

SMARTBOX™

Auto CO₂ System

TT-4000



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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.

TABLETOP SYSTEM OVERVIEW

The SMARTBOX Tabletop Auto CO₂ System is an advanced automated euthanasia unit that has been developed specifically for euthanizing small rodents. The system incorporates two key components, the SMARTBOX TT Controller and the TT Chamber. The system works with preset timings that assure humane and efficient levels of CO₂. The controller has 2 timer settings for operation times for Adult and Neonates. 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 TT-SB 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) Dwell Time: Gas flow shuts off and the chamber remains fully charged to assure euthanasia of all animals.
- 3) Exhaust Time: The exhaust blower will activate and remove Co2 from inside the chamber. (The exhaust blower is an optional accessory.)



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 1 amp Max (auto select)
Pressure	75 psi max to inlet
Temp	0 to 40°C <> 10 to 85% RH (no condensation)

SYSTEM SETUP



- 1) The SMARTBOX TT controller comes attached to the Tabletop chamber utilizing the four holes on the right side of the Chamber.



- 2) Attach the supplied 1/2" check valve onto the left side of the chamber. The valve is threaded and will screw into the chamber wall.

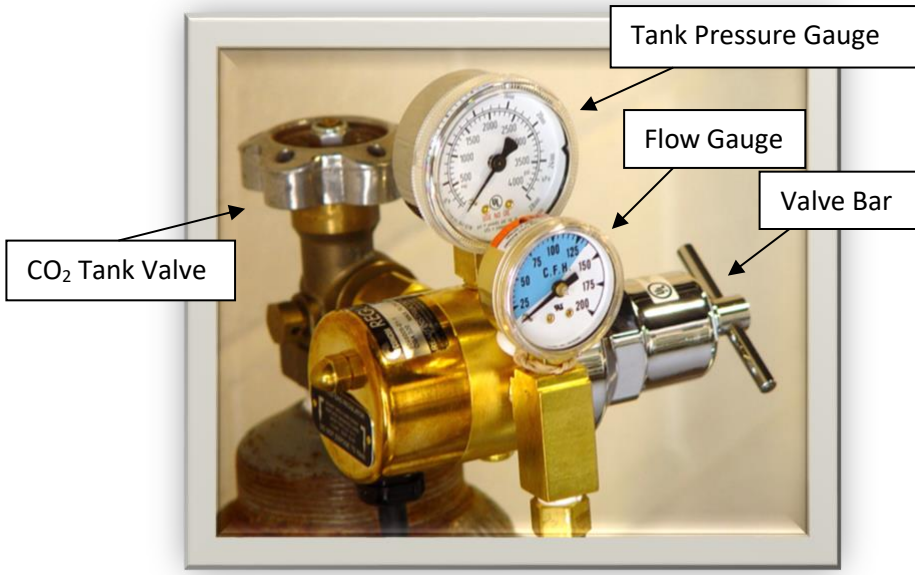


- 3) Attach the supplied 1/2" hose onto the right side of top chamber. This hose is coming off of the exhaust blower unit.

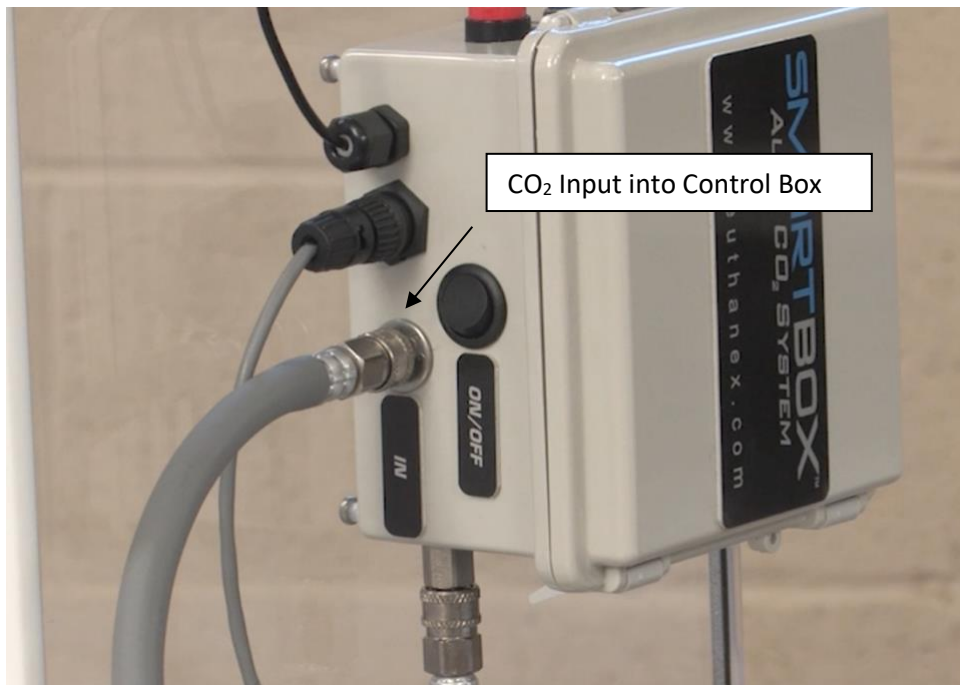
The 4" hose from the blower unit can be draped to the floor, set into a hood or it can be attached to house exhaust.



- 4) 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.



- 5) 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.



- 6) Attach the tubing between the CO₂ regulator output hose to the "CO₂ IN" on bottom of the SMARTBOX TT controller. The input into the control box utilizes a quick connect fitting.

Plug blower control cord into the SMARTBOX TT controller.



7) Plug blower unit ac into main power source.

Blower unit only operates when exhaust cycle is engaged by controller.

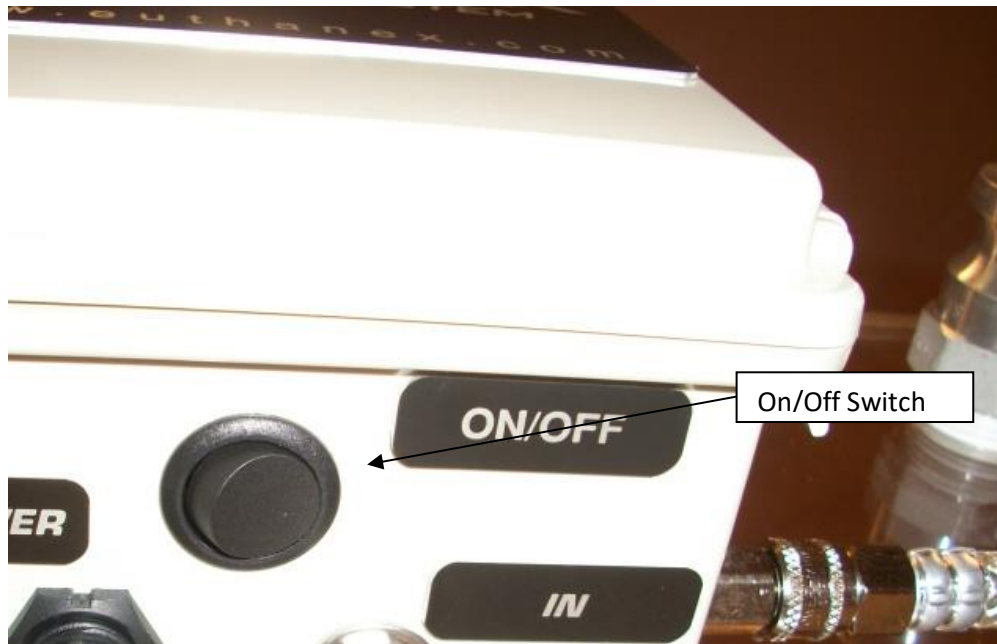
Vent exhaust close to room return vent.

8) Plug AC cord from SMARTBOX TT controller into AC power outlet.

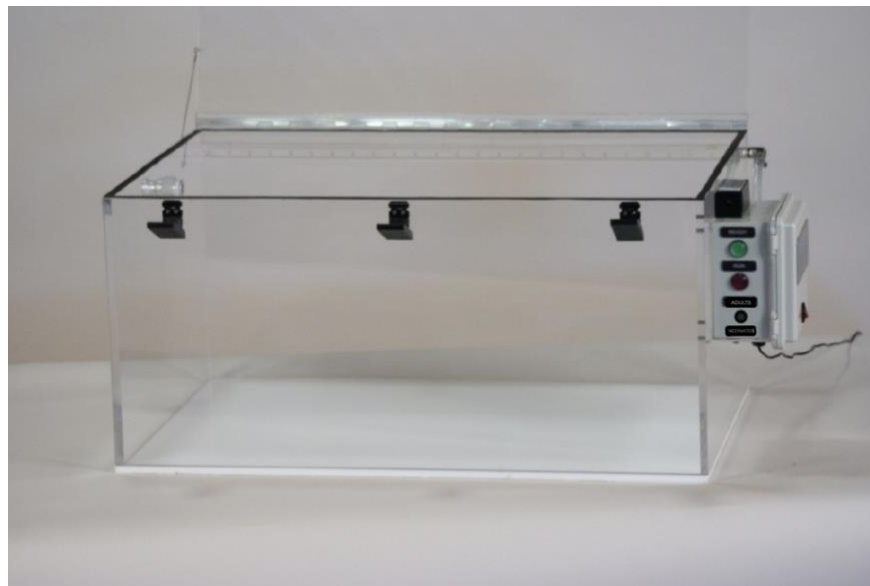
9) Turn on main power, ready light will come on.

Setup is now complete.

OPERATING THE SYSTEM



- 1) Press the On switch that is on the bottom of the controller. The green "READY" light will turn on.



- 2) Release the three latches on the front of the chamber to open the lid.



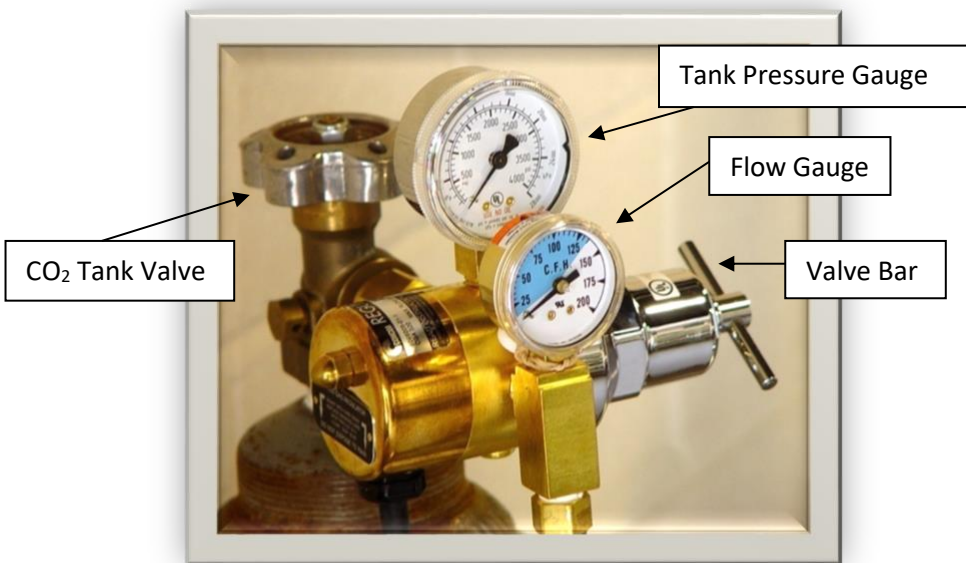
3) The chamber is now ready to be loaded. Cages with wire bar lids can be stacked in two layers.

A TT-4000 chamber can accommodate up to 6 standard mouse cages or one standard rat cage. 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.

NOTE: Cages should be set askew to allow optimal penetration of gas to the lower cages.



- 4) After the chamber is loaded, close the lid and **secure the three latches to seal**. If the latches are not fully secured, a slight gas leak may occur.



- 5) 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.

- 6) Open the gas flow out of the regulator by turning the “T” bar counterclockwise. This begins the flow of gas to the controller. **Set the regulator flow rate at 36 CFH for the TT-4000.**
- 7) The system has two preset timers for species selection. Press up for “ADULTS” or down for “NEONATES” on the front of side control box. The red “RUN” light indicates the euthanasia cycle is operating.



- 8) During the first initial run, adjust the regulator flow rate to 36 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.)
- 9) The system will cycle through three stages:
 - Stage 1 Charging:** Gas flows through the chamber for **8:30 minutes**, fully charging the chamber with CO₂.
 - Stage 2 Dwell:** Gas flow stops and the chamber remains fully charged with CO₂ for **5 minutes**.
 - Stage 3 Exhaust:** Blower will activate for 3.5 minutes, chamber will unlock and return to ready state (green).

CHANGING THE SYSTEM PRESETS:

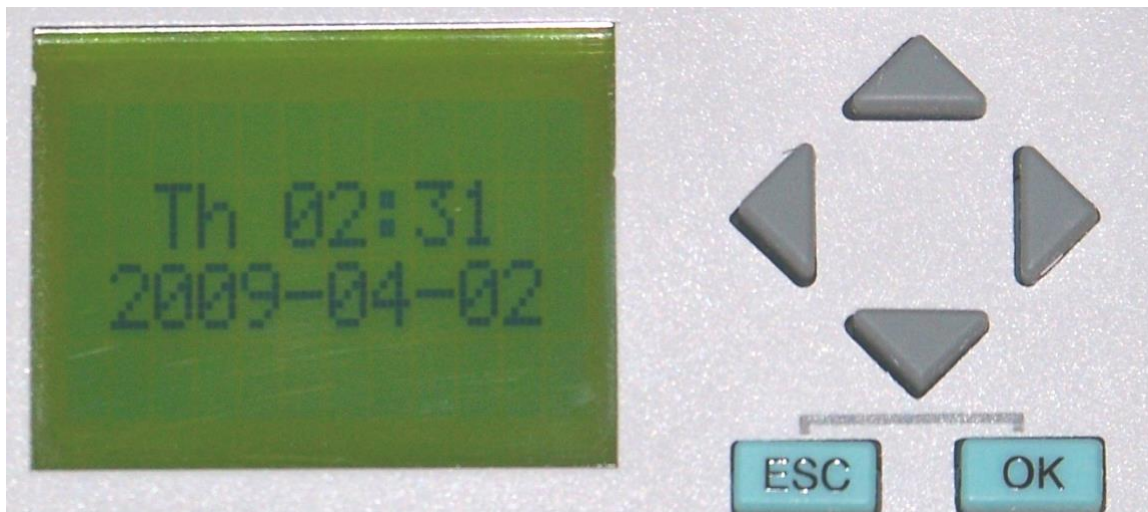
Recommended flow rates and preset times were determined with extensive testing done by Euthanex Corporation and are designed to comply with the latest guidelines of the AVMA Panel on Euthanasia.

Factory settings for presets are:

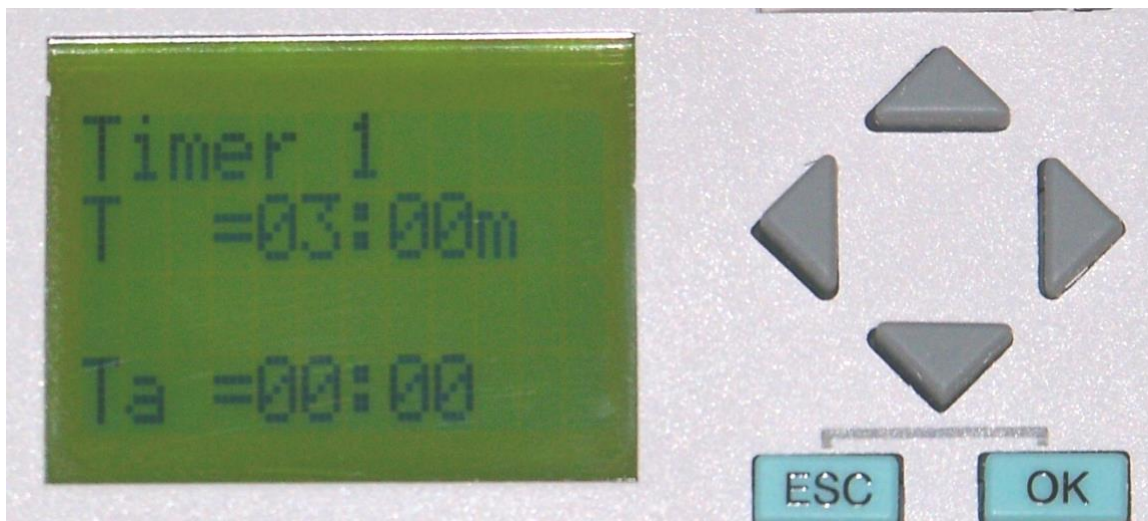
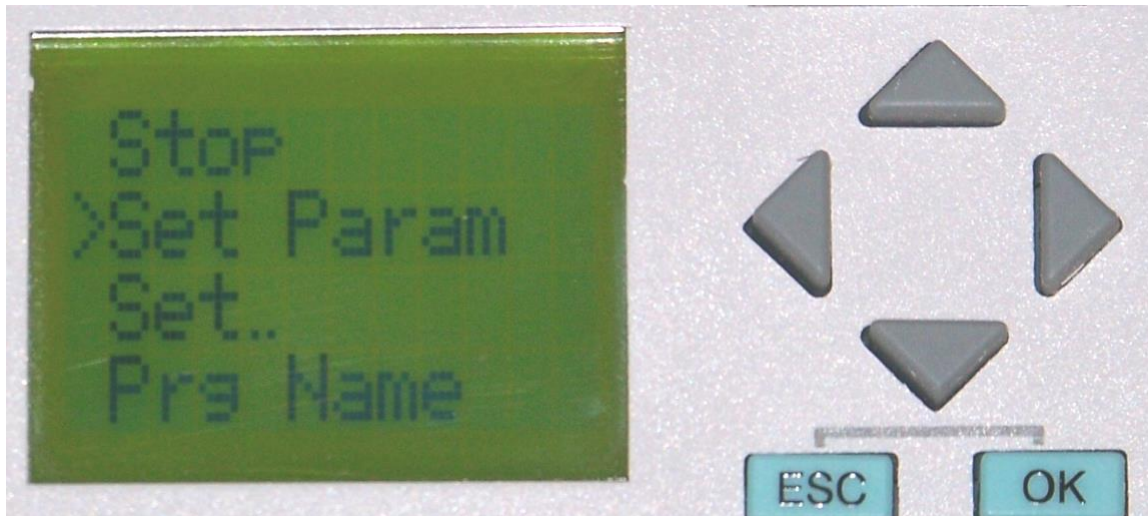
Adult CO2 Charge: 8.5 minutes
Adult Dwell: 5 minutes
Neonate CO2 Charge: 8.5/3 minutes
Neonate Dwell: 45/30 minutes
Exhaust: 3.5 minutes

The following is the procedure for changing the preset times:

1. Release the latch to open the controller door.
2. The start-up screen appears 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. The cursor will blink for the "T" settings.
 - a. Use the up/down keys to increase or decrease the value.
 - b. Use the right/left keys to move the cursor to the next number you would like to change.
 - c. After the desired time is set, press OK.

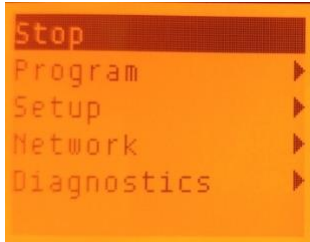
Note: Only the T = 00:00m will be set. The Ta = 00:00 is not a programmable function.

6. Repeat steps 5 and 6 to set dwell and exhaust times, if necessary.
7. After all the timers have been set, press the ESC button twice to return to the home screen. The system is now ready to operate with the newly programmed times. Close and latch the door.

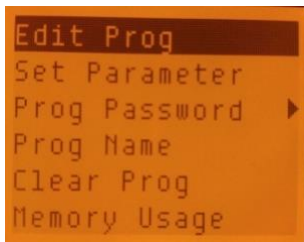
Repeat above for timer 2.

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.



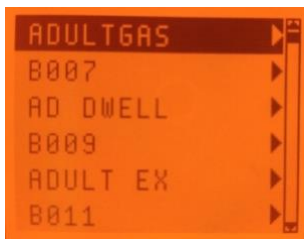
4. Press the down button , to move the arrow to: "> Program". Press OK.



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



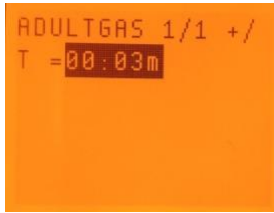
6. The password screen appears. Use the up/dw and Rt/Lt arrow to input password "CLUTCH" then hit OK



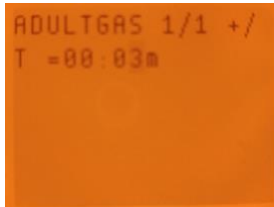
6. Timer select screen appears. This screen is maybe different that the picture based on the program loaded.

* 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.

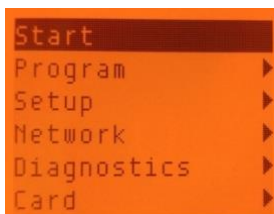
* Use the up/down keys to increase or decrease the value.

* 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.

Operational Parameters

TT-4000 (57 liters)

Flow Rate & Preset Times:

Default flow rates and times were chosen to comply with the latest guidelines of the AVMA Panel on Euthanasia and through extensive testing performed by Euthanex. Flow rates and times are programmable and may be changed by a designated administrator.

Factory Preset Time:

Adult CO2 Charge: 8.5 minutes
Adult Dwell: 5 minutes
Neonate CO2 Charge: 8.5/3 minutes
Neonate Dwell: 45/30 minutes
Exhaust: 3.5 minutes

CO2

Set regulator to 36CFH

Flow meter to 17LPM / 30% displacement.

The heated regulator can be left plugged in since it is thermostatically controlled and will shut off when the heat is not required.

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.

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 50 CFH.
- 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.

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 50 CFH.
- 4) It may be necessary to revise settings for the particular species that you are having difficulties with. Try extending flow and dwell times. See page 14 for instructions on changing presets.

Note; If the unit does not have the exhaust blower option , the blower time needs to be set at 00:00

If this troubleshooting guide does not resolve your problem, contact Euthanex Tech Support



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