

CO₂ Incubator Operation Manual

Model: NB-203XXL



Table of Contents

NO.	CONTENTS	PAGE
	WARRANTY	3
	GENERAL INFORMATION ON PRECAUTION	4
	TRANSPORTATION, STORAGE AND LOCATION OF INSTALLATION	6
	PREREQUISITE AND CONFIGURATION	8
	FEATURES, SPECIFICATIONS, CONTROL PANEL	11
	OPERATION	13
	TROUBLE SHOOTING	19

● Warranty

Thank you for choosing N-BIOTEK product.

This operation manual describes practical information such as performance, usage, cautions and notices for use of the product.

So, before using the product, please read it carefully all the safety instructions described in this manual and keep this manual for future use.

Model			
Date of Installation	mm-dd-year	Supplier	
Serial NO.		Period	1 year

N-BIOTEK product is warranted from defect in all parts and workmanship. This product is warranted for 1 (one) year against faulty components and assembly. Our obligation under warranty is limited to repairing and replacing the instrument or part after our examination.



This warranty does not extend to any N-BIOTEK products which have been misused, neglected, accident or mis-installation, application.

1. The free warranty service will be provided once the unit is proved to be defective by wrong workmanship after NBIOTEK or reliable distributor's examination.
2. The warranty period is 1 year from date of installation or 1 and Half year from the date of shipment from NBIOTEK, whichever is sooner as indicated in above table. This period is proved by serial number.
3. N-BIOTEK will not be responsible of free warranty service for the faulty caused by user's improper operation, excessive use, use of incorrect voltage & frequency, storage in wrong environment mentioned in Manual.
4. Complete the above table after installation and keep this card. Then, present it to a dealer or N-BIOTEK when warranty repair is needed.

● General Information on Precaution

Precaution is to prevent the possible accident or danger during operation. So, you must keep it.


Precaution is divided into caution and warning. And, each of them has following meanings.


	If you don't keep this warning, you can get an accident or a fire.		If you don't keep this caution, you can get injured as well as a property loss
Warning		Caution	


Other marks..


						
Warning	Caution	Compliance	Prohibition	No disassemble	Remove plug	Ground


1. Precaution for using the power cable


 Do not make the power plug be pressed by back of the product.
Compliance (A space between the product and the plug must be 30cm at least.)

 The power outlet must be only for this product.
Compliance (Using various products simultaneously can cause a fire)
Clean the power plug with a dry towel and connect it properly.
(Foreign substances or unsafe connection can cause a fire.)

 Do not bend the power cable hard and do not make it to be pressed by
Prohibition heavy products.(When it is damaged, it can cause a fire.)

 Do not touch the power code with wet hands. (It can cause an electric shock.)
Prohibition

 Do not use the damaged power code and outlet.
Prohibition (It can cause an electric shock and a fire)

 When you see smoke coming from the product or smell something is
Remove plug burning or see any other strange symptoms, you have to pull out the power
code and stop using it. (It can cause an electric shock and a fire.)

2. Precaution for ground connection



Compliance

Please ground before use the product, if you don't ground, you can get an electrocution when malfunction or an electric leakage occurs.



Compliance

At the place where you can't ground,

* Please buy the equipment to prevent any electrical leakage.

* An electric shock, an electric leakage and a fire can be occurred without an electric leakage breaker.



Prohibition

Do not ground to these places; Gas Pipe, water pipe, pipe, lighting rod, telephone wire etc. * Wrong ground connection can cause electrical leakage which eventually results in fire



Compliance

If you don't have the outlet for AC 220V, then bury it under the ground after connecting the ground line to copper plate.

* No ground connection can bring an electrocution, an electric leakage and a Fire.

3. Precaution for use



No disassemble

You must not disassemble, fix and remodel the product by yourself. (You can damage the product throughout a fire and malfunction or get a property loss as well as experimental loss.



Prohibition

Do not use the product for different purpose.

(It can cause malfunction or poor function. Consequently, you will get a wrong result.)



Prohibition

Do not use a flammable spray near the product.

(The switch and other electric connection parts can cause a fire.)



Prohibition

When you use flammable substances such as benzene, thinner, alcohol and LP gas, please be careful .(It can cause a fire and an explosion.)



Compliance

To prevent water and experiment material from going into the control panel during the experiment, make sure to clean the control panel with a dry cloth. (It can cause an electric leakage and a fire.)



Compliance

Do not wash the product with excessive quantity of water, thinner, benzene and Petroleum. (It can cause an electric leakage, and malfunction or damage on the surface.)



When you don't use the product or clean it, please pull out the power plug.
(It is to prevent an eclectic leakage.)



Open and close the door softly and please use a door knob.
(A heavy shock can damage the product and breakdown the operating part.
Also your hands can be stuck between the door and body.)



Do not detach the built-in lamp and electrical devices.
(It can cause an electric shock and a fire.)



Please be sure to prevent foreign substances from getting into the sealing silicon
of the door. (The inflow of open air can cause the change of temperature in chamber and
discoloration of the packing part by a foreign substance.)

● Transportation, Storage and Location of Installation

1. Transportation



DO NOT try to slide or tilt the unit.



Permissible ambient temperature range for transport: -10°C to 60°C.

2. Storage



Do not keep it at Place in High Humidity. Permissible ambient humidity: max. 70%
storage in a cold location is the place you transfer the unit to the installation site for
start-up, condensation may form. In this case, Wait at least one hour until the CO2
incubator has attained temperature and is completely dry.



Please check the voltage & Hertz written on serial label.
(Over-voltage, under-voltage can damage the product and poor performance.)



Do not install in humid place.
(It causes an electric leakage accident and a corrosive of the product.)



Keep this product out of the direct ray of sun and do not install at a hot
place or a place that is near an electric heat.
(The proper room temperature is 20°C ~ 30°C.)

3. Location of installation and ambient conditions



Prohibition

Do not put flammable substances near the product. (It can cause a fire)



Compliance

When you install the product, you have to put the distance of at least 30cm from the wall. To completely separate the unit from the power supply, power plug must be disconnected. Install the unit in the way that the power plug is easily accessible and can be easily pulled in case of danger.



Compliance

Install the unit at a flat surface, free from vibration and in a well-ventilated location. (If the ground is not flat, it can cause an excessive vibration of the product.)



Compliance

When you move the product, hold the door and other movable parts of the product with a tape. (When the product is moved, the movable door can cause injury of you and damage of the product.)



Compliance

When you move the product, you must hold up the product. (Pushing or pulling the product can damage the bottom part of the product.)



Prohibition

When you move the product, do not lay it down to its side or reverse the head to bottom. (It can cause a malfunction.)

● Prerequisite and Configuration

1. Prerequisite

Inspection of Boxes

When you have received the instrument which is packed on pallet, inspect the box carefully for any damages that may have caused any damages to product during shipping. Please report any damage to the carrier or to your local NBIOTEK distributor immediately.

Location

The incubator is designed to operate at temperature 5 °C above ambient, and recommended to operate at minimum ambient(temperature in the place for use), 15 °C. Maximum Room Temperature is 32 °C.

To avoid place for use this incubator is as below.

1. Near Heater or Freezer(if it may generate heat and affect temperature control of incubator)
2. Near Equipment generating heat or cold air to incubator.
3. Directly Sunlight Exposed to incubator
4. Uneven ground or table head
5. The place where is being vibrated
6. Too narrow to use lift handle(at side of bottom) and power cable of incubator.

Cleaning before use

Before conducting cell culture, It is recommended to clean up entire chamber and shelves, water tray by using at least 70% Ethanol mixed of 30% distilled water and soft clothes.

Inserting shelves

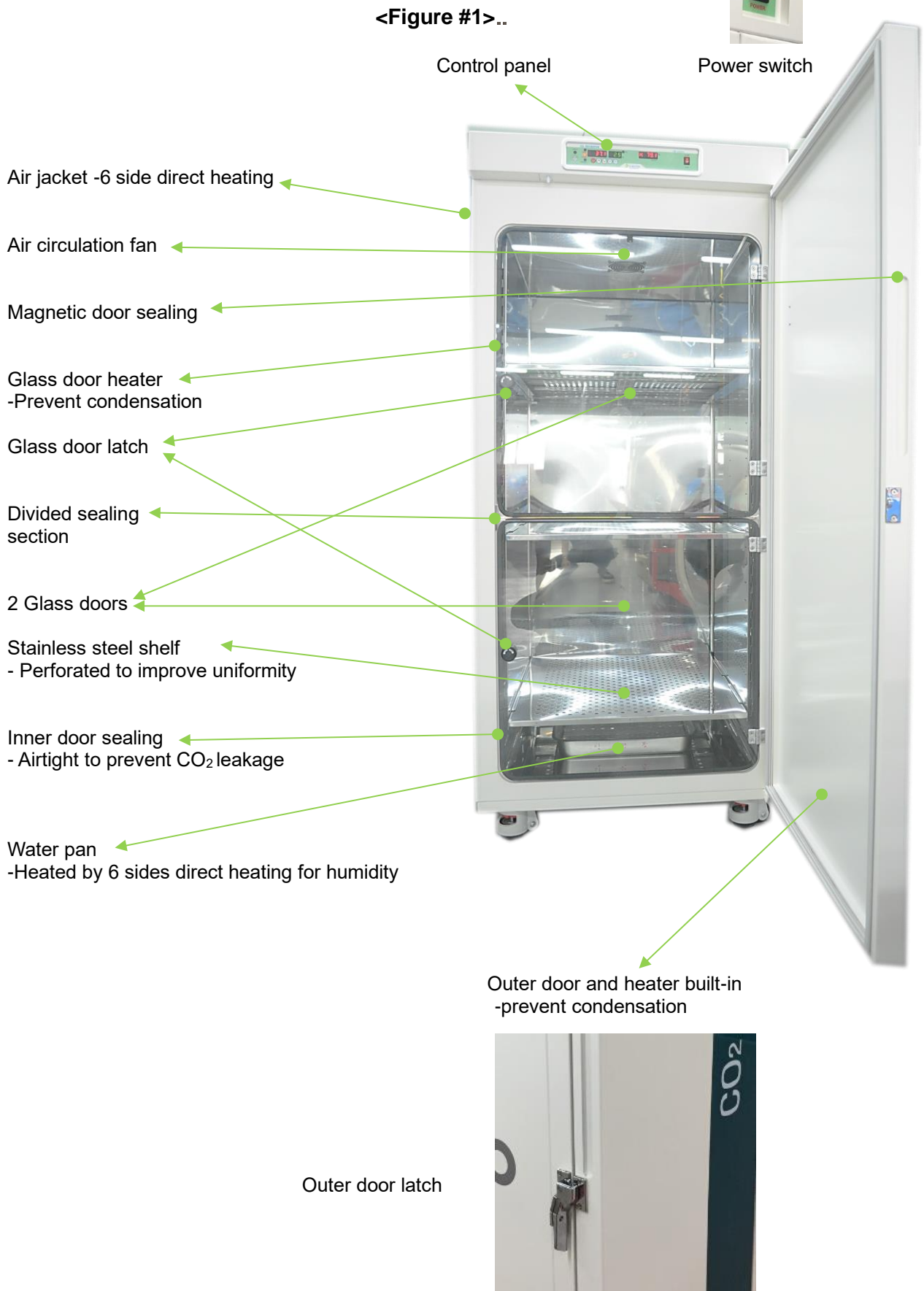
Shelves are mounted onto the shelf racks in such a way that the edge of shelves which is slightly bent up about 8mm goes to the back of the chamber until it is too close to the back wall. Basically, 2 shelves are provided. Insert the shelves from top to bottom.

Level the incubator by adjusting bottom of chamber if needed.

After inserting the shelves, place humidity tray on the bottom of chamber if humidification is required for your application.

2. Configuration

Exterior Configuration of CO₂ incubator



<Figure #2 : Back of Incubator>



NOTE

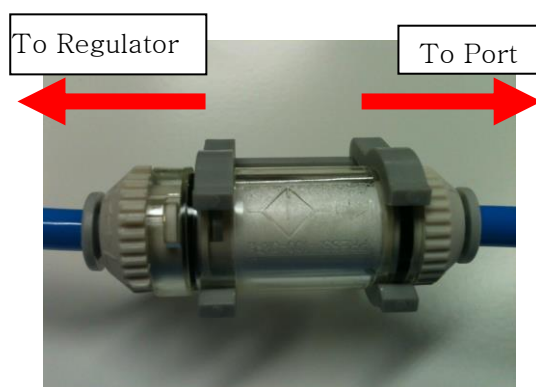
1. The figure 1 is to show you the name of each part of exterior incubator.
2. The diameter of blue PVC tube that we use for inflow of gas is 6mm. (total diameter 6mm, hole 4mm)

Connecting Power Cord:

1. Verify your supply voltage matches the voltage of your incubator.
2. Insert the power cord into its receptacle.
3. Plug the cord into power supply outlet.

3. Connecting Gas Tubes

Find two gas inlet ports at back of incubator and connect the incubator to the CO2 supply using 6mm PVC tubing with installed HEPA filter. There is direction of gas injection flow on the plastic cover of HEPA filter(see photo #5). Following this direction, insert the edge of tube into the port until it is not moving forward.



<PHOTO #3, HEPA filter on Tube>

Note: When needed to put the tube out from the port, press the port and put tube out.

- NOTIFICATION: To create hypoxic condition(lower O₂ than atmosphere) N₂ must be supplied.
- NOTIFICATION: To create hyperoxic condition(higher O₂ than atmosphere) O₂ must be supplied.

● Features, Specification, Control Panel

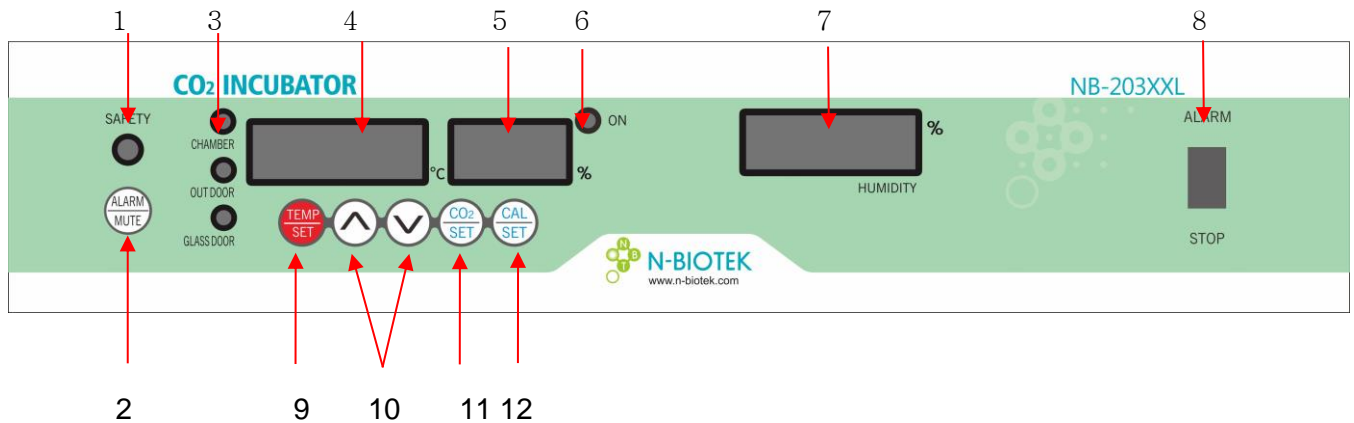
1. Feature

1. Excellent Uniformity of Temperature and CO₂
2. 6 Sides Direct Heat for Temperature Uniformity and Fast Recovery
3. IR CO₂ Sensor detects precise density of CO₂
4. Outer Heated Door ensures no condensation on glass door
5. Max. 125°C Decontamination by hot air sterilization (optional)
6. Convenient Decontamination Process (Easy Preparation, Automatic Program)
7. Microprocessor PID control for Temperature and CO₂
8. Natural Humidification System by water tray and circulation fan
9. Special Air Jacket allows effective heat preservation between insulation and chamber

2. Specification

Items	NB-203XXL
Temp. Range	Ambient +5°C to 60°C
Temp. Accuracy	±0.5°C at 37°C
Temp. Increment	0.1°C
Controller	Microprocessor
Humidity	70% ~ 80% at 37°C
CO ₂ Range	0% to 20%
CO ₂ Accuracy	±0.1% at 5% at 37°C
CO ₂ Increment	0.1%
CO ₂ Sensor	IR CO ₂ Sensor
CO ₂ Inlet Pressure	0.9~ 1.0 bar
Outer Door	Silicon Packing Magnet Door
Inner Door	Tempered Safety Glass Door
Control Panel	LED Display/Micro Processor Control
Operating Panel	Individual 2 Channel Touch Button
Jacket Type	Dry wall type (6 sides direct heating)
Chamber Material	Stainless steel (SUS 304)
Chamber Volume	850 Liter
Weight	266kg
Capacity Perforated Shelf	3ea / Max 15ea
Chamber Dimension	698(W) x 799(D) x 1528(H)mm
Overall Dimension	820(W) x 950(D) x 1840(H)mm
Power	110/220V, 50/60Hz , 1.2kW

3. Control Panel



1. SAFETY : Overheating Alarm(in case that thermal-cut is activated)
2. Alarm Mute
3. Heating Signal : To show status of heating activation at 3 parts where is controlled by 3 each sensors. Glass door means the heater around glass door.
4. Temperature Display LED window
5. CO₂ Gas Display(%)
6. Pilot Lamp for CO₂ valve: Pilot lamp ON position means inflow of gas
7. Humidity Display
8. Alarm power on/off button
9. Temperature Setup Key
10. Adjustment button
11. CO₂ Gas Setting Button
12. Calibration button

● Operation

- * Before Switch ON, insert water tray filling with distilled water. Make sure connection of gas supply. And Open CO₂ gas cylinder or supply with the pressure of regulator set to 4.5Psi or 0.3 bar.
- * Please check connection of gas supply. And Open CO₂ gas cylinder for supply with the pressure of regulator set to a certain level.

CO₂ incubator set-up process



1. Place and install the product.

Install the product at the desired place and check the level in all directions (side by side, front to back and ground).

2. Connect the power

Prior to connect the power plug, make sure that the POWER S/W is off

3. Connect the CO₂ gas



- 1 Regulator Pressure Gauge
- 2 Bombe Pressure Gauge
- 3 Flow Meter
- 4 Regulator Valve
- 5 Master Valve

- Check whether CO₂ gas is leaking at any point of regulator.
If leak is found, please take a measure to stop leaking before supply of CO₂ gas to incubator.
- Clear the air passage for gas input gasket at the rear of the unit.
Also check the gas tube and get rid of any obstacles for smooth gas flow.

- ▶ Before supply of CO₂ gas to incubator by gas tube, check the gas volume in CO₂ Gas cylinder.
- ▶ When previous stage is cleared, connect the gas tube to regulator and incubator.
At this point, Make sure that valves of all the part besides gas cylinder, Regulator are locked.
(④ and ⑤ have the opposite lock direction each other. ④ is clockwise and ⑤ is counterclockwise)
- ▶ Open #5(Master valve of cylinder) and #4(the regulator valve), #3 Flow meter. While Flow meter fully open, control the supplying pressure up to 1bar with adjusting regulator valve(#4).

Note

Once power is on with all connection for CO₂ gas done, please check the solenoid valve works well by solenoid sounding. Also, observe the CO₂ density on display goes up well. Factory setup for initial CO₂ gas supply is up to 4%. This will be covered more at page 17.

4. Power switch on

Once power is on, digital readout of current temperature and CO₂ % in chamber will be displayed after below message passed.



5. Setting temperature

- a. [Connect the power](#), then, the LED screen will display the temperature in the chamber.
- b. [Press the "TEMPSET" key](#), then, the LED screen will flicker and display.
- c. Then, [input the desired temperature by pushing UP \(▲\) and DOWN \(▼\)](#).
- d. [Press "TEMP/SET" key again](#) after putting the desired value. "SAVE" is shown up on the LED screen as below.



Note

If you don't press "SET" key lastly after set-up, the new set-up value will not be saved at all.

6. Setting Up CO₂

- a. [Press "CO2SET" key](#). Then, LED screen will flicker continually.
- b. [Input the desired value of Co2 density](#) by pushing UP (▲) and DOWN (▼) key
- c. [Press "SET" key again](#) after input. "SAVE" is shown up on LED screen as below.



Note

If you don't press "CO2SET" key again after set-up, the new set-up value will not be saved at all.

7. Calibration for temperature and CO₂








Please follow up below procedure for calibration in case of discrepancy between actual value (measured by reliable measurement device) in chamber and displayed value.



Caution

Measure CO₂ density and Temperature after incubator is stabilized in which takes about more than 2 hours (you might want to perform this stabilization process at night before home)

Please note that low deviation range such as $\pm 0.1 \sim 0.3\%$ may not be corrected precisely by this calibration.

No.	DISPLAY	FUNCTION
1		Chamber Temperature
2		Door Heater Temperature
3		Glass Door Heater Temperature
4		CO ₂ Calibration
5		Heating control
6		CO ₂ gas supply control
7		To apply a new value

a. Press and hold “CAL/SET” for 10 seconds. Then, LED will be flickering as below.



Channel 1 is at chamber's Main Temp calibration stage.

Press UP (▲) as much as difference from measured value by precise analyzer if it is higher.

Press DOWN (▼) as much as difference from measured value by precise analyzer if it is lower.

Ex) If measured temperature is 38 °C and Display shows 37 °C, then press up 1 °C.

Note

* Calibration range for temperature is $\pm 5^{\circ}\text{C}$

* To go to next channel is to press “CAL/SET” button. After 5th channel, the LED is back to temperature display.

b. Second Click "CAL/SET" ➞ Outer door's Temp calibration



Caution

Channel 2 is purposed to remove water condensing on glass door caused by high temperature difference between chamber and outside. Recommend to use calibration at Channel 2 in case of water condensing on glass door.

Note

Except water condensing on glass door, calibration of channel 2 and 3 is not recommendable. Check if the water condensing is removed in 3 Hours after calibration of CH2 is done.

c. Third Click "CAL SET" ➞ Door Frame Heater calibration



Caution

Channel 3 is purposed to remove excessive water condensing on glass door caused by high temperature difference between chamber and outside. When failed to remove water condensing by calibrating CH2, try to calibrate.

d. Fourth Click "CAL SET" ➞ CO2 density calibration



Channel 4 is at CO2 density calibration stage.

Press UP (▲) as much as difference from measured value by precise analyzer if it is higher.

Press DOWN (▼) as much as difference from measured value by precise analyzer if it is lower.

Ex) If measured CO2 value is 5% and Display shows 4%, then press up 1%.

e. Fifth Click "CAL SET" ➞ Heating control

*** This is pre-programmed mode before releasing from manufacturer.**



Push UP (▲) and DOWN (▼) to set the value

NOTE

Channel 5 is to set heating control point.

If it is set at 3, then the heating control works from 34 °C against setting value i.e. 37 °C.

This is in order to minimize overshooting and faster reaching time to setting value.

Therefore, user is kindly required not to change this value.

f. Sixth Click "CAL SET" CO2 gas supply control.

*** This is pre-programmed mode before releasing from manufacturer.**



Push UP (▲) and DOWN (▼) to set the value

NOTE

Channel 6 is to set starting point of solenoid control for CO2 supply.

Factory pre-programmed set point is at 1 to optimize set-up at 5% and it means that CO₂ control valve is in open position until the CO₂ density reaches to 4%. From 4% of CO₂ to setting value, solenoid valve takes control of CO₂ supply until it gets to setting value.

When above stage is cleared, please press the button to save the new value.



8. Alarm

In order to activate alarm system, it should maintain $\pm 1^\circ\text{C}$, $\pm 1\%$ to set point for 3 minutes.

This course is recognised as stabilizing process.

After stabilizing process, alarm activation is as below.

Alarm Activation

Temperature: (beep beep beep ---)

If it stays out of $\pm 1^\circ\text{C}$ from set point for 8~9 minutes, it will give you an alarm.

CO2: (beep -----)

If it stays out of $\pm 1\%$ from set point for 8~9 minutes, it will give you an alarm.

Door Open: (beep beep beep ---)

Alarm is on 1 minute after door opening. No alarm if closed within 1 minute.

After 1 minute of door open with alarming,

-- Alarm will stop 2.5 seconds after door closed.

-- Mute button will give no alarm. But alarm will activate every 10 minutes of mute button.

9. Safety Switch

It is the safety device to prevent the heater from overheating when the temperature controller is malfunctioning.

- Set the Safety S/W higher than setting point.
- The Safety S/W has wide deviation
- Safety S/W is the safety device for preventing the heater to overheat when TEMP. CONTROL is malfunctioning.



● Troubleshooting

Fault description	Possible fault cause	Required measures
Heating		
Chamber heating permanently, set point not held	SSR relay defective	Replace SSR relay
	Control panel display defective	Replace display screen
	Temperature sensor defective	Replace temperature sensor
Chamber does not heat up.	SSR relay defective	Replace SSR relay
	Power not supplied to heating circuit	Reconnect the power plug on the panel. Contact N-BIOTEK service
Unit does not switch on (main switch is in position "I")	The miniature fuse has blown.	Replace the fuse with type 5x20mm, 220V(5A), 110V(7A). If the newly inserted fuse triggers again, there is short circuit: contact N-BIOTEK service.
	Switch defective	Replace the switch
Gas		
CO2 concentration in chamber is too high/ too low.	Defective function of the CO2 controller	Reset the alarm.
	CO2 sensor system defective	Contact N-BIOTEK service.
The concentration of CO2 or O2 does not reach the adjusted set value.	Gas inlet defective	Replace the gas tube
	Gas leaking from inner tube connecting region.	Replace the inner tube.
	Solenoid valve defective.	Replace solenoid valve
Humidity		
Condensations inside the chamber	Fan defective	Replace the fan. (contact N-BIOTEK service)
Condensation on the door	Improper temperature distribution b/w the door and the chamber	Increase the value of door heating temperature. (Ch.2)
No or too low humidity inside	Water pan empty	Fill the water pan with distilled, sterile water.