# *$CO_2$ Incubator Operation Manual*

## Model: NB-203 / NB-203XL

N-BIOTEK
Leading Life science

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# 1. SAFETY AND GENERAL PRECAUTION

## 1.1 General Information on Precaution

- Precaution is to prevent the possible accident or danger during operation.

  So, you must keep it.

- Pprecaution 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.

### 1.1.1 Safety warning symbols


## 1.2 Precaution for using the power cable


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


The power outlet must be only for this product.
(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 hardly and do not make it to be pressed by heavy products. (When it is damaged, it can cause a fire.)


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


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


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

### 1.3 Precaution for ground connection


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


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.


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.


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.

### 1.4 Precaution for use


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.)


Do not use the product for different purpose.
(It can cause malfunction or poor function. Consequently, you will get a wrong result.)


Do not use an inflammable spray near the product.
(The switch and other electric connection parts can cause a fire.)


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


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.)


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.)

## 2. TRANSPORTATION, STORAGE AND LOCATION OF INSTALLATION

### 2.1 Transportation


DO NOT try to slide or tilt the unit


Lift the unit at its four lower corners with the aid of 2 people. (Weight: 35kg)


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

### 2.2 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.)


Prohibition

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


Prohibition

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 indoor temperature is 20℃ ~ 30℃.)

### 2.3 Location of installation and ambient conditions


Prohibition

Do not put inflammable 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.)


Prohibition

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


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.)


Compliance

CO2, as well as O2, and N2 are harmful in human when in high concentrations.
Any excess has to be led out via good room ventilation or by connection to a suitable exhaust system.

# 3. PREREQUISITE AND CONFIGURATION

## 3.1 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℃ above ambient, and recommended to operate at minimum ambient(temperature in the place for use), 15℃. Maximum Room Temperature is 32℃.

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.

If you use Hot Air sterilization(option) prior to cell culture, take the step described in Appendix I.

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, 3 shelve are provided. Insert the shelves from top to bottom.

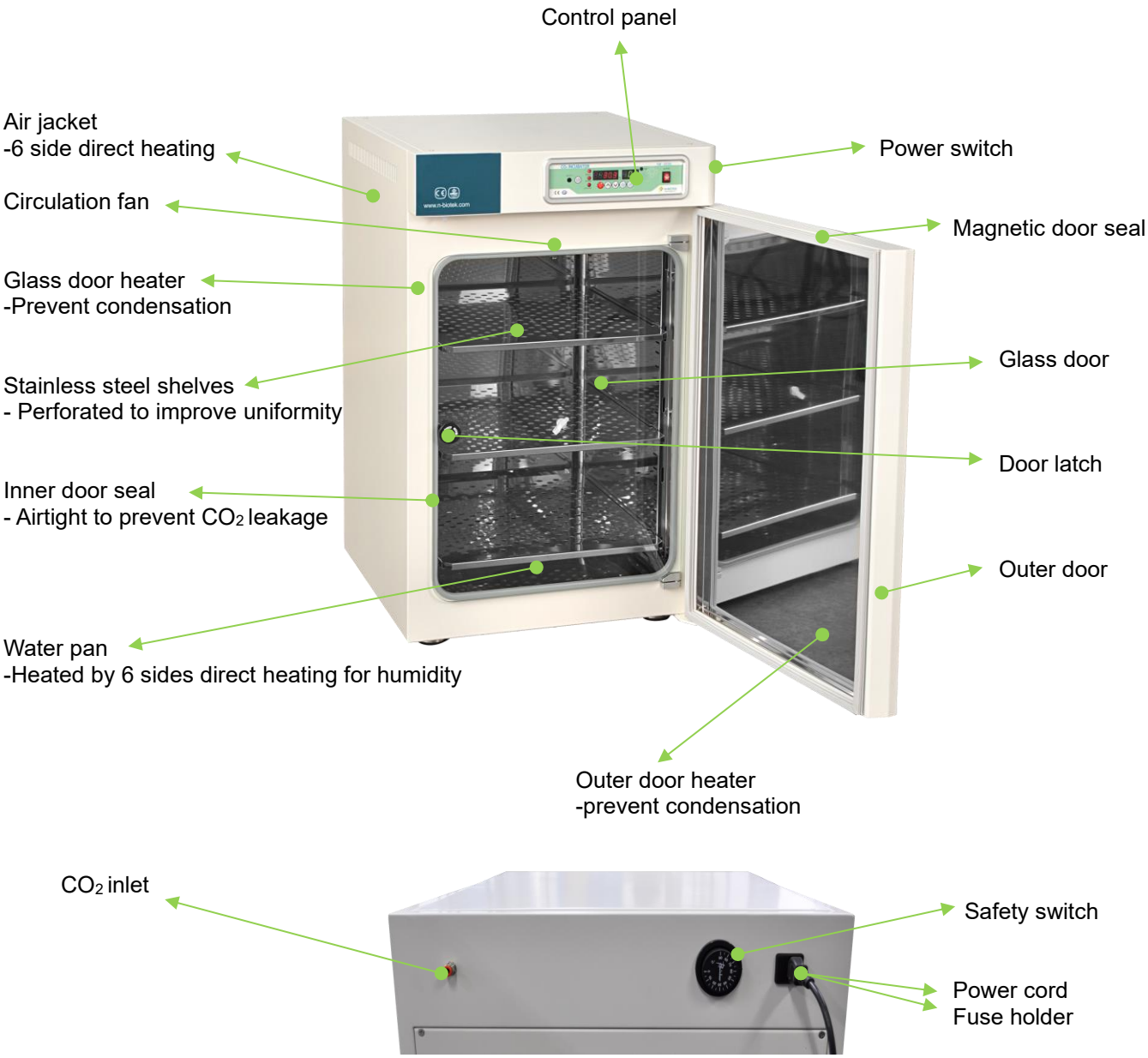
Level the incubator by adjusting feet. Place a small level on the second shelf of the incubator adjusts the levelling feet until the incubator is level and stable.

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

### 3.2 CONFIGURATION

Exterior Configuration of CO2 incubator.

**<Figure #1>**




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.

# 4. FEATURES AND SPECIFICATIONS OF THE UNIT

## 4.1 Features

1. Excellent Uniformity of Temperature, $CO_2$, $O_2$(optional)
2. 6 Side Direct Heat for Temperature Uniformity and Fast Recovery
3. IR $CO_2$ Sensor detects precise density of $CO_2$
4. Outer Heated Door ensures no condensation on glass door.
5. Max. 125℃Decontamination by hot air sterilization (optional)
6. Convenient Decontamination Process (Easy Preparation, Automatic Program)
7. Microprocessor PID control for Temperature, $CO_2$ , $O_2$(optional)
8. Natural Humidification System by water tray and circulation fan.
9. Special Air Jacket allows effective heat preservation between insulation and chamber.

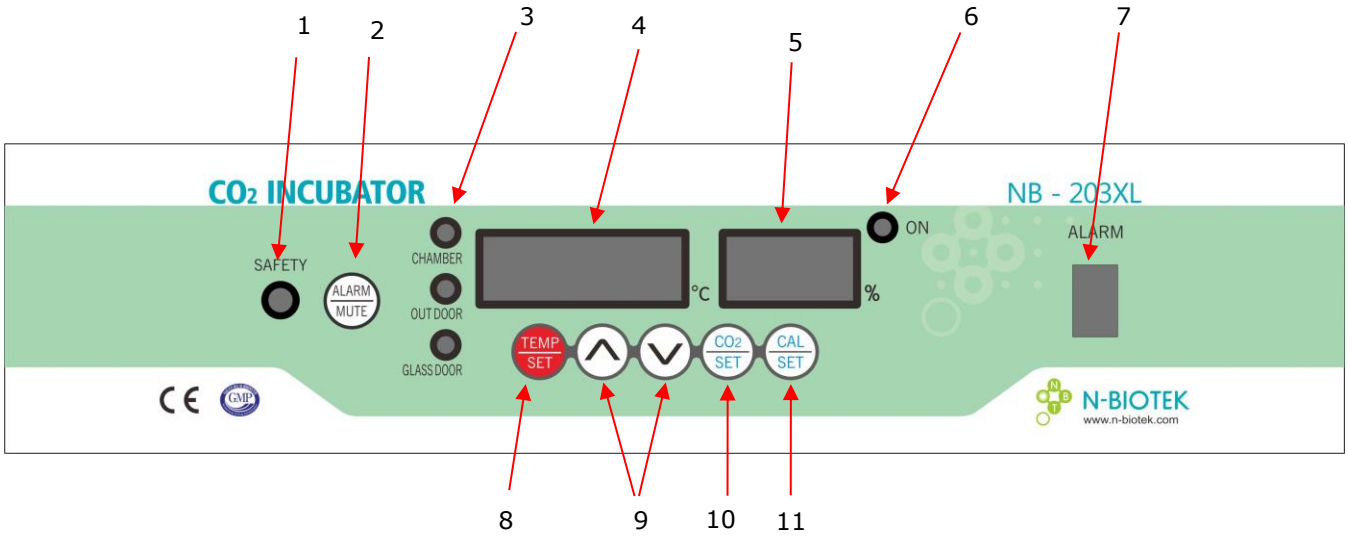
## 4.2 Specification

| Items | NB203 | NB203XL | NB203C (Peltier) | NB203XLC (Peltier) |
|---|---|---|---|---|
| Temperature | | | | |
| Range | Ambient +5℃ to 60℃ | | Ambient -5℃(Max 18℃ at Room Temperature 23℃) to 60℃ | |
| Accuracy | ±0.25℃ at 37℃ | | ±0.5℃ at 37℃ | |
| Controller | Microprocessor Digital PID | | | |
| Humidity | 70% ~ 80% at 37℃ | | | |
| CO2 | | | | |
| Range | 0% to 20% | | | |
| Accuracy | ±0.1% at 5% at 37℃ | | | |
| Increment | 0.1% | | | |
| Sensor | IR CO2 Sensor | | | |
| Outer door | Silicon Packing Magnet Door | | | |
| Inner door | Tempered Safety Glass Door | | | |
| Control panel | LED Display | | | |
| Jacket type | Dry wall type (6 sides direct heating) | | | |
| Chamber material | Stainless steel (SUS 304) | | | |
| Weight | 35KG | 78KG | 37KG | 85KG |
| Capacity<br>Perforated Shelve | 42Liter<br>2ea | 179Liter<br>3ea | 42Liter<br>2ea | 179Liter<br>3ea |
| Chamber dimension | 320x350x370(H) (mm) | 473x528x710(H) (mm) | 320x350x370(H) (mm) | 473x528x710(H) (mm) |
| Overall dimension | 408x482x550(H) (mm) | 560x665x945(H) (mm) | 408x482x550(H) (mm) | 560x665x945(H) (mm) |
| Power | 110/220V, 50/60Hz | 110/220V, 50/60Hz | 110/220V, 50/60Hz | 110/220V, 50/60Hz |

## Note

**With Peltier control of temperature, ambient -5℃ can achieve no lower than 23℃(room temperature). Ensure actual low temperature availability in incubator for at least 2 hours when use it at lower temperature than 23℃.**

## 5. CONTROL PANEL




1. Temp Safety Indicator : Lighting, in case of Thermal cut-off is activated by over temperature
2. Alarm Mute : For Temporary Pause when Sound of Alarm is activated
3. Heating Activation Indicator : If part of heater is heated, lamp is flashing
4. Temperature Display
5. $CO_2$ Display
6. $CO_2$ valve Control Indicator : Flashing, if solenoid valve of $CO_2$ gas control is open
7. Alarm ON/OFF Switch : If turned off, alarm is disarmed and no warning with audible alarm
8. Temperature Setup Button : To enter setup mode of temperature
9. Adjustment Button : Up and Down
10. $CO_2$ Gas Setting Button : To enter $CO_2$ Setup mode
11. Calibration Button : To enter Calibration Mode, press and hold it for 10 seconds

# 6. OPERATION

Before Switch ON, insert water tray filling with distilled water. Make sure connection of gas supply.

And Open $CO_2$ gas cylinder or supply with the pressure of regulator in 14.5Psi or 1 bar.

**1) Turn on the power switch**

The digital readout of current temperature and density of CO2 & O2 in chamber will be displayed.

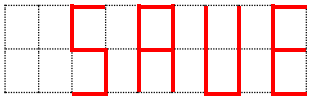
Note: $O_2$ value is displayed in its display even in case that the power of oxygen control is off.

### 6.1 SETTING TEMPERATURE:

a. Press the "TEMP/SET" key, Then, LED screen will flicker continually.

b. Input the desired temperature by pushing UP (▲) and DOWN (▼).

c. Press "TEMP/SET" key again after input. “SAVE” is shown up on LED screen like below.



After set-up, LED screen will stop flickering.

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

* Set-up Temperature range is Ambient +5℃ ~ 60℃ **(Normal)**

* In case of low temperature control option like NB-203C, NB203XLC, turn on Cooling S/W when low temperature setup is required. The maximum controllable low temperature is 18℃ at room temperature 23℃. In low temperature condition, Peltier absorb warm air to cool down temperature and also, Peltier & cooling air absorb the humidity. So, the humidity in low temperature condition should be much lower than the humidity at high temperature like 37℃.

**DO NOT TURN ON cooling switch** when only heating is necessary.

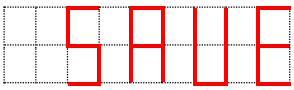
Note: Temperature is programmed at 37℃ before the release from the factory.

### SETTING $CO_2$ DENSITY:

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 like below.



After set-up, LED screen will stop flickering.

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

## 6.2 CALIBRATAION OF TEMPERATURE & $CO_2$ :

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 $CO_2$ 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 ±0.1 ~ 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 |  | $CO_2$ Deviation Calibration |
| 5 |  | Heating On Off Range Control<br>**(Factory Setup Only, DO NOT CHANGE)** |
| 6 |  | $CO_2$ gas supply speed control<br>**(Factory Setup Only, DO NOT CHANGE)** |
| 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℃ and Display shows 37℃, then press up 1℃.

Note

* Calibration range for temperature is ±5℃
* To go to next channel is to press "CAL/SET" button. After 6th 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 $CO_2$ 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 $CO_2$ 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 $CO_2$ supply.

Factory pre-programmed set point is at 2 (2 for NB203XL, 3 for NB203) to optimize set-up at 5% and it means that $CO_2$ control valve is in open position until the $CO_2$ density reaches to 3%. From 3% of $CO_2$ to setting value, solenoid valve takes control of $CO_2$ supply until it gets to setting value.

* When above stages are cleared, please press the CAL/SET button to save the new value.


### 6.3 ALARM

3 minutes after both temperature and CO2 density reach to set point, all alarm systems are activated as programmed. If the temperature or CO2 is not reached to set point, its alarm system is not stated at all. When turning off alarm switch{Location "I"}, all alarm system is not worked

**Alarm Activation**

Temperature: ±2℃ from set point for 8~9 minutes

CO2: ± 1% from set point for 8~9 minutes

Door Open: 1 minute after door opening

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 1 minute of mute button.

* When pressing the alarm mute button on the control panel will stop the alarm from activating.

If the alarm was stopped by mute button, the audible alarm(except alarm for the door) will be re-activated every 10minutes from the initial alarm if either or both CO2 and Temperature is still in alarm range. This is to remind user of the error which continued and not corrected.

## 7. 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.

## 8. SERVICE AND CHECK POINT

WARNING: Technical service should only be performed by qualified service personnel. When replace any electrical or mechanical components, the disconnect units should be far away from its electrical power source.

A. Electrical connection: Try to disconnect main power cable and connect again.
B. Voltage supply: Please check to voltage.
C. Fuse check
D. Verify voltage on unit
E. Defective power switch (check voltage at switch)

**※ Notes on Humidity**

- ✓ For long-term culture with this product, please use a tray with a small surface.
- ✓ It is recommended to use a large surface tray when the door of product is frequently opened/closed, and when a quick restoration of humidity is required.
- ✓ It is recommended to use the appropriate size of tray according to the culture situation and conditions.
  (※ When using a lager surface tray, condensation may form in the chamber.)
- ✓ After using the product (power OFF condition), please be sure to remove the tray out of the chamber.
  (※ It may cause the condensation.)

# 9. TROUBLE SHOOTING

| 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.<br>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.<br>(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. |

## 10. 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** | **NB-203 / NB-203XL** | | |
|---|---|---|---|
| **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 has 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 N-BIOTEK 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 N-BIOTEK, 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.

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