



Environments For Science™



# ReCO<sub>2</sub>ver™

## Rapid Recovery CO<sub>2</sub> Incubator



# Operation Manual

This Manual applies to Models: • REC 602, • REC 602 -Plus

**The Baker Company  
175 Gate House Road  
Sanford Maine 04073**

## Introduction & Welcome

It is a pleasure to welcome you to the growing number of customers who own and operate Baker laboratory products. As the inventors of the laminar flow biological safety cabinet and a leader in the design and development of innovative contamination control technologies, we take pride in providing you with a product that is designed for maximum performance and protection for your work.

Your new ReCO<sub>2</sub>ver™ is a CO<sub>2</sub> incubator designed to prevent contamination and deliver precise, stable and user-defined control over three variables critical for optimal cell growth—temperature, CO<sub>2</sub> concentration and relative humidity. The introduction of a CO<sub>2</sub> incubator with this unique combination of proven benefits is a natural next step in Baker's evolution as the leader in the development of contamination control technologies. The ReCO<sub>2</sub>ver™, when used alongside a biosafety cabinet from Baker, is an essential tool for experimental work in cell biology, microbiology and molecular biology.

In addition to the high quality you expect from all Baker equipment, this model has been designed to provide the lab user with the most productive and trouble free operation possible. With full, finely-tuned control over interior conditions, you can create more lifelike conditions for your cultures to thrive and improve the validity of your results. Baker's exclusive InteliCELL® technology when combined with true unidirectional down flow air to the chamber, provides a "clean air" incubator where the impact from cross contamination and condensation on your work is greatly reduced.

Synonymous with our brand promise for all Baker products, ReCO<sub>2</sub>ver™ places further emphasis on user-safety, having been tested in accordance with relevant electrical and safety standards (cULus / CE) and achieving compliance with the directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS/WEEE).

Remember that you, the owner and user, are ultimately responsible for the operation of, and work procedures conducted within, your incubator. We recommend that this manual, along with the factory test report, be kept near the incubator for convenient reference by operators and qualified maintenance personnel.

If you have any questions about the use or care of your new ReCO<sub>2</sub>ver™ CO<sub>2</sub> Incubator, please do not hesitate to contact our Customer Service Department at 1-800-992-2537 for assistance or e-mail us at [bakerco@bakerco.com](mailto:bakerco@bakerco.com).

**Sincerely,**



**David Eagleson, President**



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## 1. INTRODUCTION

**1.1. Please read this manual carefully before using the Baker ReCO<sub>2</sub>ver™ CO<sub>2</sub> incubator. Familiarize yourself with all aspects of using the unit. The Baker Company (Baker) does not accept any responsibility for accidents to personnel or damage to the Baker ReCO<sub>2</sub>ver™ CO<sub>2</sub> incubator resulting from incorrect use.**

- All installation work and adjustments to the unit must be carried out by qualified personnel. Work performed by persons with insufficient technical knowledge may adversely affect the performance of the unit or cause physical injury or damage to the equipment.
- All servicing and repairs must be carried out by a qualified customer service engineer. Only genuine replacement parts must be used.

**1.2. This product must be used in the manner described in this manual. Safety protections incorporated in the product may be impaired if the product is not used in the manner specified in this manual.**

**1.3. The Baker ReCO<sub>2</sub>ver™ CO<sub>2</sub> incubator has been specifically designed and developed to meet laboratory requirements.**

### 1.4. **Warranty**

- 1.4.1. The Baker Company, Inc., expressly represents and warrants all goods (a) to be as specified (and described) in The Baker Company catalogs and literature, and (b) to be free under normal use, service and testing (all as described in The Baker Company catalogs and literature) from defects in material and workmanship for two years. Wear items such as bulbs, gloves, filters, etc. are not covered by Baker's standard warranty.
- 1.4.2. The exclusive remedy for any breach or violation of this warranty is as follows: The Baker Company, Inc., will F.O.B. Sanford, Maine, furnish without charge repairs to or replacement of the parts or equipment which proved defective in material or workmanship. No claim may be made for any incidental or consequential damages.
- 1.4.3. This warranty is expressly in lieu of all other warranties, expressed or implied, including any implied warranty of merchantability or fitness for a particular purpose unless otherwise agreed in writing signed by The Baker Company. (The Baker Company shall not be responsible for any improper use, installation, service or testing of the goods.)

### 1.5. **Symbols used in this manual:**

**The warning “!” symbol identifies potential hazards associated with the use of this equipment.**



### 1.6. **Navigating this document**

This manual contains many hyperlinks that will help you move to related content. Hyperlinks appear in **BLUE** font (typically a section number). Click on the blue links to navigate quickly to related sections of the manual.

## 2. DESCRIPTION

### 2.1. ReCO<sub>2</sub>ver™ is intended for typical biological work in a laboratory environment.

### 2.2. Operating environment:

- 2.2.1. The ambient temperature of the location should be from 59°F to 86°F (15°C to 30°C). ReCO<sub>2</sub>ver™ can maintain chamber temperature when set at least 7°C above ambient. If ambient temperature is warmer than 7°C below chamber temperature, chamber temperature will tend to drift upward. ReCO<sub>2</sub>ver™ automatically compensates for changes in ambient temperature but rapid changes in ambient may affect chamber stability. A temperature-regulated environment will ensure best chamber stability.
- 2.2.2. The relative humidity must not exceed 85% at an ambient temperature of 86°F (30°C). For peak performance, ambient humidity of 50% and temperature of 73°F (23°C) should be targeted.
- 2.2.3. The altitude of the location must not exceed 6,500 ft. (2,000 m).

### 2.3. Regulatory Compliance

The Baker Company ReCO<sub>2</sub>ver™ incubator complies with “UL 61010-1 3rd Edition: Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use”. UL file number E161118 certifies compliance for US and Canada.

CE Compliant: The product complies with the requirements of the European Union directives listed below.

2014/35/EU: The Low Voltage Directive and its amending directives (LVD)

2014/30/EU The Electromagnetic Compatibility Directive and its amending directives (EMC)

2011/65/EU: Restriction of the use of certain hazardous substances (RoHS)

2012/19/EU: Waste Electrical & Electronic Equipment (WEEE)

### 2.4. Standard features included

**Your Baker incubator came equipped with the following standard features:**

- 2.4.1. Measurement and active closed-loop control of temperature, humidity and CO<sub>2</sub> concentration
- 2.4.2. Full flow HEPA filtration of chamber air
- 2.4.3. Four (4) Stainless Steel Shelves
- 2.4.4. Cable port
- 2.4.5. Ultraviolet (UV) Light
- 2.4.6. Automatic Water Fill

### 2.5. Optional features

**Your Baker incubator may be equipped with one or more of the following optional features:**

- 2.5.1. Ultrasonic Hydrogen Peroxide Vapor Decontamination
- 2.5.2. Backup CO<sub>2</sub> supply auto-transfer
- 2.5.3. Serial Communications Package
- 2.5.4. Analog Communications Package
- 2.5.5. Copper Interior Components

Depending on the product configuration ordered, your incubator may have been shipped with separate packages. Ensure that you have received all of these packages prior to setting up your incubator.

### 2.6. Optional accessories

- 2.6.1. Stacking Kit (P/N: 673A401)
- 2.6.2. Rolling Cart (P/N: 673A400)

2.6.3. CO<sub>2</sub> gas pressure regulator (P/N: RUS GP402-125-320)

2.6.4. Detachable cordsets for various countries and regions

### 3. SHIPPING AND TRANSPORT

**3.1. Check for damage to the packaging upon delivery. If you find that damage has occurred in transit, immediately contact the shipping company to place a claim.**

Key characteristics to inspect upon arrival and unpacking:

3.1.1. Verify that the leveling feet are intact.

3.1.2. Verify that there is no visible damage to the outer casing of the unit.

3.1.3. Verify that both the outer door and inner glass door close without difficulty and that both door seals are properly seated.

3.1.4. Verify that the interior components are properly located in the packaging provided.

**3.2. Retain the original shipping container if there is any possibility of a return or further shipment. The container has been carefully designed and tested to protect the unit during the normal rigors of transport.**



**Do not operate a unit that has been damaged in transit! If you are unsure, contact Baker customer service.**

### 4. PLANNING YOUR INSTALLATION

**4.1. A few minutes of planning and preparation may save you a good deal of frustration later! Have you confirmed:**

Adequate clearance is available for moving the incubator into place (See separate unpacking instructions for crated dimensions, Section 6.2.1 for incubator dimensions)

An appropriate location is available (Section 6.2)

The required utilities are available (Section 6.10 through 6.12)

Do you need the door to open to the left or to the right? (Section 6.3)

Safety considerations are addressed (see section 5)

### 5. CAUTIONARY NOTES

**5.1. Baker Company Inc. does not accept responsibility for damages caused by using the equipment for purposes other than those described in this manual.**

**5.2. All installation work and adjustments to ReCO<sub>2</sub>ver™ must be carried out by qualified personnel. Work performed by persons with insufficient technical knowledge may adversely affect the performance of your incubator or cause physical injury to personnel or damage to the equipment.**

**5.3. Ensure that the power cable is not squeezed, cut or bent sharply when the incubator is being installed or moved.**

**5.4. Before cleaning or carrying out maintenance work, always switch the machine off and disconnect the power plug.**

**5.5. Ensure that the door connecting cable, located on the underside of the door, is not squeezed or bent when the unit is being installed or moved.**

**5.6. Before cleaning or carrying out maintenance work, always switch the machine off and disconnect the main plug. Always pull the plug and never the cable. If the plug is not accessible, switch off at the safety device.**

**5.7. This product must be used in the manner described in this manual. Safety protections incorporated in the product may be impaired if the product is not used in accordance with the instructions in this manual.**

**5.8. Safety features**

5.8.1. Your Baker incubator is equipped with a door switch that will disable several functions when the glass door is opened. When the door is open, many functions including the circulation fan, humidification, and (if so equipped) the UV lamp are disabled. When the door is closed, normal operation resumes.

5.8.2. A pressure relief valve on the inner chamber prevents accidental over pressurization of the chamber by CO<sub>2</sub> injection.

5.8.3. Other safety features include:

- a. Circuit protector main switch

**5.9. All servicing and repairs must be carried out by a qualified customer service engineer. Only genuine replacement parts must be used.**

 <p><b>Asphyxiation Risk</b></p>	<p>ReCO<sub>2</sub>ver™ releases a small, controlled flow of CO<sub>2</sub> into its environment as it maintains CO<sub>2</sub> concentration in the chamber. Normally the volume released is inconsequential but in the event of a leak or malfunction, this CO<sub>2</sub> release could conceivably become excessive. <b>DO NOT OPERATE</b> this unit in a <b>SMALL ENCLOSURE</b> such as a very small room or walk-in closet. Accidental release of CO<sub>2</sub> could create an asphyxiating atmosphere in a small space.</p>
 <p><b>UV radiation</b></p>	<p>The optional germicidal UV lamp emits UV light that can be hazardous to people, especially to the eyes. When the glass inner door is opened, the UV lamp is disabled for your protection. Do not attempt to disable the door switch that provides this protection as this will result in an unsafe condition for the operator. If the UV light remains on when the glass door is opened, close the glass door immediately and contact Baker customer service to correct this safety issue.</p>

## 6. SETUP

### 6.1. Unpacking ReCO<sub>2</sub>ver™

**Unpacking instructions are provided separately for your convenience as you address the newly arrived incubator.**

#### 6.1.1. Handling

Keep ReCO<sub>2</sub>ver™ upright at all times, except when reversing the door hinges (see section 11.1).

When lifting ReCO<sub>2</sub>ver™ lift from the bottom of the main chassis only. Do not lift by the front door.

Before moving your incubator, drain water reservoir. Remove all contents. Remove all detachable shelves and panels to reduce the weight of the cabinet and avoid damage to interior components that could move during handling.

### 6.2. Location

### 6.2.1. Dimensions

26.9" W x 26.5" D x 40.5" H (683mm W x 673mm D x 1029mm H)

6.2.2. Clearance from the back of incubator to the wall must be at least 4" (10 cm).

6.2.3. Clearance on the sides must be at least 3" (7 cm) for essential ventilation

6.2.4. Additional space may be required for your utility connections (power, water, CO<sub>2</sub>)

6.2.5. Supported weight: 244 pounds (111kg) plus content of 75 pounds (34kg) recommended maximum

### 6.2.6. Power switch access

The main power supply switch is located on the rear of the incubator. Normally, ReCO<sub>2</sub>ver™ is turned on and off using the touch screen on the front. Locate the unit such that the operator can readily access the power switch when necessary.

### 6.2.7. Door swing clearance

Ensure 3 inches (7 cm) clearance on the hinge side of the door to accommodate door travel when opening.

### 6.2.8. Levelness

Levelling feet will accommodate some unevenness of surface but a flat level surface is important. See section 6.8 for leveling instructions.

### 6.2.9. Environment

a. ReCO<sub>2</sub>ver™ is intended for indoor use only.

b. Avoid placing ReCO<sub>2</sub>ver™ in direct sunlight or locating it close to a heat source.

c. Ensure that the incubator operating environment meets the specifications listed in section 2.2

d. Room ventilation

Do not install your incubator in a small unventilated space. CO<sub>2</sub> is normally vented from the incubator at a very small rate but leaks or faults could create an asphyxiating environment in a small space.

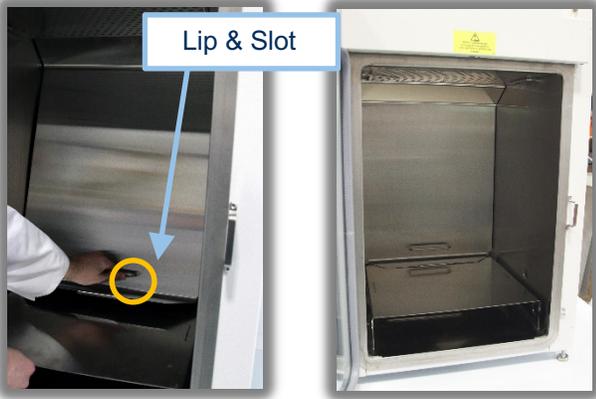
e. Units may be stacked using the optional stacking kit (see instructions with stacking kit). Do not stack more than two units.

## 6.3. Door Reversal

ReCO<sub>2</sub>ver™ is normally shipped with its doors hinged on the left. Before installing, consider whether this is the appropriate orientation for your installation. Reverse the door opening if necessary. See section 11.1 for detailed door reversal instructions.

### 6.4. Assembling interior components

Shelves slide into and out of the incubator in grooves in the removable side panels. Insert the shelves into the chamber with the narrow end at the rear of the incubator. The front lip toward the user should be oriented downward.

<p>6.4.1. Insert the inner floor Be careful of the level switch and the optional UV lamp assembly as you insert this piece.</p>	
<p>6.4.1. Insert the rear plenum partition into the chamber. a. Push the panel to an upright position at the back of the chamber. b. Engage the lip on the bottom of the rear panel in the slot at the back of the inner floor.</p>	
<p>6.4.1. Insert the left and right side-wall/shelf bracket panels. a. Note orientation of notches at front edge b. The bottom edge of the shelf panel engages a slot in the inner floor c. Note that the right panel has an opening for the cable port, which should be plugged from the inside.</p>	

- 6.4.1. Slide the shelves into the desired locations
- Consider the anticipated loading of shelves when choosing shelf positions
  - Note the downward orientation of the front lip
  - Note the upward orientation of the lip on the side of the shelf.



## 6.5. Disassembling interior components

Disassemble interior components by reversing the steps for assembly.

## 6.6. Weight limits

6.6.1. Each shelf is capable of supporting 25lbs (4.5kg).

6.6.2. Total shelf loads should not exceed 75lbs (27kg).

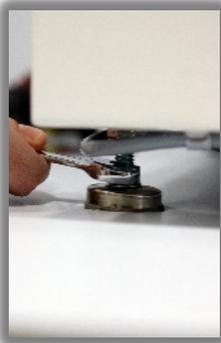
Overloading shelves may cause sagging of shelves creating non-level condition or even damage the shelves.

## 6.7. Recommendations related to airflow

For best results, do not cover all the holes of any shelf. Leaving a few holes uncovered will allow HEPA filtered air to flow smoothly through the chamber. Covering a whole shelf will not damage the incubator or affect regulation of temperature, humidity or CO<sub>2</sub> concentrations, but it will affect air cleanliness recovery time after opening the door.

## 6.8. Levelling

Ensure your incubator is level and that all four feet make contact with the mounting surface before use. Adjustment should be done with reference to the levelness of the shelves (put your level on a shelf while adjusting). Loosen the lock nut using a 9/16" wrench to turn the nut down away from the cabinet bottom. Adjust the foot up or down with a 1/2" wrench. When the shelves are level and all four feet are in contact with the mounting surface, turn each locknut up against the bottom of the cabinet to lock its foot in place



### 6.9. Stacking (optional)

<p>Tipping  Risk</p>	<p><b>Use the ReCO<sub>2</sub>ver™ stacking kit (P/N: 673A401)</b> if two units are to be stacked on top of one another.</p> <p>Failure to install the Baker stacking kit properly may result in serious injury or equipment damage.</p>
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- a. Installation instructions are provided with the stacking kit.

### 6.10. Power

6.10.1. ReCO<sub>2</sub>ver™ is supplied in two power configurations:

- 120V 60Hz for North American and similar power systems, rated 4.0A (REC602)
- 230V 50/60Hz for European and many other power systems, rated 2.0A (REC602-INT)

6.10.2. Before connecting power, ensure that your incubator power configuration is compatible with your power source. Check the electrical ratings on the nameplate on the right side of the cabinet. Serious damage may result if ReCO<sub>2</sub>ver™ is connected to the wrong power source!

6.10.3. Detachable molded power cordsets are available as an optional accessory. A wide selection of cordsets are available covering the majority of the world's AC power sockets. If you wish to procure a cordset locally, specify an IEC 60320 C14 connector for the cabinet end and a cord ampacity adequate for the incubator's current rating (refer to unit nameplate) in compliance with local codes or standards.

6.10.4. Locate the power entry connector at the back of the unit in the upper right hand (front view) corner. Insert the female end of the cordset into this connector. Then plug the male end into your facility power outlet.

6.10.5. When you are ready to operate the incubator, (finish the setup steps) turn on the circuit breaker at the top rear of the cabinet.



### 6.11. CO<sub>2</sub> supply

 <b>Gas related hazards</b>	<p><b>Warning: Only use CO<sub>2</sub> with this incubator!</b></p> <p>Do not connect gasses other than CO<sub>2</sub> to this unit.</p>
	<p><b>Warning: Do not use CO<sub>2</sub> gas cylinders equipped with siphon tubes.</b></p> <p>Consult your gas supplier to ensure your CO<sub>2</sub> cylinder does not use a siphon tube.</p>
	<p><b>Warning: Do not exceed 20 PSI gas pressure.</b></p> <p>Excessive pressure could cause hazardous failure of pressure containing components.</p>

#### CO<sub>2</sub> supply requirements

Parameter		
Required pressure	15 PSI	103 kPa
Typical Flow Rate (while injecting)	6 SCFH	170 Lph
Typical consumption (at 5% chamber CO <sub>2</sub> )	.17 SCFH	4.8 Lph

#### CO<sub>2</sub> Accessories

Item	Ordering information
Connecting tubing	SMC Pneumatics TIUB 11C-33 Baker part number: 43557
CO <sub>2</sub> pressure regulator	Baker part number: RUS GP402-125-320
Tubing Barb Adapter	Baker part number: 43719

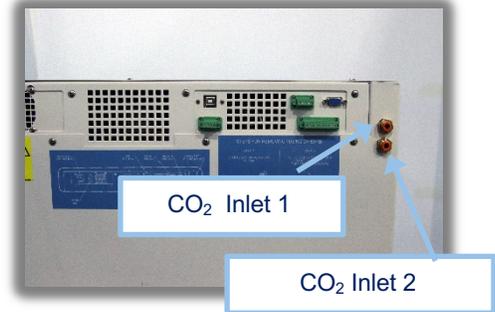
6.11.1. Pressure must be maintained at specified pressure at all times. Use a two-stage regulator on the gas cylinder for pressure control. CO<sub>2</sub> service regulators are widely available, typically from your local gas supplier.

If there is any doubt or further information is needed please contact Customer Service or your Sales Representative before proceeding with the installation.

6.11.2. The selection of CO<sub>2</sub> grade will depend on the application. Select a grade that meets the purity requirements of your application.

6.11.3. After confirming that your CO<sub>2</sub> supply meets ReCO<sub>2</sub>ver™ pressure regulation and flow requirements, connect your CO<sub>2</sub> source to the CO<sub>2</sub> fitting located on the top rear of your incubator by inserting the recommended connecting tubing into the CO<sub>2</sub> inlet fitting.

6.11.4. If your incubator is equipped with automatic CO<sub>2</sub> transfer, connect your second or backup CO<sub>2</sub> source to the other CO<sub>2</sub> fitting. ReCO<sub>2</sub>ver™ will automatically switch between sources once the active source is depleted.



## 6.12. Humidification Water

6.12.1. Water quality:

Use sterile purified water (e.g. deionized) water only in the humidity reservoir to provide humidity. Do not use highly purified water with a high resistivity (e.g. MilliQ 18M Ohm-cm). Do not use disodium chlorate or other halogen-based solutions for cleaning this incubator as they may cause corrosion. Water pH must be greater than 5.

Your application may dictate certain water quality requirements.

6.12.2. External water supply:

Connect a water source to the water inlet located on the lower right (front view) side. A small internal water pump will deliver water to the reservoir as needed. The water source may be:

- a. The four-liter plastic bottle supplied with the incubator
- b. a vented container or collapsible container (which does not create a vacuum in the container as it empties) or
- c. a pressurized water source of NOT MORE THAN 2 PSI (13 kPa). Higher pressure will cause overflow.

Place the water level of a container not more than 5 feet (1.5m) above or below the bottom of the incubator.

Use tubing type SMC Pneumatics TIUB 11C-33, Baker part number 43557 (same as for CO<sub>2</sub>), or supplied barb fitting.

6.12.3. Initial fill

- a. Let the internal water pump fill the reservoir (this may take a few minutes).



## 6.13. Water Drain Port

6.13.1. There is a water drain fitting on the front of the ReCO<sub>2</sub>ver™ which allows the user to empty the water reservoir easily with a vacuum source or hand pump using the included fitting.

## 6.14. System integrity

- 6.14.1. All panels should remain installed as installed at the factory. Removal of any panels, guards, etc. can create safety hazards and impair proper operation of incubator.
- 6.14.2. Both the glass door and outer door need to remain fully closed during operation.



## 7. PRINCIPLES OF OPERATION

### 7.1. ReCO<sub>2</sub>ver™ helps you create more lifelike conditions for your cultures to thrive by offering full, precise control over *three variables: temperature, CO<sub>2</sub>, and relative humidity.*

ReCO<sub>2</sub>ver™ draws on Baker's deep knowledge of contamination control technologies to provide unparalleled protection for your work.

Baker's proprietary IntelliCELL® PID control algorithm offers true active humidity control, giving users complete freedom to precisely define all three variables. Industry-leading stability, uniformity, and recovery times mean that even with a full load, cultures grow consistently from shelf to shelf, for dependably high quality, robust cells on every plate.

The vertical, unidirectional downward airflow with full-face HEPA filter delivers better than ISO Class 4 (Class 10) clean air to the chamber, protecting valuable cultures from potential contaminants.

Outstanding condensation control virtually eliminates wet spots where contaminants can grow and spread, even at humidity levels above 90%. The fogless interior door with heated frame provides a crystal clear view to every shelf, reducing the need for door openings. The ultrasonic humidity delivery system lets you ditch your water pan, eliminating the risk of contaminants and tedious water changes that typically go with it.

An intuitive color touchscreen gives users full control over incubator functionality, and an optional vaporized hydrogen peroxide decontamination protocol (ReCO<sub>2</sub>ver™ Plus) effectively kills even resistant contamination microbes in just under four hours (vs. up to 12 hours for other decontamination methods).

With plenty of options and accessories, including copper interior components, integrated automatic CO<sub>2</sub> switchover, and germicidal UV light, users can choose the level of control and protection their research requires.

### 7.2. Temperature regulation

ReCO<sub>2</sub>ver™ controls chamber temperature by gently heating the entire surface of the chamber walls. A temperature sensor inside the chamber provides a high-resolution measurement of temperature in the incubation chamber. IntelliCELL® uses this temperature measurement to meter heater power precisely in response to minute changes in temperature to achieve stable and uniform temperature in the chamber. The uniform application of heat across the entire jacket and the active stirring of air prevent local variations in chamber temperature.

### 7.3. Humidity regulation

An integrated humidity and temperature sensor provide precise relative humidity measurements.

IntelliCELL® controls chamber humidity by controlled generation of a water aerosol from an ultrasonic nebulizer. The nebulizer introduces the water aerosol into the air stream at the intake to the filter plenum. The aerosol evaporates as it moves through the plenum and filter. The vaporized water continues into the work area.

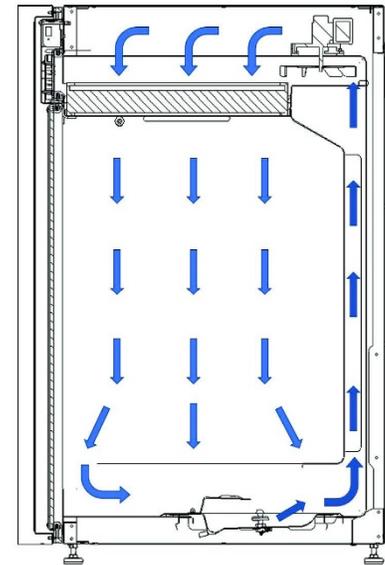
IntelliCELL® rapidly cycles the nebulizer on and off as required to maintain relative humidity. This system responds to changes much more quickly than evaporative pan systems, providing faster recovery from door opening transients.

#### 7.4. CO<sub>2</sub> Regulation

A non-dispersive infrared sensor measures CO<sub>2</sub> concentration. IntelliCELL® cycles a CO<sub>2</sub> solenoid valve injecting gas from your CO<sub>2</sub> source into the chamber as required to maintain the desired CO<sub>2</sub> concentration.

#### 7.5. Full flow HEPA filtration and air circulation

A circulation fan draws air in from the bottom front and bottom sides of the chamber. Air then travels through a plenum up the rear of the cabinet to the circulation fan. Fan discharge enters a plenum extending across the top of the cabinet, above the full-face HEPA filter. Air then moves through the full flow, total top area HEPA filter before cascading uniformly down through the work area, returning to the intake plenum at the bottom.



#### 7.6. Touch-screen operator panel

ReCO<sub>2</sub>ver™ is equipped with a color touch-screen interface that allows the user to operate and monitor the conditions within the incubator. The home screen shows the current conditions inside the chamber, as well as buttons to quickly access the control screens to view or change system settings, environmental conditions, and alarm conditions.

#### 7.7. Data logging with download to USB Thumb Drive

Once per minute, your incubator logs internal chamber conditions. Conditions are logged as a .csv file that can be downloaded onto a USB drive.

#### 7.8. Germicidal UV lamp

A ReCO<sub>2</sub>ver™ equipped with the UV option has an ultraviolet lamp in the return air plenum at the bottom of the chamber. The lamp irradiates the water reservoir and the return air stream. The lamp can be programmed for daily cycles and for after-door-opening cycles. Note that the lamp is a non-ozone producing type (lamp glass does not transmit ozone-creating UV wavelengths).

#### 7.9. Hydrogen peroxide biodecontamination (optional feature)

- 7.9.1. The ReCO<sub>2</sub>ver™ Plus model includes a potent decontamination routine, which disperses H<sub>2</sub>O<sub>2</sub> throughout the chamber condensing it on all surfaces.
- 7.9.2. The biodecontamination cycle involves removing some water from the reservoir, adding H<sub>2</sub>O<sub>2</sub> solution to the reservoir, and initiating an automatic biodecontamination sequence that vaporizes the H<sub>2</sub>O<sub>2</sub> solution and disperses it throughout the chamber. After an initial biodecontamination phase, the UV lamp is energized to decompose the H<sub>2</sub>O<sub>2</sub>.

#### 7.10. CO<sub>2</sub> backup gas supply transfer (optional feature)

Incubators equipped with this feature will automatically switch CO<sub>2</sub> supplies if regulation is lost with the active CO<sub>2</sub> source. This provides protection from the dreaded “empty bottle alarm” syndrome.

#### 7.11. Automatic water refill

The automatic refill feature eliminates the needs for frequent operator attention and for repeated door openings to service the water reservoir.

- 7.11.1. The automatic refill incorporates a small positive displacement water pump capable of lifting water from below the incubator (e.g. a container on the floor) and pumping it into the humidification pan/reservoir. See section 6.12 for detailed water quality and water source requirements.

7.11.2. The pump control logic provides reliable unattended operation while precluding large spills: When a low-level condition occurs, the pump will run for a preset period OR until the water level is restored, whichever occurs first. If the level is not restored in the allowed time the pump will stop until an operator intervenes. This prevents a large spill in the event that a leak is diverting the water or if the level detection somehow failed, resulting in an overflow.

7.11.3. This low-volume pump provides initial fill of the water reservoir. The pump will then maintain water level after the initial fill.

### 7.12. Alarm Relay Electronic interface

An alarm relay provides contact closure indication of the incubator status (OK/not OK). This is intended to serve as an input for a central monitoring system.

### 7.13. Analog Communications Interface (optional feature)

The analog communications option provides three 4-20mA channels. The channels consist of a temperature, relative humidity, and a carbon dioxide current loop. The 4-20mA option can be used in conjunction with a data acquisition system to externally monitor the three key system parameters of the incubator. See section [Error! Reference source not found.](#) for more information.

### 7.14. Digital Communications Interface.

#### 7.14.1. USB Communications Device

As a standard feature the incubator is equipped with a USB port conforming to the USB Communication Device Class (CDC). This allows for real time event and data records to be streamed to a USB Host computer or remote terminal. The event and data records can then be processed for a variety of purposes.

#### 7.14.2. Serial Communications Interface (optional feature)

**The digital communications option provides two serial communications channels. The channels consist of EIA-232 (RS-232) and EIA-485 (RS-485).**

Real time event and data records are streamed out of these channels. The event and data records can then be processed by a building management system or data acquisition system.



## 8. OPERATOR CONTROL PANEL

**8.1. ReCO<sub>2</sub>ver™ provides many powerful and versatile control capabilities that allow you to select detailed operating characteristics and functions to optimize performance for your needs.**

**8.2. To help you understand all these capabilities we will group them in broad categories:**

- 8.2.1. Basic operation
- 8.2.2. Alarm functions
- 8.2.3. Data and event logging
- 8.2.4. Security
- 8.2.5. Special functions
- 8.2.6. Service functions

**8.3. Conventions used in this manual and in the control design**

### 8.3.1. Navigation:

ReCO<sub>2</sub>ver™ provides many operating controls. In order to present all the associated information many display pages or “screens” are provided. The design anticipates that you will use only a few on a regular basis. Navigation buttons allow you to move from screen to screen to access the desired information and controls. Navigation buttons are generally located along the left side and bottom of the screen.

### 8.3.2. Numerical entry:

In order to enter a numerical value, press the highlighted box around the number to be changed. A numerical keypad will appear. Delete the existing value, then enter the new value using the keypad.

#### a. Messages:

Messages provide alerts to remind the user to order a replacement UV lamp, replace a UV lamp that has reached the end of its useful life, and to replace the HEPA filter at the recommended interval.

#### b. Cancel/Save:

Generally, any numerical entry or setting change that you might make can be cancelled if you make an entry error or change your mind before accepting the change.

#### c. Optional features are reflected in screen displays in this manual.

Display associated with optional features will only appear on your incubator if the feature is present.

#### d. “Menu” navigation descriptions in this manual:

When describing a sequence of navigating steps we will assume that the starting point is the HOME screen.

## 8.4. Basic Operations

### 8.4.1. Power up:

Turn ON the circuit breaker on the back of the unit (see section 6.10.5). Upon power-up, the unit will initialize and perform a quick system diagnostic. If any issues are detected, they will be displayed on the UI. The incubator will then automatically return to the state of operation it was in prior to losing power. In the case of Hibernate mode, the “I/O” button will appear on the operator screen. Press the I/O button to activate ReCO<sub>2</sub>ver™. The HOME screen will appear.

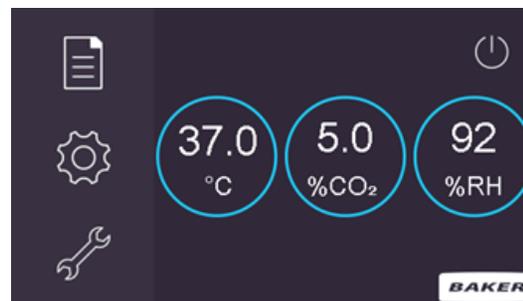
- To confirm that the incubator is indeed operating, close the glass interior door and observe that the circulation fan runs. If you cannot hear the fan with the door closed (it is quiet), listen closely while opening the glass door. The fan will shut off as the door opens.
- To ensure full equilibration of temperature, humidity and CO<sub>2</sub> concentration, wait several hours before loading the incubator with specimens. Baker recommends at least an overnight trial period after installation to ensure that ReCO<sub>2</sub>ver™ has arrived in good operating order and been properly installed.



### 8.4.2. The HOME screen

This is the HOME screen as it will appear when no alarms or other events are active, with the circles appearing blue.

- The three key measurements are shown in large numbers so that you can see these values at a glance from a distance.
- The I/O symbol (upper right) is the OFF button. It will deactivate the incubator.
- The navigation buttons:
  - LOG (Document Icon) opens a screen which allows for the graphical display and export of Temperature, CO<sub>2</sub>, Relative Humidity, or event records. See 8.7
  - SETTINGS (Gear Icon) - Opens a menu of configuration sections. See 8.5.1
  - SERVICE (Wrench Icon) - Opens a menu of service related displays
  - TEMP, CO<sub>2</sub>, RH each provide access to control set points and alarm settings related to the respective parameters. See 8.4.3



- d. This is the HOME screen with all alarm and event indicators active.  The Bell icon indicates an alarm condition exists.  A line through the bell indicates a silenced alarm.
- e.  The Envelope icon indicates a message is available. Press the envelope icon to view the message.
- f.  The Water Drop icon indicates that the internal water level is low. Your ReCO<sub>2</sub>ver™ is equipped with an automatic refill pump, it will be active when this icon appears. Ensure there is enough water in the external reservoir.
- g.  The UV Star icon appears when the optional germicidal UV lamp is energized.
- h.  The normally blue colored circle encompassing temperature, CO<sub>2</sub>, or relative humidity parameter will turn red when a high or low alarm condition exists for the respective parameter.
- i. "ERR" will be displayed for temperature, CO<sub>2</sub>, or relative humidity if there is either an error with the respective sensor or the parameter is out of range.
- j.  Wrench navigation button (SERVICE) becomes red when an alarm associated with that button is active.



#### 8.4.3. Changing operating set points for Temperature and CO<sub>2</sub>:

These screens display the current settings for each parameter (Temperature and CO<sub>2</sub>) and allow these settings to be changed. These screens are accessed by pressing the associated button on the home screen.

Note that changing the settings may require a passcode (see section 8.7.5).

a. Press the box around the number you wish to change. A number keypad will

appear. Delete the current setting, enter the desired value and press the 

check to confirm. Pressing the  "X" will cancel and return to the Home screen.

b. Select alarm thresholds that will provide acceptable process protection without generating nuisance alarms. See section 8.6.4 for a detailed description of alarm logic.

c. When you have completed your entries, press the check to accept the new

entries. Press the  "X" to abandon the new entries.

d. Setting limits are listed in Section 11.3



This is the Temperature setting screen, the CO<sub>2</sub> screen is similar.

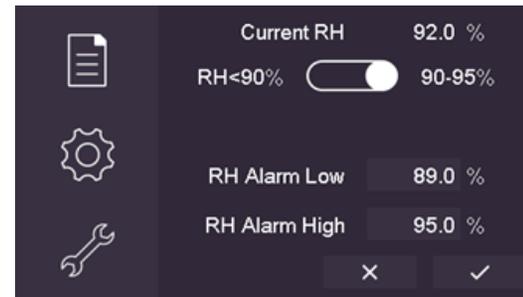
**8.4.4. Changing operating set points for Relative Humidity:**

The IntelliCELL control provides two humidity control modalities

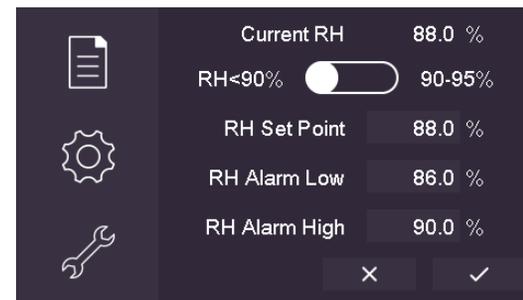
1. Maximum humidity (90-95%) and
2. Variable humidity (RH<90%)

- a. Select the desired mode by pressing the toggle selector at top center of the screen.
- b. If variable humidity is selected, enter the desired RH Set Point
- c. Select alarm thresholds that will provide acceptable process protection without generating nuisance alarms. See section 8.6.4 for a detailed description of alarm logic.
- d. When you have completed your entries, press the  check to accept the new entries. Press the  “X” to abandon the new entries.
- e. Setting limits are listed in Section 11.3

**Maximum mode:**

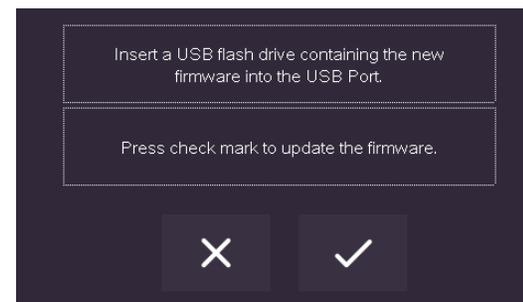


**Variable mode:**



**8.4.5. Confirmations and prompts**

- a. **CONFIRMATIONS:** ReCO<sub>2</sub>ver™ will ask for confirmation before accepting certain entries in order to guide your operation of the system and to prevent inadvertent disruptions.
- b. **PROMPTS:** ReCO<sub>2</sub>ver™ will provide prompts for certain operations (e.g. decontamination routines) which require operator actions.



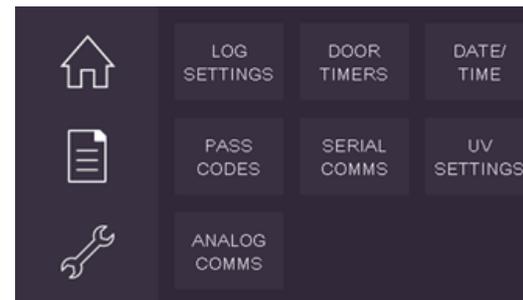
## 8.5. Navigation screens

### 8.5.1. Access to SETTINGS

The SETTINGS screen provides access to several sets of configuration settings. Note that access to some of these settings may require a passcode.

See [8.7.6](#)

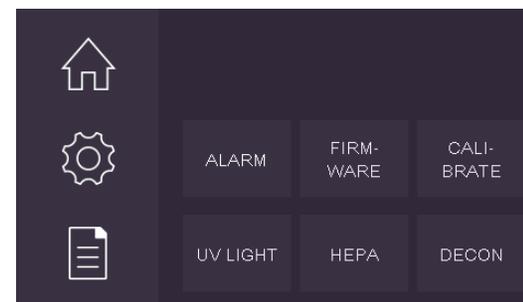
- a. LOG SETTINGS: See [8.7.6](#)
- b. DOOR TIMERS: See [8.6.5](#)
- c. DATE/TIME: See [0](#)
- d. PASS CODES: See [8.8](#)
- e. SERIAL COMMS (if equipped): See [8.8.9](#)
- f. UV SETTINGS (if equipped): See [8.8.4](#)
- g. ANALOG COMMS (if equipped): See [8.8.10](#)



### 8.5.2. Access to SERVICE

The SERVICE screen provides access to various configuration settings and service functions. Note that access to some of these functions may require a passcode (See [8.7.6](#))

- a. ALARM: See [8.6.3](#)
- b. DECON: For ReCO<sub>2</sub>ver™ Plus equipped for decontamination, press this button to initiate preparation for the H<sub>2</sub>O<sub>2</sub> decontamination cycle. This is a multistep process which requires a kit of materials available from Baker. Detailed instructions for this process are included with the kit. A series of prompts will appear to coordinate the biodecontamination process.
- c. CALIBRATE: ReCO<sub>2</sub>ver™ provides for field calibration of its Temperature, Humidity and CO<sub>2</sub> sensors. Detailed instructions are provided in the Service Manual.
- d. UV LAMP: For ReCO<sub>2</sub>ver™ equipped with germicidal UV lamp, See [8.8.4](#)
- e. HEPA: To view the or reset the HEPA filter age, See [8.8.7](#)
- f. FIRMWARE: To update the firmware or view current firmware and hardware version, See [8.8.8](#)



**8.6. Alarm functions****8.6.1. What is an alarm?**

An alarm is an indication that a condition or situation exists that you should be aware of or one that may require corrective action on your part.

**8.6.2. Conditions causing alarms**

- a. Temperature, CO<sub>2</sub>, or Relative Humidity above High Alarm setting or below Low Alarm setting
- b. The glass door has been open too long
- c. The water level is low and water pump is unable to replenish it.
- d. CO<sub>2</sub> supply is low.

## 8.6.3. Alarm indications

see HOME screen icons (section 8.4.2.d)

This screen provides additional information about some alarm events.

a. **Door Open:** “CLOSED” normally or “OPEN”. If the inner door has been held open longer than the preset time limit then a red “!” will be displayed. (see 8.6.5)

b. **CO<sub>2</sub> Source:**

“CO<sub>2</sub> Source 1” indicates operation from the 1<sup>st</sup> CO<sub>2</sub> source. Its states are OK, IDLE, OK ACTIVE, or LOW PRESSURE

“CO<sub>2</sub> Source 2”: indicates operation from the 2<sup>nd</sup> CO<sub>2</sub> source. Its states are OK, IDLE, OK ACTIVE, LOW PRESSURE, or N/A. On systems equipped with (optional) backup CO<sub>2</sub> auto-transfer, this indicates that CO<sub>2</sub> source 2 is in use, otherwise it will be shown as “N/A”.

An orange “!” warns that one of the CO<sub>2</sub> sources is empty and the other source is still “OK”.

A red “!” indicates CO<sub>2</sub> source(s) are empty and the system will be unable to maintain the desired CO<sub>2</sub> level.

c. **Water Level:** The humidification water level is low and needs to be replenished in order to maintain relative humidity.

d. **Water Pump:** This has three states:

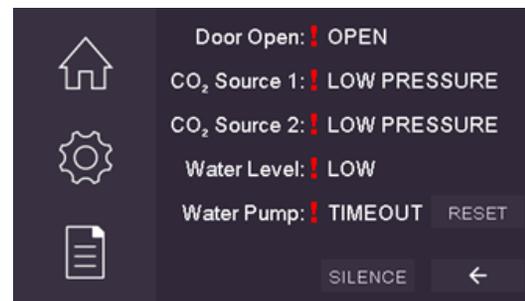
d.1. “OK”: pump is idle

d.2. “Running”: pump is running to replenish humidification reservoir

d.3. “TIMEOUT”: The pump has tried repeatedly to replenish the reservoir without success and has stopped cycling. If the external water supply is empty, refill it. If it is not empty, inspect the unit for water leaks and verify that the water hose is not blocked. Press the RESET button for the pump to return to normal operation.

e. **SILENCE:** press this to quiet the audio alarm for 15 minutes. This can also be accomplished by touching the bell icon on the home screen.

f.  Back arrow: return to previous screen



#### 8.6.4. Alarm thresholds

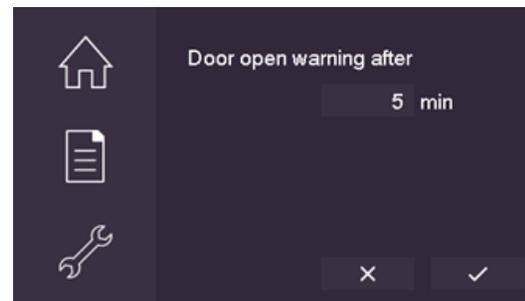
- a. You may adjust the thresholds for high and low alarms for all three of the monitored parameters: Temperature, CO<sub>2</sub>, Relative Humidity. See [8.4.3](#)
- b. These thresholds should be set to meet the needs of your application without causing nuisance alarms (e.g. each time the door is opened). Note that the audible parameter alarms are suppressed after the door has been opened, or at unit start up to prevent nuisance alarms. See [8.6.5](#)
- c. Silencing the audio annunciator  
Press the bell icon on the HOME screen OR see [8.6.3.e](#) for the SILENCE button.

#### 8.6.5. Alarms and door openings

When the glass door is opened, temperature, CO<sub>2</sub> and relative humidity will all be disturbed. Longer door opening intervals create larger disturbances. After the door is closed, some period of time will be required to restore all parameters to normal controlled operation.

The IntelliCELL® alarm logic will alert operators to abnormal conditions while avoiding nuisance alarms.

- a. While the door is open:  
A door open timer reminds the operator to shut the door after a preset interval. You may adjust that interval by entering the desired time at **“Door open warning after”**. Choose an interval short enough to minimize door opening time but long enough to prevent nuisance alarms in your situation. Setting range is 0 – 255 minutes.
- b. When you have completed your entries, press the  check to accept the new entries. Press the  “X” to abandon the new entries.
- c. After the door is closed-  
Controlled parameters (Temperature, CO<sub>2</sub>, Relative Humidity) will likely be outside of the alarm limits when the door closed. High and low limit parameter alarms are disabled temporarily.  
When each parameter returns to its normal range (between high and low alarm limits) the alarm for that parameter become enabled. Subsequent deviations will cause an alarm.  
If a parameter does NOT return to its normal range within 3 hours, parameter alarms become enabled and an alarm will occur.



## 8.7. Data and Event logs

### 8.7.1. Displaying the data:

If Data Log is selected, historical data in the data log is displayed graphically. One parameter (Temperature, CO<sub>2</sub> or RH) is displayed at a time. You may scroll through the historical data one screen at a time. You may initiate a download of data to the USB port.

- Select the parameter to be displayed by pressing the appropriate parameter label in the lower left corner. Sensor readings appear as a black line, alarm settings appear as red lines, and setpoint is a green line
- Scroll forward and backward in time by pressing the left (backward) and right (forward) arrow keys. Date and time boundaries are shown in the corners of the graph.
- To initiate a data download, press the USB icon at lower center-right

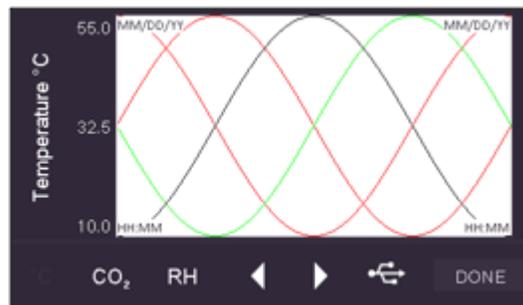
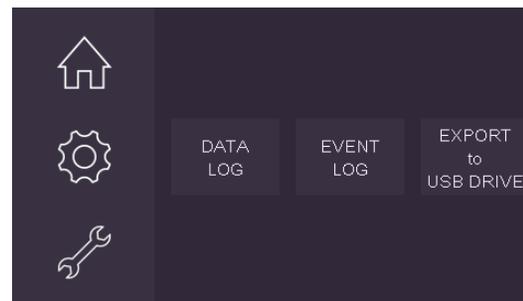
-  Back Arrow: return to previous screen

### 8.7.2. What data is captured in the data log?

The data log captures sensor readings and set points providing a detailed record of operating history to authenticate your process integrity and support analysis of any unusual occurrences.

These are the columns or fields in the data log:

- Checksum
- Timestamp
- Temperature reading
- Temperature Setpoint
- Temperature High Alarm Setpoint
- Temperature Low Alarm Setpoint
- Humidity reading
- Humidity Setpoint
- Humidity High Alarm Setpoint
- Humidity Low Alarm Setpoint
- CO<sub>2</sub> Concentration reading
- CO<sub>2</sub> Setpoint
- CO<sub>2</sub> High Alarm Setpoint
- CO<sub>2</sub> Low Alarm Setpoint



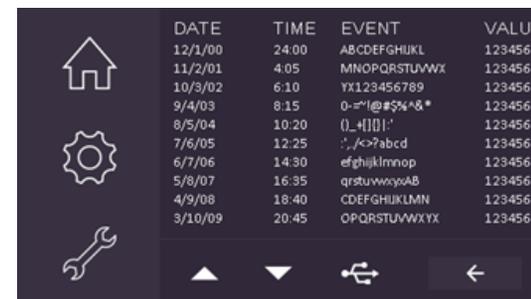
8.7.3. Displaying the event log

- a. The most recent event is shown at the top
- b. Use the UP (more recent) and Down (older) arrows to scroll through the log.
- c. Press the USB icon to download the event log

d.  Back Arrow returns to 8.7.2

8.7.4. What information is in the event log?

- a. Each event record consists of
  - Checksum
  - Event date and time
  - Event description
  - Numerical entries involved (readings, set points, calibrations)
- b. A complete list of recorded events appears in the Appendix, section 11.3.



DATE	TIME	EVENT	VALUE
12/1/00	24:00	ABCDEFGHIJKL	123456
11/2/01	4:05	MNOPQRSTUWXX	123456
10/3/02	6:10	YX123456789	123456
9/4/03	8:15	0-="!@#\$%^&*~	123456
8/5/04	10:20	()_+[] :;'	123456
7/6/05	12:25	./<>?abcd	123456
6/7/06	14:30	efghijklmnop	123456
5/8/07	16:35	qrstuvwxyzAB	123456
4/9/08	18:40	CDEFGHIJKLMN	123456
3/10/09	20:45	OPQRSTUVWXYZ	123456

**8.7.5. Downloading Data and Event logs**

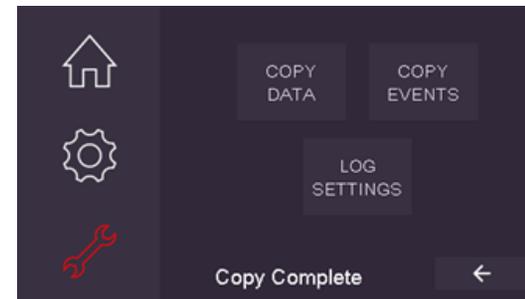
COPY DATA and COPY EVENTS, copies the internal data or event record files to an external USB Thumb Drive. LOG SETTINGS, this screen allows the user to select what records will be download.

- a. Find a suitable USB Thumb Drive
  - a.1. Must not contain any other Data or Event files, preferable empty.
  - a.2. Must not be formatted to exFAT.
  - a.3. Must be smaller than 32 GB.

On the “LOG SETTINGS” screen set the “Starting Date of Export”. All records after the “Starting Date of Export” will be copied to the external USB Thumb Drive. Using this feature can greatly reduce download times by limiting the transfer size. See [8.7.6](#)

- b. Insert your USB Thumb Drive in the USB socket above the glass door (behind the outer door).
- c. Navigate to the LOG SELECTION screen.
- d. Press COPY DATA to copy the data log contents to the USB Thumb Drive.
- e. Press COPY EVENTS to copy the event log contents to the USB Thumb Drive.
- f. Progress messages appear at screen bottom center.
- g. The data log is a .csv file (readable by Excel)
- h. The event log is a .csv file (readable by Excel)

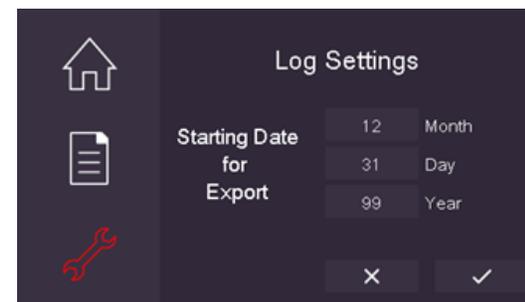
- i. When you have completed your entries, press the  check to accept the new entries. Press the  “X” to abandon the new entries.

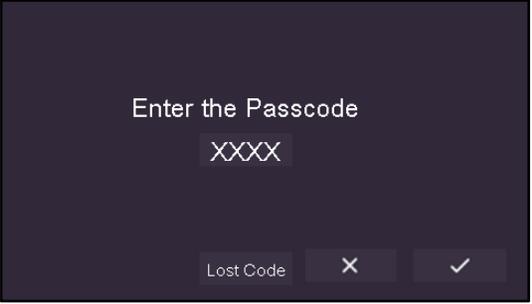


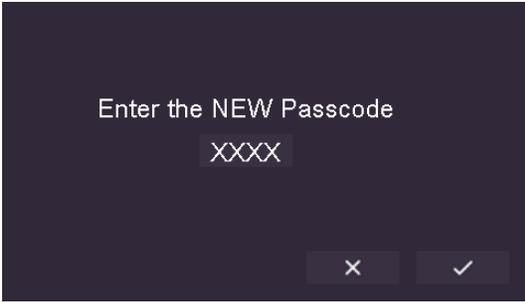
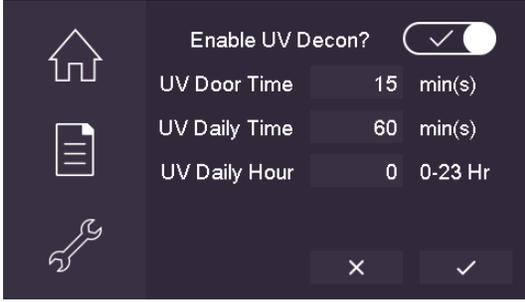
**8.7.6. Configuring Starting Date of Export**

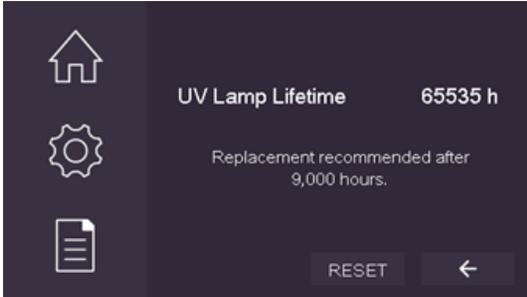
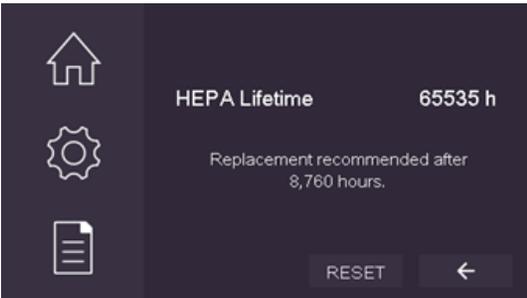
All records after the “Starting Date of Export” will be copied to the external USB Thumb Drive. Using this feature can greatly reduce download times by limiting the transfer size.

- a. When you have completed your entries, press the  check to accept the new entries. Press the  “X” to abandon the new entries.



8.8. Security	
<p>8.8.1. When you attempt to access a passcode protected setting, the passcode entry screen will appear. Press the XXXX box and a number keypad will appear.</p> <ol style="list-style-type: none"> <li> The Check completes the passcode entry</li> <li> “X” abandons the attempt to change a setting</li> <li>Lost Code provides information about what to do if the passcode has been lost.</li> </ol>	
<p>8.8.2. Security choices</p> <p>In order to avoid problems with unauthorized changes to the incubator’s settings, you may configure the control system to require a passcode in order to change various settings.</p> <ol style="list-style-type: none"> <li>Passcode protection may be completely <u>disabled</u> if this feature is not required. Passcode protection must be <u>enabled</u> in order to implement general passcode protection and to select certain specific restrictions. Press the  at top right to enable or disable general passcode protection.</li> <li>“Set points”: select  to require passcode entry in order to change the control set points for Temperature, CO<sub>2</sub> and Relative Humidity.</li> <li>“Alarm Limits”: Select  to require passcode entry in order to change the high and low alarm thresholds for high and low Temperature, CO<sub>2</sub> and Relative Humidity alarms.</li> <li>“Date/Time”: select  to require passcode entry in order to change the date and time for the internal clock.</li> <li>Edit Code button allows you to change the passcode. To change the PASSCODE, navigate to this screen and enter a new numeric code. (Press the XXXX box and a number keypad will appear).  Press  to save your change. Note: Passcode was set to “0000” when it left the factory.</li> <li> “X”, disregards entries and returns to the SETTINGS screen. See <a href="#">8.5.1</a></li> <li> Check, saves entries and returns to the SETTINGS screen. See <a href="#">8.5.1</a></li> </ol>	

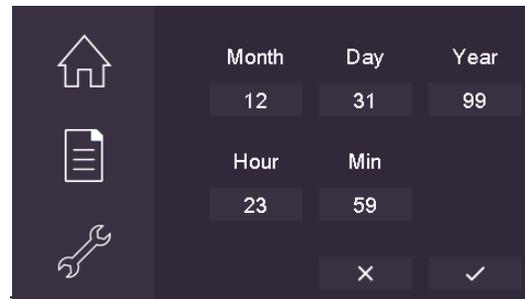
<p><b>8.8.3. Setting the passcode</b>          To change the PASSCODE, navigate to this screen and enter a new numeric code.          (Press the XXXX box and a number keypad will appear).</p> <p>Press  Check to save your change. Press  "X" to disregard and return to previous screen.</p> <p>Note: Passcode was set to "0000" when it left the factory.</p>	
<p><b>8.8.4. UV Decontamination (optional equipment)</b></p> <ol style="list-style-type: none"> <li>ReCO<sub>2</sub>ver™ equipped with UV decontamination provides two automatic timed operation cycles for regular decontamination.</li> <li>The UV decontamination may be enabled or disabled by toggling the toggle button.</li> <li>The incubator will energize the UV lamp every time the door is closed in order to minimize the entry of viable contaminants. The duration of this door cycle is set here with the "UV Door Time" entry.</li> <li>The incubator will energize the UV lamp once each day for a preset period and at a preset hour. Typically, this decontamination would be done following normal business hours.</li> <li>Set the duration of the daily decontamination cycle at "UV Daily Time."</li> <li>Set the hour when the daily cycle will occur at "UV Daily Hour."</li> </ol> <p>g. Press  Check to save your change. Press  "X" to disregard and return to previous screen.</p>	

<p>8.8.5. When the UV lamp is energized a small icon will appear on the Home screen (see section 8.4.2.g). When that icon appears you may press it to navigate to this screen. This screen shows the time remaining for the UV lamp cycle.</p>	
<p>8.8.6. UV Lamp Life Counter The optional UV germicidal lamp has a life counter to help you recognize when this component may have reached the end of its useful life. This screen shows the accumulated operating hours for the lamp.</p> <ol style="list-style-type: none"> <li>Press RESET to clear the timer after installing a new lamp (P/N: 673A703).</li> <li> Back Arrow returns to previous screen.</li> </ol>	
<p>8.8.7. HEPA filter life counter The HEPA filter has a life counter to help you recognize when this component may have reached the end of its useful life. This screen shows the accumulated operating hours for the filter.</p> <ol style="list-style-type: none"> <li>Press RESET to clear the timer after installing a filter (P/N: 673A704).</li> <li> Back Arrow returns to previous screen.</li> </ol>	

**Date/Time setting**

ReCO<sub>2</sub>ver™ has an internal clock/calendar which provides timestamps for the data and event logs and the time of day control for UV lamp decontamination. Enter the correct date and time. It is recommended not to adjust for daylight savings time to avoid duplicate or confusing timestamps during the transition.

Press  Check to save your change. Press  "X" to disregard and return to previous screen.



**8.8.8. Firmware/Hardware Version & Update**

The firmware and hardware version of the installed electronics is displayed on this screen. UPDATE button provides instructions on how to update the firmware.

 **Back Arrow returns to previous screen.**

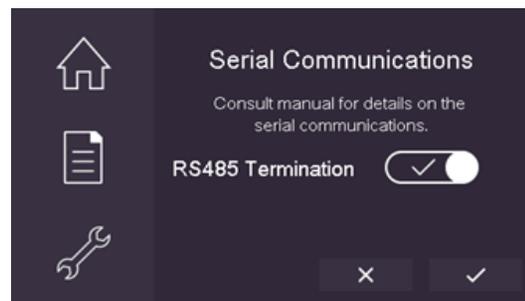


**8.8.9. SERIAL COMMS (if equipped):**

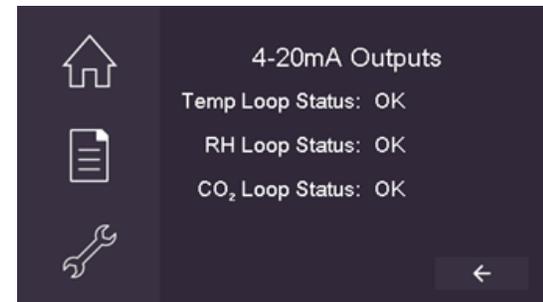
This screen allows for a RS485 termination resistor to be enabled or disabled.

Pressing  will the state of the RS485 Termination and return to the previous screen.

Pressing  will disregard changes and return to the previous screen.



**8.8.10. ANALOG COMMS** (if equipped): displays the current condition of each 4-20mA chip. The status for the 4-20mA channel is either “OK”, “Over Temp”, or that there is an “Open Loop”.



## 9. ROUTINE SERVICE

### 9.1. Periodic Inspection

#### 9.1.1. Verify proper operation:

Baker recommends that you periodically review the data log for consistent operation. The frequency of your review will depend on your protocol but we suggest at least a monthly check. Download the data log and review the three key parameters (temperature, humidity and CO<sub>2</sub>) for unexplained disturbances. See section 8.7.5.

#### 9.1.2. Check Utilities:

- a. Check CO<sub>2</sub> supply and water source for proper parameters See sections 6.11 and 6.12
- b. Check connections for integrity. See sections 6.10 and **Error! Reference source not found.**

#### 9.1.3. Inspect Cleanliness:

Inspect all visible surfaces for contamination. Check the water reservoir for biological activity and mineral deposits. See section 9.3 for manual cleaning instructions. See section 9.4 for biodecontamination with the ReCO<sub>2</sub>ver™ Plus model.

#### 9.1.4. Check the HEPA filter age and operating time. See section 8.8.7

#### 9.1.5. Check the UV lamp age. See section 8.8.6

#### 9.1.6. Baker offers a Preventative Maintenance kit (P/N: 673A702) which includes a replacement HEPA filter, a replacement door gasket, and a replacement gasket for the HEPA filter cover.

### 9.2. Extended shutdown

If the incubator will be unused for an extended period (more than a few days) some simple preparations will ensure that ReCO<sub>2</sub>ver™ is ready for use again when needed:

#### 9.2.1. Remove and safely dispose of humidification water

#### 9.2.2. Leave both doors open while the unit cools and dries.

#### 9.2.3. Ensure the inside of the unit is completely dry before closing the doors for storage.

### 9.3. Manual Cleaning

Clean or disinfect the unit inside and outside before using it or as your protocols require.

#### 9.3.1. Cleaning agents and materials

- a. Dirt deposits on stainless steel (dust, dirt and finger marks) can easily be removed. Frequently, warm water, with or without detergent, is sufficient. If this does not remove the deposits, mild, non-abrasive household cleaners can be used with warm water and bristle brushes, sponges or clean cloths.
- b. Iron rust discoloration can be treated by rubbing the surface with a solution of 15% to 20% by volume of nitric acid and water and letting it stand for one to two minutes to loosen the rust. Rinse with sterile water.
- c. Do not spray liquid cleaning agents on the CO<sub>2</sub> or RH sensor (located in the HEPA filter cover) as this will damage the sensors. Spray onto a cloth or paper towel first, then wipe surfaces.
- d. To clean the ultrasonic nebulizer, carefully wipe any accumulation with a soft cloth or swab. Do not use any abrasive substance or harsh chemical as these may damage the thin coating on the nebulizer.

#### 9.3.2. Disassembly procedure for cleaning (this is the reverse of the assembly procedure in Section 6.4).

- a. Remove all shelves by sliding them out the front of the unit.
- b. Remove the side panels: lean them inward and lift out.
- c. Lift the rear panel by the handle at the bottom and pull the bottom toward you. Support the top as you pull the rear panel out of the incubator.

- d. Lift the inner floor out.
  - e. Empty the water reservoir. Use the drain port to suck the water out. A vacuum pump is recommended with the provided port attachment (P/N: 45187).
- 9.3.3. Reassembly procedure: See Section 6.4

**9.4. Biodecontamination**

This is a multistep process which requires a kit of materials available from Baker. Detailed instructions for this process are included with the kit, and in the appendix1) of this manual. Contact your Baker representative to order the biodecontamination kit.

**9.5. HEPA filter Install and Replacement**

**9.5.1. Remove the Sensor Panel**

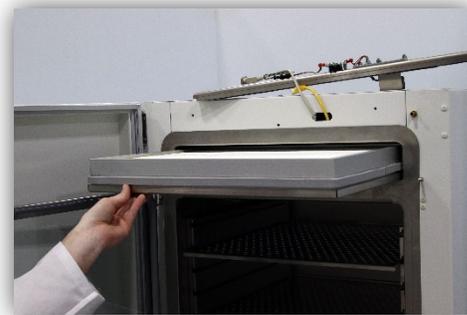
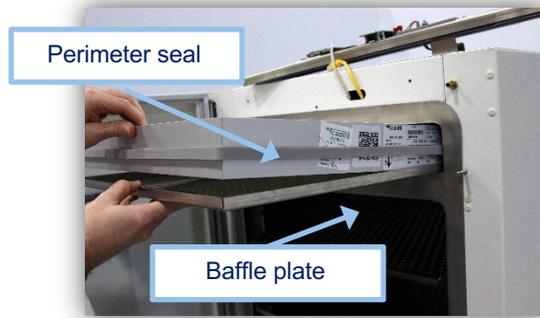
- a. Open the outer door
- b. Remove 2 mounting screws which hold the sensor panel cover in place.
- c. Gently pull the panel off and set aside.
- d. Remove 3 mounting screws which secure the sensor panel in place.
- e. Carefully disconnect the two cables and tuck them out of the way. Set the sensor panel to the side being careful not to touch the exposed humidity sensor. The USB cable is disconnected by removing the two screws securing the end.



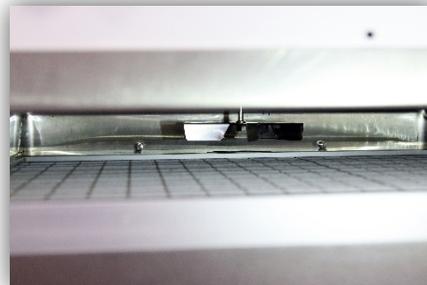
**9.5.2. Insert the HEPA filter**

Handle the filter with appropriate care! DO NOT touch the filter membrane.

- a. Inspect the HEPA filter. Ensure that the perimeter seal is intact and secure. Inspect filter membrane for damage.
- b. Place the HEPA filter on the baffle plate from the top of the chamber.
- c. Orient the baffle plate with the fan baffle (flange with big round hole) up and to the rear.
- d. Gently slide the filter and baffle plate into the filter chamber being careful not to hit the fan blade or to tear or dislodge the perimeter seal.



- e. With the HEPA filter fully inserted, push down gently to seat the filter and baffle plate against the stops at the top of the chamber.
- f. The installed filter should look like this. The baffle plate extends under the fan blade, which is visible at the rear.

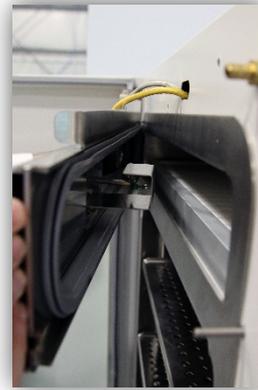


**9.5.3. Reinstall the Sensor Panel**

- a. Reposition the Sensor Panel and secure loosely with 3 screws.
- b. Reinstall the wires.
- c. Inspect the gasket with a flashlight to ensure it is seated properly. Improperly seated gasket can cause erratic behavior of the incubator and high CO<sub>2</sub> usage.
- d. Tighten the 3 screws to secure the panel.

**9.5.4. Reinstall the sensor panel cover using the 2 screws.**

**9.5.5. Complete!**



9.5.6. The useful life of the HEPA filter utilized within the ReCO<sub>2</sub>ver™ system is largely contingent upon the conditions it encounters in the laboratory environment. Those conditions may affect the performance of the incubator and its ability to deliver better than ISO Class 4 (Class 10) air to the incubator chamber. To ensure optimum performance of ReCO<sub>2</sub>ver™ for a wide variety of environmental conditions, Baker recommends replacement of the HEPA filter annually or after 8,760 hours of service, whichever occurs first.

**9.5.7. Remove Sensor Panel (See 9.5.1)**

- 9.5.8. Gently push the baffle plate upward.
- a. Be careful not to push against the fan blade in the rear



- 9.5.9. Slide the baffle plate and filter forward and out through the opening.
- 9.5.10. Discard the old filter



9.5.11. See section **Error! Reference source not found.** for filter installation

## **9.6. Service supplies**

Contact your Baker representative for these service supplies:

9.6.1. HEPA filter (P/N: 673A704)

9.6.2. UV lamp (P/N: 673A703)

9.6.3. Preventative Maintenance Kit (P/N: 673A702)

## **10. ADDITIONAL INFORMATION**

### **10.1. Additional information about your ReCO<sub>2</sub>ver™ and its accessories is available in other documents.**

Instructions for accessories generally accompany those accessories. A separate service manual is available for customers who prefer to have some service tasks performed by their own technicians. Related documents include:

10.1.1. Installation instructions

10.1.2. Stacking kit instructions provided with the stacking kit.

10.1.3. Biodecontamination procedure provided with the biodecontamination kit and in the appendix of this manual for use in properly equipped units.

10.1.4. Rolling cart instructions provided with rolling cart.

10.1.5. Service manual

### **10.2. Quick access to ReCO<sub>2</sub>ver™ documents**

10.2.1. Scan the QR code on the ReCO<sub>2</sub>ver™ nameplate for quick access to electronic documents pertaining to your incubator. Manuals are also available at [www.bakerco.com](http://www.bakerco.com).

## 11. APPENDIX

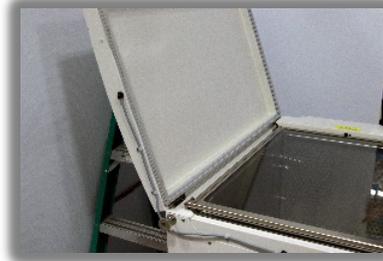
### 11.1. Door reversal

If your installation requires reversal of the door hinge side, complete this procedure before installing your ReCO<sub>2</sub>ver™.

11.1.1. Lay the incubator on its back on the foam packing material or other support.  
Do not put it on its back directly on a surface; the gas fitting(s) on the back must be protected.



11.1.2. Support the door in the open position to gain access to the screws and decorative screw plugs.



11.1.3. Remove the decorative plugs and the door catch.



- 11.1.4. Remove the two screws on the face of the Sensor Panel.  
11.1.5. Remove the cover and set aside.



- 11.1.6. Remove the C clips in the bottom of the glass door hinges (two hinges).

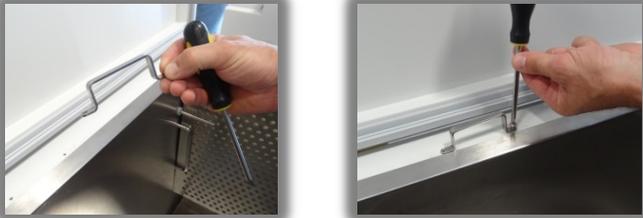
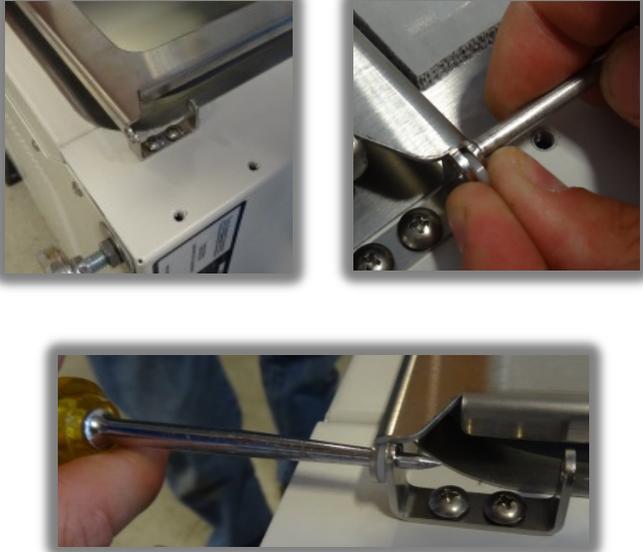


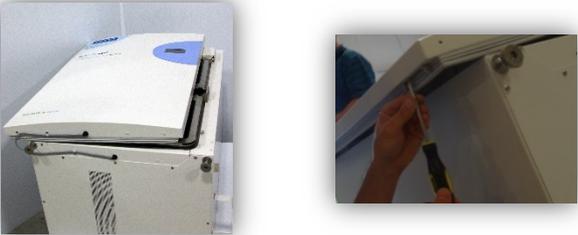
- 11.1.7. Remove door pins. Save the nylon washer.

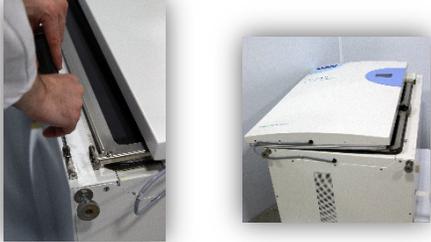
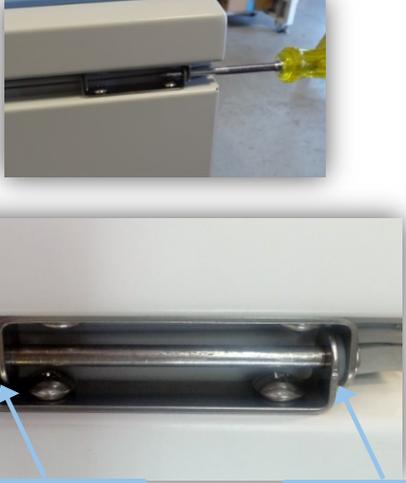


- 11.1.8. Lift glass door and place in a safe location.



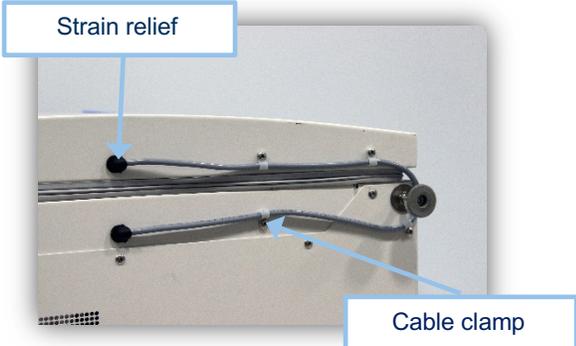
<p>11.1.9. Remove the inner door hinges and attach them on the opposite side. Ensure that the lock washers are in place on the screws.</p> <p>11.1.10. Ensure that both hinges are parallel before tightening.</p>	
<p>11.1.11. Attach door catch to the opposite side with the taller end toward the top of the chamber.</p>	
<p>11.1.12. Place the glass door over the hinges as shown.</p> <p>11.1.13. Put the nylon washer in as shown then insert the hinge pin.</p> <p>11.1.14. You may need to insert an awl or a small screwdriver to align the holes with the washer. Repeat for the bottom hinge.</p>	
<p>11.1.1. Put the C clips back on the pins.</p>	

<p>11.1.2. Replace the Sensor Panel Cover</p> <ol style="list-style-type: none"> <li>a. Align the screw holes.</li> <li>b. Reinstall the screws.</li> </ol>	
<p>11.1.3. Remove the nylon door cable clips as shown.</p>	
<p>11.1.4. Remove the C clips at the top and bottom of the outer door.</p>	
<p>11.1.5. Remove the hinge pins. Save the nylon washers.</p> <ol style="list-style-type: none"> <li>a. Note that the washers are on each side of the door hinge.</li> </ol>	
<p>11.1.6. Place the door as shown and remove the hinges from the door.</p>	

<p>11.1.7. Offset the door to the other side as shown.</p> <p>11.1.8. Attach the hinges to the opposite side of the door.</p>	
<p>11.1.9. Offset the door again and remove the hinges from the cabinet.</p> <p>11.1.10. Reposition the door again and attach the hinges to the cabinet on the opposite side keeping them parallel.</p>	
<p>11.1.11. Align the hinges as shown.</p>	
<p>11.1.12. Using an awl put the washers back in place and reinsert the hinge pins.</p> <p>a. Place the two washers in each of the outer door hinges as shown.</p> <p>11.1.13. Put the C clips back onto the pins.</p>	

Nylon washer

Nylon washer

<p>11.1.14. Reposition the door cable</p> <ol style="list-style-type: none"> <li>Rotate the strain reliefs to face in the new direction</li> <li>Secure with the cable clamps and screws as shown.</li> </ol>	
<p>11.1.15. Stand the incubator back up and test the swing of the door for proper operation, adjust if necessary.</p>	

**11.2. ALARM RELAY CONNECTION AND OPERATION**

An alarm relay provides an opportunity for remote detection of fault conditions in the incubator.

11.2.1. The relay contact circuit is isolated from internal circuits and from the chassis ground. A chassis ground connection is available at the relay connector.

11.2.2. Connection

A four terminal connector is provided at the rear panel near the power switch and power inlet.

The four connections are:

- Pin 1: NO relay normally open terminal (closed when ReCO<sub>2</sub>ver™ is operating normally)
- Pin 2: C relay common terminal
- Pin 3: NC relay normally closed terminal (closed when ReCO<sub>2</sub>ver™ is off or when a fault exists)
- Pin 4: G chassis (grounding) terminal

a. The connector is available from Baker Customer Service (P/N: 42860).

11.2.3. Circuit ratings

The circuit connected to the relay must not exceed these ratings:

- Voltage: 24VDC or 24VAC. The voltage source shall be ground referenced.
- Current: 1A
- Load: resistive or pilot duty

11.2.4. Operation (relay logic)

- The alarm relay will be in its de-energized (normal) condition when power is OFF or an alarm exists.
- The alarm relay will be in its energized condition when power is ON and no alarm exists.

**11.3. SETPOINT and ALARM THRESHOLD LIMITS**

Parameter	Control Set point Range	Low Alarm Range	High Alarm Range	Alarm Hysteresis
Temperature (C)	15.0 – 55.0	0.0 – 100.0	0.0 – 100.0	+/- 0.2
Humidity %	0-90	0.0 – 100.0	0.0 – 100.0	+/- 0.4
	90-95			
CO <sub>2</sub> %	0.0 – 20.0	0.0 – 100.0	0.0 – 100.0	+/- 0.2

- 11.3.1. High alarm must be set higher than set point plus the hysteresis
- 11.3.2. Low alarm must be set lower than set point minus the hysteresis
- 11.3.3. Hysteresis: sensor reading must change by this amount in order to change alarm state (alarm/no alarm)

#### 11.4. SENSOR RANGE LIMITS

- 11.4.1. Under certain circumstances, sensors may produce readings outside their useable range. These range limits are:
  - a. RH range: 0-100%
  - b. CO<sub>2</sub> range: 0.0-30.0%
  - c. TEMPERATURE range: 10.0-99.9°C
- 11.4.2. When readings outside these limits occur, the control display will show “ERR“. When the abnormal condition clears, normal display will resume.

#### 11.5. EVENT LOG INTERPRETATION

- 11.5.1. POWER-ON After a restart cause, this event shall be generated if the restart cause was due to a loss of power.
- 11.5.2. POWER-ON After a restart cause, this event shall be generated if the restart cause was due to a loss of power.
- 11.5.3. 2. RUN MODE This event shall be generated when the Main System State transitions from one of the other two states to the RUN state or when System Initialization successfully completes and the RUN state is entered.
- 11.5.4. 3. HIBERNATE This event shall be generated when the Main System State transitions from one of the other two states to the HIBERNATE state or when System Initialization successfully completes and the HIBERNATE state is entered.
- 11.5.5. 4. RESET After a restart cause this event shall be generated if the restart cause was due to a reset button press or STM32 Reset Instruction. The following arguments will be appended to the message
- 11.5.6. a. 1 = Reset Button Press
- 11.5.7. 5. RESET ERROR After a restart cause this event shall be generated if the restart cause was not caused by a power loss or reset button press. This event shall be appended with an argument denoting the restart cause. See the list below for restart causes and arguments.
- 11.5.8. a. 0 = WDT Reset
- 11.5.9. b. 1 = Faults (memory access, invalid instruction, etc)
- 11.5.10. c. 2 = Power Issues (STM32F4 has various power monitors)
- 11.5.11. 6. H<sub>2</sub>O<sub>2</sub> START This event shall be generated when the UI’s “Decon Start” (36.02) screen’s “OK” button is pressed. This denotes that the H<sub>2</sub>O<sub>2</sub> Decontamination has started.
- 11.5.12. 7. H<sub>2</sub>O<sub>2</sub> ABORT This event shall be generated when the UI’s “Decon Abort” (36.14) screen’s “OK” button is pressed. This denotes that the user has aborted the H<sub>2</sub>O<sub>2</sub> Decontamination.
- 11.5.13. 8. H<sub>2</sub>O<sub>2</sub> END This event shall be generated when UI’s “Decon Cycle Complete” (37.3) screen’s “OK” button is pressed This denotes that the H<sub>2</sub>O<sub>2</sub> Decontamination has successfully completed.
- 11.5.14. 9. H<sub>2</sub>O<sub>2</sub> FAILURE This event shall be generated to denote that the H<sub>2</sub>O<sub>2</sub> Decontamination has failed. This event can be generated multiple ways. Please see H<sub>2</sub>O<sub>2</sub> Decon Rev\*.xlsx for details. If the Main System State is H<sub>2</sub>O<sub>2</sub> and any of the following conditions happen this event shall be generated with argument 0-6 listed below.
- 11.5.15. a. 0 = While not in the H<sub>2</sub>O<sub>2</sub> State DESTRUCT\_1, DESTRUCT\_2, REMOVE/COMPLETE, or FAILED and Water Pump Alarm is in the ALARM state

- 11.5.16. b. 1 = While not in the H<sub>2</sub>O<sub>2</sub> State REMOVE/COMPLETE or FAILED and Air Temp Sensor/Value Alarm is in the ALARM state.
- 11.5.17. c. 2 = While not in the H<sub>2</sub>O<sub>2</sub> State REMOVE/COMPLETE or FAILED and Door/Face Temp Sensor/Value Alarm is in the ALARM state
- 11.5.18. d. 3 = UV Bulb Age is or will become greater than its useful age during decontamination.
- 11.5.19. e. 4 = Door is Open during the H<sub>2</sub>O<sub>2</sub> states of WARM\_UP/WAIT, SOAK, DESTRUCT\_1, and DESTRUCT\_2
- 11.5.20. f. 5 = During the H<sub>2</sub>O<sub>2</sub> State of Warm-Up/Wait and the general H<sub>2</sub>O<sub>2</sub> timer expires. This indicates the incubator was not able to achieve the required decon temperature in the allotted time.
- 11.5.21. g. 6 = While not in the H<sub>2</sub>O<sub>2</sub> State REMOVE/COMPLETE or FAILED, any Restart Cause while in the main system state of H<sub>2</sub>O<sub>2</sub>
- 11.5.22. 10. DOOR OPEN This event shall be generated in all main system states, except HIBERNATE, when the door transitions from closed to opened.
- 11.5.23. 11. DOOR CLOSE This event shall be generated in all main system states, except HIBERNATE, when the door transitions from opened to closed.
- 11.5.24. 12. DOOR ALARM This event shall be generated when the Door Open Alarm transitions from OFF to ALARM. This denotes that the door has been open longer than the operator configurable period.
- 11.5.25. 13. RECOVERY ON This event shall be generated when the Transient Recovery state is changed to ACTIVE from another state.
- 11.5.26. 14. RECOVERY OFF This event shall be generated when the Transient Recovery state changes from ACTIVE to another state.
- 11.5.27. 15. RECOVERY ERR This event shall be generated when the Transient Recovery state transitions into the ERROR state.
- 11.5.28. 16. DRYOUT ON This event shall be generated whenever the RH Dryout Status is ON and RH Sensor Heater Status changes states. The following arguments shall be appended to the event.
- 11.5.29. a. 0 = This indicates the RH Sensor Heater Status is ON
- 11.5.30. b. 1 = This indicates the RH Sensor Heater Status is OFF
- 11.5.31. 17. DRYOUT OFF This event shall be generated when the RH Dryout Status transitions from ON to OFF
- 11.5.32. 18. ALARM MUTE This event shall be generated when the Audible Alarm has been muted by the user.
- 11.5.33. 19. LOG DATE This event shall be generated when the "SAVE" button is pressed on the "Log Settings" (20) screen of the UI. The Data Logging Starting Export Date shall be append to the event.
- 11.5.34. 20. UV DECON ON This event shall be generated to denote that the user has enabled the UV Decontamination. This indicates that the Enable UV Decon has changed states from NO to YES and saved via the UI. The save is not valid until the UI's "UV Timer Confirmation" screen's "OK" button is pressed. This event indicates that the UV Decon is now enabled.
- 11.5.35. 21. UV DECON OFF This event shall be generated to denote that the user has disabled the UV Decontamination. This indicates that the Enable UV Decon has changed states from YES to NO and saved via the UI. The save is not valid until the UI's "UV Timer Confirmation" screen's "OK" button is pressed. This event indicates that the UV Decon is now disabled.
- 11.5.36. 22. 90% UV LIFE This event shall be generated when the UV Bulb Age transitions to equaling 8100 hrs, 00 mins, 00 secs or if during system initialization, the UV Bulb Age is between 8100 and 9000 hrs. This indicates the UV Bulb is at 90% of its life span or in other words, 10% of the life span is remaining.

- 11.5.37. 23. END UV LIFE This event shall be generated when the UV Bulb Age transitions to equaling 9000 hrs, 00 mins, 00 secs or if during system initialization, the UV Bulb Age is greater than 9000 hrs. This indicates the UV Bulb is at 100% of its life span
- 11.5.38. 24. UV ON This event shall be generated if the UV Lamp transitions from OFF to ON. This indicates that the UV Lamp just turned on.
- 11.5.39. 25. UV OFF This event shall be generated if the UV Lamp transitions from ON to OFF. This indicates that the UV Lamp just turned off.
- 11.5.40. 26. UV RESET This event shall be generated when the “RESET” button on the UI’s UV Lamp screen is pressed. The reset is dependent on if passcode protection is enabled for “General” and the correct passcode being entered. This denotes that the user reset the UV Bulb Age to 0 hrs via the LCD touchscreen which indicates that the UV bulb has been replaced.
- 11.5.41. 27. 90% HEPA This event shall be generated when the HEPA Filter Age transitions to equaling 7884 hours or if during system initialization, the HEPA Filter Age is between 7884 and 8760 hours. This indicates the HEPA Filter Age is at 90% of its life span or in other words, 10% of the life span is remaining.
- 11.5.42. 28. END HEPA This event shall be generated when the HEPA Filter Age transitions to equaling 8760 hours or if during system initialization, the HEPA Filter Age is greater than 8760. This indicates the HEPA Filter is at 100% of its life span
- 11.5.43. 29. HEPA RESET This event shall be generated when the “RESET” button on the UI’s HEPA screen is pressed. The reset is dependent on if passcode protection is enabled for “General” and the correct passcode being entered. This denotes that the user reset the HEPA Filter Age to 0 hrs via the LCD touchscreen which indicates that the HEPA has been replaced.
- 11.5.44. 30. DATE/TIME This event shall be generated when the “OK” button is pressed on the “Date and Time Confirmation” screen, 36.12, on the UI. This indicates that the user has changed the date and time stored within the RTC.
- 11.5.45. 31. TEMP SET This event shall be generated when the “Temp Set Point” value is changed and successfully saved on the UI’s “Temp” screen. The save is dependent on if password protection is enabled for “Setpoints and entered values interlock, Low Alarm ≤ Set point < High Alarm. Append the new set point value.
- 11.5.46. 32. HI TEMP SET This event shall be generated when the “Temp Alarm High” value is changed and successfully saved on the UI’s “Temp” screen. The save is dependent on if password protection is enabled for “Alarms Limits” and the entered values interlock, Low Alarm ≤ Set point < High Alarm. This event shall only be generated during the main system state of RUN. Append the new high alarm value.
- 11.5.47. 33. LO TEMP SET This event shall be generated when the “Temp Alarm Low” value is changed and successfully saved on the “Temp” screen, 4. The save is dependent on if password protection is enabled for “Alarms Limits” and entered values interlock, Low Alarm ≤ Set point < High Alarm. This event shall only be generated during the main system state of RUN. Append the new low alarm value.
- 11.5.48. 34. TEMP H ALARM This event shall be generated when the Air Temp High Alarm transitions from the OFF to ALARM state. This indicates that the air temperature is in a high alarm state.
- 11.5.49. 35. TEMP L ALARM This event shall be generated when the Air Temp Low Alarm transitions from the OFF to ALARM state. This indicates that the air temperature is in a low alarm state.
- 11.5.50. 36. TEMP OFFSET This event shall be generated when the “Air Temperature Offset” value is changed and successfully saved, on screen 12. The save is dependent on “OK” being pressed on the “Calibration Save” screen 36.05. The new calibration value shall be appended to this event.

- 11.5.51. 37. TEMP SLOPE This event shall be generated when the “Air Temperature Slope” value is changed and successfully saved, on screen 12. The save is dependent on “OK” being pressed on the “Calibration Save” screen 36.05. The new calibration value shall be appended to this event.
- 11.5.52. 38. RH SET This event shall be generated when the “RH Set Point” value is changed and successfully saved on the “RH” screen, 6. A successful save is dependent on multiple factors. The “RH Set Point” value may change two different ways, by moving the RH slider, and by entering a value into the “RH Set Point” box on the UI. Append the new set point value.
- 11.5.53. 39. HI RH SET This event shall be generated when the “RH Alarm High” value is changed and successfully saved on the “RH” screen, 6. A successful save is dependent on multiple factors. This event shall only be generated during the main system state of RUN. Append the new high alarm value.
- 11.5.54. 40. LO RH SET This event shall be generated when the “RH Alarm Low” value is changed and successfully saved on the “RH” screen, 6. A successful save is dependent on multiple factors. This event shall only be generated during the main system state of RUN. Append the new low alarm value.
- 11.5.55. 41. RH HI ALARM This event shall be generated when the RH High Alarm transitions from the OFF to ALARM state. This indicates that the RH is in a high alarm state.
- 11.5.56. 42. RH LO ALARM This event shall be generated when the RH Low Alarm transitions from the OFF to ALARM state. This indicates that the RH is in a low alarm state.
- 11.5.57. 43. RH OFFSET This event shall be generated when the “RH Offset” value is changed and successfully saved, on screen 12. The save is dependent on “OK” being pressed on the “Calibration Save” screen 36.05. The new calibration value shall be appended to this event.
- 11.5.58. 44. RH SLOPE This event shall be generated when the “RH Slope” value is changed and successfully saved, on screen 12. The save is dependent on “OK” being pressed on the “Calibration Save” screen 36.05. The new calibration value shall be appended to this event.
- 11.5.59. 45. CO<sub>2</sub> SET This event shall be generated when the “CO<sub>2</sub> Set Point” value is changed and successfully saved on the “CO<sub>2</sub>” screen, 2. A successful save is dependent on multiple factors. Append the new set point value.
- 11.5.60. 46. HI CO<sub>2</sub> SET This event shall be generated when the “CO<sub>2</sub> Alarm High” value is changed and successfully saved on the “CO<sub>2</sub>” screen, 5. This event shall only be generated during the main system state of RUN. A successful save is dependent on multiple factors. Append the new high alarm value.
- 11.5.61. 47. LO CO<sub>2</sub> SET This event shall be generated when the “CO<sub>2</sub> Alarm Low” value is changed and successfully saved on the “CO<sub>2</sub>” screen, 5. This event shall only be generated during the main system state of RUN. A successful save is dependent on multiple factors. Append the new low alarm value.
- 11.5.62. 48. CO<sub>2</sub> LOW ALARM This event shall be generated when the CO<sub>2</sub> Low Alarm transitions from the OFF to ALARM state. This indicates that the CO<sub>2</sub> is in a low alarm state.
- 11.5.63. 49. CO<sub>2</sub> HI ALARM This event shall be generated when the CO<sub>2</sub> High Alarm transitions from the OFF to ALARM state. This indicates that the CO<sub>2</sub> is in a high alarm state.
- 11.5.64. 50. CO<sub>2</sub> #1 This event is generated when the CO<sub>2</sub> pressure Switch #1 Status transitions. This message shall only be generated in the main system state of RUN. The following arguments shall be appended to the event.
- 11.5.65. a. LOW = transition is from “OK” to “LOW”
- 11.5.66. b. OK = transition is from “LOW” to “OK”

- 11.5.67. 51. CO<sub>2</sub> #2 This event is generated when the CO<sub>2</sub> pressure Switch #2 Status transitions. This message shall only be generated in the main system state of RUN. The following arguments shall be appended to the event.
- 11.5.68. a. LOW = transition is from “OK” to “LOW”
- 11.5.69. b. OK = transition is from “LOW” to “OK”
- 11.5.70. 52. CO<sub>2</sub> S ALARM This event shall be generated when the CO<sub>2</sub> Source Alarm transitions from OFF to ALARM. This event indicates when the CO<sub>2</sub> Source(s) are in the alarm state.
- 11.5.71. 53. CO<sub>2</sub> OFFSET This event shall be generated when the “CO<sub>2</sub> Offset” value is changed and successfully saved, on screen 12. The save is dependent on “OK” being pressed on the “Calibration Save” screen 36.05. The new calibration value shall be appended to this event.
- 11.5.72. 54. CO<sub>2</sub> SLOPE This event shall be generated when the “CO<sub>2</sub> Slope” value is changed and successfully saved, on screen 12. The save is dependent on “OK” being pressed on the “Calibration Save” screen 36.05. The new calibration value shall be appended to this event.
- 11.5.73. 55. WATER LEVEL This event shall be generated when the Water Level Status transitions. Note, this is not the same as the raw level switch transitioning from OK to Low. The water level status includes 2 seconds of hysteresis. This event shall be generated in the main system state of RUN; HIBERNATE; and the H<sub>2</sub>O<sub>2</sub> sub-states WARM\_UP/WAIT and SOAK. Append the following arguments depending on the transition.
- 11.5.74. a. LOW = transition from OK to LOW
- 11.5.75. b. OK = transition from LOW to OK
- 11.5.76. 56. PUMP ALARM This event shall be generated when the Water Pump Alarm transitions from OFF to the ALARM state.
- 11.5.77. 57. PUMP RESET This event shall be generated when the “OK” button on the UI’s Water Pump Reset screen is pressed. This event denotes that the user has reset the water pump safety lockout via the LCD touchscreen.
- 11.5.78. 58. PASS CHG This event shall be generated if the passcode is changed by the user. This is accomplished by entering a new passcode on the “Set Passcode” screen, 23, and pressing “OK” on the “Passcode Change Message” screen, 36.09.
- 11.5.79. 59. PASS SET CHG This event shall be generated when the passcode settings on the “Passcode Configuration” screen, 25, are changed and saved.
- 11.5.80. 60. UI ERROR This event shall be generated when a fault with the LCD Touchscreen is detected. The event shall be generated when the LCD Touchscreen Fault transitions from OFF to the FAULT state. This event shall have an argument appended to the end. The arguments correspond with the following errors listed below:
- 11.5.81. a. 0 = Communications Error
- 11.5.82. 61. MEMORY 1 ERR This event shall be generated when a fault with the internal SD-Card is detected. The event is generated when the SD-Card Fault transitions from OFF to the FAULT state. This event shall have an argument appended to the end. The arguments correspond with the following errors listed below:
- 11.5.83. a. 1 = SD-Card Not Detected
- 11.5.84. b. 2 = Filesystem Mount Failure
- 11.5.85. c. 4 = SD-Card Read Error
- 11.5.86. d. 8 = SD-Card Write Error
- 11.5.87. e. 10 = SD-Card Initialization Error
- 11.5.88. 62. MEMORY 2 ERR This event shall be generated when a fault with the EEPROM is detected. The event is generated when the EEPROM Fault transitions from OFF to the FAULT state. This event shall have an argument appended to the end. The arguments correspond with the following errors listed below:
- 11.5.89. a. 1 – Read Error

- 11.5.90. b. 2 - Write Error
- 11.5.91. c. 4 – Initialization Error
- 11.5.92. d. 8 – Mutex Timeout
- 11.5.93. e. 16 – Verification of Written Data Failure
- 11.5.94. 63. RTC INTRN This event shall be generated when there is an error with the internal RTC. This event shall have an argument appended to the end. The arguments correspond with the following errors listed below:
  - 11.5.95. a. 1 = Read Error
  - 11.5.96. b. 2 = Write Error
  - 11.5.97. c. 4 = Initialization Error
- 11.5.98. 64. RTC EXTRN This event shall be generated when there is an error with the external RTC. This event shall have an argument appended to the end. The arguments correspond with the following errors listed below:
  - 11.5.99. a. 1 = Low Battery
  - 11.5.100. b. 2 = Read Error
  - 11.5.101. c. 4 = Write Error
  - 11.5.102. d. 8 = Bad Data
  - 11.5.103. e. 16 = Initialization Error
- 11.5.104. 65. USB HOST ERR This event shall be generated when a fault with the USB Host is detected. The event is generated when the USB Host Fault transitions from OFF to the FAULT state. This event shall have an argument appended to the end. The arguments correspond with the following errors listed below:
  - 11.5.105. a. 0 = Communications Error
- 11.5.106. 66. SERIAL ERROR This event shall be generated when a fault with the Serial Communications is detected. The event is generated when the Serial Comms Status transitions from OK to the ERROR state. This event shall have an argument appended to the end. The arguments correspond with the following errors listed below:
  - 11.5.107. a. 0 = USB CDC Communications Error
  - 11.5.108. b. 1 = RS-232 Communications Error
  - 11.5.109. c. 2 = RS-485 Communications Error
- 11.5.110. 67. 4-20mA 0 ERR This event shall be generated when a fault with the 4-20mA RH transmitter is detected. The message is generated when the 4-20mA RH Fault transitions from OFF to the FAULT state. This event shall have an argument appended to the end. The arguments correspond with the following errors listed below:
  - 11.5.111. a. 0 = Communications Error
  - 11.5.112. b. 1 = Over temperature
  - 11.5.113. c. 2 = Open Loop
- 11.5.114. 68. 4-20mA 1 ERR This event shall be generated when a fault with the 4-20mA CO<sub>2</sub> transmitter is detected. The event is generated when the 4-20mA CO<sub>2</sub> Fault transitions from OFF to the FAULT state. This event shall have an argument appended to the end. The arguments correspond with the following errors listed below:
  - 11.5.115. a. 0 = Communications Error
  - 11.5.116. b. 1 = Over temperature
  - 11.5.117. c. 2 = Open Loop
- 11.5.118. 69. 4-20mA 2 ERR This event shall be generated when a fault with the 4-20mA Temp transmitter is detected. The event is generated when the 4-20mA Temp Fault transitions from OFF to the FAULT state. This event shall have an argument appended to the end. The arguments correspond with the following errors listed below:
  - 11.5.119. a. 0 = Communications Error
  - 11.5.120. b. 1 = Over temperature
  - 11.5.121. c. 2 = Open Loop

- 11.5.122. 70. CO<sub>2</sub> ERR This event shall be generated when the CO<sub>2</sub> Sensor/Value Alarm transitions from OFF to ALARM. This denotes an error with the CO<sub>2</sub> sensor or value. This event shall have an argument appended to the end. The arguments correspond with the following errors listed below:
- 11.5.123. a. 0 = Sensor Communications Error
  - 11.5.124. b. 1 = Calibration Range Error
- 11.5.125. 71. RH ERR This event shall be generated when the RH Sensor/Value Alarm transitions from OFF to ALARM. This denotes an error with the RH sensor or Value. This event shall have an argument appended to the end. The arguments correspond with the following errors listed below:
- 11.5.126. a. 0 = Sensor Communications Error
  - 11.5.127. b. 1 = Sensor Range Error
  - 11.5.128. c. 2 = Calibration Range Error
- 11.5.129. 72. AIR ERR This event shall be generated when the Air Temp Sensor/Value Alarm transitions from OFF to ALARM. This denotes an error with the Air Temp sensor or value. This event shall have an argument appended to the end. The arguments correspond with the following errors listed below:
- 11.5.130. a. 0 = Sensor Communications Error
  - 11.5.131. b. 1 = Calibration Range Error
- 11.5.132. 73. D/F ERR This event shall be generated when the Door/Face Sensor/Value Alarm transitions from OFF to ALARM. This denotes an error with the Door/Face Temp sensor or value. This event shall have an argument appended to the end. The arguments correspond with the following errors listed below:
- 11.5.133. a. 0 = Sensor Communications Error
  - 11.5.134. b. 1 = Calibration Range Error
- 11.5.135. 74. UPDATE START This event shall be generated when “OK” is pressed on the “Firmware Update Prep” screen, 36.13. This indicates the firmware update has started.
- 11.5.136. 75. UPDATE STATE This event shall be generated when important milestones are reached during the firmware update process.
- 11.5.137. a. 0 = All firmware related have been successfully copied from the USB drive to the internal SD drive
- 11.5.138. b. 1 = The system has or will reboot due to the update process.
- 11.5.139. 76. UPDATE DONE This event shall be generated when the firmware update successfully completes. This is triggered on the transition from the “Firmware Update” screen, 34, to the “Firmware Update Complete” screen, 37.7.
- 11.5.140. 77. UPDATE ERR This event shall be generated when there is an error with the firmware update. This may be generated multiple ways. This event shall have an argument appended to the end. The arguments correspond with the following errors listed below:
- 11.5.141. a. 0 = The USB drive contains more than four .bin files, the update is unable to proceed.
- 11.5.142. 78. CONFIG UPD This event shall be generated when the System Configurable Options have been changed. The argument is a 3-digit hexadecimal value; when converted to binary, the bits correspond to the following:
- 11.5.143. a. Bits 0-7: defines the model, 0b11111111 = Unconfigured, 0b00000001 = Nebulizer, 0b00000010 = Evaporator
  - 11.5.144. b. 8th Bit: defines if the UV Option has been is enabled, Enabled = 0b1, Disabled = 0b0
  - 11.5.145. c. 9th Bit: defines if the H<sub>2</sub>O<sub>2</sub> Decon Option has been enabled, Enabled = 0b1, Disabled = 0b0
  - 11.5.146. d. 10th Bit: defines if the Auto Water Refill Option has been enabled, Enabled = 0b1, Disabled = 0b0

- 11.5.147. e. 11th Bit: defines if the CO<sub>2</sub> Auto SwitchOver Option has been enabled, Enabled = 0b1, Disabled = 0b0
- 11.5.148. f. Bits 12-31: Erroneous, may be ignored.
- 11.5.149. FAULT This is a generic fault event message. Arguments indicating the type of fault will be appended to the message. Please consult engineering for assistance deciphering the appended fault code.

## 12. BIODECONTAMINATION PROCEDURE

# Ultrasonic Hydrogen Peroxide Vapor Biodecontamination Procedure

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ReCO<sub>2</sub>ver™ Plus CO<sub>2</sub> incubator can be ordered with a vaporized hydrogen peroxide biodecontamination package to aid the researcher in performing biodecontaminations. The package includes a biodecontamination kit that contains several items needed to perform a biodecontamination procedure (see list below). The package also includes pre-programmed on-screen instructions that will guide you through the preparations for the cycle and show the progress of each phase of the biodecontamination procedure.

The biodecontamination kit contains sufficient 50% H<sub>2</sub>O<sub>2</sub>, stabilized to use in the following process. **Use all proper PPE** to handle this highly concentrated material. We recommend a lab coat and gloves with all exposed skin covered. Follow all company and laboratory safety protocols.

The kit contains:

- 1 – Removal syringe (100cc)
- 1 - Waste container to contain the water evacuated from the drain pan to allow room for the H<sub>2</sub>O<sub>2</sub> to be added. (500 mL)
- 2 - Amber bottles of 50% H<sub>2</sub>O<sub>2</sub> for decontamination.
- 1 - Evacuation system (Pump)
- 1 - Lockout tape to seal unit during biodecontamination process

### Phase 1: Preparation

- 1) Order / locate biodecontamination kit from Baker. Check that all components are present.
- 2) Pre-warm one bottle of H<sub>2</sub>O<sub>2</sub> per incubator to 37°C before beginning the cycle. This allows a higher concentration of H<sub>2</sub>O<sub>2</sub> vapor within the incubator. Be sure to place the amber bottles in a secondary container in case of leakage. This usually takes 15-20 minutes.
- 3) Remove any samples, biological instruments, or other material you do not wish to expose to H<sub>2</sub>O<sub>2</sub>.
- 4) Keep all shelves and internal incubator parts inside the unit. Do not remove them.
  - a) If you would like to use chemical indicators or biological indicators to ensure you have a proper biodecontamination, place them in the unit now.
- 5) Ensure the cable port is plugged, close and secure the glass door, and close the outer door.
- 6) Go to the unit and touch “Service” from the home screen.
- 7) Touch the “Decon” button to access the biodecontamination initiation screen.
- 8) The CO<sub>2</sub> input is stopped and the nebulizer is turned off to allow the steps outlined below.
- 9) Follow the instructions on the screen.
- 10) Remove 175 mL or more of water from the reservoir with the 100cc syringe and collect in the waste container both provided in the kit. Dispose of this water according to your biosafety protocols.
- 11) Pour the contents of **one** amber bottle into the reservoir. You now have 15% H<sub>2</sub>O<sub>2</sub> in the reservoir to run the cycle. Mix the solution gently within the reservoir with the 100cc syringe provided. Make sure to blow off any bubbles that form on the nebulizer with the syringe.
- 12) Place the “Lock Out” tape across the opening so the warning is visible and the area indicating signature and date is accessible. Wrap around the side of unit to cover opening.
  - a) **\*DO NOT OPEN THE DOOR** once the H<sub>2</sub>O<sub>2</sub> has been added to the reservoir.\*

13) Follow the prompts on the screen to begin the cycle.

### **Phase 2: Warm-Up**

14) The unit will achieve temperature (45°C) before the next step (approximately 40 minutes).

### **Phase 3: Nebulizing**

15) The nebulizer will engage and run for approximately 20 minutes to achieve a sufficient suspension of vaporized hydrogen peroxide and density.

### **Phase 4: Destruction**

16) The UV light will be turned on and the nebulizer will stop. The UV light acts as a catalyst to break down the suspended hydrogen peroxide, with destroys contaminating microbes. At the end of the destruction phase (approximately 130 minutes), the UV light will turn off.

### **Phase 5: Cool-Down**

17) Once the screen indicates it is safe to open the incubator, the concentration of vaporized H<sub>2</sub>O<sub>2</sub> will be greatly reduced. The fan will shut off and allow any suspended reactive H<sub>2</sub>O<sub>2</sub> to settle for cleanup. Cool Down will bring the temperature down slowly.

18) Remove the “Lock Out” tape from the outside.

### **Phase 6: Clean-Up**

19) Open the door slowly. The internal atmospheric concentration of H<sub>2</sub>O<sub>2</sub> will be <1ppm, which is below the OSHA Permissible Exposure Limit standard for H<sub>2</sub>O<sub>2</sub> exposure. However, all damp surfaces may potentially contain H<sub>2</sub>O<sub>2</sub>, so use gloves and follow precautions for handling H<sub>2</sub>O<sub>2</sub>.

20) Utilize either the evacuation system provided or a vacuum aspiration flask found within most laboratories to remove all reservoir contents and wipe it dry.

a) \*Note: For ease of use and safety, we recommend that you use your lab’s vacuum aspiration flask (greater than 1L) to evacuate out the reservoir.

b) **REMEMBER** the reservoir holds the remaining 15% H<sub>2</sub>O<sub>2</sub>. Dispose of the H<sub>2</sub>O<sub>2</sub> in a proper manner using the procedures followed by your company or laboratory.

21) There will be no residue to re-clean as in a ClO<sub>2</sub> decontamination.

22) The pump will refill the reservoir with clean water. Be sure your water tank is sufficiently filled (~0.5L needed).

23) The unit is ready to use once temperature, humidity, and CO<sub>2</sub> levels have been reestablished.

## Quick Guide for ReCO<sub>2</sub>ver™ H<sub>2</sub>O<sub>2</sub> Biodecontamination

- 1) Warm H<sub>2</sub>O<sub>2</sub> to 37°C. Use a secondary container.
- 2) Remove all samples and equipment from unit.
- 3) On screen, select the wrench for Service and then “DECON”. Follow on-screen instructions.



- 4) Remove 175+ mL of water from reservoir.
- 5) Add 1 brown bottle of warm 50% H<sub>2</sub>O<sub>2</sub>. **WEAR PROPER PPE!**
- 6) Mix gently with syringe.
- 7) Wrap lockout tape around door opening.
- 8) Initiate cycle. **DO NOT OPEN THE DOOR!**
- 9) When screen indicates cycle is complete, remove lockout tape.
- 10) Aspirate remaining 15% H<sub>2</sub>O<sub>2</sub> from reservoir. **WEAR PROPER PPE!** Wipe out reservoir with towels.
  - \* **Recommended:** Use vacuum flask >1L in size.
- 11) Once temperature, relative humidity and CO<sub>2</sub> have been reestablished, unit is ready for use.



**WEEE**

This equipment must be disposed of in accordance with the Waste from Electrical and Electronic Equipment (WEEE) Directive

This product must not be treated as household waste. Instead, it shall be handed over to an appropriate collection point for the recycling of electrical and electronic equipment. If in doubt, please contact your Baker or CleanAir by Baker sales representative on how to correctly dispose of this product.



Environments For Science™

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This manual includes information for proper incubator operation.  
We recommend that the manual be kept near the unit for ready reference.

**ReCO<sub>2</sub>ver™**

RAPID RECOVERY INCUBATOR

Operation Manual RevC 6-30-21