing period.

Appendix C: TotalAlert Embedded Control System

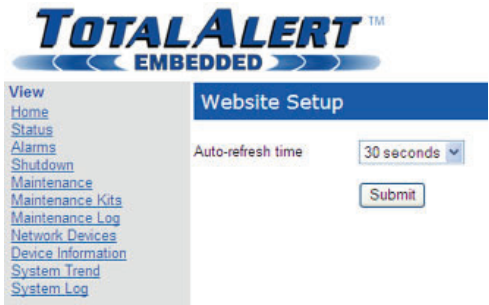


Figure C.34 Website Setup

1. Click Website Setup to access the Website Setup page.
2. Select a time interval from the pull-down list of options.
3. Click the Submit button.

C.7.9 System Trend Setup

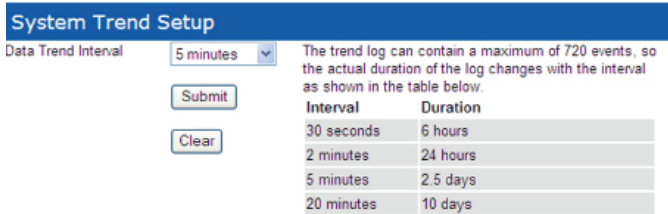


Figure C.35 System Trend Setup

This System Trend Setup page (Figure C.35) is used to configure the trend log for the website and to allow the data to be cleared. The System Trend screen contains a maximum of 720 events for each of the items recorded, so the actual duration of the trend log changes with the time interval selected. The durations available to select are 6 hours, 24 hours, 2.5 days, and 10 days.

1. Click System Trend Setup to access the System Trend Setup page.
2. Select a time interval from the pull-down list of options.
3. Click the Submit button.

C.7.10 Electronic Notification Setup

This Electronic Notification Setup page (Figure C.36) is used to configure the Electronic Notification feature of the TotalAlert Embedded control system. By setting up the Electronic Notification, key personnel can receive notifications of all alarm/shutdown alerts and/or all maintenance alerts (e-mail, pager, phone text message). The device acts as an SMTP client. An SMTP server is required for electronic notification to function.

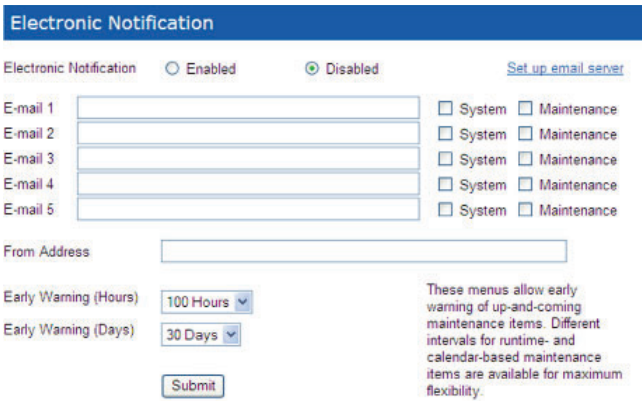


Figure C.36 Electronic Notification Setup

1. Click Electronic Notification Setup to access the Electronic Notification Setup page.
2. Select Enable to enable the e-mail notification tool.
3. Enter up to five email addresses.

Appendix C: TotalAlert Embedded Control System

4. For each address, select “System” for that person to receive all alarm/shutdown alerts. Select “Maintenance” for that person to receive all maintenance alerts. An individual may receive both types of alerts.
5. Enter an email address in the “From” box as this will be the sender of the notifications.
6. If desired, early warning notifications can be set up for maintenance items. By selecting these time intervals, a notification will be sent before the maintenance item is due, providing time for planning the service activity.
7. Click the Submit button.

C.7.11 Navigating the Website

The TotalAlert Embedded website allows the user to easily view the status of all activity pertaining to the medical air system. By clicking the menu items to the left of the screen, a user can view pages displaying accurate and timely information about the system. These pages include:

Status

Data at 2010-05-27 11:24:46 [Refresh Now](#) (Auto refresh every 5 seconds)

System

Hours	Pressure	Dewpoint	CO Level	Ambient	Alarms	Shutdown	Service
311.9 hrs	120 psig	-98 degC	N/A	24 degF	OK	OK	Not Due

Units

Number	Hours	Operation Mode	Run Mode	Seq	Alarms	Shutdown	Service
1	77.9 hrs	Automatic	Stopped	Lag 1	OK	OK	Not Due
2	72.7 hrs	Automatic	Stopped	Lead	OK	OK	Not Due
3	Expansion Unit (Not Installed)						

Dryers

Number	Hours	Operation Mode	Cycles	Tower A Mode	Tower B Mode
1	247.5 hrs	Off	32519	Off	Off
2	3.7 hrs	Off	196	Off	Off

Figure C.37 Status Page

Status: The Status page (Figure C.37) displays current information for both the overall system (run hours, pressure, ambient temperature, alarms, shutdown, and service) and the units (run hours, operation mode, run mode, sequence, alarms, shutdown, and service).

Alarms

Data at 2010-05-27 11:41:42 [Refresh Now](#) (Auto refresh every 5 seconds)

System			
Alarm	Status		
Dew Point	OK		
CO Level	OK		
Lag Alarm	OK		
Ambient Temp.	OK		
Control Circuit	OK		

Units			
Alarm	Unit 1	Unit 2	Unit 3
Discharge Temp.	OK	OK	Expansion
Control Circuit	OK	OK	Expansion

Figure C.38 Alarms Page

Alarms: The Alarms page (Figure C.38) displays the current status of all system alarms and alarm status for each unit.

Shutdown

Data at 2010-05-27 11:42:07 [Refresh Now](#) (Auto refresh every 5 seconds)

System

Shutdown	Status
Unit 1	OK
Unit 2	OK
Unit 3	OK

Units

Shutdown	Unit 1	Unit 2	Unit 3
Motor Overload	OK	OK	Expansion
Discharge Temp.	OK	OK	Expansion
Inlet Vacuum	OK	OK	Expansion

Figure C.39 Shutdown Page

Shutdown: The Shutdown page (Figure C.39) displays the current status of all system shutdowns and shutdown status for each unit.

Appendix C: TotalAlert Embedded Control System

Maintenance		
Data at 2010-05-27 11:42:31 Refresh Now (Auto refresh every 5 seconds)		
System		
Service Item	Due In	Interval
Check Receiver Drain	4976 Hours	24 Hours
Rotate Dryers	29 Days	30 Days
System Basic Kit	351 Days	365 Days
System Sensor Kit	729 Days	730 Days
System Extended Kit	1081 Days	1095 Days
Unit 1		
Service Item	Due In	Interval
Check Belt Tension	16 Days	30 Days
Unit Basic Kit	351 Days	365 Days
Unit Extended Kit	1081 Days	1095 Days
Grease Pump Bearings	3923 Hours	4000 Hours
Replace Pump Tip Seals	7923 Hours	8000 Hours

Figure C.40 Maintenance Page

Maintenance: The Maintenance page (Figure C.40) displays a listing of all service items for both the system and each unit. The display includes the time frame for which the service activity is due and the time interval for each service activity.

Maintenance Kits		
System (1 per system)		
Service Item	Interval	Service Kit
System Basic Kit	365 Days	4107 4000 29 - Scroll System Basic Kit [Size A] (Dryer Filters, Sight Glass Kit, Valve Kits etc.)
System Sensor Kit	730 Days	4107 4000 59 - System Dew Point Sensor Kit (Dew Point Sensor)
System Extended Kit	1095 Days	4107 4000 36 - Scroll System Extended Kit [Size C] (Desiccant, O-rings, Valve Kits etc.)
Unit (1 per unit)		
Service Item	Interval	Service Kit
Unit Basic Kit	365 Days	4107 4000 44 - Unit Basic Kit [10 HP, 60Hz] (Inlet Filter, V-Belts - 1 Kit per Unit)
Unit Extended Kit	1095 Days	4107 4000 53 - Unit Extended Kit [10 HP] (O-rings, Valve Kits etc. - 1 Kit per Unit)
Grease Pump Bearings	4000 Hours	2903 0139 00 - Grease Pump (Grease pump with no grease cartridge. For cartridge, order 2892 6100 20 - 1 cartridge per Unit)

Figure C.41 Maintenance Kits Page

Maintenance Kits: The Maintenance Kits page (Figure C.41) displays all service kits required to perform the maintenance activities on the Maintenance page. Included on the page are the service item, the time interval for each time, and the part number and description of the service kit required to perform the maintenance function, specific to the medical air system installed.

Maintenance Log	
Data at 2010-05-27 11:43:46 Refresh Now Click here to create a downloadable text file	
Page 1 of 2 (17 events total) ← ← → →	
Date / Time	Event
2010/05/26 14:12:18	System - Rotate Dryers - Maintenance Performed (291.7 hrs)
2010/05/26 13:33:01	System - System Sensor Kit - Maintenance Performed (291.2 hrs)
2010/05/26 13:31:50	System - System Sensor Kit - Maintenance Due (291.2 hrs)
2010/05/26 13:31:50	System - System Sensor Kit - Maintenance Interval Reset (291.2 hrs)
2010/05/26 09:55:49	System - Check Receiver Drain - Maintenance Interval Reset (288.0 hrs)
2010/05/26 09:55:13	System - Check Receiver Drain - Maintenance Due (288.0 hrs)
2010/05/25 09:20:10	System - Check Receiver Drain - Maintenance Performed (264.7 hrs)
2010/05/25 07:23:00	System - Check Receiver Drain - Maintenance Due (263.0 hrs)
2010/05/24 08:11:04	System - Check Receiver Drain - Maintenance Performed (239.8 hrs)

Figure C.42 Maintenance Log Page

Maintenance Log: The Maintenance Log page (Figure C.42) displays a listing of all maintenance activity for both the system and the units. The log displays the date/time of the event and a description of the event (maintenance due alert, maintenance performed, interval reset). The Maintenance Log page includes the option to create a downloadable text file of the log.

Network Devices				
Data at 2010-05-27 11:44:45 Refresh Now (Auto refresh every 5 seconds)				
Device Name	Browse	Device Type	Device S/N	Device Location
TAE_12100	http://10.213.9.43	This_TAE	12100	West Wing, Level 6 Plant Room
TAE_12102	http://10.213.11.79	TAE_Scroll	12102	Ray Wilson's Office

Figure C.43 Network Devices

Network Devices: The Network Devices page (Figure C.43) displays all TotalAlert and TotalAlert Embedded devices on the facility's network. The page displays the device name, IP address, device type, device serial number, and device location. By clicking the IP address of a device, the user moves to the website of that device.

Appendix C: TotalAlert Embedded Control System

Device Information	
Data at 2010-05-27 11:45:01 Refresh Now	
System Information	
Item	Value
System Model Number	SAS15D-240V-DCDY
System Serial Number	HOP159621
System Warranty Level	Standard
Service Contact	Gordon Yeomans
Device Name	TAE_12100
Device Type	TAE_SCROLL
Device Serial Number	12100
Device Location	West Wing, Level 6 Plant Room
Facility Name	Doncaster Royal Infirmary
Facility Contact	Mike Myers
System Ship Date	2010/04/01
System Startup Date	2010/04/26
System Startup Person	Matt Clark
System Wiring Diagram PN	4107950010

Figure C.44 Device Information

Device Information: The Device Information page (Figure C.44) displays information specific to the TotalAlert Embedded device. The information displayed includes an array of details pertaining to the system, including model number, serial number, contact information for service, and much more. The Device Information page includes specific information about the printed circuit boards found in the control cabinet (hardware and software descriptions).

System Trend				
Data at 2010-05-27 11:46:06 Refresh Now Click here to create a downloadable CSV file				
Date / Time	Tank Pressure (psig)	Dew Point (Degrees C)	Ambient Temp. (Degrees F)	Cabinet Temp. (Degrees F)
2010/05/27 11:45:51	120.85	-98	24	24
2010/05/27 11:43:51	120.85	-98	24	24
2010/05/27 11:41:51	120.85	-98	24	24
2010/05/27 11:39:51	120.85	-98	24	24
2010/05/27 11:37:51	120.85	-98	24	24
2010/05/27 11:35:51	120.85	-98	24	24
2010/05/27 11:33:51	120.85	-98	24	24
2010/05/27 11:31:51	120.85	-98	24	24
2010/05/27 11:29:51	120.85	-98	24	24
2010/05/27 11:27:50	120.85	-98	24	24
2010/05/27 11:25:51	120.85	-98	24	24
2010/05/27 11:23:51	120.85	-98	24	24

Figure C.45 System Trend

System Trend: The System Trend page (Figure C.45) displays multiple items on the system measured at specified time intervals. These items may include tank pressure, dew point, CO level, and ambient temperature. The time intervals may be every 30 seconds, 2 minutes, 5 minutes, or 20 minutes (see section C.7.6 System Trend Setup). The System Trend page includes the option to create a downloadable spreadsheet file of the events. To clear the system trend data, go to the System Trend Setup page on the website (see Section C.7.6).

System Log	
Data at 2010-05-27 11:48:08 Refresh Now Click here to create a downloadable text file	
Page 1 of 36 (355 events total) ← → ↶ ↷	
Date / Time	Event Message
2010/05/27 11:43:30	Alarm - System - Control Circuit Unit 1 (120# 24F)
2010/05/27 11:43:29	Alarm - System - Control Circuit Dryer 2 (120# 24F)
2010/05/27 11:43:29	Alarm - System - Control Circuit Dryer 1 (120# 24F)
2010/05/27 11:43:29	Alarm - System - Control Circuit Unit 2 (120# 24F)
2010/05/27 11:43:29	Alarm Reset - System (120# 24F)
2010/05/27 11:43:29	Alarm - System - Control Circuit Dryer 2 (120# 24F)
2010/05/27 11:43:29	Alarm - System - Control Circuit Dryer 1 (120# 24F)
2010/05/27 10:45:35	Alarm Reset - System (120# 24F)

Figure C.46 System Log

System Log: The System Log page (Figure C.46) displays a listing of all alarm and shutdown activity for both the system and the units. The log displays the date/time of the event and a description of the event (alarm/shutdown, reset, test). The System Log page includes the option to create a downloadable text file of the log.

Appendix C: TotalAlert Embedded Control System

C.7.12 Available for Download

In three of the viewing pages on the website, the user can download information for analysis or record keeping. The Maintenance Log, System Trend, and System Log pages all contain a link for the user to click to create the downloadable file.

1. Click on one of the pages to display the information available for download (Maintenance Log, System Trend, or System Log).
2. Click on the link to create a downloadable file, located in the upper right above the displayed information.
3. Select to view the information on the web page or to save the file to the computer.

The Maintenance Log and the System Log create text files that list all of the events in descending order from most recent to oldest. See Figure C.47.

The System Trend creates a CSV file (spreadsheet) that contains all of the trend information, descending from most recent to oldest. See Figure C.48.

Appendix C: TotalAlert Embedded Control System

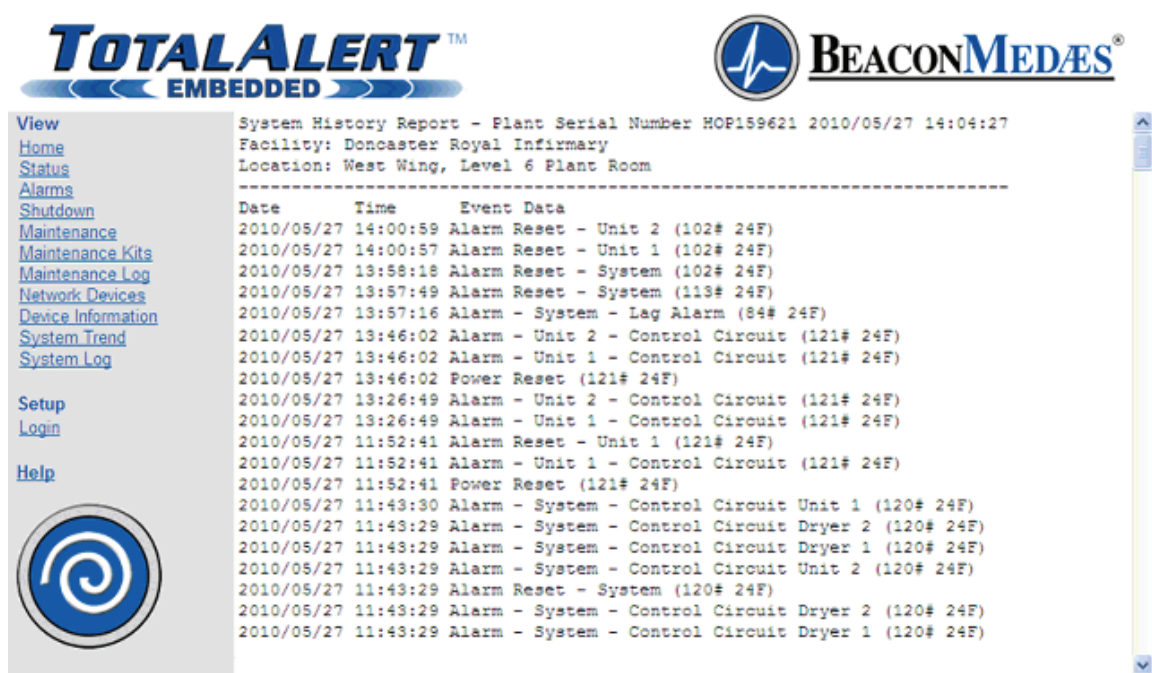


Figure C.47 System Log Download

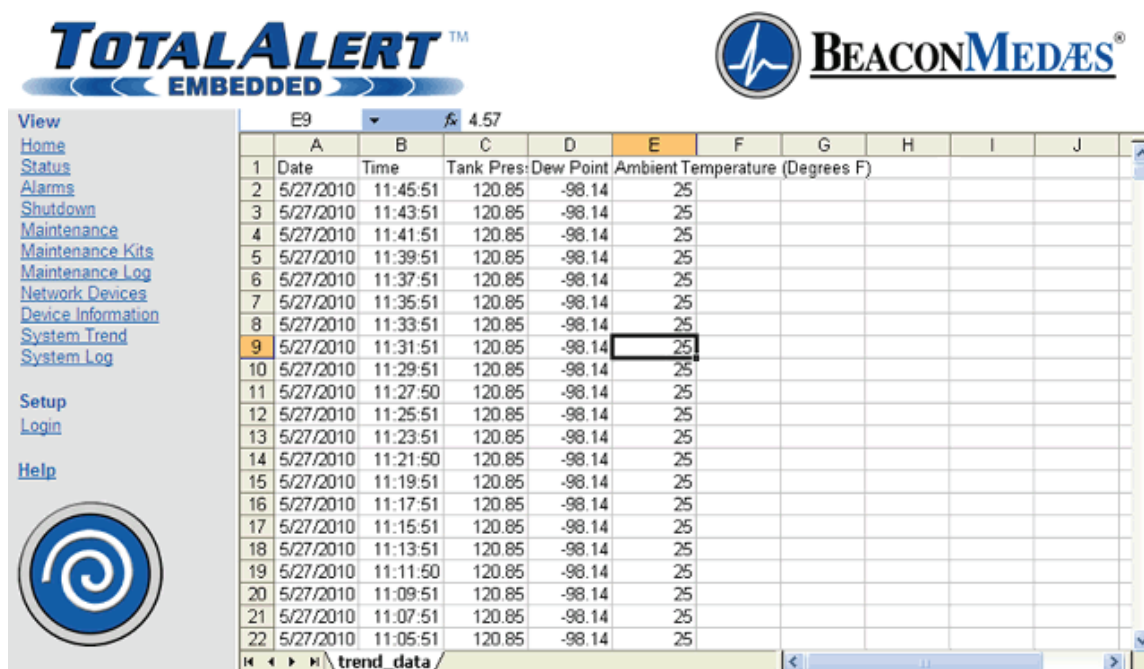


Figure C.48 System Trend Download

Appendix C: TotalAlert Embedded Control System

C.8 BACnet Activation

C.8.1 BACnet Activation

To activate the BACnet device, go to the TotalAlert Embedded web page for the system, using the IP address found in the set up menu on the touchscreen. Enter the password protected Setup section by logging in with the basic password (see section C.4).

C.8.2 BACnet Setup

On the BACnet Setup page, set the BACnet Device ID#. The default value is 10000 but the owner must set this to the Device Number they want for their BACnet Network. Enter a name for the BACnet Device after assigning the ID# (see Figure C.49).

C.8.3 BACnet Unlock

After submitting the ID# and name, the BACnet Unlock Screen appears. If system shipped with the BACnet Activation complete, the Activation code is populated and the readout states “Unlocked” (see Figure C.50).

If the system is not unlocked during production, the Activation code must be entered at this time. Enter the code and press Submit. When the page is reloaded, the code will remain in place and the box to the right will show “Unlocked”.

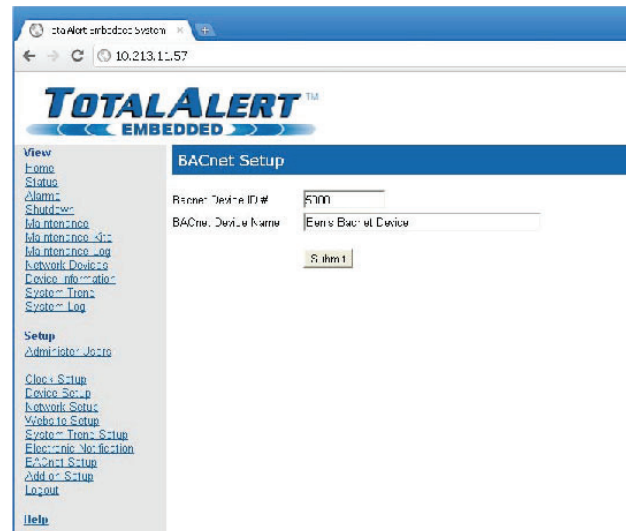


Figure C.49 BACnet Setup

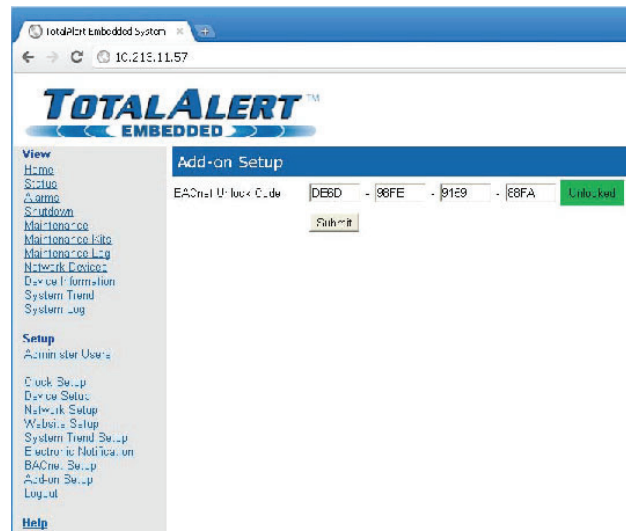


Figure C.50 BACnet Unlock



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