NB203QR Operation Manual

CO2 incubator + Roller

Model : NB-203QR

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.

- 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.

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 burning, 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 could get an electric shock 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 on each corner of bottom with the aid of 2 people.

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.)

Do not install at a 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 indoor temperature is 20℃ ~ 30℃.)

2.3 Location of installation and ambient conditions

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

When you install the product, you are required to keep the distance 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.

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

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

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.)

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

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 N-BIOTEK 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

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

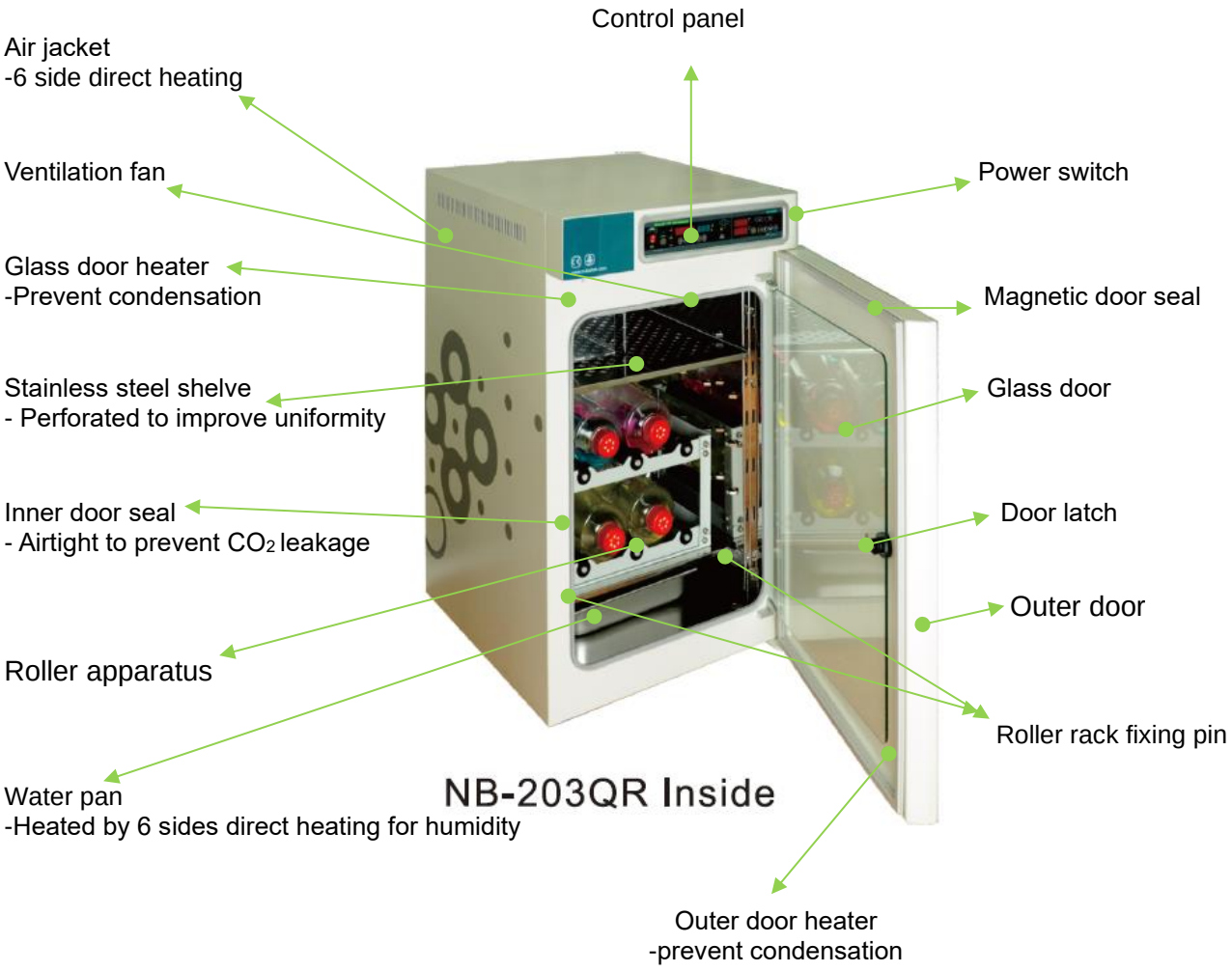
Level the incubator by adjusting feet. Place a small level on the second shelf of the incubator adjust the levelling fee until the incubator is level and stable.

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

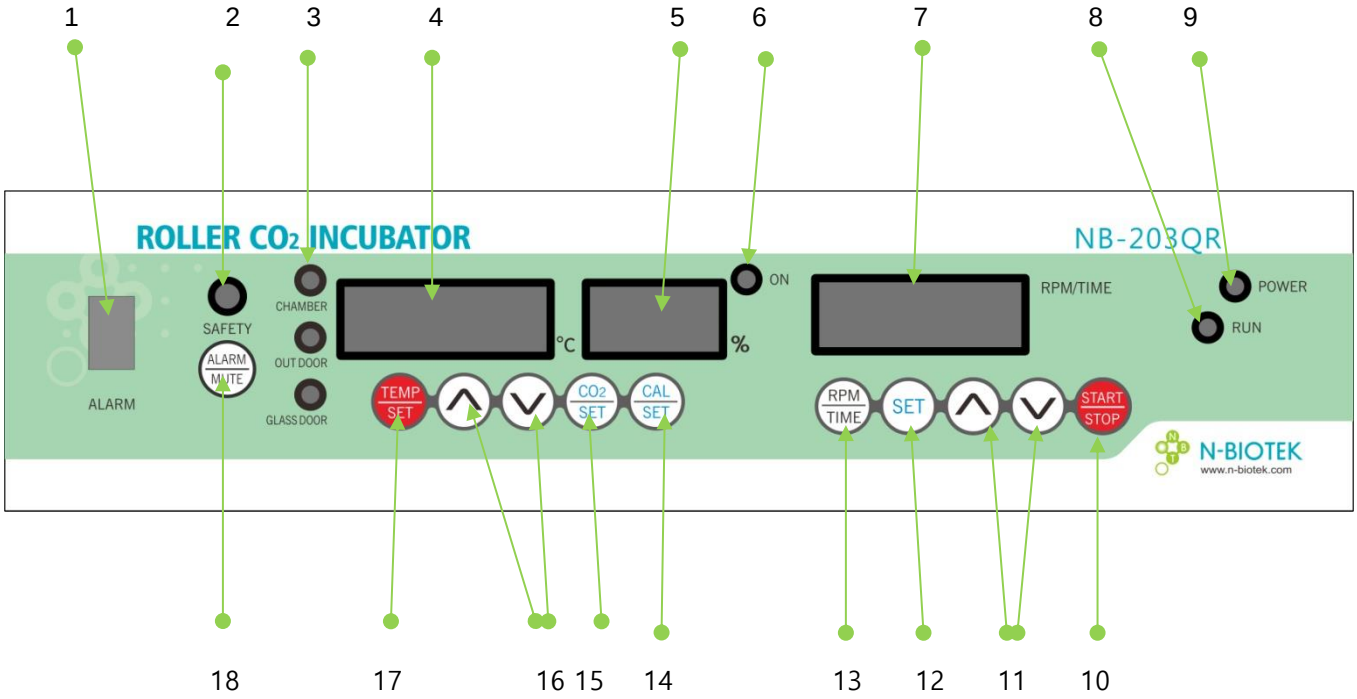
4.1 Features

1. Excellent Uniformity of Temperature, CO_2.
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. Microprocessor PID control for Temperature, CO_2
6. Natural Humidification System by water tray and circulation fan.
7. Simple operation for Roller apparatus.

4.2 Specifications

Items	NB-203QR
Temperature	
Range	Ambient +5℃ to 60℃
Accuracy	±0.25℃ at 37℃
Controller	Microprocessor Digital PID
Humidity	70% ~ 80% at 37℃
CO2	
Range	0% to 20%
Accuracy	±0.1% at 5% at 37℃
CO2 Increment	0.1%
CO2 Sensor	IR CO2 Sensor
Roller	2 stairs Roller apparatus
RPM	2 rpm to 30 rpm
Accuracy	±0.1 rpm
Increment	0.1 rpm
Time	
Range	Continuous or up to 99h 59min
Outer door	Silicon Packing Magnet Door
Inner door	Tempered Safety Glass Door
Control panel display	LED Display
Jacket type	Dry wall type (6 sides direct heating type)
Chamber material	Stainless Steel (304)
Weight	89kg
Capacity / Shelve	179Liter / 1 shelf
Chamber dimension	473x528x710(H)mm
Overall dimension	560x640x940(H)mm
Power	110/220V, 50/60Hz

5. CONTROL PANEL



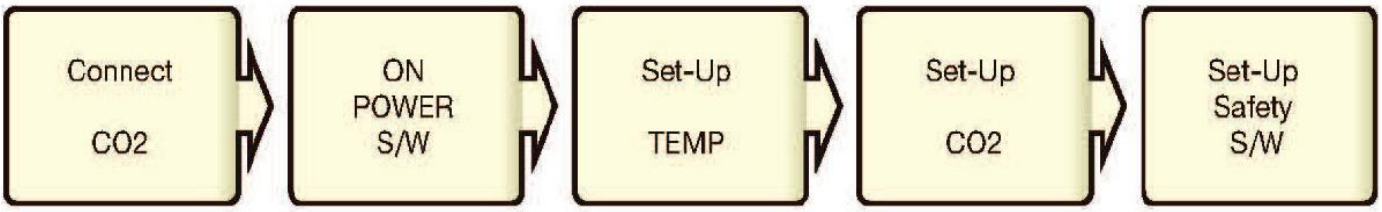
1. Alarm ON/OFF switch
2. Safety Activation Indication Lamp: If Safety is activated, it will be ON.
3. Heating Signal : To show status of heating activation at 3 parts.
   Glass door means the heater around glass door.
4. Temperature display LED window
5. CO_2 Gas % display window
6. Pilot Lamp for CO_2 valve: Pilot lamp ON position means inflow of gas
7. Roller RPM display
8. Roller operating pilot lamp (ON running, OFF not running)
9. Roller power lamp
10. Start/Stop button
11. Adjustment button for roller RPM/TIME
12. SET button for roller RPM/TIME
13. Mode key : RPM/TIME selection button
14. Calibration setting button
15. CO_2 Gas setting button
16. Adjustment button for Temperature and CO_2
17. Temperature setting button
18. Alarm mute button

6. 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



6-1. 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).

6-2. Connect the power

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

6-3. 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 remaining 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, do adjust regulator valve at 0.3bar.

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 3%. This will be covered more at page 16.

6-4. Power switch on

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


Temp. Display


CO2 Display

6-5. Setting temperature

a. Connect the power, then the LED screen will display the temperature in the chamber.
b. Press the "TEMP/SET" 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.

Set-up Temperature range is Ambient -8℃ (lowest 15’C at 24’C RT ~ 45℃)

6-6. Setting Up CO2

a. Press "CO2/SET" 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 "CO2/SET" key again after set-up, the new set-up value will not be saved at all.

6-7 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 ±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		CO2 Calibration
5		Heating control
6		CO2 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℃ 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 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 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 CO2 to setting value, solenoid valve takes control of CO_2 supply until it gets to setting value.

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

6-8 Alarm

In order to activate alarm system, it should maintain ±1℃, ± 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 ±1℃ from set point for 8~9 minutes, it will give you an alarm.

CO2 : (beep -------)

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

Door Open :

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.

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.

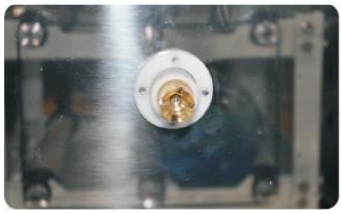
8. ROLLER OPERATION

8.1 Connecting the Roller

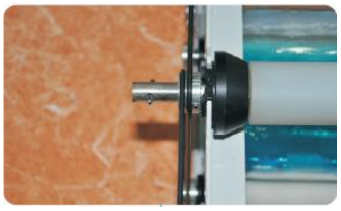
After cleaning the surface of chamber or separating the roller, please connect the roller with the shaft correctly.

Axis of rotation

Connected with Motor



Shaft of roller



Correct connection

8.2 RPM & TIME Set up

RPM setting range is from 2 ~ 30rpm, and time range is from 00.00 ~ 99hours 59minutes.

RPM setting change can be done by UP(∧), DOWN(∨) button and possible to change setting value during running.

When the roller stops by power failure or is turned off and on by user's mistake, then RPM shows by a message of n _ _ _ on display.

(RPM is based on the number of roller rotating.)

<RPM setting>

① Press RPM/TIME button to have RPM mode on display (r _ _ _)

② Press SET button for display of (r _ _ _) flickering.

③ Press UP(∧), DOWN(∨) button to change the RPM value.

④ Press SET button for saving it then rSAVE and RPM value message will appear.

⑤ Then press START/STOP button to run it.

User can change RPM value during its operation by UP(∧), DOWN(∨) button and with no saving a new value.

<TIME setting>

① Please STOP the product first.

② Press RPM/TIME button and get TIME MODE DISPLAY(t 00.00).

③ Press SET button then first 2 digits of DISPLAY TIMER will be flickering.

④ Set the desired time of hour by UP(∧), DOWN(∨) button.

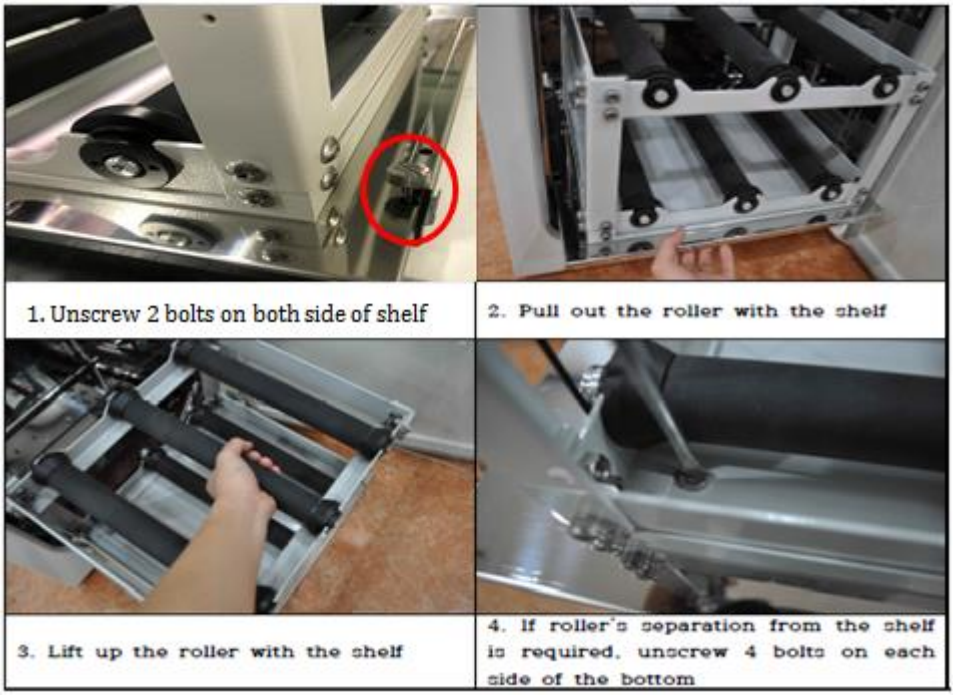
⑤ Press SET button once more, then last 2 digits of DISPLAY TIMER will be flickering.

⑥ Set the desired time of minute by UP(∧), DOWN(∨) button.

⑦ Press SET button to save then t SAVE on display will appear.

⑧ Start operation by START/STOP button and it will stop after set time is over with END message on display.

9. HOW TO DETACH THE ROLLER



Note : Make sure to turn off the product first prior to disconnect the roller from the product.

10.TROUBLESHOOTING

Fault description	Possible cause	Recommended fix
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.
Roller		
Not running roller	Main board defective possibly	Replace main board
	Not proper engaged with axis and shaft	Make sure to fix both axis and shaft in.