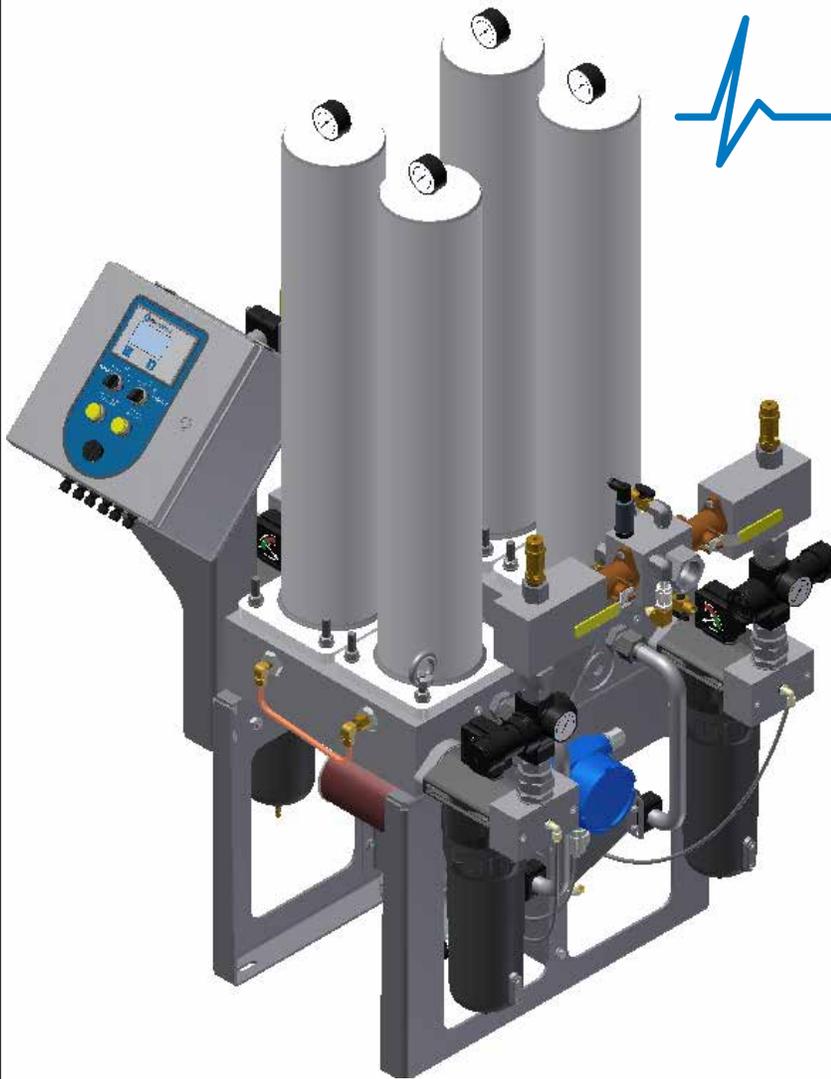


Installation, Operation and Maintenance Instructions

 **Lifeline**
Medical Systems



Retrofit Dryer 35-200 CFM

Part number 4107 9013 48

Revision 00

May 1, 2013



BEACONMEDÆS[®]



Installation, Operation and Maintenance Manual
Medical Air Dryer

This unit 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

1800 Overview Drive
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 and support materials without notice or obligation.

Part number 4107 9013 48

Revision 00

May 1, 2013

Table of Contents

8.9 Replacement

Safety Precautions

1.0 General Information

- 1.1 Desiccant Dryer
- 1.2 Drying Cycles

2.0 Installation

- 2.1 Inspection Upon Receiving
- 2.2 Handling
- 2.3 Location
- 2.4 Space Requirements
- 2.5 Piping
- 2.6 Wiring

3.0 Operation

- 3.1 Start-up
- 3.2 Procedure to switch off the dryer
- 3.3 Normal start-up
- 3.4 Maintenance shut down

4.0 Troubleshooting

5.0 Maintenance

- 5.1 Routine Inspection
- 5.2 Maintenance schedule
- 5.3 Service Kits

6.0 Replace/Repair

- 6.1 Desiccant replacement procedure
- 6.2 Check Valve Replacement Procedure

7.0 Specifications

8.0 Ceramic Dew Point Transmitter

- 8.1 General Information
- 8.2 Introduction
- 8.3 Specifications
- 8.4 Operation
- 8.5 Alarms
- 8.6 Maintenance
- 8.7 Troubleshooting
- 8.8 Sensor Calibration

9.0 CO Transmitter

- 9.1 General Information
- 9.2 Introduction
- 9.3 Specifications
- 9.4 Power Connection
- 9.5 Alarm
- 9.6 Operation
- 9.7 Maintenance
- 9.8 Sensor Checkout and Replacement
- 9.9 Calibration
- 9.10 Troubleshooting
- 9.11 Accessories and Replacement Parts

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.
- All wiring should be connected by a certified electrician.
- 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 towers, valves, fittings, connections, or other devices.
- Notify appropriate hospital personnel if repairs or maintenance will affect available compressed air levels.

- Prior to using the **LifeLine** Medical Air dryer, the medical facility must have a Verifier perform all installation tests as specified in NFPA 99. The medical facility is also responsible for ensuring that the Medical Air meets the minimum requirements for Medical Air as specified in NFPA 99.

- Check all safety devices periodically for proper operation.

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

1.0 General Information

CAUTION: This manual is designed to serve as the installation, operation and maintenance guide for your medical air dryer. 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.

A dryer serial number plate has been permanently attached to the dryer. When requesting information, service, ordering spare parts, etc., please reference all information supplied on the serial number plate.

To facilitate maintenance, recommended spare parts for your specific dryer model are available. Failure to maintain recommended spare parts and filter cartridges may 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** at 888-4-MEDGAS option 4, or fax 803-817-5770.

This Dryer is not suitable for Liquid Ring applications.

1.1 Desiccant Dryer

Duplex System

The duplex dryer system includes two, twin tower desiccant dryers, prefilters, afterfilters, regulators, safety relief valves, and integral purge saving control system with a four-valve bypass arrangement. A dew point hygrometer/CO monitor and certifier's test port is included in the system. All of the above are pre-wired and pre-piped in accordance with the latest edition of NFPA 99, Standard for Healthcare Facilities. The system is completely pre-packaged for easy passage through a 34.5" wide opening.

Dryer Design

The dryer is a twin tower, pressure swing adsorption, regenerative type. The desiccant dryer is sized for NFPA peak calculated demand and capable of producing a -12°C (10°F) outlet pressure dew point at 55 psig. Purge flow is minimized through an integral purge-saving control system. The desiccant is contained within a packed bed canister to prevent excessive downstream dusting. Tower changeover is achieved by means of a 441™ transfer valve with a ceramic plate design capable of a guaranteed minimum life of five years without servicing.

Prefilter

The coalescing prefilter is rated for 0.01 micron and capable of removing both aerosols and particulate from the gas stream before the gas enters the dryer. Liquids collected by the assembly's filter cartridge fall to the housing sump, which are drained by a float in prefilter. The prefilter is mounted and pre-piped with the drain float and element change indicator.

Afterfilter

The afterfilter is rated for 1 micron particulate removal. The afterfilter is mounted and pre-piped with an element change indicator.

Dryer with Combination Dew Point Hygrometer/CO Monitor

The dryer incorporates a dew point hygrometer/CO monitor with integral chemical CO sensor that is mounted, pre-piped, wired and includes remote alarm contacts. The hygrometer sensor is a ceramic type. Aluminum oxide sensors are not used. The system accuracy has a minimum of $\pm 2^\circ\text{C}$ for dew point and $\pm 2\text{ PPM}$ (at 10 PPM) for carbon monoxide. The dew point alarm is factory set at 2°C (36°F) per NFPA 99, and the CO alarm is factory set at 10 PPM. High CO and high dew point conditions are indicated with visual and audible alarms with isolated contacts for remote alarms.

Dryer with Dew Point Hygrometer ONLY

The dryer shall incorporate a dew point hygrometer that is mounted, pre-piped, wired and include remote alarm contacts. The hygrometer sensor shall be a ceramic type. The system accuracy shall be a minimum of $\pm 2^\circ\text{C}$ for dew point. The dew point alarm is factory set at 2°C (36°F) per NFPA 99 and shall be adjustable. A high dew point condition shall be indicated with visible and audible alarms with isolated contacts for remote alarms.

Control Panel

The control panel allows the operator to view the current status alarm condition and control both Dryer 1 and Dryer 2.

The visual display is a 2 7/8" diagonal LCD which shows both the Dew Point and CO condition. The Dew Point is displayed in either degrees F or C, the CO is displayed in parts per million. When the Dew Point or CO is in alarm condition, the display flashes DP Alarm or CO Alarm, sounds the alarm horn, and activates the remote alarm contacts.

There are two alarm indicator buttons that light up with the alarm condition. The indicator buttons stay lit until the alarm condition is resolved and the button is reset. Pushing the indicator buttons will also silence the alarm horn. The horn is rated at 95 decibels at 24 inches.

The control panel incorporates two selector switches. One for Dryer 1 and one for Dryer 2. The three positions for each switch are Manual, Auto, and Off.

See Figure 1.1 and Figure 1.2 For Control Panel Components

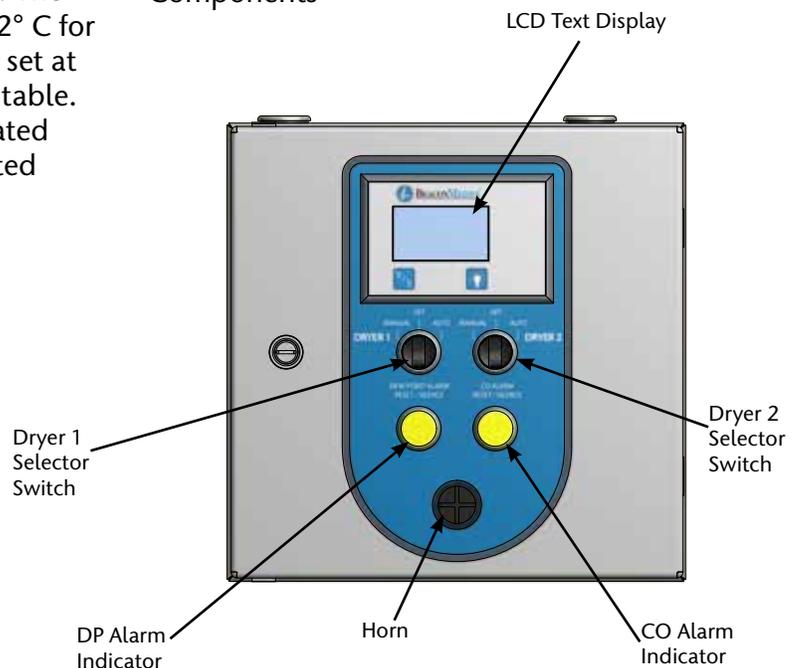


Figure 1.1 Control Panel Components

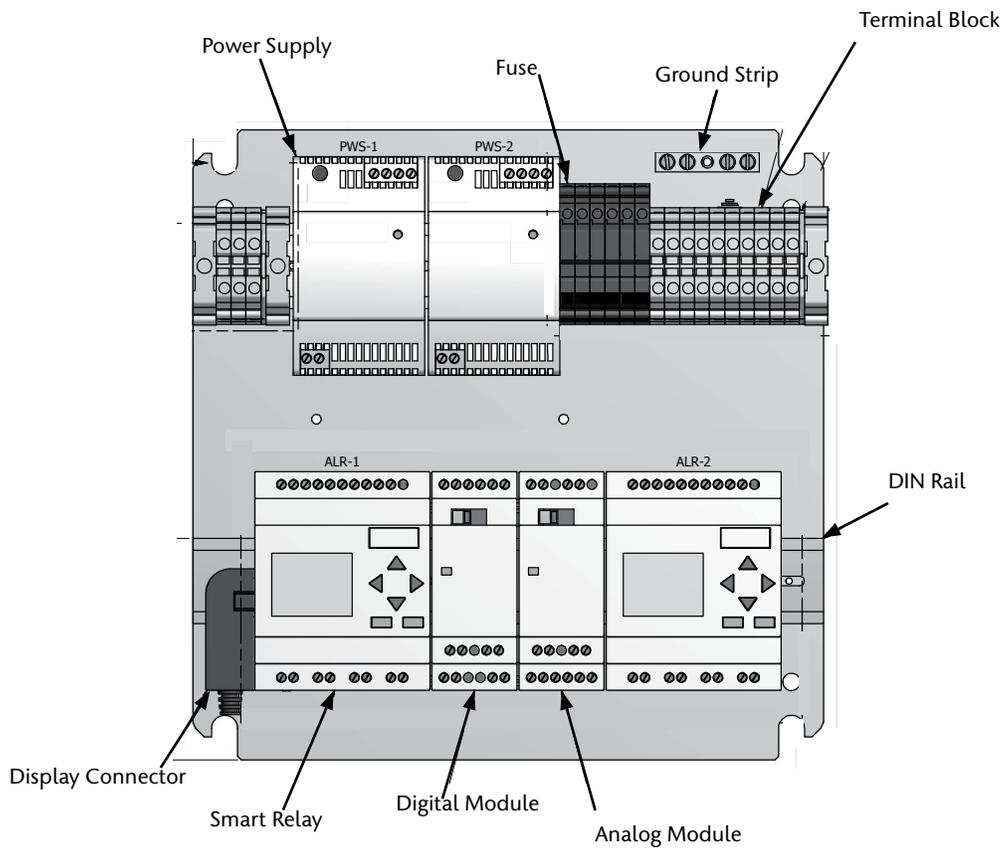
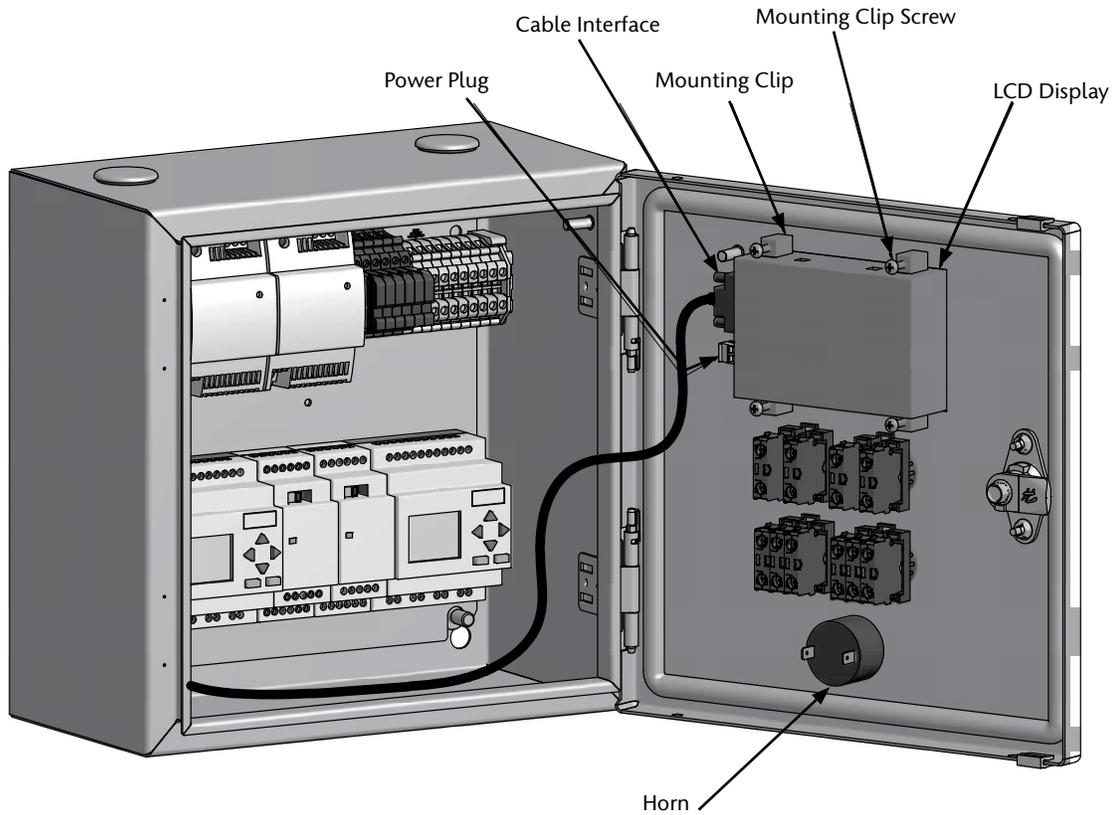


Figure 1.2 Control Panel Components

1.2 Drying Cycles

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

1.2.1 Manual Purge

When the dryer selector switch is in the “Manual purge” position, the dryer will shift towers every 30 seconds. At normal operating conditions, one tower is at line 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 on-line chamber will exhaust, and the chamber that is regenerating (purging) will come to line pressure. There is a five second repressurization cycle. If the selector switch is on the “Manual” position, the dryer will use 15% of the system capacity to purge the dryer.

1.2.2 Automatic Purge

When the dryer selector switch is in the “Auto” position, the dew point monitor controls the dryer purge, depending on the dew point condition. When the dew point reading is above the setpoint of -10°C (14°F), the dryer will purge (one tower at line pressure one tower at 0 p.s.i.). When the dew point is below the setpoint of -10°C (14°F) on the dew point monitor, purge is turned off by closing the purge valve. In this condition both towers will be at line pressure and the dryer will not shift towers until the dew point is above -10°C (14°F).

2.0 Installation

2.1 Inspection Upon Receiving

The condition of the **Lifeline**® Medical Air dryer should be carefully inspected upon delivery. Any indication of damage by the carrier should be noted on the delivery receipt, especially if the dryer will not be immediately uncrated and installed. The **Lifeline**® dryer may remain in its shipping containers until ready to be installed. If the dryer is to be stored prior to installation, it 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 dryer until it is 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 dryer can be moved by any means utilizing the lifting eyes supplied at the mounting point of the dryer towers. **Lifeline**® dryers are designed to go through 34.5" doorways. Units should be placed to ensure easy access to perform maintenance and high visibility of indicators and gauges.

2.3 Location

The **Lifeline**® Medical Air dryer 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 dryer to a flat, level surface capable of supporting the weight and forces of the unit. **No special foundation is required.** However, the dryer must be securely bolted using all mounting holes provided in the bases. If a raised concrete pad is used, the dryer 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.

The area should have an average ambient temperature of 21°C (70°F) with a minimum ambient temperature of 4.4°C (40°F) and a maximum ambient temperature of 40°C (104°F) (Note: At temperatures below 0°C (32°F) freezing of the condensate can occur which could affect operation.)

2.4 Space Requirements

The dryer 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 dryer for ventilation and maintenance. A minimum vertical distance of 36" is required above the dryer for ventilation and maintenance. Refer to the installation drawing supplied with your dryer for actual dimensions of the modules.

2.5 Piping

All connecting pipe must be pre-cleaned for medical gas in accordance with NFPA 99. Pipe size should not be reduced below the size of the pipe connections on the dryer.

2.0 Installation

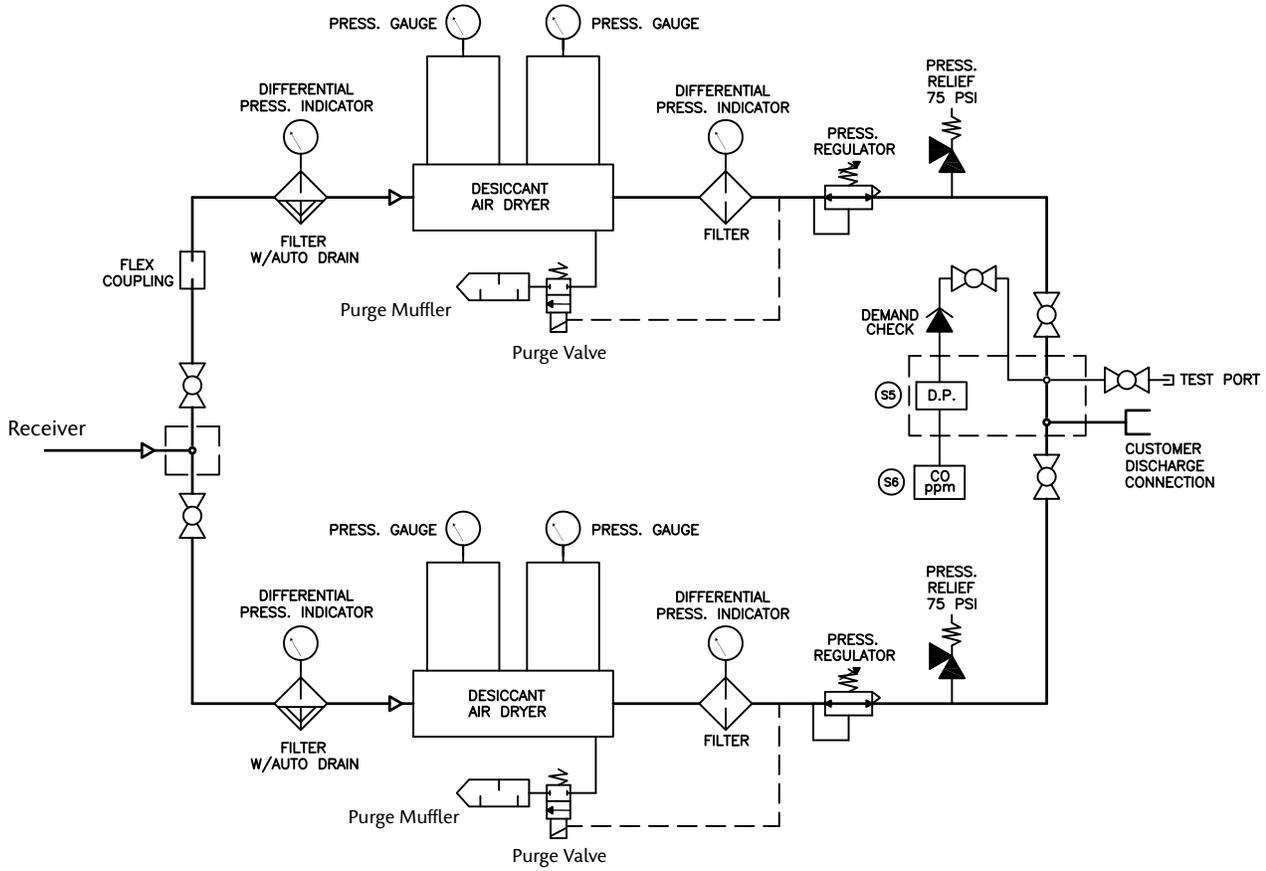


Figure 2.0 Typical Dryer Piping

2.0 Installation (continued)

2.6 Wiring

WARNING!
BE SURE TO DISCONNECT ALL ELECTRICAL POWER FROM THE DRYER BEFORE PERFORMING ANY ELECTRICAL PROCEDURES.

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

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

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

WARNING!
All electrical and alarm wiring connections are to be made at the terminal strip inside the control panel. (Refer to diagrams supplied with your dryer)

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

Electrical power for the medical air dryer must be supplied from the emergency life support circuit.

Check the control voltage, phase, and amp ratings before starting the electrical installation, and make sure the voltage supplied by the hospital is the same. The wire size should be able to handle peak amp load of the dryer. Refer to the nameplate mounted on the dryer or the wiring diagram for power requirements.

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

ONLY qualified electricians should make power connections to the control panel and any interconnecting wiring.

Do not drill additional holes in control panel as this may void system warranty.

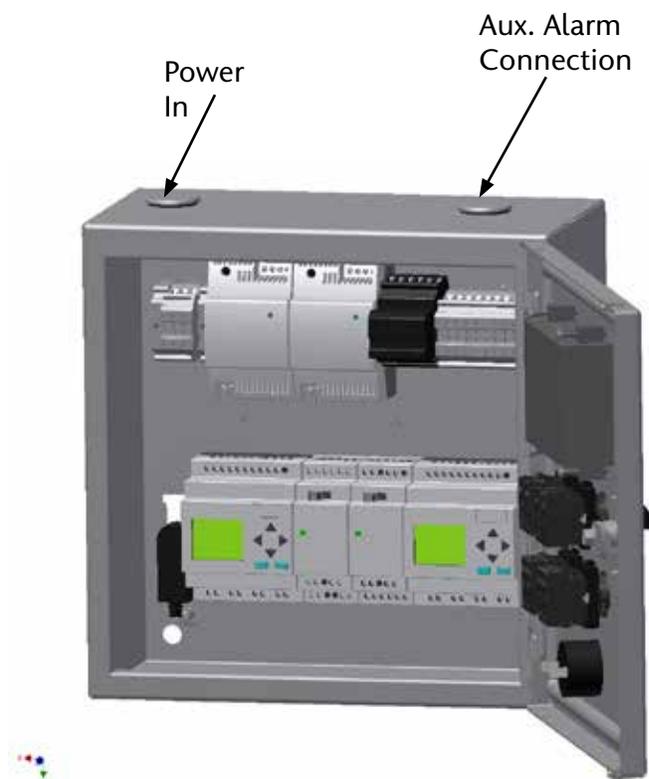


Figure 3.0 Control Box Wiring Openings

3.0 Operation

3.1 Start-Up

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. Rotate the dryer selector switch to the “Manual” position. The dryer will now begin to cycle.
6. Ensure that dryer cycles.
7. Slowly OPEN the dryer outlet isolation valve.
8. Adjust Regulator to 50-55 psi.
9. Open the dew point and CO sensor (if supplied) isolation valves.
10. Check for airflow at the dew point sensor orifice.
11. Operate the dryer for five to ten minutes with the source isolation valve closed.
12. During the conditioning run, test for leaks. Repair any leaks and retest.

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

11. Rotate the dryer selector switch to the “Auto” position.
12. On the completion of the conditioning run, **slowly open** the source isolation valve. The dryer will now be fully operational.

3.2 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. Turn selector switch on control panel to the “Off” position.
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.

3.3 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. Set the appropriate dryer to Automatic mode.
2. Slowly OPEN the dryer inlet isolation valve.
3. Slowly OPEN the dryer outlet isolation valve.
4. Check operation of the dryer.

3.4 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.
 - 3a. Depressurize all filters by opening the manual drain valve.
4. Switch off electrical power to the dryer.

WARNING:

Display prominent notices indicating that maintenance is being carried out.

4.0 Troubleshooting

WARNING:

To protect the lives of patients, always notify the appropriate medical 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.

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.

4.0 Troubleshooting (continued)

Problem	Possible Causes	Solution
Dryer not cycling	Main power disconnected Power failure Main fuse blown Fuse blown in control circuit Dryer circuit board failure Dryer selector switch in Off position Loose or faulty connection Switching valve failure	Turn on main power Restore power Replace fuse Replace fuse Check and replace if defective Select Automatic or Manual mode Check & tighten all wire connections Replace switching valve
Dew point degradation	Incorrect purge air flow Excessive system flow rate Inlet air temperature is above the dryer's design inlet working temperature Liquids entering the dryer inlet Purge muffler restricted	Check purge orifice for blockage. Clean and replace as required Reduce inlet flow rate and/or increase operating pressure 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 40°C (104°F) 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 float drain. Ensure that it is not clogged and is draining properly. Repair or replace as necessary, if a problem is noted. Replace muffler.

4.0 Troubleshooting (continued)

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

***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.

5.0 Maintenance

WARNING:

To protect the lives of patients, always notify the appropriate medical 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.

5.1 Routine Inspection

Check that the online dryer cycles correctly and that tower pressure gauges are reading the appropriate pressures:

- A. When purging, one tower will be at zero psi and the other at system pressure.
- B. When in purge control, both towers will be at system pressure.

Check the filter element change indicators.

Check that the Dew Point and CO readings are within normal levels:

- A. The Dew Point should be within minus 8 to minus 12 degrees C.
- B. The CO reading should normally be zero.

Check that there is flow through the dew point orifice.

5.2 Maintenance Schedule

1. Monthly procedure - Rotate Dryers - dryers should be exercised on a monthly basis to evenly distribute run time and ensure proper dryer performance.

2. Six month procedure - Calibrate the CO transmitter.

3. Annual procedure - Replace all filter cartridges, purge mufflers and automatic drain valves.

4. Two year procedure - Replace the Dew Point and CO sensors.

5. Three year procedure - Change all annual parts, plus change desiccant, check valves and o-rings.

Service Interval	Description
Monthly	Alternate Dryers
Every 6 month	Calibrate CO Transmitter
Every year	Check accuracy of DP Transmitter
Every year	Replace Pre-Filters
Every year	Replace Drain Valves in Pre-Filters
Every year	Replace After-Filters
Every year	Replace Purge Mufflers
Every 2 years	Replace DP Transmitter
Every 2 years	Replace CO Cell
Every 3 years	Desiccant
Every 3 years	Check Valves
Every 3 years	Tower O-rings
Every 3 years	Canister O-rings
As needed	Switching Valve
As needed	Tower Pressure Gauge
As needed	Purge Valve

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

5.0 Maintenance (continued)

5.3 Service Kits

Note: The service kits listed in this section are standard for NFPA 99 medical air dryers.

5.3.1 6-Month CO Service Kits (For Dryers with CO Transmitter)

KIT NUMBER	DESCRIPTION	QTY	CONTENTS
4107 6525 13	GAS - Zero Gas Bottle CO Free	1	0 PPM CO Gas Bottle
4107 6525 14	GAS - 20 PPM CO Gas Bottle	1	20 PPM CO Gas Bottle
4107 4004 63	KIT - CO Calibration	1	20 PPM CO Gas Bottle 0 PPM CO Gas Bottle 0.5 LPM Regulator #ABL-4021 Nylon Tubing Storage Case

5.3.2 1-Year Service Kits

KIT NUMBER	DESCRIPTION	QTY	CONTENTS
4107 4015 10	KIT - Retrofit Dryer - 35 CFM	1	(2) Dryer inlet filters (2) Dryer discharge filters (2) Inlet filter float drains (2) Purge mufflers
4107 4015 11	KIT - Retrofit Dryer - 55 CFM	1	
4107 4015 12	KIT - Retrofit Dryer - 75 CFM	1	
4107 4015 13	KIT - Retrofit Dryer - 105 CFM	1	
4107 4015 14	KIT - Retrofit Dryer - 155 CFM	1	

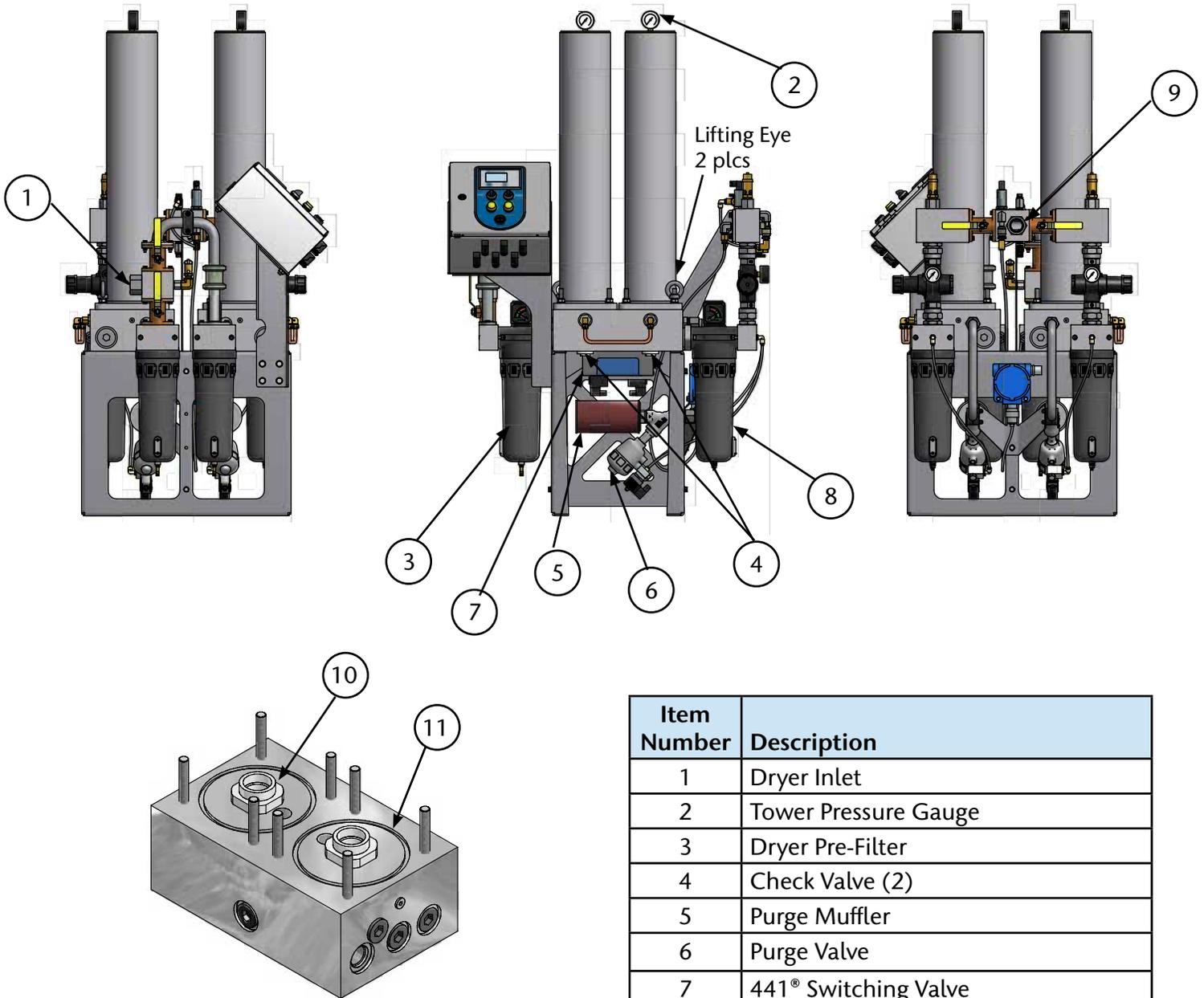
5.3.3 2-Year Sensor Kits

KIT NUMBER	DESCRIPTION	QTY	CONTENTS
4107 4015 21	Dew Point	1	(1) Dew Point Sensor
4107 4000 59	Dew Point / CO Sensors	1	(1) Dew Point sensor (1) CO sensor

5.0 Maintenance (continued)

5.3.4 3-Year Dryer Service Kits

KIT NUMBER	DESCRIPTION	QTY	CONTENTS
4107 4015 15	KIT - Retrofit Dryer - 35 CFM	1	(2) 6 lb. bags desiccant (4) O-Ring - Canister o-ring (4) O-Ring - Tower o-ring (4) Check Valve (4) O-Ring - Check Valve Plug o-ring
4107 4015 16	KIT - Retrofit Dryer - 55 CFM	1	(3) 6 lb. bags desiccant (4) O-Ring - Canister o-ring (4) O-Ring - Tower o-ring (4) Check Valve (4) O-Ring - Check Valve Plug o-ring
4107 4015 17	KIT - Retrofit Dryer - 75 CFM	1	(4) 6 lb. bags desiccant (4) O-Ring - Canister o-ring (4) O-Ring - Tower o-ring (4) Check Valve (4) O-Ring - Check Valve Plug o-ring
4107 4015 18	KIT - Retrofit Dryer - 105CFM	1	(6) 6 lb. bags desiccant (4) O-Ring - Canister o-ring (4) O-Ring - Tower o-ring (4) Check Valve (4) O-Ring - Check Valve Plug o-ring
4107 4015 19	KIT - Retrofit Dryer - 155 CFM	1	(9) 6 lb. bags desiccant (4) O-Ring - Canister o-ring (4) O-Ring - Tower o-ring (4) Check Valve (4) O-Ring - Check Valve Plug o-ring
4107 4015 20	KIT - Retrofit Dryer - 200 CFM	1	(11) 6 lb. bags desiccant (4) O-Ring - Canister o-ring (4) O-Ring - Tower o-ring (4) Check Valve (4) O-Ring - Check Valve Plug o-ring



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

Figure 4.0 Desiccant Dryer Components

6.0 Replace / Repair

6.1 Desiccant Replacement Procedure

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.

WARNING:

Used desiccant material must be 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 dis-assembly.

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 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.

6.2 Check Valve Replacement Procedure

1. Remove the caps/plugs from the underside of the dryer block. See Figure 5
2. Using a 1 1/8 deep well socket, remove the check valves.
3. Replace check valve and cap/plug in dryer block.

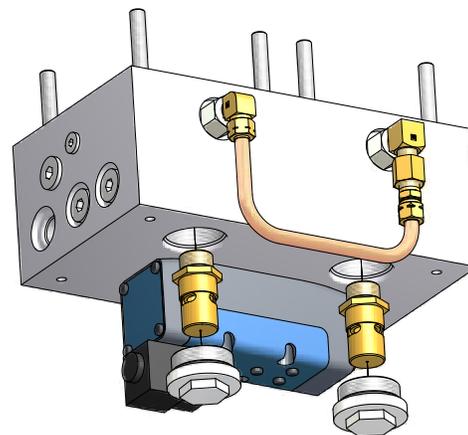


Figure 5.0 Dryer Block Check Valves

7.0 Dryer Specifications

Type:	Desiccant Heatless
Operating Pressure:	60 psig minimum, 135 psig maximum
Maximum Inlet Air Temperature:	104°F
Ambient Temperature:	4.4°C (40°F) minimum, 40.5°C (105°F) maximum
Pressure Dew Point Delivery @ 50 psig:	-10°C (14°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 13 psig @ Rated Flow
Desiccant:	Activated Alumina
Control:	Fully automatic solid-state electric
Supply Voltage:	110V - 240V/1/50-60 Hz
Control Voltage:	24VDC Power (Control Voltage)

8.0 Dew Point Transmitter

8.1 General Information

CAUTION: This manual is designed to serve as the operation and maintenance guide for your Dew Point Transmitter. 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 medical 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 Medical Air line.

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

8.2 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.

8.3 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)

8.3.1 Output

Analog output: 4 - 20 mA

8.3.2 General

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

8.4 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.

8.0 Dew Point Transmitter (continued)

8.5 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 Medical 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.

8.6 Maintenance

8.6.1 Repair Policy

Do not use a dryer that is not functioning properly until all necessary repairs have been made and the dryer has been tested to determine that it is functioning in accordance with the manufacturer’s published specifications. Contact **BeaconMedæ’s 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.

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 **BeaconMedæ’s**. Test the unit after installation of replacement parts to make certain that it complies with the published specifications.

8.6.2 Maintenance Schedule

Maintenance	Frequency	Action
Check flow through orifice	Monthly	Check for proper flow
Check transmitter accuracy	Yearly	Verify dew point sensor accuracy (contact BeaconMedæ’s)
Replace Sensor	Every 2 years	See Section 8.9

8.0 Dew Point Transmitter (continued)

8.7 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
Erratic display	Unit defect	Contact BeaconMedæS
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

8.0 Dew Point Transmitter (continued)

8.8 Dew Point Sensor Calibration

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

8.9 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	1089 9481 53	1
Cable	4107 6510 89	1

NOTE: The Dew Point Sensor is included in the 2-Year System Sensor Kits as shown in section 5.2.3. If ordering the 2-Year System Sensor Kits, there is no need to order the above Sensor as well.

9.0 CO Transmitter

9.1 General Information

CAUTION: This manual is designed to serve as the operation and maintenance guide for your CO 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 medical gas line connections, make sure the system is depressurized in order to avoid personal injury.

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

9.2 Introduction

The CO transmitter is a continuous, on-line instrument that measures the carbon monoxide level in the final product line. The instrument's electronics are enclosed in a NEMA-4 corrosion resistant case. The unit operates on 24 VDC power supplied from the control panel and sends a 4-20mA signal to the control panel. The transmitter uses a state-of-the-art electrochemical cell for detecting carbon monoxide. The sensor has a life expectancy of approximately two years. It is easily replaced and should be periodically calibrated as its output diminishes during its life especially during the final months. Contact **BeaconMedæ's Technical Services** department at 1-888-4MEDGAS (1-888-463-3427) for technical support or to order spare parts.

9.3 Specifications

1. Analog output: 4-20mA
2. Operation Voltage: 24 VDC
3. Sensor body material: Aluminum
4. Air Consumption: Minimum 0.5 to 0.9 CFH (14 to 25 lph)

9.4 Power Connection

This is a two wire transmitter. Connect to 24VDC power supply only (See Fig 9.1).

9.5 Alarms

CO levels that exceed 10 ppm set point shall cause an alarm condition at the control panel. When the CO level exceeds the set point, the alarm contacts are de-energized. The alarm remains de-energized until the alarm condition is cleared by the operator. A high CO alarm will activate if the transmitter loses power or is disconnected from the control system.

9.0 CO Transmitter (continued)

9.6 Operation

CAUTION: At initial startup, if the unit is reading a gas level, do not make any adjustments for a few hours until the unit has a chance to warm up and stabilize.

If gas readings remain high or below zero (-0), re-calibration may be needed. We also recommend checking the compressor’s air intake for contamination first.

9.7 Maintenance

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.

Replace damaged parts with components from **BeaconMedæS**. Test the unit after installation of replacement parts to make certain that it complies with the published specifications. Contact **BeaconMedæS Technical Services** department at 1-888-4MEDGAS (1-888-463-3427) for technical support or to order spare parts.

9.7.1 Maintenance Schedule

Maintenance	Frequency	Action
Recalibration	Every 6 months	See Section 9.9
Replace Sensor	Every 2 years	See Section 9.8

9.8 Sensor Checkout & Replacement

To check a sensor’s response, test gas has to be placed on the sensor. When it fails to show a gas response during this test, a new sensor is required.

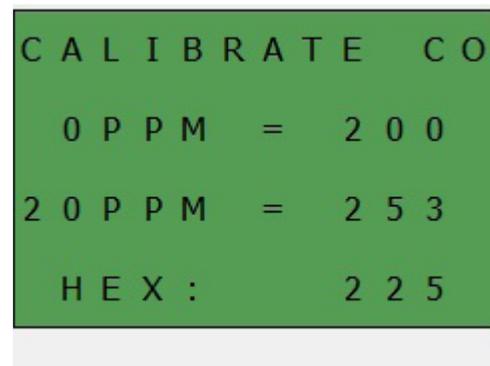
To replace the sensor (see Fig C.1), disconnect the power to the unit, disconnect the inlet air connection and unscrew the cover to access the inside of the transmitter. Next, unplug the CO sensor from the bottom of the internal PC board. Then remove the cap on the bottom of the transmitter and remove the CO sensor and wiring. Unplug the wiring from the sensor and replace it with a new one. Reinstall the sensor in the reverse order. Once the sensor is installed go through steps 9.9 to calibrate and verify the proper operation of the CO sensor.

9.9 Calibration

9.9.1 Zeroing Transmitter

The following procedure should be used for zeroing the transmitter. (See 9.11 Accessories and Replacement Parts for zero gas part numbers)

- Turn on the power and allow the transmitter to warm up for several hours to stabilize.
- Install jumper from terminals 1A to I7 of ALR-1 relay module. (Note: The dryer can operate in either Auto or Manual Purge mode as normal; however, the auxiliary alarm contacts for the CO and Dew Point sensor will remain closed and alarm conditions are disabled.)
- When the jumper has been installed, the LCD will display the calibrate CO screen:



9.0 CO Transmitter (continued)

- Allow the calibration gas from the cylinder to flow across the sensor for approximately 3 minutes to stabilize the sensor.
- Apply zero gas and let flow for 3 minutes. Adjust the zero pot (Z) on the sensor until the HEX value is 200.
- Allow the calibration gas from the cylinder to flow across the sensor for approximately 3 minutes to stabilize the sensor.
- Using the 20 PPM cylinder, adjust the calibration pot ("C") on the CO sensor until the HEX value is 253.

9.9.2 Transmitter Calibration

The following procedure should be used to calibrating the transmitter. (See 9.11 Accessories and Replacement Parts for calibration kit part numbers)

- Zero the transmitter prior to calibration, see 9.9.1 for zeroing procedure.
- Disconnect the zero gas cylinder from the transmitter and connect the air line from the 20 ppm CO gas cylinder.
- Repeat the zeroing procedure and calibration procedure once more to ensure the transmitter is set properly.
- Reinstall the cover on the transmitter.
- Reconnect the inlet air line from the dryer.

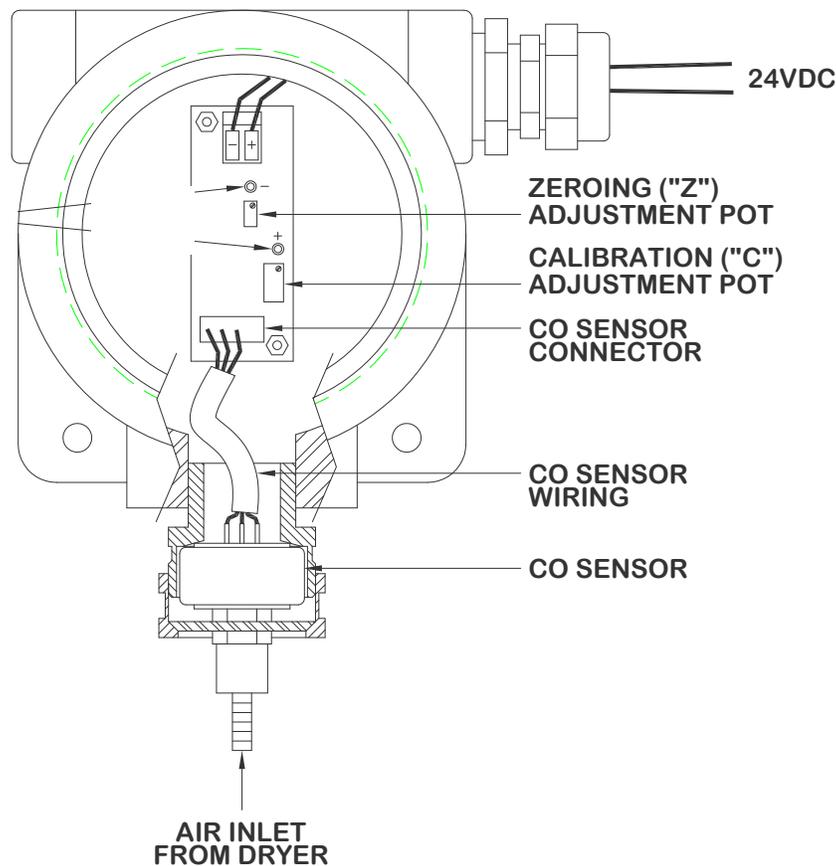


Figure 9.1 CO Transmitter Assembly

9.0 CO Transmitter (continued)

9.10 Troubleshooting

Before servicing the CO sensor, do the following:

WARNING:

Before removing the CO sensor, verify that line pressure has been valved off or reduced to atmospheric pressure.

1. Unplug sensor(s) or turn off monitor.
2. Depressurize the CO sensor.

NOTE: Remote alarms will be activated.

Problem	Possible Causes	Solution
CO Alarm - 10 ppm or above	Inlet air to the medical air system is contaminated	Move air inlet location or remove source of CO contamination
Monitor will not calibrate	Sensor depleted	Replace sensor
CO Alarm - CO reading erratic	Incoming power feed to control panel adjacent to CO signal wires	Separate incoming power feed from CO signal wires
	Possible Radio Frequency Interference	Locate and Remove source of Radio Frequency Interference

9.11 Accessories & Replacement Parts

Description	Part No.	Qty Required
Calibration Kit*	4107 6525 12	1
CO Sensor	4107 6510 38	1
20 ppm Carbon Monoxide Gas	4107 6525 14	1
Impurity Free Air (Zero Gas)	4107 6525 13	1

* Kit includes calibration connector, 0 ppm and 20 ppm test gas in carrying case.

NOTE: CO Sensor is a component of the 2-Year System Sensor Kit as listed in Section 5.2.3. If purchasing the 2-Year System Sensor Kit, there is no need to purchase the CO Sensor listed above in addition.