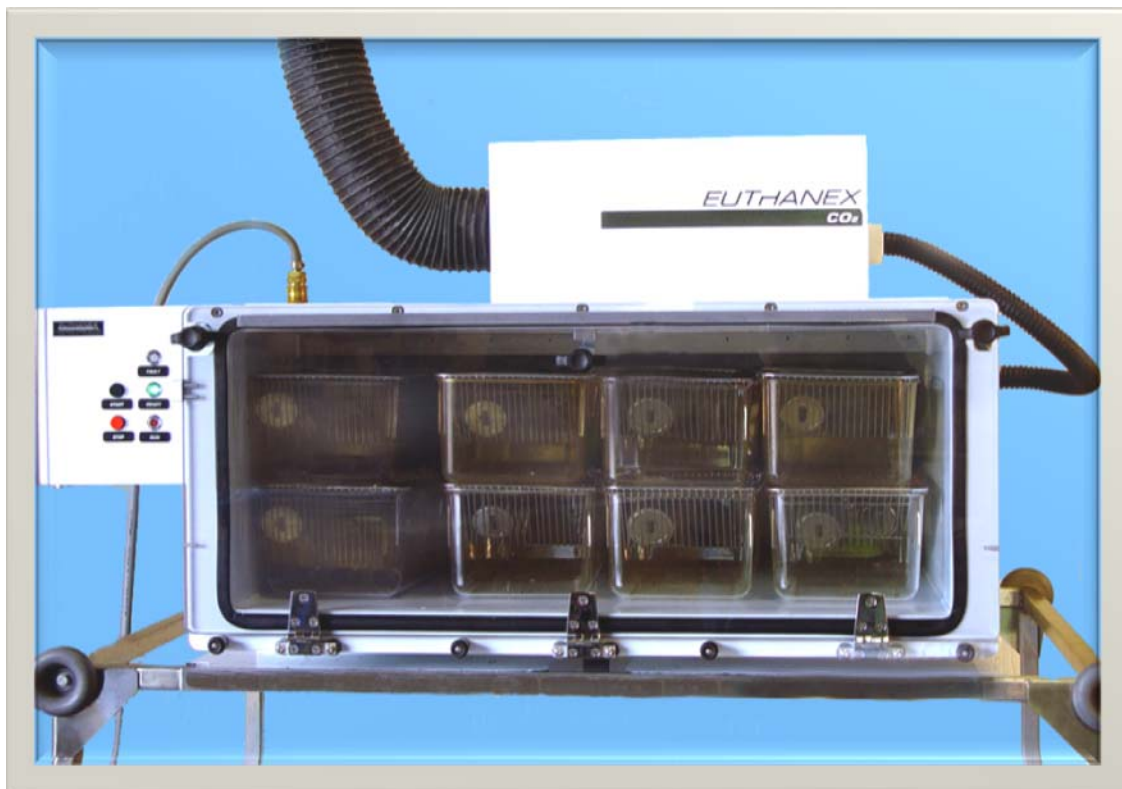


SMARTBOX™

Auto CO₂ System

Models *M1-SBFF, M1-SBFF-2C*



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EMC / EMI.

This equipment has been tested and found to comply with the limits for a Class A Equipment, pursuant to part 15 of the FCC rules.

IEC 61326-1:2005 / EZ 61326-1:2006

For the customers in Canada:

This Class A Equipment complies with Canadian ICES-003:2012.

Cet appareil numérique de la classe A est conforme à la norme NMB-003:2012 du Canada.



DISCLAIMER

THIS MANUAL MUST BE READ BEFORE SETTING UP AND OPERATING THE AUTO CO₂ SYSTEM. The user should be thoroughly familiar with the contents of this manual prior to using the system with animals. Only technicians that are properly certified should operate the Auto CO₂ System. The user/owner of this equipment shall have the sole responsibility for any damage or injury resulting from operation that is not in accordance with the authorized instructions. This includes, but is not limited to, operating the equipment outside of recommended safety levels, variation from specified operating instructions and not following standard laboratory safety procedures when working with anesthetic agents and volatile compressed gases.

The system and its components must only be modified or repaired by Euthanex-authorized service technicians. Improper modification or repair may result in danger to personnel, harm or death to animals and/or equipment damage. The user/owner of this equipment shall have the sole responsibility for any damage or injury resulting from improper maintenance and repair that is not done by authorized maintenance and repair personnel.

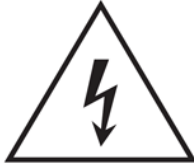
Parts that have failed, in whole or in part, exhibit excessive wear, are contaminated or are otherwise at the end of their useful life, should not be used and should be replaced with parts supplied by Euthanex Corporation. Tampering with the controller unit by unauthorized personnel voids all warranties and specifications. The manufacturer assumes no responsibility for any malfunction or failure of the unit if tampering is suspected.

SMARTBOX FIXED FLOW SYSTEM OVERVIEW

The SmartBox Fixed Flow (M1-SBFF)(M1-SBFF-2C) Auto CO₂ System is an advanced automated euthanasia unit that has been developed specifically for euthanizing small rodents. The system incorporates three key components, the SmartBox Fixed Flow Controller, the M1 Chamber and the Exhaust Blower. The system works with preset timings that assure humane and efficient levels of CO₂. Gas flow rate is set at the source (fixed flow), while the timings are controlled by the automated controller unit. The controller does not impact the flow rate, but delivers gas at the rate that is output by the source.

The SBFF Controller operates in preset automated stages:

- 1) Gas Flow Level One: Flow rate is set to conform to the AVMA guidelines for humane euthanasia. CO₂ flows into the top chamber and anesthetizes the animals with minimal stress. While the animals are anesthetized, the gas flow continues and increases the chamber's CO₂ concentration to euthanizing level.
- 2) Gas Flow Level 1,2: CO₂ flows into both the top and bottom chambers simultaneously and anesthetizes the animals with minimal stress. While the animals are anesthetized, the gas flow continues and increases the chamber's CO₂ concentration to euthanizing level.
- 3) Dwell Time: Gas flow shuts off and the chamber remains fully charged to assure euthanasia of all animals.
- 4) Evacuation Time: Onboard blower evacuates CO₂ out of the chamber and into the in-house exhaust system and then shuts off after the chamber is fully purged. All gas is completely purged from the chamber, making it safe for personnel to remove cages at the completion of the cycle.



The lightning flash with an arrowhead symbol within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Do not use this unit near water.
6. Do not clean by spraying liquid directly onto unit.
7. Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
8. Do not install near any heat sources such as radiators, heat registers, stoves, or other unit that produce heat.
9. Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
10. Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the unit.
11. Unplug this unit during lightning storms or when unused for long periods of time.
12. Refer all servicing to qualified service personnel. Servicing is required when the unit has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the unit, the unit has been exposed to rain or moisture, does not operate normally, or has been dropped.



The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.

Warning!

- To reduce the risk of fire or electric shock, do not expose this unit to rain or moisture.
- Use line cord supplied with the product.
- Be advised that different operating voltages require the use of different types of line cord and attachment plugs. The unit was shipped with the requested plug. If the installation requirements change please contact us for the correct plug.
- This equipment should be installed near the socket outlet and disconnection of the device should be easily accessible.
- Do not install in a confined space.
- Do not open the unit - risk of electric shock inside.

Caution:

You are cautioned that any change or modifications not expressly approved in this manual could void your authority to operate this equipment.

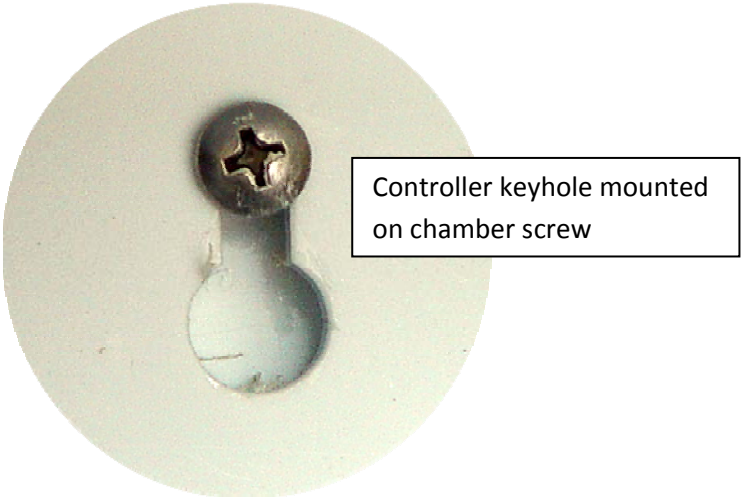
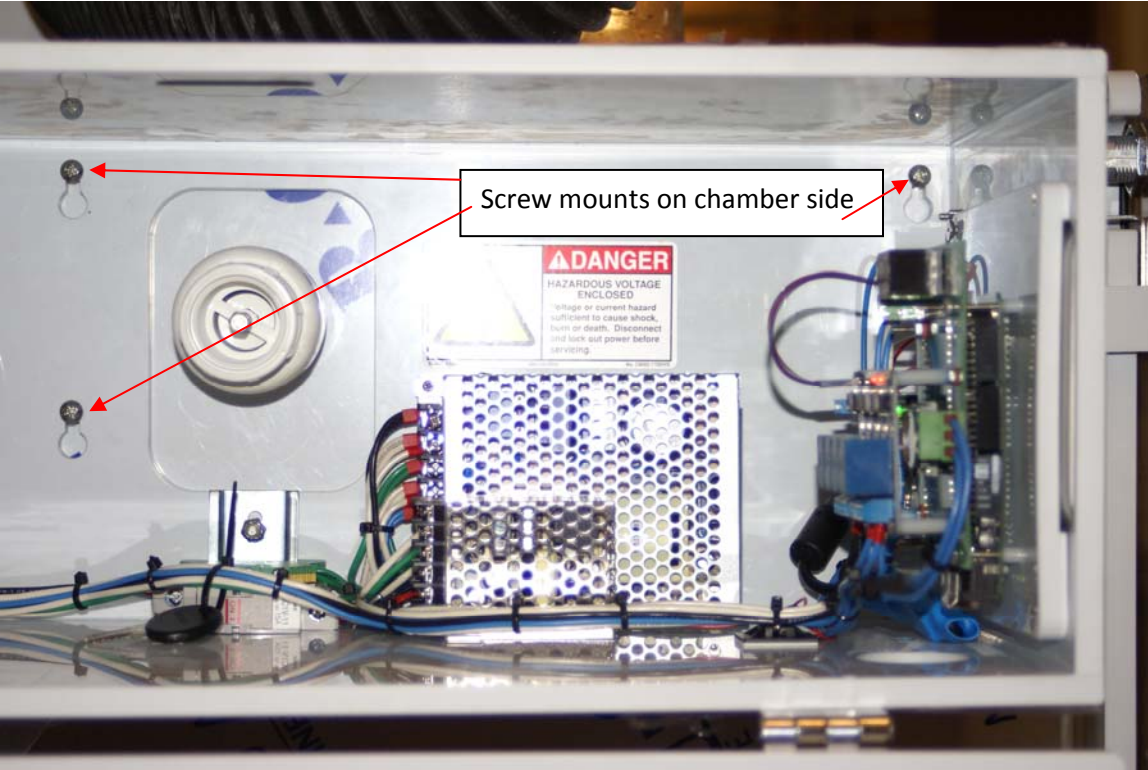
Service

- There are no user-serviceable parts inside.
- All service must be performed by qualified personnel.

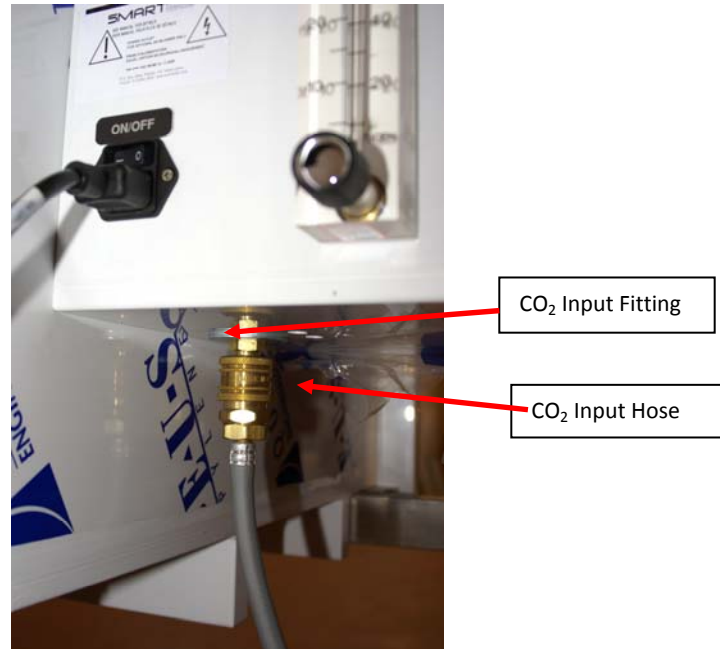
Voltage	100-240 v ac 50-60hz 5 amp Max (auto select)
Pressure	175 psi max to inlet
Temp	0 to 40°C <> 10 to 85% RH (no condensation)

SYSTEM SETUP

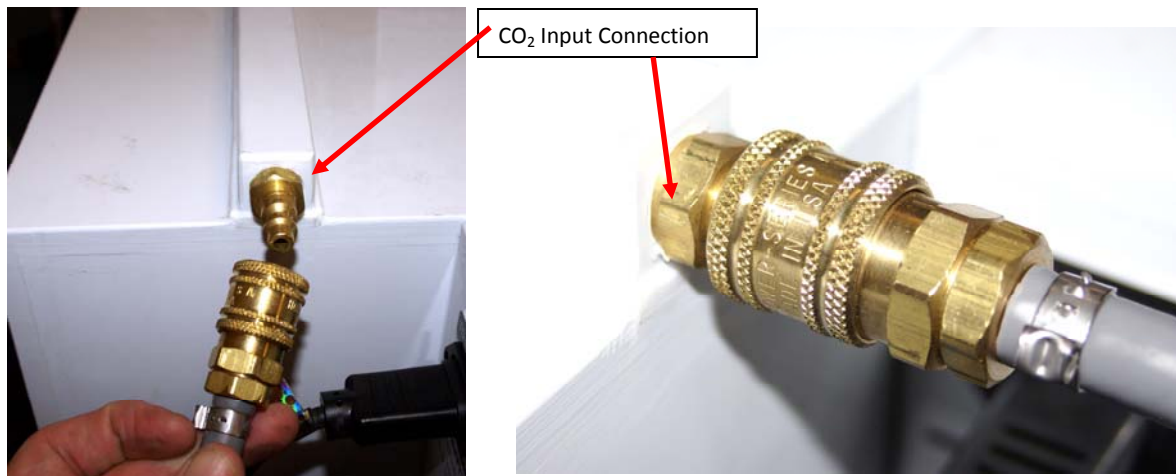
- 1) The SmartBox controller is attached to the top M1 chamber utilizing the four keyholes on the back of the controller.



Align the keyholes with the four screws on the left side of the chamber. Push in and slide down to secure. The screws may be tightened for permanent mounting.



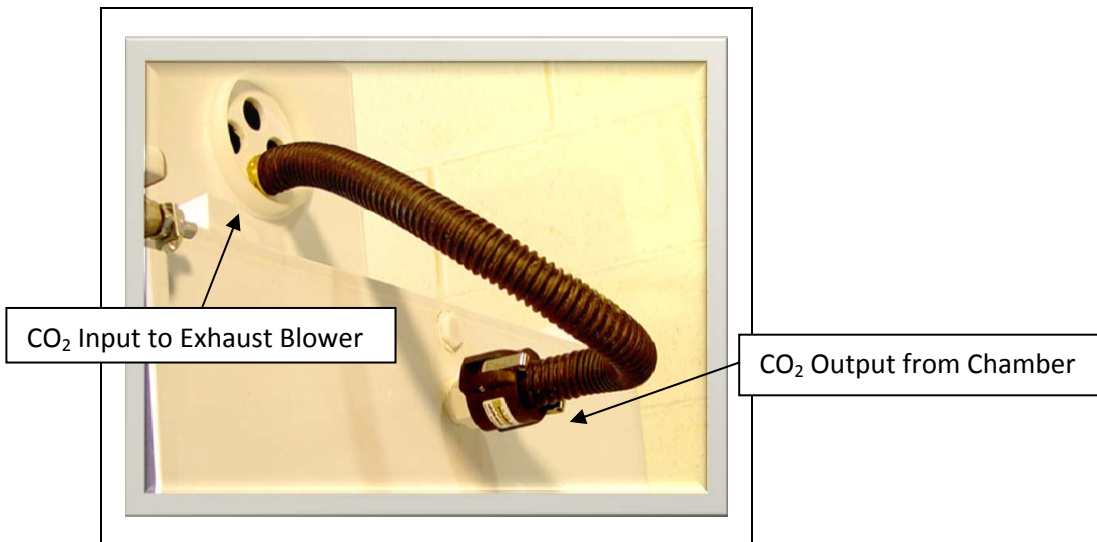
- 2) On the bottom of the SmartBox side control box is a brass CO₂ input fitting that must be connected to the CO₂ supply.



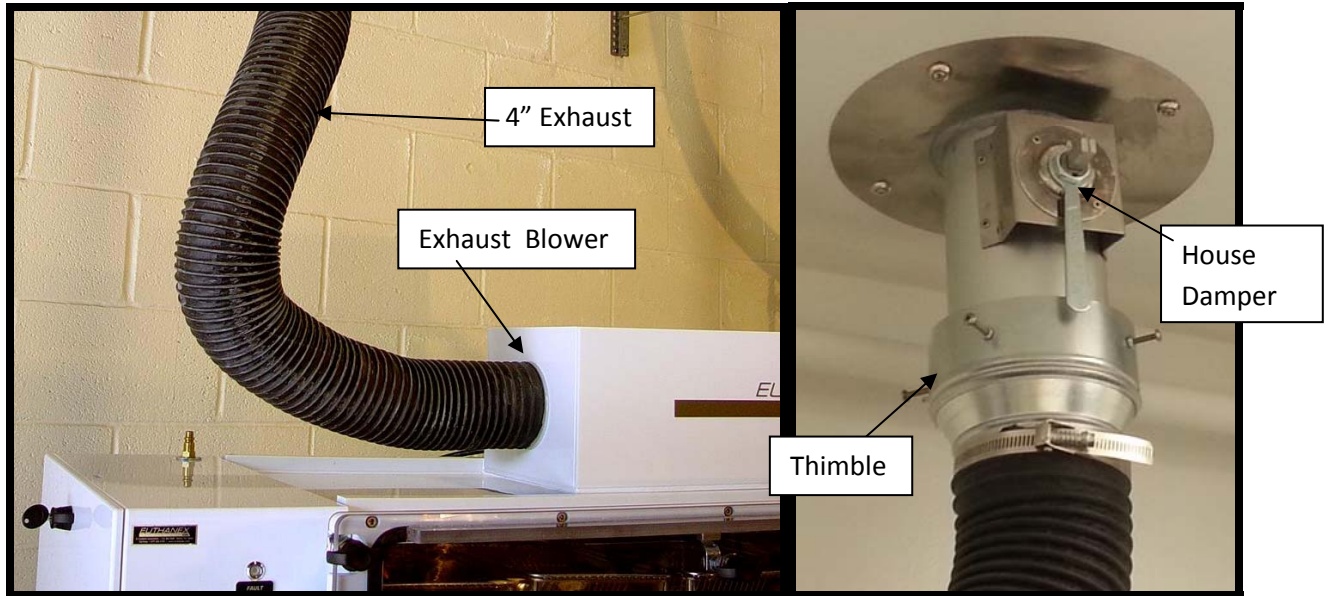
- 3) On the side of the M1 chamber is a brass CO₂ input fitting that must be connected to the CO₂ supply line that is coming out of the side control box.



4) Rest the exhaust blower on top of the chamber. The large 4" exhaust hose must be on left and the 1" intake hose on the right.

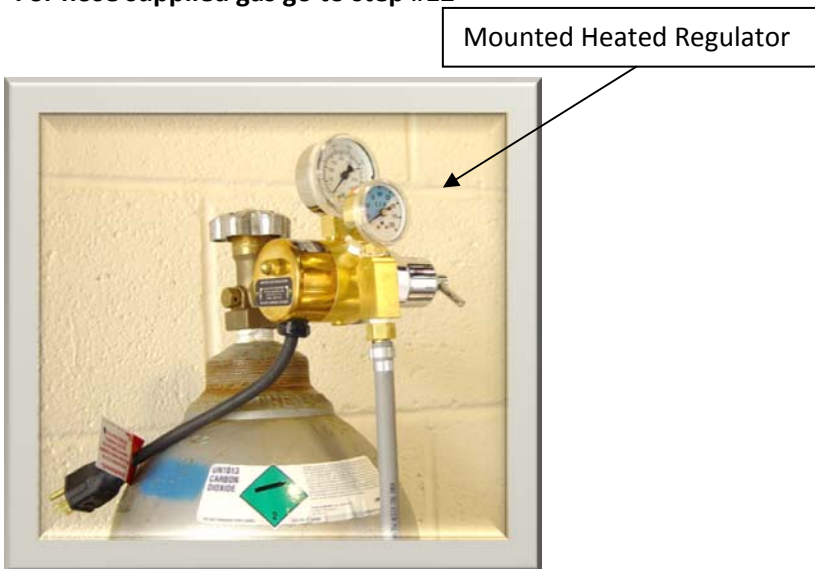


5) Attach the 1" intake hose from the blower to the "CO₂ Out" on the right side of top chamber. The clamp connector fastens by pulling the two clamps away from chamber. Also attach the 1" intake hose from the blower to the "CO₂ Out" on the right side of the bottom chamber (M1-SBFF-2C). If the hose is not already attached to the blower, simply slide the hose onto the fitting.

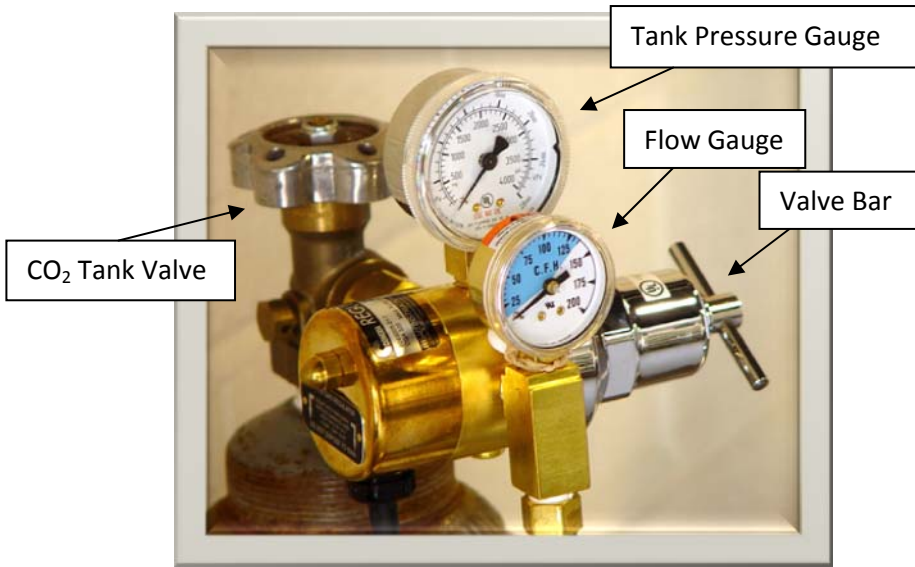


6) Attach the 4" exhaust hose from the blower to the in-house exhaust system. For facilities without in-house exhaust, drop the exhaust hose to the floor, allowing the CO₂ to dissipate away from personnel.

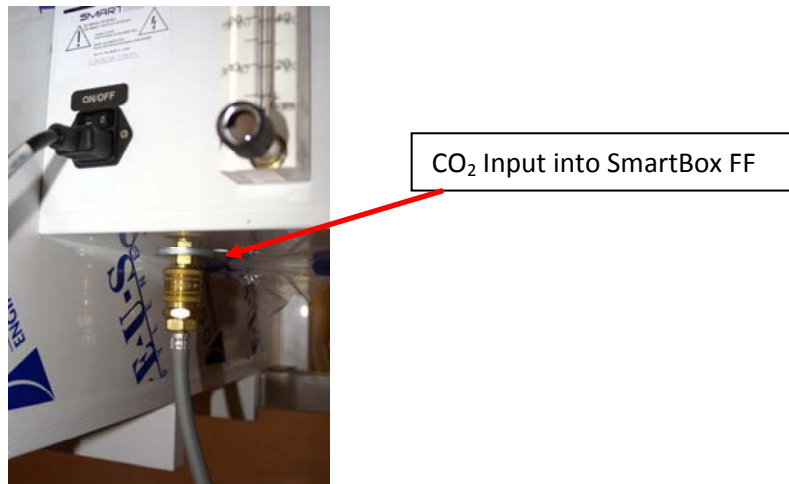
7) For hose supplied gas go to step #12



8) Attach the heated regulator to the CO₂ tank. It is recommended that Teflon tape be used on the CO₂ tank threads before attaching regulator. Use a wrench to tighten the mounted regulator. **Note: The EA-285 Electrically Heated Regulator is required to operate the system. Using a non-heated regulator will likely result in frozen CO₂ lines.**



- 9) Plug the regulator into an AC outlet. The regulator is thermostatically controlled to automatically turn on and off heat as needed to maintain CO₂ temperature. The larger gauge indicates the pressure from the CO₂ tank. A full tank typically runs at 800 lbs PSI. As the tank is used, the tank pressure reduces accordingly. The regulator flow output is indicated on the smaller gauge. It controls flow output in cubic feet per hour (CFH). The output is controlled by turning the valve bar clockwise or counterclockwise.



- 10) Attach the tubing between the CO₂ regulator output hose to the “CO₂ IN” on the bottom of the SmartBox FF controller. The input into the control box utilizes a quick connect fitting.

11) For house supplied gas connect the supplied FF-1130 hose from the barb on the house side to the connector for gas in on the side control box as shown above.

Gas flow is regulated using the flowmeter on the back side of the side control box. ADJUST GAS INLET RATE @ 50 LPM DURING CYCLE (GAS CHARGING)



12) Plug AC cord from SmartBox controller into AC power outlet.



13) Plug AC cord from exhaust blower into back of the SmartBox controller.



This outlet is to only be used for the EA-Blower supplied by Euthanex.

Cette sortie est à être utilisé uniquement pour l'EA-Soufflante fournies par Euthanex.



Plugging any other device into this outlet can cause electrical shock or fire.

Brancher un autre appareil sur cette prise peut provoquer un choc électrique ou un incendie.

Setup is now complete.

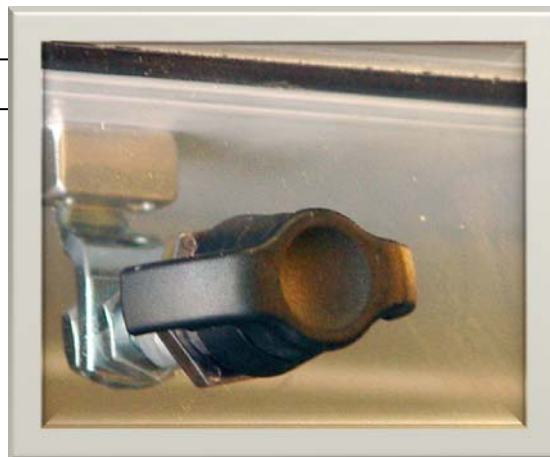
OPERATING THE SYSTEM



- 1) Press the On switch in the back of the SmartBox FF. The white “READY” light will turn on.



switch



- 2) Turn the three knobs on the front of the M1 chamber door counterclockwise to open. **Please note: Knobs must be in a fully horizontal position in order to open.**



While the front door is open, the red “Fault” light will turn on, indicating that the door is open. **No gas will flow and the system will not operate while the “FAULT” light is activated.**

3) **M1-SBFF-2C Model Only** has a “LEVELS” selector switch. Set to “1” for upper chamber only or “1,2” for both upper and lower chamber operation.



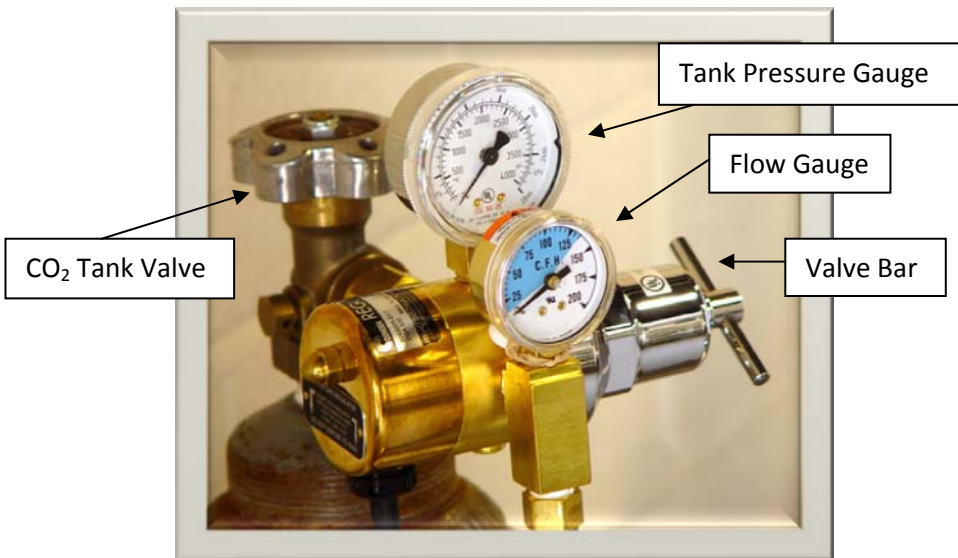
- 4) The chamber(s) is now ready to be loaded. Cages with wire bar lids can be stacked in two layers. Do not position upper layer cages directly on top of cages below. Cages must be slightly offset to allow circulation of gas to lower level cages.

A chamber can accommodate up to 20 standard mouse cages or 3 standard rat cages. Number of cages accommodated will vary based upon actual cage size. Do not attempt to place more cages than will comfortably fit into the chamber.

Cages without wire bar lids require the optional "Shelf Divider Panel."



- 5) After the chamber is loaded, close the door and **turn all three knobs fully clockwise to seal. If the knobs are not fully turned, a slight gas leak may occur.** The red “Fault” light indicates that the door is open. It does NOT indicate that the door is not fully latched.



- 6) Open the gas flow from the CO₂ tank by turning the tank valve knob counterclockwise. The large PSI gauge should be reading 800 PSI if the tank is full, less if it is not a full tank.
- 7) Open the gas flow out of the regulator by turning the control bar counterclockwise. This begins the flow of gas to the controller. **Set the regulator flow rate at 100 CFPH.**

- 8) Select the species using the selection switch. Press the black “START” green button on the front of side control box. The white READY light remains on and the green “RUN” light indicates the euthanasia cycle is operating.



- 9) During the first initial run, adjust the regulator flow rate to 100 CFPH. This adjustment will assure a humane process. Animals will first be anesthetized with minimal stress and then euthanized while asleep. Exceeding this flow rate may introduce stress to animals and result in operation outside of AVMA guidelines. (This regulator adjustment is typically only required the first time using the system and when a full CO₂ tank is first put on line.)

- 10) The system will cycle through three stages:

Stage 1: Gas flows through the chamber for **8 minutes**, fully charging the chamber with CO₂.

Stage 2: Gas flow stops and the chamber remains fully charged with CO₂ for **5 minutes**.

Stage 3: Exhaust blower turns on and purges the chamber for **4 minutes**, fully evacuating CO₂.

- 11) After the blower automatically switches off, the animals may be safely removed from the chamber.

- 12) The red emergency “STOP” button may be pressed at any time to stop the euthanasia cycle. Gas will immediately stop flowing.

TROUBLESHOOTING

Before any service is done that would require opening the unit it must be disconnected from the power source. If your location has lockout-tagout protocols please follow them.

System will not turn on:

- 1) Make sure power cord is properly plugged in.
- 2) Make sure the power switch on the back of the unit is turned in the "ON" position.



- 3) Before Checking fuses located on top of the ON/OFF switch in the back of the unit, disconnect the supply power to the unit by unplugging power cord.

Gas is not being delivered to the chamber or the flow rate is not correct:

- 1) Check that your gas supply has not run out.
- 2) Check that the CO₂ tank valve is fully open.
- 3) Check that the connections from the gas supply regulator to the controller CO₂ input is properly mated.
- 4) Check that the gray hose inside the controller is connected to the chamber input fitting.
- 5) Check that the regulator is open and set to 100 CFPH.
- 6) Check that the electric heater, inline from the gas supply to the regulator, is operating. The heater runs intermittently, switching on when heat is required. If the gas is not adequately heated, it will not flow properly.

Gas does not completely purge from the chamber during the evacuation stage of the gas cycle:

- 1) Check that the blower box is properly connected to the chamber.
- 2) Check that all chamber exhaust/vent lines are connected to the exhaust side of chamber.
- 3) If problem continues, you may change the length of time the blower is activated by reprogramming the purge time. See page 17 for instructions on changing presets.

Not all animals are being euthanized after the completion of gas cycle:

- 1) Check that all connections in the entire system are properly attached.
- 2) Check that your gas supply has not run out.
- 3) Check that the regulator is properly set at 100 CFPH.
- 4) It may be necessary to revise settings for the particular species that you are having difficulties with. Contact Euthanex for information on this.

Personnel gas exposure limits are being exceeded:

- 1) Check that all connections in the entire system are properly attached.
- 2) Check that the blower box is properly wired to the controller.
- 3) Check that the exhaust/vent line is connected to the exhaust side of chamber.
- 4) Check that the 4" exhaust duct is properly connected between the exhaust blower and the in-house exhaust system. The house exhaust must pull 100 – 150 CFM.

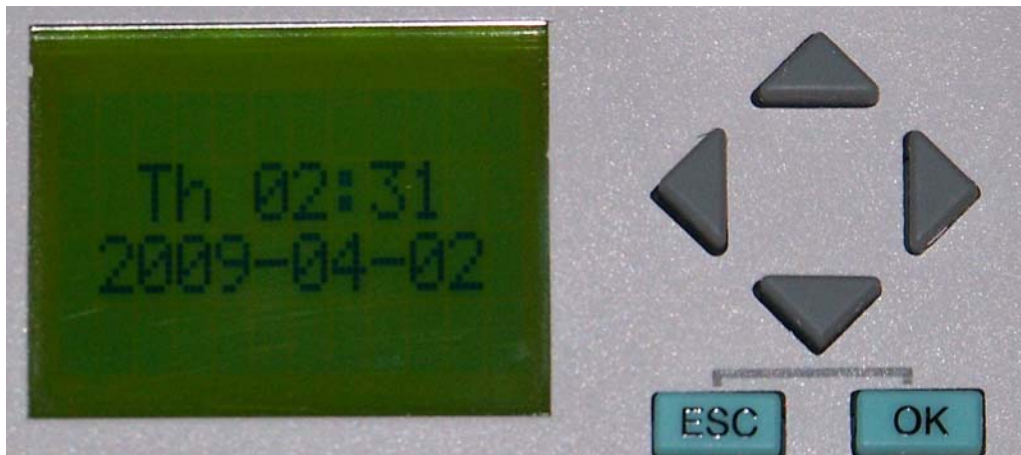
If this troubleshooting guide does not resolve your problem, contact Euthanex Tech Support at 1-877-559-0159, or info@euthanex.com.

Changing the System Presets:

Before any service is done that would require opening the unit it must be disconnected from the power source. If your location has lockout-tagout protocols please follow them.

Preset times were determined based on extensive testing done by Euthanex Corp. and designed to comply with the latest guidelines of the AVMA Panel on Euthanasia. Refer to the Flow Rate to determine AVMA compliant flow rates and the timing presets. The following is the procedure for changing the preset times:

1. Release the two latches to open the controller door.
2. The start-up screen will appear on the PLC.



3. To change the preset cycle times, press "ESC". The option screen will appear.
4. Press the down button to move the arrow to: "> Set Param". Press "OK".



5. "Timer 1" screen will appear.

- * Press "OK" and the first number will begin to flash.
- * Use the Up/Down keys to increase or decrease the value.
- * Use the Right/Left keys to move the cursor to the number you would like to change.
- * After the proper time is set, press "OK".

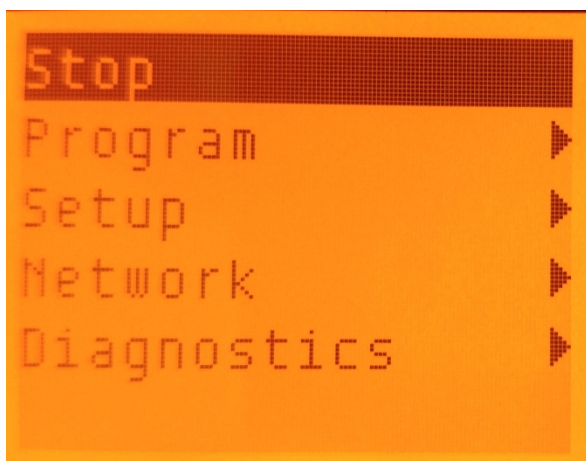
Note: Only the T = 00:00m will be set. The Ta = 00:00 is not a programmable function.



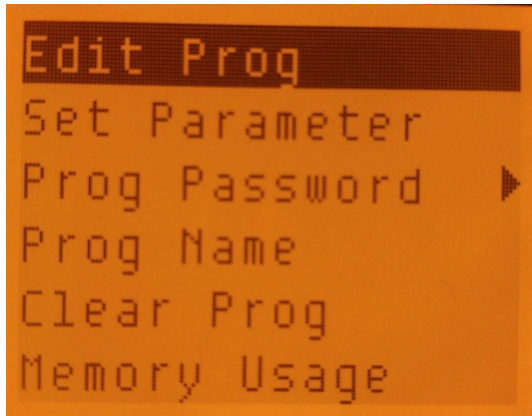
6. After setting the timers, press the "ESC" button twice to return to the opening screen. The Lab Control Unit is now ready to operate. Close and latch the door.

F series IDEC or Siemens:

1. Release the two latches to open the controller door.
2. The clock screen is on the PLC.
3. To change the preset cycle times, press ESC, then OK. The option screen will appear.



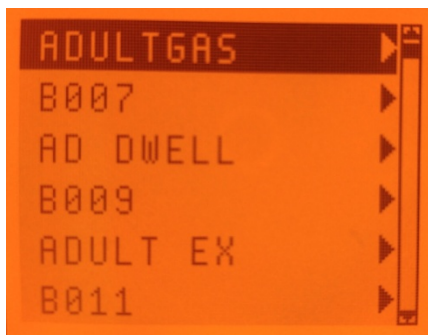
4. Press the down button , to move the arrow to: "> Program". Press OK.



5. Press the down button , to move the arrow to: "> Set Parameter". Press OK.



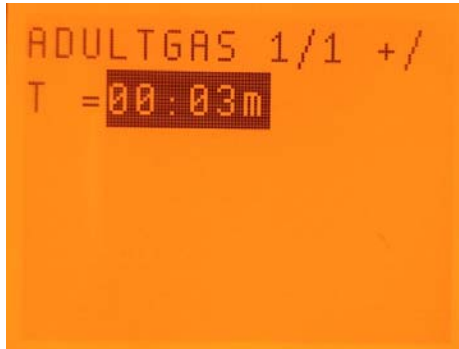
6. The password screen appears. Use the up/dw and Rt/Lt arrow to input password "CLUTCH" then hit OK



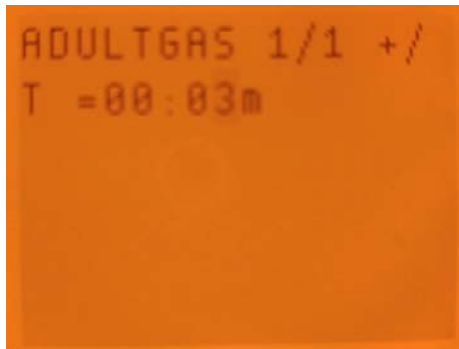
6. Timer select screen appears. This screen is maybe different that the picture based on the program loaded.

* Use the up/down keys to move to the value to change.

* Press "OK" and the screen will change. Press the right arrow until a large box will be over the timer.



* Press "OK" and the box will become small and over the first value of the timer.



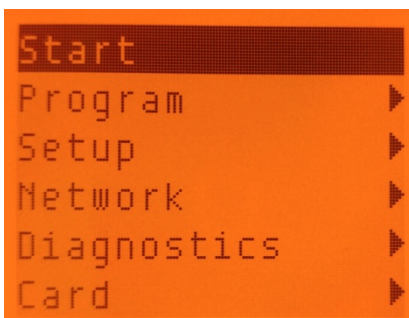
* Use the right/left keys to move the cursor to the number you would like to change.

* Use the up/down keys to increase or decrease the value.

* Use the right/left keys to move the cursor to the number you would like to change.

* After the proper time is set, press OK. The box will change back to large.

Note: only the T = 00:00m will be set. The Ta = 00:00 is not a programmable function.



6. After setting the timers, press the "ESC" button to return to the main screen.

Use the up key to move to start, hit "OK" button, use left arrow to move to Yes, Hit "OK" button.

The Lab Control Unit is now ready to operate. Close and latch the door.

Flow Rate & Preset Time:

Default times were chosen to comply with the latest guidelines of the AVMA Panel on Euthanasia and through extensive testing performed by Euthanex Corp. The preset time is customizable to facility needs. The programmable time may be changed by a designated administrator.

Preset Time: Typical Setting. For the exact setting for your system please refer to the QC sheet that was provided with the system

PRESET	CO2 TIMES	SPECIES/DWELL	EXHAUST
CHAMBER A:	8.30	A : ADULT 5:00	A: 3:30
CHAMBER B:	13.00	B : NEONATE 60:00	B: 3:30

How to derive AVMA compliant flow rate from chamber size (for a single chamber):

Height(in) x Width(in) x Length(in)= Liters x 20% = flow rate

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The 2013 AVMA Euthanasia Guidelines recommend 10 – 30% fill rate.



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