

ICU MODEL 2100 OPERATIONS MANUAL



Snyder Mfg. Co.
6228 S. Troy Circle
Centennial, CO 80111
303-706-9012 / 800-756-0631
F: 303-706-9015

A. Table of Contents

B. Introduction.....	2
C. General Precautions.....	3
D. Quick Start Instructions.....	4
E. System Overview.....	5
F. Initial Set-up.....	6
1. Locate the unit.....	6
2. Align Cages.....	6
3. Adjust Gates.....	6
4. Accessory Box.....	7
5. Base Unit.....	9
G. System use and operation.....	10
1. Climate Control.....	10
2. Oxygen Control.....	10
3. Carbon Dioxide Monitoring and Scrubbing.....	11
4. Heated Floors.....	11
5. Moisture Control.....	12
6. Fans.....	12
7. Nebulizer/Humidifier.....	12
H. Touch screen instructions.....	13
1. Main Screen.....	13
2. Climate Controls.....	14
3. Oxygen Controls.....	15
4. Carbon Dioxide Monitoring.....	16
5. Graph Pages.....	17
6. Left/Right Heated Floors.....	18
7. Alarm Display.....	19
8. System Options.....	20
9. Remote Control and Monitoring / Upgrading Software.....	21
I. Membrane Control Panel.....	22
1. Operation.....	22
2. 40% O2 Chip.....	22
J. Prior Model ICU Parts.....	23
1. Drip Trays.....	23
2. Oxygen Sensors.....	23
K. Maintenance.....	24
1. Cleaning.....	24
2. Acrylic Doors.....	24
3. Oxygen Sensor.....	24
4. Carbon Dioxide Sensor.....	25
5. Gate Adjustment.....	25
6. Compressor Maintenance.....	26
7. General Maintenance.....	26
8. Oxygen Source information.....	26
L. Troubleshooting.....	27
1. Power Issues.....	27
2. Oxygen System.....	27
3. Compressor and Cooling Issues.....	28
4. Dehumidify Issues.....	29
5. Recovery Base Issues.....	29
6. Touch Screen Control Panel.....	29
7. Membrane Control Panel.....	30
M. System details.....	31
1. Dimensions / Weights.....	31
2. Included Parts.....	31
3. Component Specifications.....	32
4. General Electrical Specifications.....	32
5. Compressor Technical Info.....	33
6. Other Product Specifications.....	34
N. Warranty Information.....	36
O. Reference Information.....	37

B. Introduction

Thank you for purchasing your Snyder Mfg. Intensive Care Unit. We hope that you will be highly satisfied with our product for many years. We have put our passion for the care of animals into the assembly of every one of our units and know that it will serve you well. Please read through this manual to familiarize yourself with the care, use, and operation of your unit. If you have any questions or concerns please give us a call and we will help you out in any way we can.

We have been manufacturing out ICU since 1974. Over the last 40 years we have made many improvements to the system while still retaining our original quality design.

Your intensive care unit is designed to be a closed looped climate and oxygen controlled system. The air within the system can be climate controlled from 35 degrees to 100 degrees Fahrenheit, and have the oxygen concentration adjusted between 20.9% to 100% oxygen. Carbon dioxide is removed from the system using a chemical scrubbing material such as soda lime or baralyme. The system also features the ability to add moisture or medication using bubble-jet nebulizers. Excess moisture is condensed and removed using a moisture catch tray beneath the evaporation coil.

The newest version of our system debuted in 2013 and has several new features. We have completely redesigned the control system for the unit, making it more user friendly and feature rich. All inputs are via a high contrast 10.4" TFT touch screen. All alarms and user settings are readily adjustable and there are help screens available for the main window systems. The system is now viewable and adjustable from most modern browsers and smart phones by connecting the ICU to your local network. This will allow for remote monitoring and adjusting of current ICU conditions.

Another new feature is the ability to monitor carbon dioxide. This will allow you to check the age of the carbon dioxide scrubbing material and to know when the material is no longer keeping up with the patient's respiration rate. The system will read carbon dioxide levels from 0-5000 parts per million (ppm).

We have also added 2 lights to the system, easily toggled via the control screen. These compact, waterproof, LED lights illuminate the chamber providing increased visibility of patients in our cages. Our newest style drip tray holds one gallon of liquid and catches more condensation than our previous models. The compressor compartment is also sloped inward to prevent condensation runoff. The system also has a re-designed compressor system allowing for improved chamber cooling and greater serviceability. This ensures that your system will continue to be useful for many years to come. System oxygen retention and overall system sealing has been improved as well.



C. General Precautions

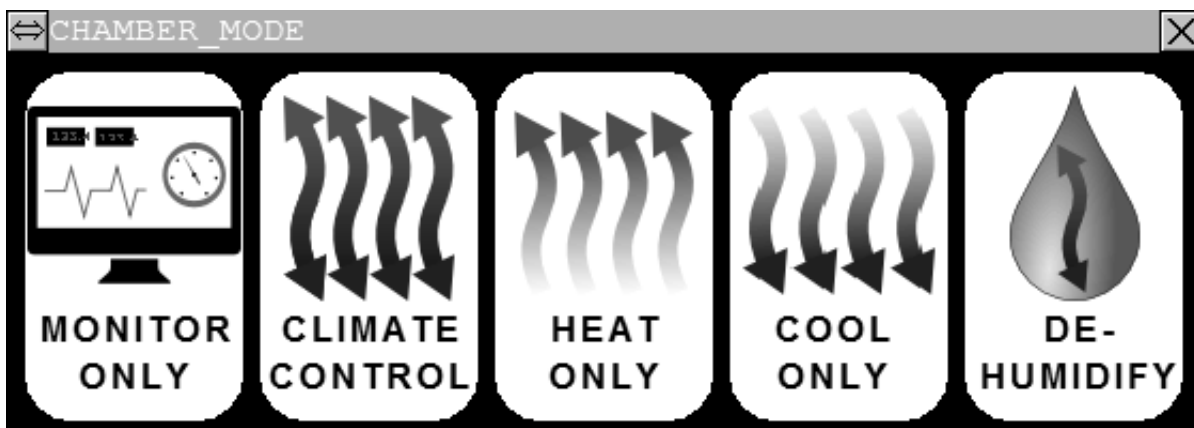
1. Make sure the power twist-lock plug is securely inserted and rotated 1/8 of a turn clockwise.
2. Do not defeat or compromise the grounding on the power cord. Do not convert the 3 prong plug to a 2 prong, non-grounded plug.
3. Use of an extension cord is not recommended. We can supply a longer power cord if needed.
4. This system is designed to run on a 20 amp dedicated circuit with no other significant current draws on that circuit. Please be aware a circuit may include several other outlets and/or lights.
5. Leave at least 2”+ of clearance behind the unit to allow proper ventilation of the compressor system. We recommend placing an object behind the system to prevent accidentally pushing the system up against the wall.
6. Do not use a pen or any other hard, sharp object to press the buttons on the touchscreen.
7. Snyder Mfg. Co. warns that any user who enhances oxygen concentration creates a potentially hazardous environment. Mixtures of oxygen and flammable gases are extremely explosive. Use normal oxygen cautions in the vicinity of the unit.
8. Do not expose the electronics to water.
9. The electrical wiring for the lighting system is run on the top of the cage just below the surface of the laminate. Be careful that you do not damage this wiring when installing or attaching equipment to the top of the ICU. Snyder Mfg. does not warranty negligent damage to the lighting wiring.
10. We do not recommend leaving animals in the unit unattended for long periods of time. Problems could occur, for instance, if the power went out at your facility or you run out of oxygen.
11. Use caution when opening the center 'B' acrylic door when changing the soda lime or checking the drip tray. If the system is set to climate control or to heat only the heating element could quickly warm up to 200 F+ without air circulating past it. This extremely hot element could cause burns or present a fire risk to the entire unit. Make sure to turn off the climate control of the unit if removing the 'B' door for any length of time.
12. Our systems will come with a "new car" smell due to the materials used in manufacturing. This smell will generally dissipate over your first few weeks of use. This odor should be considered nuisance and increasing room air circulation will help to shorten the amount of time the system needs to off-gas.



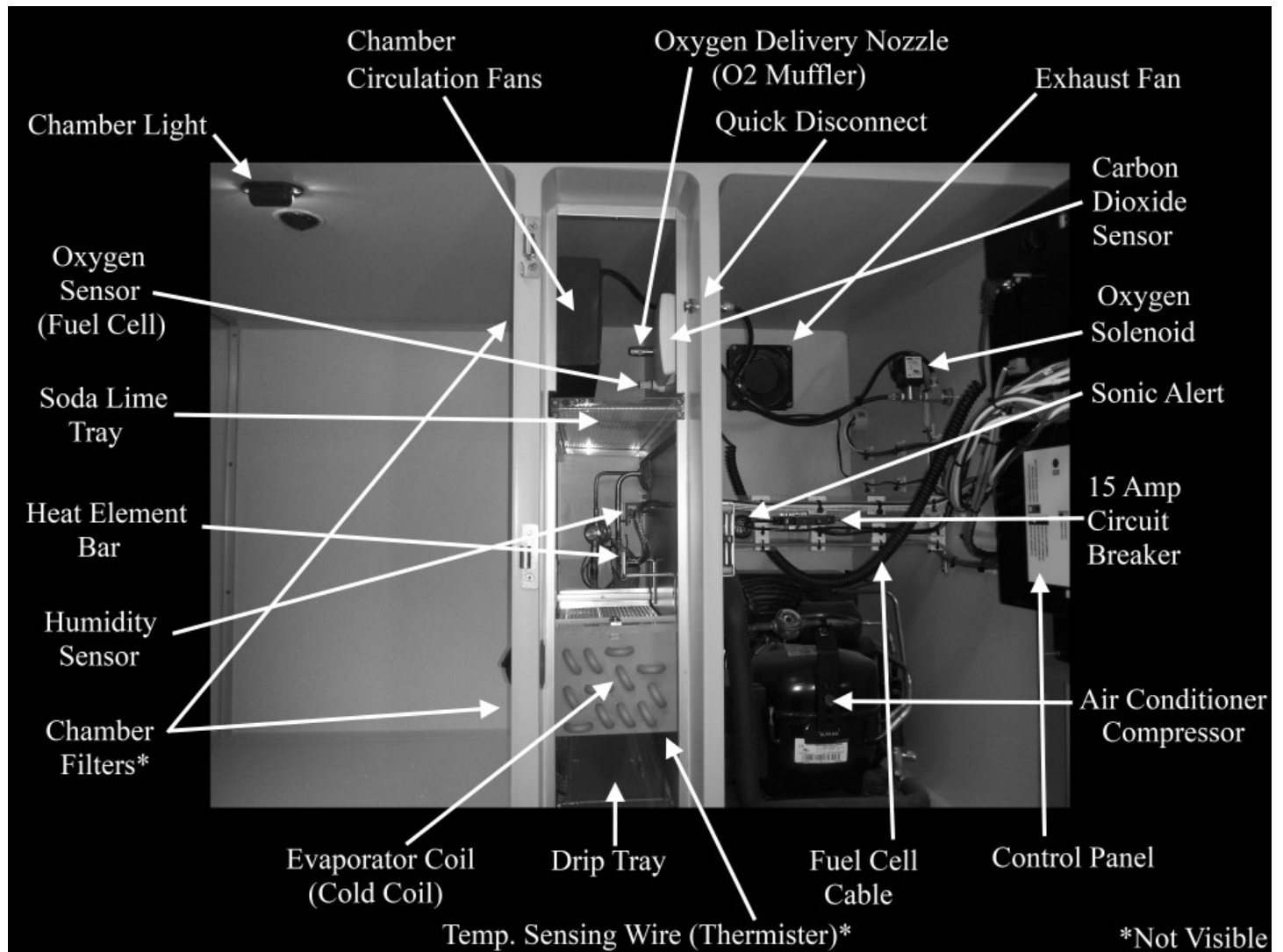
D. Quick Start Instructions

These instructions will allow you to quickly set up and use your system. More detailed operations and set up instructions can be found on page 6.

1. Unpack the unit and discard the packing materials
2. Connect the heated floor wires and temperature sensing wires in the back of the cage
3. Attach the flowmeter and connect to your oxygen supply.
4. Install the carbon dioxide scrubbing material into the tray in the center compartment
5. Optionally install the nebulizer and quick disconnect
6. Connect the power cord
7. Calibrate your oxygen system and choose your settings
8. Adjust your climate control



E. System Overview



Compartment A is the patient compartment on the left side of the unit.

Compartment B is the center 6.5" wide compartment with the cam latched acrylic 'B' door.

Compartment C is control panel and compressor compartment on the right side of the unit.

F. Initial Set-up

1. Locate the unit

- a) If you have any optional heated floors, connect the heated floor and temperature sensing wires to the back of the cage. This is accomplished by pushing the black sensor connectors together and the colored insulated male-female connectors together. The wires can be strung through the wire tie hangers to keep them out of the way.
- b) Locate the metallic compressor filter in the accessory box and install in the back of compartment C.



2. Align Cages

- a) If you have a stacked ICU and the top unit and the base are not lined up, get a few people to help push and pull them until the corners are aligned. Next, place a bead of silicone between the two units to prevent liquid from getting in between the two pieces.
- b) The system utilizes an exhaust fan in the back of the unit to remove heat from the compressor compartment. The compressor heat is also dissipated by bringing in air from the back of the unit. Make sure that the system is not positioned directly against a wall. We recommend at least 2-4" of clearance behind the unit for proper ventilation. Positioning a 2x4" stud, cinder block, or similar item behind the unit will prevent the unit from being inadvertently pressed against the wall.

3. Adjust Gates

- a) Check the base unit gates and ICU acrylic doors for proper locking. They can lose adjustment in shipping or by being on an uneven floor. See gate adjustment instructions for assistance with this.

4. Accessory Box

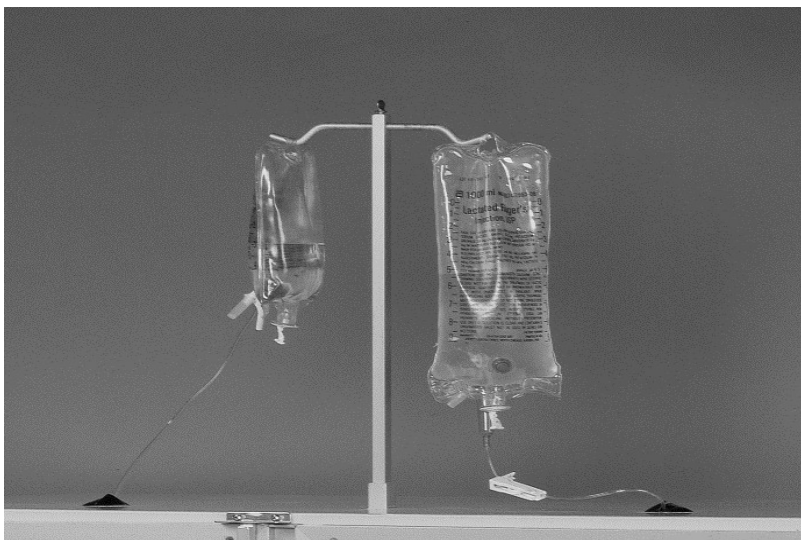
- a) Remove the accessory carton from compartment A and reinstall the following items, which were disconnected for shipping:
 1. Oxygen Flowmeter
 - i. Screw the flowmeter into the fitting located on the right side of the unit, being careful not to cross thread the pieces (keep flowmeter parallel to side of unit).
 - ii. Check that the flow control knob is turned all the way closed (clockwise) to 0 liters per minute.
 - iii. Connect the oxygen supply hose to the back of the flowmeter and the other end to your oxygen source, which may be a wall outlet, ceiling drop, or cylinder regulator. 50 psi (pounds per square inch) is the normal pressure used for medical apparatus and will give accurate readings on the flowmeter.
 - iv. If other connectors or adapters are required for your oxygen source, these may be obtained from your oxygen supplier.
 - v. For longer life of the flowmeter, turn off pressure by turning off tank, disconnecting from wall outlet, etc., when not using the ICU.
 - vi. Teflon tape is acceptable on any pipe fittings you wish and is typically not needed on any compression fittings.
 - vii. Snyder Mfg. Co. is not responsible for leaky fittings where your flowmeter, oxygen hose, or oxygen supply are concerned. Soapy water and/or the oxygen probe (by taking it out of the unit and pointing it at the fittings) can be used if you wish to check for leaks.
 2. Power Cord
 - i. Connect the female twist-lock portion of the cord to the male adapter located on the right side of the unit and the other end to your 110-120 VAC outlet. Make sure the power cord is completely inserted and a 1/8 turn clockwise is applied to the plug to make a solid connection. A 20 amp dedicated circuit with no other significant loads is required for power supply to the Model 2100 ICU.



3. Carbon Dioxide Absorption
 - i. Open the Compartment B door, slide out the tray and pour the included soda lime into it. Use just enough to cover the screen, approximately 2-3 granules deep. This media will need to be replaced periodically according to the manufacturer's recommendations. A small quantity of soda lime is included with the unit and further info about this product can be found on page 27.

4. IV Stand

- i. Place the IV stand in the top of your cage and hang IV bags as needed.



5. Nebulizer.

- i. The included 350 mL Bubble-Jet humidifier produces particles from $.5\mu\text{m}$ to $5\mu\text{m}$. The black tube with fittings gets threaded onto the top of the humidifier, and the other end connects into the fitting near the top front of the bulkhead between the B and C compartments. The blue hose is fitted over the humidifier's outlet and pushed into the port to the A compartment. The red caps for the humidifier port and the IV ports should be saved to keep the ports plugged when not in use. The black sleeves with collar will remain in place. The nebulizer has FiO_2 settings adjustable from 35% to 100% and has ports for an immersion-type heater. We recommend leaving this setting at 100%.



6. Acrylic Dividers.
 - i. Peel protective paper off of acrylic doors and partitions.
 - ii. The acrylic divider between the left and right sides of compartment A may be removed to admit a larger animal for treatment. When treating an animal that fits comfortably in the right side of compartment A, the clear acrylic divider may be kept in place. This increases the number of air changes per minute, keeps the left side of compartment A sterile, and may reduce overall oxygen usage. With the acrylic divider in place, the left side of compartment A will no longer be part of the environmental circulation, maintenance, and monitoring system, and therefore should be temporarily considered not part of the intensive care unit.
 - iii. The perforated acrylic divider is used for treatment of two animals under the same settings. Be aware the the left compartment will not receive as many air exchanges as the right when using the perforated acrylic divider.
 - iv. The gradual bevel is the bottom of the partition, and the sharp 45 degree corners are the top of the partition.
 - v. To remove the acrylic divider: Pull it toward the front of the unit until the back edge is clear of the aluminum channel at the back and then push the bottom of the divider to one side (the mat will need to be moved out of the way) until it can be removed the rest of the way. The bottom edges of the divider are ground down.
 - vi. To install the divider: Insert the partition just to one side of the cage brackets. Slide the bottom out to one side and tip the top of the divider into to upper channeling. Push the bottom underneath the top until the partition is vertical, and then put the partition towards the back channel until seated.
 - vii. Please refer to the acrylic care instructions found under the maintenance section of this manual for instructions on how to care for and clean the acrylic dividers.
7. Other Accessory Parts
 - i. Please store this instruction manual, the warranty booklet, and gate adjustment tools in a safe place for later consulting and use.

5. Base Unit

- a) Removable Partition
 1. The base unit removable partition is easily removed and replaced by twisting the two thumb bolts and positioning the tab catches out of the way of the partition. The removable partition will then slide to the right of the unit and can be removed. To replace, simply insert the partition into the back channel first, then push to the left until it makes connection with the bolts on the post. Twist the tabs into position and tighten the thumb screws to secure.
- b) Heated Floors
 1. All of our base recovery units have controlled heated floors installed by default. These floors are adjustable from 32° to 100° F. Please be aware that each floor has a thin wire strung beneath the surface of the Formica. If the floors are damaged due to sharp impact or other damage, then the heated floors may not work. If excessive amounts of liquid are allowed to get behind the resin pour than the floors may short out and be rendered inoperable as well.

G. System use and operation

1. Climate Control

- a) The climate in our Intensive Care Units is adjustable from 32° F to 100° F in 1° increments. A 1/3 Hp compressor system cools the unit while a 350 watt heater strip warms the unit. Go to the climate control screen and adjust the desired temperature of your system.
 - 1. Choose heat only if you would like only the heat element to activate.
 - 2. Choose cool only if you would like only the compressor to activate.
 - 3. Choose climate control if you would like the system to both heat and cool. Be aware that the system may 'hunt' a few degrees above or below your set point as it attempts to reach your desired temperature.

2. Oxygen Control

- a) The oxygen levels in our systems are adjustable from 0 to 100% fraction of inspired oxygen (FiO₂).
- b) Calibrating the system
 - 1. In order to calibrate the ICU system a few important details need to be noted. Calibrating the ICU will reset the sensor to a reading of 20.9%. This should only be done when the system is not enriched with extra oxygen and has stabilized at normal atmospheric concentrations of oxygen. If the system is calibrated with higher or lower concentrations then your readings will be inaccurate. Please note that oxygen concentration readings will change with temperature and barometric pressure changes. We recommend calibrating as close to 70° as possible. We typically notice a 4% change in readings between 32° F and 100° F.
 - 2. Before calibration, please vent the system of any excess oxygen by opening the doors for a minute or two, or until the concentration readings stabilize. If you need to calibrate the system and there is a patient under oxygen in the unit, the sensor can be temporally removed to calibrate in fresh air.
 - 3. To calibrate the system, go to the oxygen display window, press the calibrate button, and then press confirm.
 - 4. Snyder Mfg. recommends calibrating your system each day before use. It should be noted that calibration will typically hold for at least a week. Regular calibration will take into account any changes in barometric pressure or temperature each day.
- c) Open the flowmeter to your desired rate of oxygen delivery and readjust as necessary. Greater flow rates will increase the speed at which the system increases oxygen concentrations within the unit.
- d) If you are finding the flowmeter window difficult to view, the flowmeter may be partially disassembled to rotate the view window. Simply unscrew the clear cover and reposition the central tube to be better viewed. Make sure the align the top and bottom O-rings on center of the flowmeter as you screw the cover back down.
- e) Please be aware that high flow rates could allow for a minor overshoot of oxygen due to the sensor taking measurements after oxygen has been administered and cycled through the cage.
- f) Be aware that unlike small incubators or masks, our ICU system has a relatively large airspace to saturate with oxygen.
 - 1. A standard model 2100 ICU unit is roughly 22.5 ft³/630L of volume and 130L of oxygen naturally.
 - 2. A standard model 2160 ICU unit is roughly 17.5 ft³/500 L of volume and 104L of oxygen naturally.
 - 3. A standard model 2100F ICU unit is roughly 12 ft³/340 L of volume and 71L of oxygen naturally.
 - 4. Enriching a 2100 at 15L/min will take the unit approximately 8 minutes to reach 40% oxygen (120L more oxygen) and 17 minutes to reach 60% (250L more). The system will generally take longer than this because as you add pure oxygen to the system, the system will vent out the partially enriched environment.
 - 5. Enriching a 2100 at 90L/min (flow meter wide open) will take the system approximately 1.5 minutes to reach 40% and 3 minutes to reach 60%.

- g) Our flowmeter will accurately measure delivery rates up to 15 liters per minute at 50 psi. Opening the control further will allow for greater delivery rates. Maximum flow rate at wide open is 95+ liters per minute. If more or less pressure is applied to the oxygen system, expect less than a 1% variation of reading per psi.
- h) Typical animal consumption rates are less than 1 LPM of O₂.

3. Carbon Dioxide Monitoring and Scrubbing

- a) The ICU system is designed to remove carbon dioxide from the system by circulating the chamber air through a gas scrubbing material. As the soda lime absorbs carbon dioxide the color will change from white to reddish/purple/pink (color varies). When the soda lime is exhausted it will no longer absorb carbon dioxide within the cage. When this happens, the material needs to be changed in order to keep carbon dioxide levels from reaching dangerous levels within the cage.
- b) Changing the soda lime.
 - 1. Clean the tray paying special attention to the mesh to insure the holes are unobstructed and clear.
 - 2. Apply a layer only 2 to 3 granules thick on the soda lime tray, just enough to cover the screen. Over-filling will restrict airflow and cause your unit to display inaccurate readings.
 - 3. Shake the tray and tap the sides to agitate the soda lime and get all the smaller loose particles to fall out through the mesh screen. Failure to do this can result in soda lime falling into the components below. If this happens use compressed air or keyboard cleaner to remove any debris.
 - 4. Place the tray back in the unit. Make sure the soda lime covers the entire screen so that the air must pass through it.
- c) Normal atmospheric concentrations of carbon dioxide typically run around 400 ppm. Soda lime should generally keep the concentrations below 5000ppm at peak efficiency. Our carbon dioxide meter will read concentrations between 0 and 5000 ppm. Please consult with your anesthesiologist or respiratory gas specialist concerning acceptable levels of respiratory gases.
- d) Carbon dioxide levels should generally be kept at as low a level as possible within our systems. Larger patients will generally respire greater quantities of carbon dioxide and will need more frequent changes of the chemical absorbing material.
 - 1. As a reference:
 - i. <100ppm indicates functioning soda lime without a patient
 - ii. 500-800ppm (0.04-0.05%) is normal atmospheric concentration.
 - iii. 5,000ppm (0.5%) is the normal limit for long term exposure.
 - iv. 10,000ppm (1%) causes drowsiness and a slight rate of breathing increase.
 - v. 20,000ppm (2%) causes 50% increase in breathing rate and fatigue over several hours.
 - vi. 30,000ppm (3%) causes double breathing rates, dizziness, and heart rate increases.
 - vii. 40,000-50,000ppm (4-5%) will cause about 4x breathing rate and signs of poisoning will show.
 - viii. 70,000-100,000ppm causes death.
- e) The carbon dioxide sensor ships standard with all of our model 2100 units.
- f) Please consult with respiratory gas specialist or an anesthesiologist for any respiratory gas related questions.

4. Heated Floors

- a) The ICU system will maintain a constant and controlled temperature on each side of the heated floors. Heated floors can be located either in the base recovery unit or in the ICU itself, depending on the purchased option.

5. Moisture Control

- a) Your ICU comes with a dehumidify feature that can help reduce the humidity in your system. This option is accessed at the climate control screen.
- b) The dehumidify feature will run the compressor for a period of time that is settable in the configuration screen, and defaults to 240 seconds. While dehumidify is selected, the compressor will run in an attempt to condense liquid on the coil and reduce the system's humidity level. The heater will automatically run in order to offset the compressor cooling the system. If you are finding that the system is not removing enough humidity, or if your system is cooling too much, then you adjust the dehumidify cycle times in the settings window. **The dehumidify feature is not automated, you must monitor the system to make sure it performs as desired.**
- c) When cooling the system, the compressor will continue to run until it reaches the desired lower temperature. When warming the system, the compressor will wait to run until they system is within 1° of the set point.
- d) When the unit is no longer being used for the day, or between patients, heat only setting can be used to dry out the system for storage. Turn the panel to “heat only” setting and raise the temperature setting to 100 deg. The doors can be left open when not in use to further release any trapped humidity.
- e) The B compartment and compressor floor should be checked for water regularly. Remove or dry any moisture as needed.
- f) Your chamber filters may be washed, and should be completely dry before use.
- g) An appropriate medically approved cleaner with a fungicide should be used to clean out the compartments where water is commonly observed.

6. Fans

- a) There are 3 fans to circulate air between the animal compartment and the center compartment where the conditioning occurs, and 4th fan to exhaust the compressor compartment heat. These fans should be checked periodically to make sure that they are all functioning. Broken fans will reduce your air circulation rate potentially causing your cold coil to ice in the right conditions. If this happens, simply turn off your cool only/climate control or add heat to the system and allow air to circulate in your unit until the ice melts.

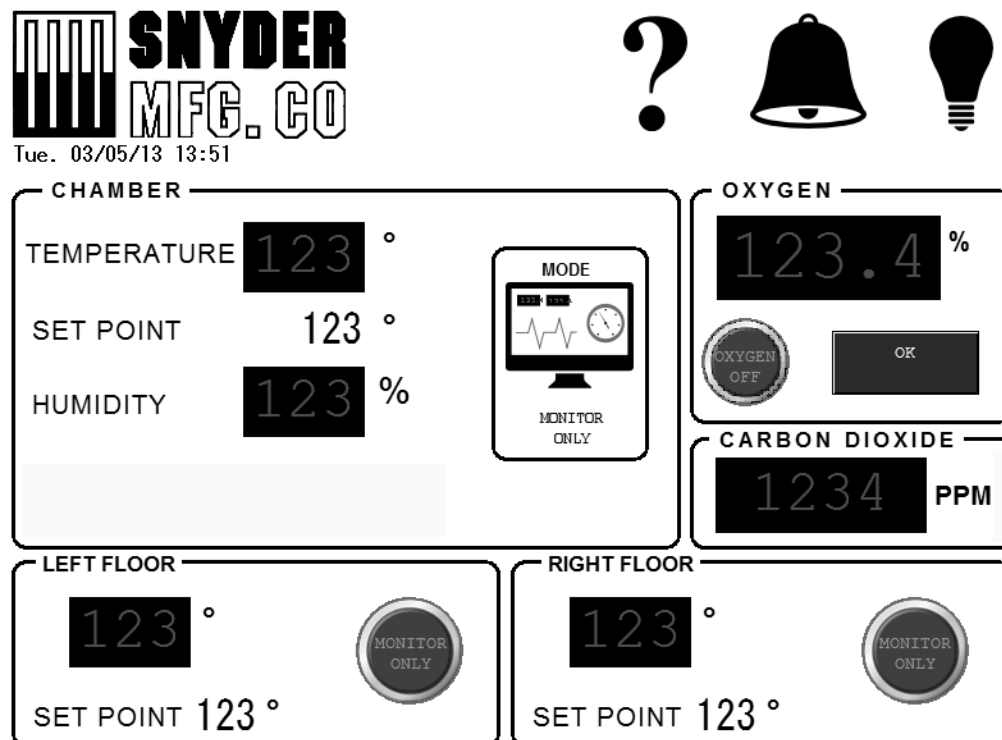
7. Nebulizer/Humidifier

- a) The Nebulizer will infuse oxygen into the ICU as a bypass to the automated valve that opens and closes per the high and low settings established on the panel.
- b) **THE NEBULIZER IS NOT AUTOMATED. IF IN USE, AND THE ICU ACHIEVES THE HIGH SET POINT, THE NEBULIZER WILL CONTINUE TO PUMP OXYGEN INTO THE ICU AND POTENTIALLY GO BEYOND YOUR HIGH SETTING. TO CORRECT THIS, YOU MUST MANUALLY READJUST THE FLOW RATE AT THE FLOWMETER TO COMPENSATE.**
- c) Our system is designed this way to allow clients to administer oxygen in the event of a power outage or system failure.
- d) On systems manufactured after 2013, we have added a second quick disconnect that will allow either regulated or bypassed oxygen delivery. When hooked up to the regulated quick disconnect, the system will split the oxygen between the nebulizer and the delivery nozzle. The bypass quick disconnect continues to function as described above.

H. Touch screen instructions

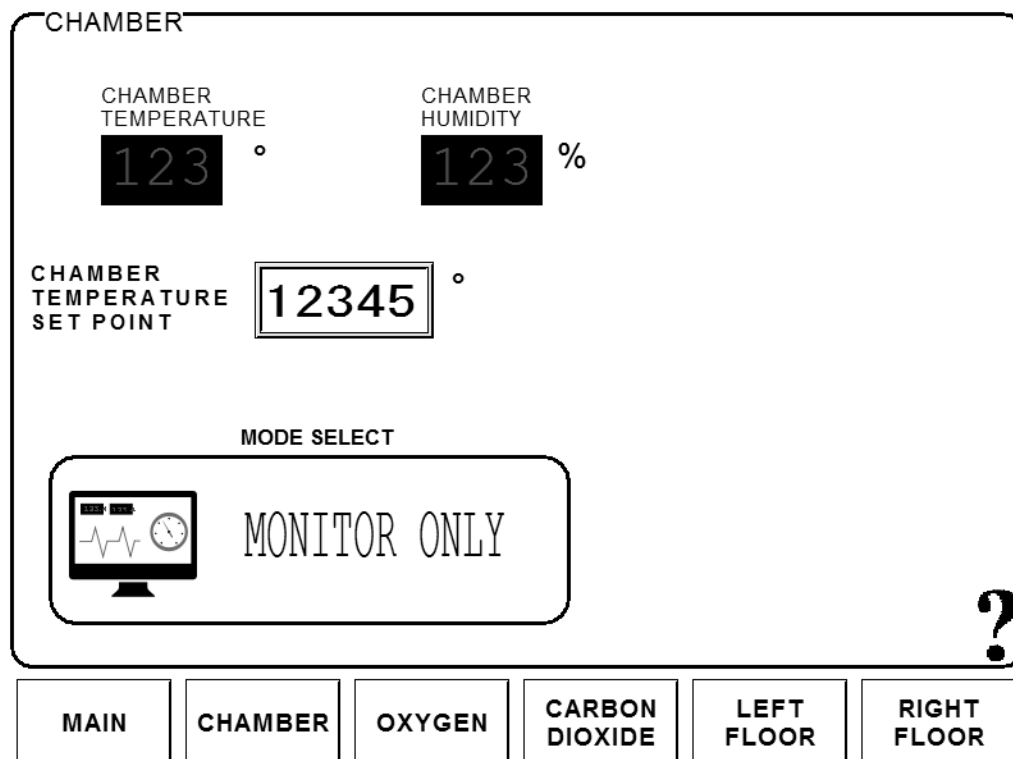
1. Main Screen

- The Main section displays information for the Chamber, Oxygen Controls, Carbon Dioxide Monitor, and optional Left and Right Floor Heating Sections. Touching within the border of each display area will display the modification screen for that section. Options available depend upon the Installed Options set in the configuration screen.
- SETTINGS SECTION:** Press the top left area of the Snyder Mfg. logo to access the settings screen. Installed options, alarm settings, temperature display, and other settings are adjustable here. In addition, manufacturing dates and serial numbers are visible here. Press the time display to change the current time.
- CHAMBER SECTION:** The Chamber Section is used to display the current temperature and humidity of the animal chamber. The set point of the chamber as well as the temperature control mode can be adjusted here.
- OXYGEN SECTION:** The Oxygen Section is used to control the oxygen concentration levels of the cage. The alarms can also be adjusted in this screen. In addition, a graph of the oxygen concentrations over time can be viewed.
- CARBON DIOXIDE SECTION:** The Carbon Dioxide Section is used to display current carbon dioxide levels and set alarms for the carbon dioxide concentrations. In addition, a graph of carbon dioxide levels over time can be viewed. This option is only available if a carbon dioxide sensor is installed in your unit.
- LEFT FLOOR SECTION:** The Left Floor Heat Section controls the temperature of the left base or left ICU floor. The floor heat can be turned on or off and the current temperature can be viewed. This is an included option with a base unit and an optional feature of a stand alone ICU.
- RIGHT FLOOR SECTION:** The Right Floor Heat Section controls the temperature of the right base or right ICU floor. The floor heat can be turned on or off and the current temperature can be viewed. This is an included option with a base unit and an optional feature of a stand alone ICU.



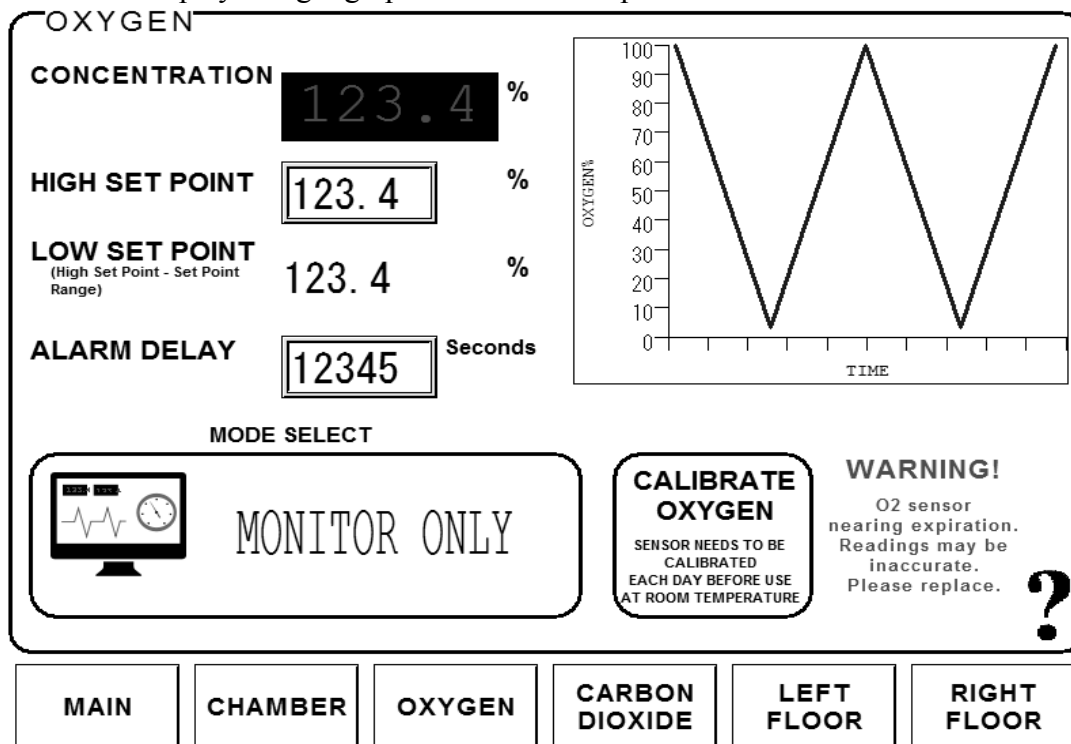
2. Climate Controls

- a) The Chamber Section is used to display the current temperature and humidity of the animal chamber. The set point of the chamber as well as the temperature control mode can be adjusted here.
- b) CHAMBER TEMPERATURE DISPLAY: Displays the current chamber temperature in 1° increments.
- c) CHAMBER RELATIVE HUMIDITY DISPLAY: Displays the current chamber relative humidity in 1% increments. Relative humidity is the amount of moisture the air is holding at a certain temperature. 100% relative humidity means that liquid water will no longer evaporate. 0% relative humidity means no water vapor is present.
- d) CHAMBER TEMPERATURE SET POINT: Displays the current chamber set point in 1° increments. Press within the yellow border to change this value.
- e) TEMPERATURE CONTROL MODE: Displays the current temperature control mode. Press to open the selection window then press the desired icon for temperature control.
 - 1. Monitor Only: All temperature controls are disabled.
 - 2. Climate Control: Heats and cools the unit to maintain a desired temperature
 - 3. Heat Only: Only heats the unit to the desired temperature.
 - 4. Cool Only: Only cools the unit to the desired temperature.
 - 5. Dehumidify: Runs the compressor for the dehumidify on/off times (adjustable in the settings window). The heat element automatically operates to keep chamber temperature at the set point.



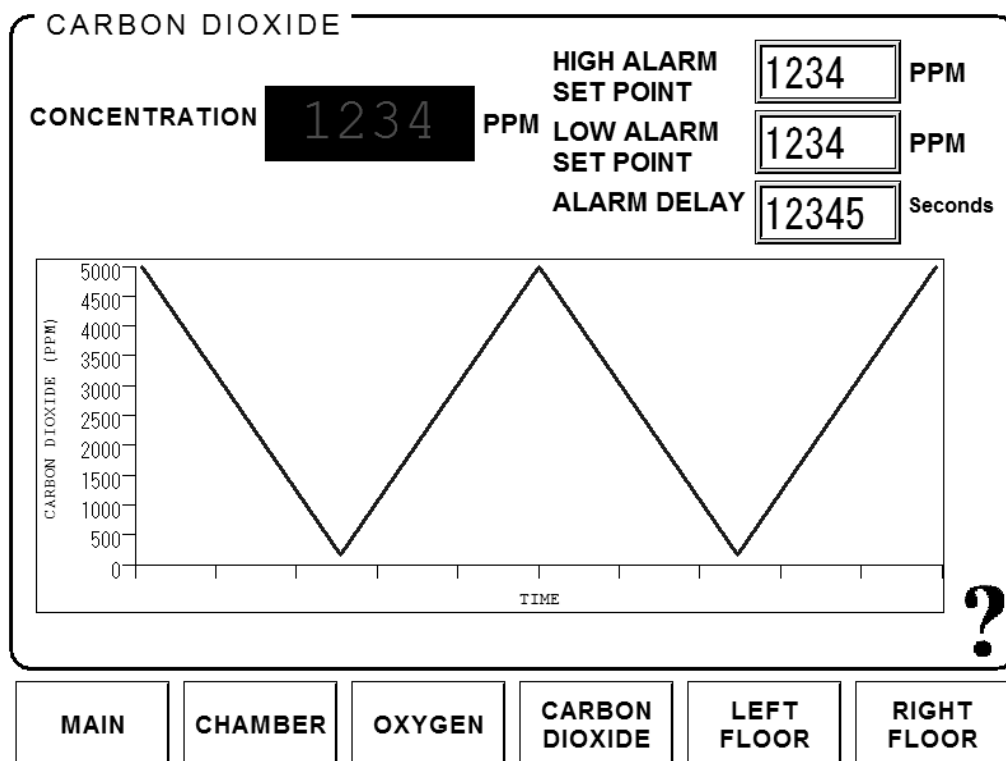
3. Oxygen Controls

- a) The Oxygen Section is used to control the oxygen concentration levels of the cage. The alarms can also be adjusted in this screen. In addition, a graph of the oxygen concentrations over time can be viewed. Calibration should be performed each day before use. See item g).
- b) **OXYGEN CONCENTRATION:** Displays the current oxygen concentrations in 0.1% increments.
- c) **HIGH SET POINT:** Displays the current oxygen high set point in 0.1% increments. With active output enabled, the system will allow oxygen into the system until the concentration reaches this set point. Press within the yellow border to change this value.
- d) **LOW SET POINT:** Displays the current oxygen low set point in 0.1% increments. This will be the high set point minus the set point range (which is adjustable in the settings window). The set point range is the difference between the high set point and the low set point. With active output enabled, the system will turn on oxygen flow when the concentration falls below this set point.
- e) **OXYGEN ALARM DELAY:** Displays the alarm delay in seconds. This is the amount of time that will pass before the alarm triggers. Press within the yellow border to change this value.
- f) **OXYGEN MODE SELECT:** Displays the oxygen control mode. Press to open the selection window then press the desired icon for oxygen control.
 1. Monitor Only: Oxygen output is disabled.
 2. Active Output: Oxygen is regulated by the panel.
- g) **OXYGEN SENSOR CALIBRATION:** Press to open the oxygen calibration confirmation screen. Then press OK to set the current reading to atmospheric concentration. Before calibrating: make sure the oxygen is turned off, the system has stabilized at natural atmospheric concentrations, and that the unit is close to room temperature of 70 °F / 21 °C. Calibration should be performed each day before use. **ATTENTION:** This operation will set the oxygen reading to neutral atmospheric oxygen concentrations. Please make sure the doors are open, the oxygen flowmeter is turned off, and the system has stabilized at natural atmospheric oxygen concentrations before continuing. Please make sure the unit is close to room temperature of 70 °F / 21 °C. Press “OK” to continue or “CANCEL” to keep current calibration. A warning will be displayed after calibration if your oxygen sensor is nearing expiration.
- h) **OXYGEN GRAPH DISPLAY:** Displays a graph of recent oxygen readings in the system. Press within the window to display a larger graph and to look at specific times.



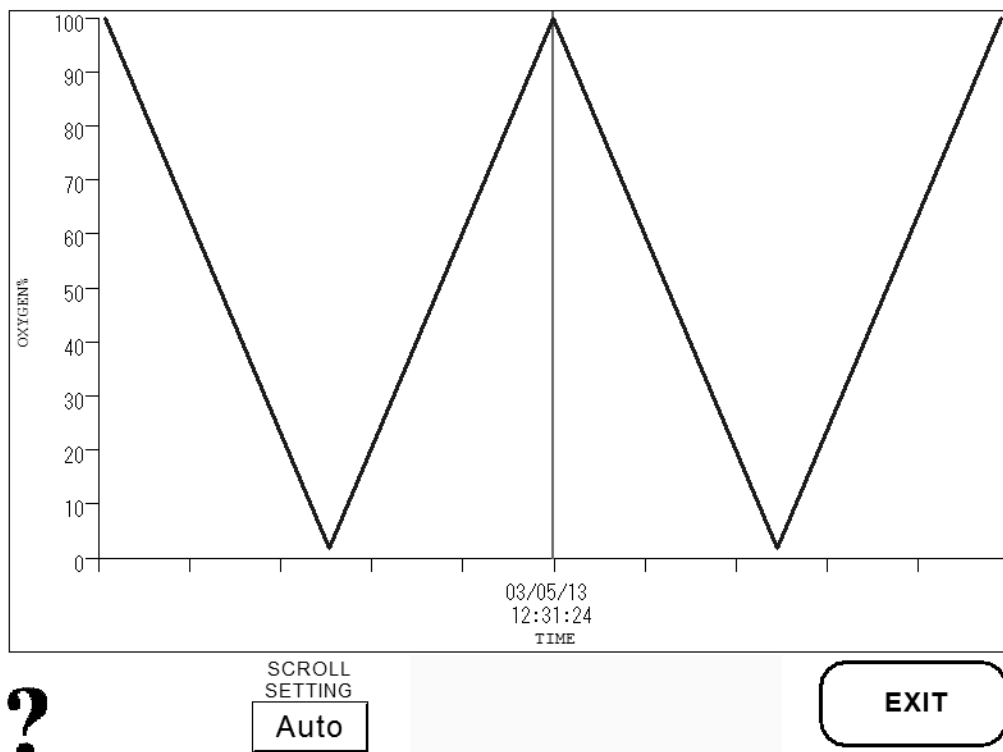
4. Carbon Dioxide Monitoring

- a) The Carbon Dioxide Section is used to display current carbon dioxide levels and set alarms for the carbon dioxide concentrations. In addition, a graph of carbon dioxide levels over time can be viewed.
- b) CARBON DIOXIDE CONCENTRATION: Displays the current carbon dioxide concentrations in 1 PPM or .0001% increments. The display value is adjustable in the configuration screen.
- c) CARBON DIOXIDE HIGH ALARM SET POINT: Displays the current carbon dioxide high concentration alarm in 1 PPM or 0.0001 % increments. An alarm will trigger if the current concentration exceeds this value. Press within the yellow border to change this value.
- d) CARBON DIOXIDE LOW ALARM SET POINT: Displays the current carbon dioxide low concentration alarm in 1 PPM or 0.0001 % increments. An alarm will trigger if the current concentration falls below this value. Press within the yellow border to change this value.
- e) CARBON DIOXIDE ALARM DELAY: Displays the alarm delay in seconds. This is the amount of time that will pass before the alarm triggers. Press within the yellow border to change this value.
- f) CARBON DIOXIDE GRAPH DISPLAY: Displays a graph of recent carbon dioxide readings in the system. Press within the window to display a larger graph and to look at specific times.



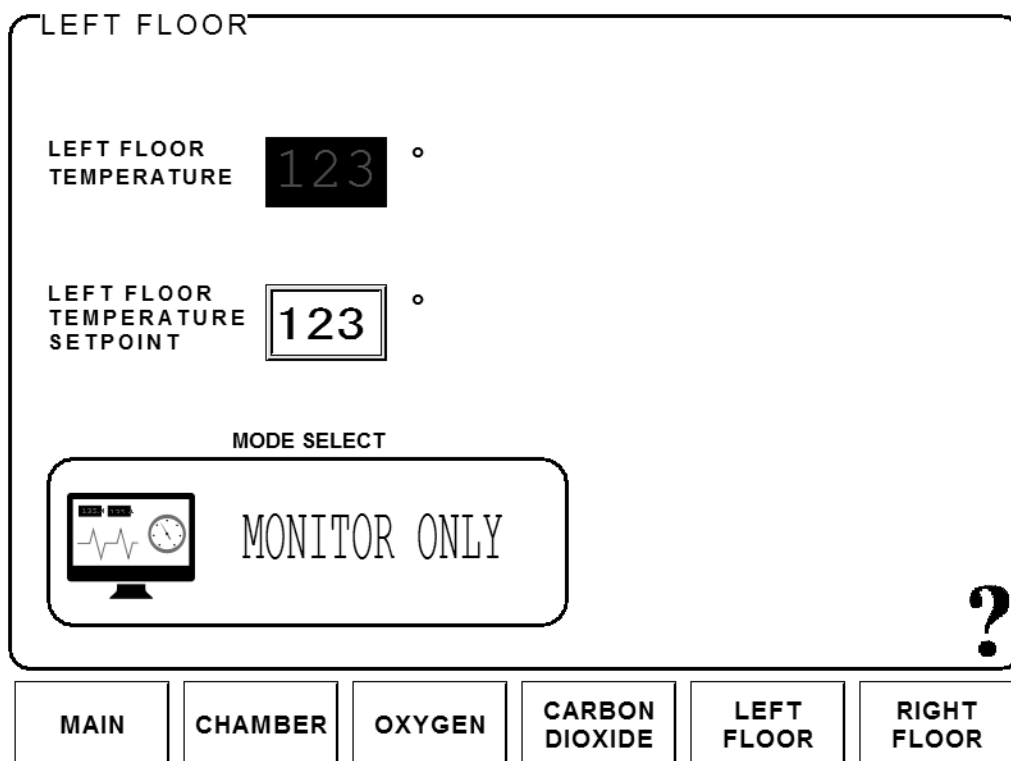
5. Graph Pages

- a) The graph page is used to display recent concentrations of oxygen or carbon dioxide. The interval for saving graph points is adjustable in the main settings window. Press a number or use the up/down arrows to navigate the help pages.
- b) **SCROLL SETTING SELECTION:** This displays the current scroll setting. Press to toggle between Auto and Manual scrolling.
- c) **Auto:** The graph will always display the most recent data.
- d) **Manual:** The two other controls become viable, Scroll Position and Cursor Position. This allows displaying other times in the graph.
- e) **SCROLL POSITION:** These buttons move the entire graph forward or backward in time. The Left Arrow scrolls back toward older data and the right arrow scrolls forward toward recent data.
- f) **CURSOR POSITION:** These buttons move the cursor forward or backward in time. The date and time for the data point is displayed below the graph.
- g) **EXIT BUTTON:** This button exits out of the graph display and returns to the previous screen.



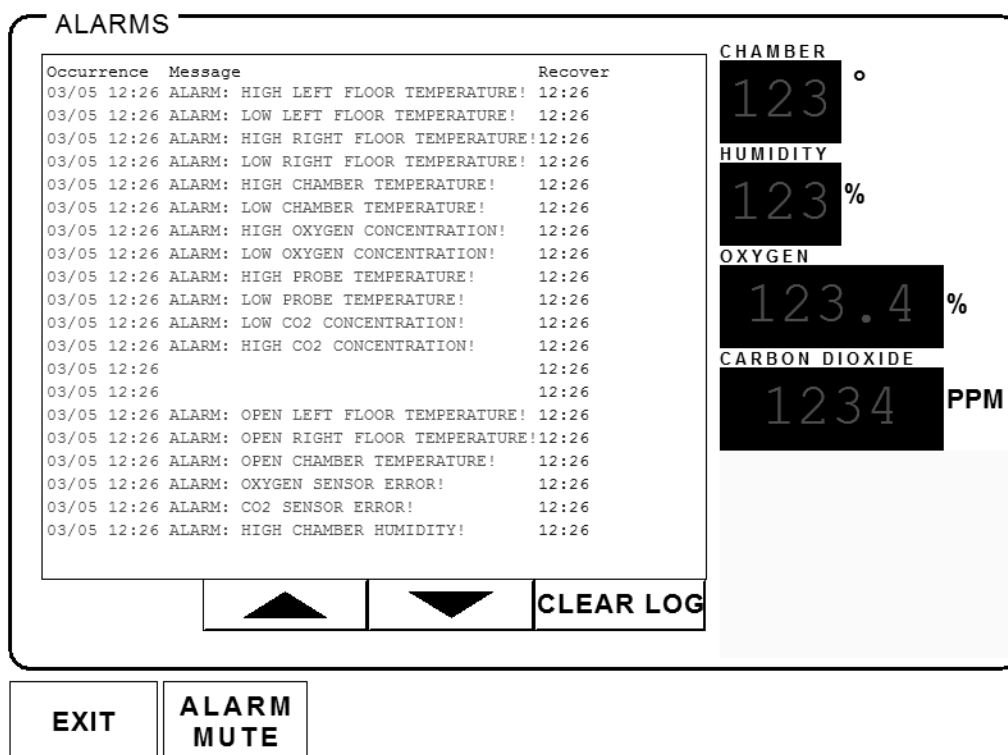
6. Left/Right Heated Floors

- a) The Left and Right Floor Heat Section controls the temperature of the left and right base or the left and right ICU floor, depending on your set up. The floor can be turned on or off and the current temperature can be viewed.
- b) FLOOR TEMPERATURE DISPLAY: Displays the current Left/Right Floor temperature in 1° increments.
- c) FLOOR TEMPERATURE SET POINT: Displays the Left/Right Floor Set Point in 1° increments. Press within the yellow border to change this value.
- d) FLOOR MODE SELECT: Displays the Left/Right Floor heating control mode. Press to open the selection window then press the desired icon for temperature control.
- e) Monitor Only: Temperature output is disabled.
- f) Active Output: Left Floor Temperature is regulated by the panel.



7. Alarm Display

- The alarm window will display any time the system is in an alarm state. Press the mute button to silence the alarm. The system will return to the alarm screen and will continue to alarm until the alarm mute button has been pressed.
- The alarm window displays current and past system alarms. All of the current system readings are present on this window.
- Press the alarm mute button to clear the current alarm. The alarm will remain muted for the alarm mute delay which is adjustable in the configuration screen.
- Press the clear log button to clean the previous alarms.
- Press the up/down arrows to scroll through previous alarms.



8. System Options

- Press the cage logo in the upper left corner of the main screen to access the system options.
- The current high and low alarms for all systems are adjustable here.
- The alarm delay is the amount of time that will pass before an alarm triggers.
- Alarms can be disabled or enabled by pressing the alarm toggle button.
- The dehumidify on time is how long the compressor will run, if the temperature is within 1° of the set point, when the dehumidify temperature control mode is selected.
- The dehumidify off time is how long the compressor will wait before running again when the dehumidify temperature control mode is selected.
- The Oxygen alarm range will trigger an alarm if the oxygen concentration range falls above or below this %.
- The set point range is the range of oxygen levels that the system will maintain. It is the difference between the high and the low set points. For example: if the high set point is 40%, and the set point range is 5%, then the low set point will be 35%.
- The carbon dioxide concentrations can be displayed in PPM or as a %.
- The panel serial number, unit serial number, and date of manufacture are displayed here.
- Return to previous run state on start up will have the unit remember the climate control, oxygen control, and heated floor control state when turned off. If this setting is off, all control options default to off upon start up.
- Temperature display units can be toggled between °C and °F.
- The Alarm reset delay is how long a muted alarm will stay muted before resetting and triggering again.
- The installed options will toggle available controls for heated floors, the carbon dioxide sensor, a probe sensor, or chamber lights.
- Reset to default will return all settings to factory defaults.
- Factory Settings contain advanced trouble shooting settings for the system. Please contact Snyder Mfg.

CHAMBER TEMPERATURE Low Alarm Set Point 12345 ° High Alarm Set Point 12345 ° Alarm Delay 12345 Seconds ALARM ENABLED	LEFT FLOOR Low Alarm Set Point 12345 ° High Alarm Set Point 12345 ° Alarm Delay 12345 Seconds ALARM ENABLED	RIGHT FLOOR Low Alarm Set Point 12345 ° High Alarm Set Point 12345 ° Alarm Delay 12345 Seconds ALARM ENABLED
CHAMBER HUMIDITY Low Alarm Set Point 12345 % High Alarm Set Point 12345 % Alarm Delay 12345 Seconds Dehumidify On Time 12345 Seconds Dehumidify Off Time 12345 Seconds ALARM ENABLED	OXYGEN Low Alarm Set Point 1234.5 % High Alarm Set Point 1234.5 % Set Point Range 12345 % O2 Alarm Range 12345 % Alarm Delay 12345 Seconds ALARM ENABLED	CARBON DIOXIDE Low Alarm Set Point 12345 PPM High Alarm Set Point 12345 PPM Alarm Delay 12345 Seconds ALARM ENABLED DISPLAY UNITS: PPM Alarm Reset Delay 12345 Minutes
Panel Serial #: 1234567890 Unit Serial #: 1234567890 Date of Mfg: ABCDEFGHIJ	Return to Previous Run State on Startup? NO Temperature Units: °F	INSTALLED OPTIONS RESET TO DEFAULT FACTORY SETTINGS EXIT

9. Remote Control and Monitoring / Upgrading Software

- a) **WARNING!** Improper adjustment of settings in this section could render your unit inoperable. Snyder Mfg. does not warranty improperly configured touch screen settings. If your system stops working, please use the reset to defaults button under the main settings window to reset the software.
- b) **Remote Control and Monitoring**
 - 1. First, navigate to the network settings screen. To do this, press the upper-left corner of the touch screen for 3 seconds or longer, and then choose System mode. Please contact Snyder Mfg. for the password to the configuration screens.
 - 2. Next press the Offline button, then the Initial Setting button, and then the Com. I/F button.
 - 3. On this screen you can now configure the static Ethernet IP address, subnet mask, and default gateway for your system.
 - 4. Please consult your network administrator for help with configuring these settings.
 - 5. Finally, go back to the main screen and choose RUN.
 - 6. Direct a browser to the IP address you assigned your system. You will be able to remotely monitor or control your ICU.
 - 7. Minimum System Requirements for remote controlling or monitoring are Microsoft Internet Explorer 8.0 or higher or Firefox 3.0 or higher. The remote monitoring needs to have Javascript enabled within your browser to function correctly. The screen image cannot be displayed on web browsers that do not support the bitmap or JPEG format. The display may not update depending on the web browser's cache settings.
 - 8. The system can only be connected using an Ethernet cable. WiFi is not supported by the system.
 - 9. The system will only accept a static IP address. DHCP is not supported by the system.
- c) **System Software Upgrade**
 - 1. In order to upgrade the software of the screen you will need to access the touch screen configuration menus as above. Next choose file management, and copy the new touch screen software over the original software. Please refer to included documentation or contact Snyder Mfg. for assistance.

I. Membrane Control Panel

1. Operation

- a) Oxygen Regulation
 - 1. Turn on or off the oxygen control section using the on/off green button.
 - 2. Adjust the upper set point by pressing the up arrow once, then pressing up or down to adjust the high set point.
 - 3. Adjust the lower set point by pressing the down arrow once, then pressing up or down to adjust the low set point. The low set point will automatically adjust to 2% below the upper set point in most circumstances.
- b) Climate Control
 - 1. Climate control functions exactly as it does with the touch screen control panels.
 - 2. Choose climate control to both raise or lower the temperature to the desired set point.
 - 3. Choose cool only to only apply the air conditioning system.
 - 4. Choose heat only to only apply the heating system.
 - 5. Choose dehumidify to run the air conditioning system on regular intervals in order to help remove the moisture within the system.
- c) Heated Floor Controls
 - 1. Turn each heated floor on or off and adjust the desired temperature setting.
 - 2. If the heated floor temperature sensing wires are disconnected, the readout will be 187 degrees.

2. 40% O2 Chip

- a) Some of our original model 2000 ICU units came standard with a 40% maximum oxygen concentration chip. Please contact Snyder Mfg. about replacing your control panel with a newer model if you would like to have your oxygen concentrations above 40%.

J. Prior Model ICU Parts

1. Drip Trays

- a) Two piece system
 - 1. Check and clean the sponge every 4 hours or as needed as it collects condensation.
 - 2. We strongly recommend switching from the 2 piece system for our current single piece design.

2. Oxygen Sensors

- a) Our first model ICU units used a Max-19 oxygen sensor which is incompatible with our new touch screen control panel. Please contact a Snyder Mfg. representative in order to change to the current Max-7L sensor.

K. Maintenance

1. Cleaning

- a) Laminated Cage Interiors
 - 1. Most commercial cleaning products and disinfectants are fine to use on the laminate covered interiors of our cage units. Please refer to the product's directions before using. We do not recommend ammonia-based products. Disinfecting with diluted chlorine bleach is a common practice and is acceptable. You should seek the recommendations of professional associations and/or animal hospital specialists for the proper disinfecting of cages. A damp cloth or sponge is all that is needed for cleaning applications. Never use heavy amounts of liquids to clean, rinse or disinfect the interior cage surfaces. Do not leave any standing liquids anywhere in our cages as this can potentially damage the cage. Rabbit urine has been reported to stain the laminate surfaces of Snyder Mfg. Co. cages. These stains can be removed with a lime dissolving product.
- b) Cage Unit Exterior Surfaces
 - 1. The outsides of our cage units are finished with a three-coat commercial grade paint system. A damp, soapy cloth is all that is needed to clean the outside surfaces. Chemical cleaners are not recommended.
- c) Over the counter products and paper towels can be used on most other parts of your Snyder cage units.

2. Acrylic Doors

- a) We have included a specific product to be used to clean, not disinfect, your cage surfaces. While the ZEP appliance cleaner was originally designed to work with acrylic surfaces only, it can also be used as an all purpose cleaner for all surfaces of your Snyder cage product. ZEP appliance cleaner is the only product we recommend for cleaning acrylic surfaces. While mild soap and water works well as a cleaner also, using other over the counter products to clean your acrylic parts will most likely have an adverse effect on that part, unless it is specified for acrylic use.
- b) For disinfecting the acrylic doors we recommend a solution of 5 parts water to 1 part denatured alcohol mixed in a separate spray bottle and labeled as such.
- c) Paper towels or synthetic fabrics should NOT be used to wipe Acrylic as they can make fine scratches, resulting in haziness over time. Please use the all cotton cleaning cloths included with your ICU to be used with the ZEP appliance cleaner.
- d) Acrylic surfaces are especially sensitive to ammonia, alcohol, and acetic-based cleaning products. These products used directly and indirectly on the Acrylic can cause crazing (fine fissures or cracks) to appear on the acrylic's surface & edges and through holes.
- e) Animals treated for fleas must be completely dry before coming into contact with any acrylic part. Solvent-based flea treatments can cause damage to the acrylic.
- f) Snyder Mfg. Co. does not warranty our acrylic products against crazing, scratching, or breaking due to chemicals, claws, or accidents.
- g) We highly recommend the purchase and continued use of these cleaning products.

3. Oxygen Sensor

- a) The oxygen sensor (fuel cell) included with your cage will last for approximately one to three years, depending on use. As your sensor nears the end of its life a warning will be displayed after calibration. Snyder Mfg. recommends ordering a replacement sensor at that time. The sensor will continue to be useable for a period of time after the warning is displayed. When the sensor stops calibrating to 20.9%, or if the readings fluctuate rapidly or erratically, then the sensor needs to be replaced.
- b) Oxygen can still be supplied to the patient via the Nebulizer, should the main oxygen source shut down. The nebulizer will always bypass the controlled oxygen system.

c) Removal/Installation

1. **To reduce the risk of an inadvertent electrical shock, the ICU's electrical breaker should be tripped while performing these functions! The electrical breaker is found in the 'C' compartment. See diagram on page 5.**
2. First, to locate the fuel cell, open the control panel door and follow the black cord that extends from the back of the control panel to the top center of the left wall. The fuel cell is attached to the end of this wire.
3. Remove the black cord from the end of fuel cell assembly in the 'C' compartment, by twisting off the small nut and disengaging the male jack plug.
4. Remove the 'B' door.
5. Locate the plastic end cap to the fuel cell in the 'B' compartment. Extending 1 arm through the 'B' compartment door and 1 arm through the 'C' compartment door, grasp each end of the Fuel Cell/Probe assembly and twist off the plastic end cap.
6. Remove the fuel cell from the cage wall, replace the cap and recycle/dispose of it as a household battery.
7. To install the fuel cell, reverse the previous steps.
8. If you have any questions concerning the removal or installation of this part, please call 800-756-0632 and ask for ICU technical support.

4. Carbon Dioxide Sensor

- a) After approximately 7 years the carbon dioxide sensor will slowly start to drift in its accuracy. Please contact Snyder Mfg. to have your sensor recalibrated.

5. Gate Adjustment

- a) Snyder Mfg Co. wants you to know that all of the individual doors/gates attached to your cages are assembled to fit each specific opening that they were originally attached to. This is important information that you and your staff should be aware of in the likely event of removing several similar gates/doors for cleaning.
- b) To eliminate the possibility of a gate getting remounted to the wrong cage opening, we recommend that you identify each gate to each cage opening. If your facility is going to be taking the gates off of the cages to be cleaned, we would suggest that you imprint a number to the interior top of the cage and also mark a corresponding number to the gate. This numbering system will insure the proper fit each time a similar door/gate is removed and remounted.
- c) In the event of an uneven floor or shifting of cage dimensions during shipment, the acrylic doors and the recovery base gates may need to be adjusted.
 1. To adjust the acrylic doors, remove the door from the cage and screw the mounting bent-bolts either inward or outward to realign the door. The locking edge of the door should be centered within the opening in order to keep the doors sealed. Turning the top bent-bolt inward or the bottom bent-bolt outward will aim the door up/higher on the opening. Turning the top bent-bolt outward or the bottom bent-bolt inward will aim the door down/lower on the opening.
 2. The lock catches on either the acrylic doors or the base aluminum gates can be moved to provide a more secure catch for the lock handles. Use a Philips head screwdriver to loosen the screws and then realign the lock catches.
- d) Over time the handles in our gate will loose their tension due to the nylon washer wearing out. The quickest and easiest method to adjust our gates is as follows.
 1. Using a 3/16" allen wrench, tighten the front hex head bolt of each handle down snug.
 2. Use a 7/16" box wrench to tighten down each high crown cap nut on the back of the handle tight.
 3. Loosen the hex head bolt very slightly until the desired handle tension is reached.

6. Compressor Maintenance

- a) Over time the compressor and evaporator cold (cold coil) will accumulate dust, dander, dirt, and debris. This material will limit the ability of the system to cool the animal compartment and may lead to the evaporator coil (cold coil) icing up. We recommend using compressed air to blow out both the compressor evaporator coil (cold coil) and condenser coil (in the right hand chamber) every few months. This will keep your system operating at peak efficiency and will reduce electricity consumption.

7. General Maintenance

- a) Plug up the IV ports and the nebulizer port with the red caps when these areas are not in use.
- b) Check the Drip Tray for moisture accumulation. The drip tray is located on the floor in the ICU's center 'B' compartment. We recommend the use of an antibacterial soap to clean the drip tray.
- c) Check for moisture under the drip tray or in the mechanical compartment. If moisture happens to get past the Drip Trays it will accumulate on the floor of the 'B' compartment. If a wet condition is noticed, remove the Drip Tray and wipe up any moisture as soon as possible. **Heavy moisture left unchecked on the 'B' compartment floor can create potential consequences in the ICU unit's appearance & functionality, which is not covered by your Warranty.** To remove the drip tray fold the wings inward and remove the tray from the cage.
- d) Check the three chamber circulation fans and the compressor exhaust fan periodically. Make sure to replace these fans as soon as possible if any are found to be not be working. Broken chamber circulation fans will limit the unit's ability to heat, cool, remove carbon dioxide, and regulate oxygen. Broken exhaust fans can potentially cause the system to overheat causing your unit to shut down.
- e) Any damage to the laminate or resin should be repaired as soon as possible. The ICU is a wooden structure and is susceptible to swelling, mold, mildew, and rot. We recommend the use of general purpose silicone to seal any damage to the cage interior, and latex paint or primer to seal the exterior of the cage. Resin repair kits may also be ordered by contacting Snyder Mfg.

8. Oxygen Source information.

(Information provided by General Air of Denver, CO, as of March 2013)

- a) E tank
 - 1. Contains approximately 660 L.
- b) H tank
 - 1. Contains 251 cubic feet of oxygen / 6,600 liters of gaseous oxygen, at 2200psi.
 - 2. Cost: \$46.40 per tank = \$.65 per 100 liters
 - 3. At 15 liters per minute / 900 liters per hour, the cost per hour is equal to: \$5.85
 - 4. Approximate hours of use: 7.9
- c) Liquid (196 Dewar)
 - 1. The Dewar 196 is the most commonly purchased liquid oxygen container.
 - 2. Contains 196 liters of liquid oxygen / 5450 cubic feet of oxygen / 154,327 liters of gaseous oxygen.
 - 3. Equal to approximately 16 H tanks.
 - 4. Cost: \$264.00 per tank = \$.17 per 100 liters
 - 5. At 15 liters per minute / 900 liters per hour, the cost per hour is equal to: \$1.53
 - 6. Approximate hours of use: 171.5
 - 7. An approximate 75% savings using liquid oxygen verses standard H tank application before bleed off. With a 2-4% bleed off per 24 hours when not in use, or an approximate 10% loss of oxygen based on 3 times a week non usage, the liquid oxygen with a bleed off can still represent a 65% savings over standard 'H' tank applications.
- d) Oxygen concentrators generally deliver 7-9 L/min and will need an external storage tank to be useful with our systems.

L. Troubleshooting

1. Power Issues

- a) Make sure the power plug is firmly inserted into the cage and a 1/8 CCW twist is applied to the plug to engage the connection. Failure to twist-lock the plug can result in electrical arcing and fires.
- b) Check the circuit breaker to the system located behind the control panel. The red button will test the breaker and the black/white 20 button will reset the breaker.

2. Oxygen System

a) Oxygen Retention

1. Our cages are factory tested to drop no more than 2% oxygen over 30 minutes from a 30% set point. If you are finding that your cage is having difficulties reaching higher oxygen set points, or that oxygen consumption has increased over the life of your cage, here are some suggestions to improve oxygen retention:
 - i. Check the acrylic door gasketing. Animals love to chew the gasketing and even minor gaps can increase oxygen use. Check each door by closing one door at a time and looking inside the cage for gaps between the gasket and the resin face. Extra door gasketing is available from us or from most home improvement stores.
 - ii. Check that the porthole doors are screwed down tight and not damaged. Replace any broken parts.
 - iii. Check that the center compartment door with cam-latches closes fairly snugly against the aluminum framing. The gasketing on the back of that door should be complete and unbroken. If the frame doesn't already have it, a thin bead of 100% silicone can be applied to the perimeter to improve sealing. Use a finger to press the silicone into the corner much like doing bathroom caulking. After allowing to dry for 24 hours, silicone is non toxic and holds up well for many years.
 - iv. The gummy material that surrounds the copper tubes for the compressor should be well positioned to seal the center compartment. Check that the tube insulation was not mistakenly placed through the gum material as that lowers it's effective sealing. Massage and remold the clay-like material to make sure it is well sealed.
 - v. Check that the black rubber IV port protectors are in place, and use the red caps to help seal the ports when not in use. Replacements for both can be ordered from Snyder Mfg.
 - vi. Check that the oxygen sensor (fuel cell) has the 2 pieces screwed to each other to hold it in place. The Max-7L fuel cell ships with both pieces. They screw together from both sides of the partition between the center B compartment and the compressor C compartment.
 - vii. Check the back of the cage to make sure the removable back is screwed down tightly around the center compartment.
 - viii. Check the oxygen supply lines inside the compressor compartment. Listen for leaks or use a soapy water solution in a spray bottle to look for possible leaks in the connections and lines.
 - ix. Check the date that the oxygen sensor (fuel cell) was last replaced. oxygen sensors will give inconsistent readings as they age and expire. The typical life span is between 1 and 3 years, depending on use.

b) Oxygen Delivery System

1. To troubleshoot oxygen delivery issues, please follow the steps below and answer the questions to help solve your oxygen delivery system issues.
 - i. Turn the oxygen regulation system off using the control panel.
 - ii. Unhook the quick disconnect that connects the nebulizer to the oxygen system.
 - iii. Connect an oxygen source to the flow meter, open the flow meter, and observe the flow indicator.
 - iv. If the flow indicator shows oxygen flow, we need to determine where that gas is going.
 - v. Put your hand in front of the nozzle the delivers oxygen to the circulation fans. Do you feel gas flowing? Plug it with your thumb. Any change in the flow meter? Is the muffler clogged?
 - vi. Put your hand in front of the nebulizer quick disconnect receptacle. Do you feel gas flowing? Plug it with your thumb. Any change in the flow meter?
 - vii. Run your hand around all of the fittings and plastic lines inside of the compressor compartment. Check all parts of the oxygen delivery system. Any hissing or gas leaks?
 - viii. Make sure the flowmeter is firmly screwed into the bulkhead. Any leaks there?
 - ix. Tighten down the plastic shield over the flowmeter. Was it loose?
 - x. Try increasing the pressure to the system. Open the flowmeter all of the way, and turn the oxygen regulation system up to 100psi if you are able to. Recheck v-ix. Find any leaks? If not, turn the flow meter back down to the ball in the middle of the gauge.
 - xi. Turn the oxygen regulation system on the control panel on. Put both the set points above current concentrations. You should hear the solenoid open up with a sharp "click".
 - xii. Turn the oxygen system on and off repeatedly. The solenoid should make a "click" and a slightly lower sounding "clack" as it opens and closes. The noises should be consistent sounding each time. Observe the flow meter as you do this. How does it respond?
 - xiii. Unplug the solenoid power supply inside the compressor compartment using the quick disconnect near the part. Is gas still flowing?
 - xiv. Connect the quick disconnect male into the female receptacle for the system. Does the flow change on the flow meter? Is the quick disconnect receptacle damaged or not functioning?
 - xv. Use the O2 sensor by removing it from the cage and pointing it at your fittings to see if there are leaks.
 - xvi. Noisy solenoids can be disassembled to quiet down.

3. Compressor and Cooling Issues

a) General Info

1. Our systems are designed to maintain a controlled temperature with a large breed of dog in the animal compartment. If you are finding that your system no longer cools as expected, here are some suggestions to improve the efficiency of the cooling system. Remember that air conditioners are essentially heat pumps: they move heat from one part of the unit to the other.
 - i. Check that the cage is not pushed up against a wall. Our systems need a minimum of 2" of clearance in the back of the system to dissipate heat taken from the animal compartment.
 - ii. Make sure that both the evaporator coil (cold coil) and the condenser coil (in the compressor compartment) are clean and free of dust and debris. Use compressed air to blow out either coil.
 - iii. Check that the 3 chamber circulation fans are operating and that the chamber filters are not greatly restricting air circulation. Reduced air circulation will possibly allow the cold coil to ice up and prevent the system from cooling at all. If this happens, turn off the climate control and allow the air to circulate past the cold coil until the ice melts.
 - iv. Please be aware that all compressor systems will slowly leak refrigerant over time. Expect that every 10-15 years your system will need some basic maintenance and possibly a recharge by a qualified HVAC technician.

4. Dehumidify Issues

- a) If your system is not removing humidity adequately or if your system is cooling several degrees below your set point while using dehumidify, then you will have to adjust your settings in the configuration window. Change the dehumidify on or off time to change how long the compressor runs during the dehumidify setting.
- b) Increase the dehumidify on time if your system is not removing as much humidity as desired. If the cage is cooling too much, then decrease the dehumidify on time.
- c) On the membrane control panel, the dehumidify times can be adjusted by pressing:
(Temperature ON/OFF - Display Temp/Humidity - De-Humidify) at the same time. Next:
Press climate control to adjust the dehumidify cycle time. (default: 900 seconds)
Press heat only to adjust the time that the heat runs during the cycle. (default: 180 seconds)
Press cool only to adjust the time that the compressor runs during the cycle. (default: 220 seconds)

5. Recovery Base Issues

- a) Check to make sure the wires are firmly connected and are undamaged.
- b) The crimps can be squeezed closed slightly to make them hold better.
- c) The base heated floor element is directly underneath of the the Formica surface. Damage and/or water penetration may render the heated floor inoperable. Repair of heated floors are next to impossible once damaged due to inherent design.
- d) Using a multimeter will be generally the best way to diagnose heated floor issues. Check for a complete circuit in the recovery base using a continuity test/resistance test. You should expect approximately 120 ohm of resistance

6. Touch Screen Control Panel

- a) Error Conditions
 - 1. Temperature displaying 999
 - i. The temperature cable is unplugged
 - ii. The temperature cable is damaged
 - 2. Oxygen reading 0%
 - i. Oxygen cable is unplugged, broken, or disconnected in some way
 - 3. Carbon Dioxide reads 0% or 100%
 - i. Check the wires, make sure that nothing is damaged or broken.
 - 4. Humidity reads 0% or 100%
 - i. Check the wiring. Make sure that nothing is damaged or broken.
 - 5. Lights not working
 - i. Check that the lights are not disconnected or damaged. The wiring for the lights is run across the top of the unit. If damaged, the entire system may not operate.
 - 6. Host Communication Error
 - i. Potentially the internal connection are disconnected. Please call Snyder Mfg. for assistance.
 - 7. Oxygen sensor nearing expiration warning
 - i. cal offset to 3000
- b) Unexpected operation
 - 1. Check the plugs and the wiring on the back of the control panel. Look for any wires that are loose, damaged, or disconnected.
 - 2. Make sure the wires match the wiring diagram attached to the back of the control panel.
 - 3. Make sure the plugs are all firmly seated and attached correctly to the back of the control panel.

7. Membrane Control Panel

a) Error conditions

1. E00
 - i. This is the invalid parameter error code. This indicates that the low set point is below 20.5%, or that the high set point is below the low set point. To fix this, simply change your set points above 20.5%.
2. E01
 - i. This indicates a general failure in the control panel. Please contact Snyder Mfg. to troubleshoot this issue.
3. 888
 - i. This indicates a general failure in the control panel. Please contact Snyder Mfg. to troubleshoot this issue.
4. CEL
 - i. This displays when the oxygen sensor has expired
 - ii. This may also flash between a reading and CEL on certain models. This is due to a minor change of design by our oxygen sensor manufacturer and should be considered nuisance. The system will perform as expected and the reading displayed is accurate.
 - iii. When the display shows CEL constantly, replace the oxygen sensor.

M. System details

1. Dimensions / Weights

- a) ICU unit standard dimensions are 69 3/4", 60", or 46 3/4" wide by 32" tall by 28" deep.
- b) ICU unit standard weights are 440#, 400#, and 355# respectively.
- c) Base unit standard dimensions are 69 3/4", 60", or 46 3/4" wide by 31 3/4" tall by 28" deep, plus an additional 4" for optional casters.
- d) Base unit standard weights are 200#, 175#, and 140# respectively.

2. Included Parts

- a) Instruction Manual
- b) Warranty Kit with gate adjustment tools
- c) Wire Ties
- d) Acrylic Care Kit with cleaning product and towels
- e) Power Cord
- f) I.V. Stand
- g) Flowmeter
- h) 4' Oxygen Hose
- i) 4 Nebulizers and 2 corrugated tubing sections
- j) Quick Disconnect
- k) Base Removable Partition
- l) Clear and Opaque ICU Partitions
- m) Compressor Filter and 2 chamber filters (installed)
- n) Condensation Drip Tray
- o) Soda Lime Tray with 1 bag of Soda Lime
- p) Disposable Oxygen Sensor (Fuel Cell) (installed)
- q) Matting for the ICU and Base Units
- r) Tube of Silicone

3. Component Specifications

- a) Cage
 - 1. Manufactured with particle board, high density Formica laminate, medium-density fiberboard, polyester resin, and 3 coat industrial paint.
- b) Compressor
 - 1. 1/3 HP CSIR compressor with approx. 2.5 lbs. of R-22 equivalent refrigerant (currently R-438a)
- c) Heat Element
 - 1. 350 Watt heater bar
- d) Flowmeter
 - 1. Measures oxygen flow from 0-15 LPM at 50 psi. Will deliver 95+ LPM in flood position. Less than 1% error per psi at different pressures.
- e) Solenoid
 - 1. Normally closed electromagnetic valve, rated up to 175psi. Snyder Mfg. recommends not more than 100psi be applied to the oxygen system.
- f) Oxygen Sensor
 - 1. Measurement range is 0%-100% volume. Nominal sensor life is greater than 1,000,000 volume % hours. Expected operating life is less than 3 years @ ambient air. Shelf life before use is no greater than 6 months. 1 year manufacture warranty. The serial number can be used to determine manufacture date of the sensor. The first letter corresponds to the year, with Y = 2013, Z = 2014, A = 2015, etc... and the second letter corresponds to the month, with A = January, B = February, etc...
- g) Carbon Dioxide Sensor
 - 1. 0-5000 ppm measurement. 2 year manufacture warranty.
- h) Lights
 - 1. 24V DC LED lights

4. General Electrical Specifications

- a) Fans
 - 1. 4 fans draw a total of .85 Amps, 120VAC
- b) Alarm output.
 - 1. Sonic alert, minimal amp draw, 120 VAC
- c) Oxygen solenoid
 - 1. Normally closed (NC), opens for oxygen delivery. Rated at 8.5 Watts (.07 A), 120VAC
- d) Chamber heat element
 - 1. Rated at 350 Watts (2.9 A) 120VAC
- e) Left floor heat wiring
 - 1. Rated between 100 and 200 Ohms, .6A to 1.2A, 120VAC
- f) Right floor heat wiring
 - 1. Rated between 100 and 200 Ohms, .6A to 1.2A, 120VAC
- g) Air conditioning compressor
 - 1. RLA (Running Load Amps) of 7.05A 120VAC
 - 2. LRA (Locked Rotor Amps) of 29.0A. 120VAC.
- h) Chamber lights
 - 1. Draws not more than .5A. 24VDC.

5. Compressor Technical Info

- a) We use a Copeland MCFH-0036-IAA-272 compressor. It is a 1/3 HP Capacitor Start – Induction Run Compressor with external overload protection. This is a R-22 system and uses Alkylbenzene oil.
- b) We used R-12 from 1974 to '93, R-22 from '93 to 2008, R-134a from 2008-2011 and R-438a from 2011 to present.
- c) If a refrigerant is not available, use R-22 or an R-22 equivalent. Don't mix refrigerants, vacuum and recharge if refrigerant is unknown or unavailable.
- d) Typical charge is 2 to 2.5 lbs (32-40oz) of R-438a. Other gasses have similar charge.
- e) The coolant reserve tank makes overcharge unlikely. (up to 70oz+).
- f) Fill the compressor to at least sight glass full on normal operation. Fill low-pressure side as a gas with system running. Don't fill liquid to low-pressure side with system running.
- g) Sight glass 1/4 full or less typically indicates a low charge, and probably won't cool effectively.
- h) Low-pressure port typically runs about 30-60psi with no heat load. Lower psi typically indicates a low charge or other problems. Higher psi indicates problems.
- i) High-pressure port typically runs about 170-220psi with no heat load. More or less can indicate problems.
- j) If system is tipped sideways, please allow 24 hours for the compressor oil to settle again.
- k) Removing the 4 Phillips truss bolts securing the compressor to the floor can increase service port and electrical access. Electrical cover slides front/back after removing screw.
- l) Compressor draws about 7A running, with a max startup draw of 29A, from the nameplate.
- m) The condenser fan is connected directly to the compressor input wires.
- n) This Capacitor Start – Induction Run (CSIR) compressor has 3 terminals on the compressor. Common (C) is the top terminal, Run (R) is the bottom right terminal, and Start (S) is the bottom left terminal.
- o) Common to Run is 1.3 Ohms. Common to Start is 7.4 Ohms. Run to Start is 8.7 Ohms.
- p) A resistance reading through the main compressor supply wires with all electrical components working is 1.3 Ohms.
- q) Disconnecting the overload protection and start/run relay from the compressor bulb gives a reading of 40.4 Ohms through the main wires for the fan only.
- r) The overload breaker reads .2 Ohms through the component normally.
- s) The start/run relay reads .1 Ohms between input and the run terminal normally.

6. Other Product Specifications

a) Soda Lime (from the company's product literature)

1. CARBO₂LIME® carbon dioxide absorbent is a granular soda lime absorbent for the efficient removal of carbon dioxide from closed and semi-closed patient breathing circuits. CARBO₂LIME is a quality compound which contains no potassium hydroxide (KOH). It is formed by proportionately mixing calcium hydroxide (Ca(OH)₂) with a small amount of sodium hydroxide (NaOH). Available in three convenient package sizes, CARBO₂LIME is supplied as hard, irregularly shaped granules which have been processed to reduce dust formation from friction. Significant process improvements have resulted in enhancements in moisture content (12-19%), hardness, and porosity generation. As a result, CARBO₂LIME delivers dependable, efficient carbon dioxide absorption. Allied's CARBO₂LIME meets or exceeds the United States Pharmacopoeia - National Formulary specifications for soda lime and is manufactured in accordance with the United States Food and Drug Administration (FDA), Good Manufacturing Practices (GMP), and ISO 9002 guidelines.
2. Features:
 - i. No KOH - Minimum anesthetic agent degradation (e.g., Sevoflurane to Compound A and other toxic products) compared to other brands containing potassium hydroxide.
 - ii. Low Dust - Minimum dust levels with the benefits of high surface area and graded particle size.
 - iii. Low risk of carbon monoxide formation due to good resistance of dry gas desiccation.
 - iv. Low Bulk Density - Less weight required to fill absorber and, therefore, less waste when refilling frequently (e.g., daily) prior to full exhaustion.
 - v. Low odor due to reliable control of indicator dye concentration. Dye overdosing causes amines to be released; dye under-dosing causes poor/no color change.
 - vi. Available in prepackaged cartridges, bags for canister refill, and 5-gallon pails.
 - vii. CARBO₂LIME contains a small amount of ethyl violet, which acts as a color indicator when the absorbent is nearing exhaustion. CARBO₂LIME color is white to off-white. As carbon dioxide is absorbed, it reacts with the ethyl violet, which causes the granules to distinctively change to purple. The purple color will intensify to indicate exhaustion of the soda lime. When the deep purple color has penetrated to half the depth of the absorber, the used material should be discarded. If exhausted self-indicating CARBO₂LIME is left to stand, its color will slowly change back to white, due mainly to a small quantity of unreacted hydroxide in the interior of the granules which slowly react with the sodium carbonate on the surface. CARBO₂LIME, in this apparently regenerated condition, should never be used again as it will become exhausted and its color will change again almost immediately. Therefore it is essential to empty canisters immediately after use.

b) Nebulizers

1. Disposable 350mL nebulizers with air entrainment from 35% to 100% oxygen and an immersion heater adapter port. Latex free.

c) Flowmeter

**FME100
Flowmeter**

**Slim Line Oxygen
Flowmeter 15 LPM**



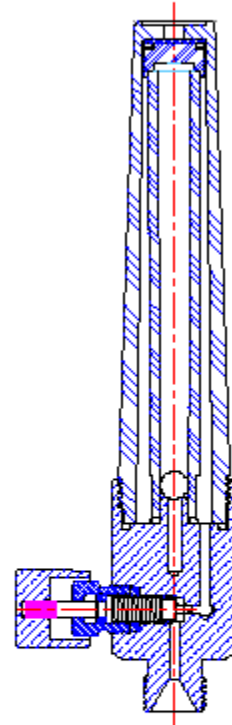
WESTERN
a Scott Fetzer company

GAS CONTROL TECHNOLOGY

MATERIALS OF CONSTRUCTION

DESCRIPTION	Weld Component	MATERIAL
Body	Y	Chrome Plated UNS C36000 Brass
Flow Tube	Y	Mobay Makrolon 2608
Flow Tube Cover	Y	GE Lexan 144-111 or 112 (or Bayer Polycarbonate 2608-1112)
Inlet Screen	Y	UNS S30400 Stainless Steel Mesh
Burst Disc	Y	Neoprene
Float	Y	Black Glass
O-rings	Y	70 Durometer Buna-N
Bumper Disc	Y	High Density Polyethylene
Needle Valve	Y	UNS C36000 Brass
Adjustment Knob	N	Chrome Plated UNS C36000 Brass
Valve Bushing	Y	Chrome Plated UNS C36000 Brass
Valve O-ring	Y	70 Durometer Ethylene Propylene
Washer	Y	Teflon (PTFE)
Lubrication	Y	Krytox 206GP

- Inlet Threads: 1/8 – 27 NPT
- Outlet Threads: 9/16 – 18 UNF-2A (CGA-022)
- Inlet Filtration: 250 X 250 Ø0.0016" SST Mesh
Nominal Filtration Rating – 61 micron
- Shipping Weight: 8.5 ozs
- Leak Rate:
Internal: 2.7×10^{-2} cc/sec Oxygen
External: Bubble Tight
- Calibrated Inlet Pressure: 50 psig
Pressure Compensated Flowmeter
- Burst Disc Rupture Pressure: 500 psig nominal
- Flow Accuracy: $\pm 5\%$ Full Scale (over operating range of 0.5 – 15 LPM Oxygen)
- Maximum Flow (Flood): > 95 LPM Oxygen @ 50 psi
Effect of Inlet Pressure on Flow Accuracy: < 1.0% of Reading per psi
- The following FME flowmeter part numbers are "MR-Conditional" for use outside of the bore of an MRI machine under the following conditions: Static magnetic field of 3.0 Tesla or less and a spatial gradient field of 720 gauss/cm or less.



Base Number	Flow Range	No Assignment	Inlet Connection
FME	1, 2, 9	0	1, 2, 3, 4, 7 & 9

Western reserves the right to make design changes without prior notice

For additional technical information or assistance in ordering, please contact Western Customer Service at 1.800.783.7890 or 440.871.2160

PRODUCT DATA SHEET
FME100 Flowmeter

Page 1 of 1

WPDS1011
ECN14052 (0709)

N. Warranty Information

TWO YEAR LIMITED WARRANTY ON SNYDER CAGES

For TWO (2) years from the date of purchase within the United States of America, its possessions and territories, SNYDER MFG. CO. Inc., will at its option, repair or replace, for the original purchaser, free of charge, any part or parts found to be defective in material or workmanship (except electronic control panels as specified elsewhere). This warranty covers cage units which have been operated and maintained in accordance with Snyder's care instructions furnished with the unit, and which have not been subject to misuse, abuse, neglect, accident, improper maintenance, alteration, or use outside an appropriately ventilated/heated building which is in good repair. Exceptions to this two year warranty are outlined below:

One-year consumer warranty on normal wear parts with Ninety-Day (90) Consumer Warranty protection

All normal wear part failures will be covered on this product for a period of 90 days regardless of cause of operational failure. This does not apply to part failure as a result of acts of God and other unforeseen acts, including vandalism. After 90 days, but withing the two-year warranty period, normal wear part failures will be covered if caused by defects in material or workmanship or other component parts. Normal wear parts are defined as handles, cage door bolts, casters, cardholder clips, removable partitions, Cat Nappers®, and one-half floors.

One Year Warranty for ICU and Dryer Cage Electronic Components

These units must be run on a dedicated circuit with no other electronic components on the same circuit. Use of this equipment without a dedicated circuit voids any warranty on the electronic parts of the units. The control panel of the ICU and the Dryer Cage are warrantied for one year by the manufacturer.

Warranty Conditions:

The provisions as set forth in this warranty provide sole and exclusive remedy of SNYDER MFG. CO. Inc's obligations arising from the sales of its products. SNYDER MFG. CO. Inc. will not be liable for incidental or consequential loss or damage.

This warranty does not cover routine maintenance items such as lubricants, filters or minor adjustments. This warranty does not cover gate damage from animals. This warranty does not cover normal deterioration of the exterior and interior finishes due to use or exposure.

This limited warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Warranty service is exclusively available through Technical Service Personnel at SNYDER MFG. CO., INC., who can be reached at (800) 433-1931, M-F 8AM to 4PM (Mountain Time).
6228 S. Troy Circle, Centennial, CO. 80111

(2013)

O. Reference Information

Invoice Number: _____

Name Purchased Under: _____

Manufacture Date: _____

Unit Serial Number: _____

Panel Serial Number: _____