NB-203QS
Operation Manual

CO2 Incubator + 1 Shaker

Model: NB-203QS

N-BIOTEK
Leading Life science

Table of Contents

1. Safety and General Precaution

1. 1 General Information on Precaution

This equipment must be operated as described in this manual. if operational guideline is not followed, equipment damage and personal injury can occur.

Please follow this mark to prevent equipment damage of personal injury.

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 code with wet hands. (It can cause an electric shock.)

Do not use the damaged power code 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 code 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, electric leakage and fire can be occurred without 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.

<u>Please check the voltage & Hertz written on serial label</u>.
(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. PREREQUISIT AND CONFIGURATION

3.1 PREREQUISIT

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

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.

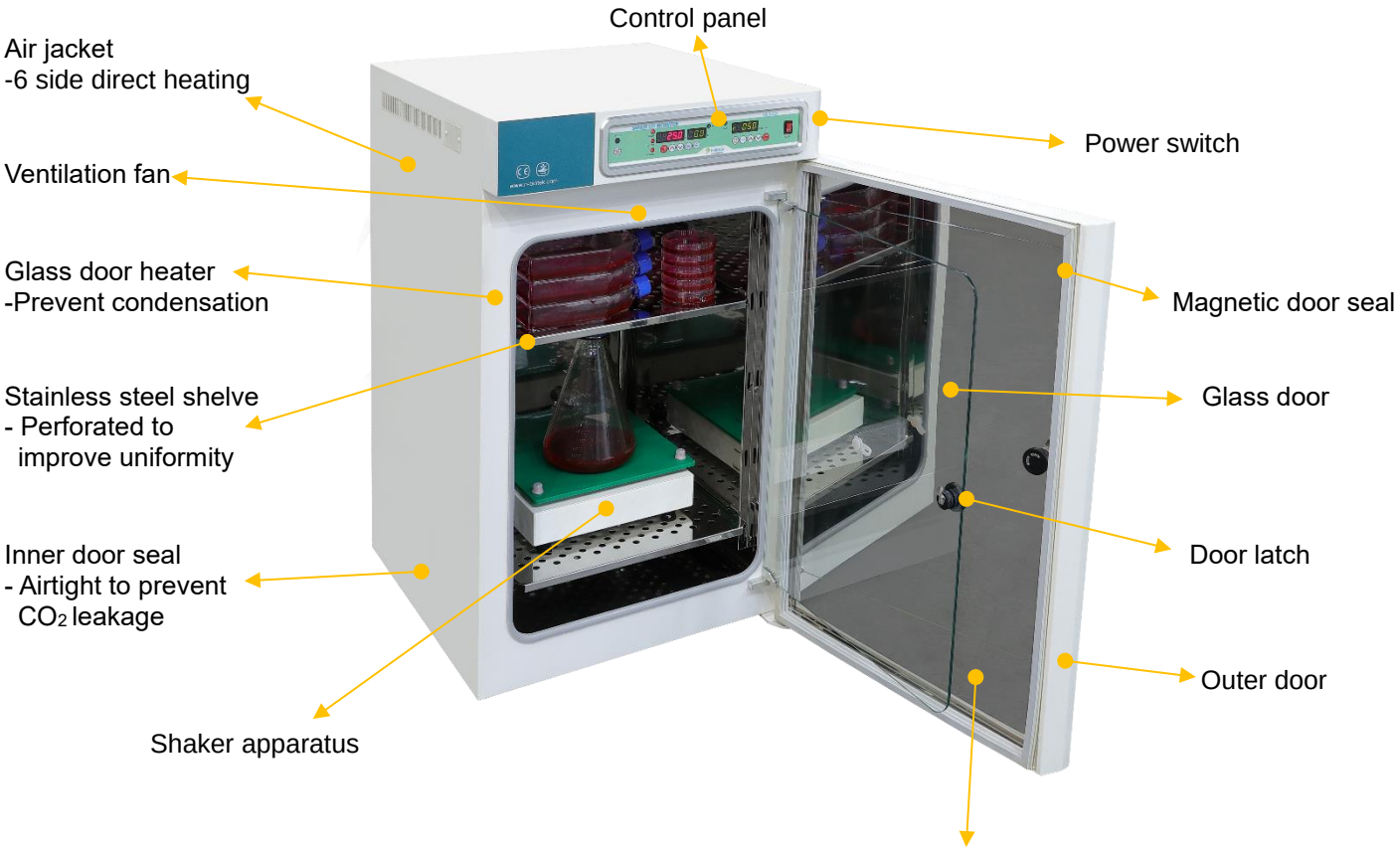
Level the incubator by adjusting feet. Place a small level on the second shelf of the incubator adjust the levelling fee until the incubator is level and stable.

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

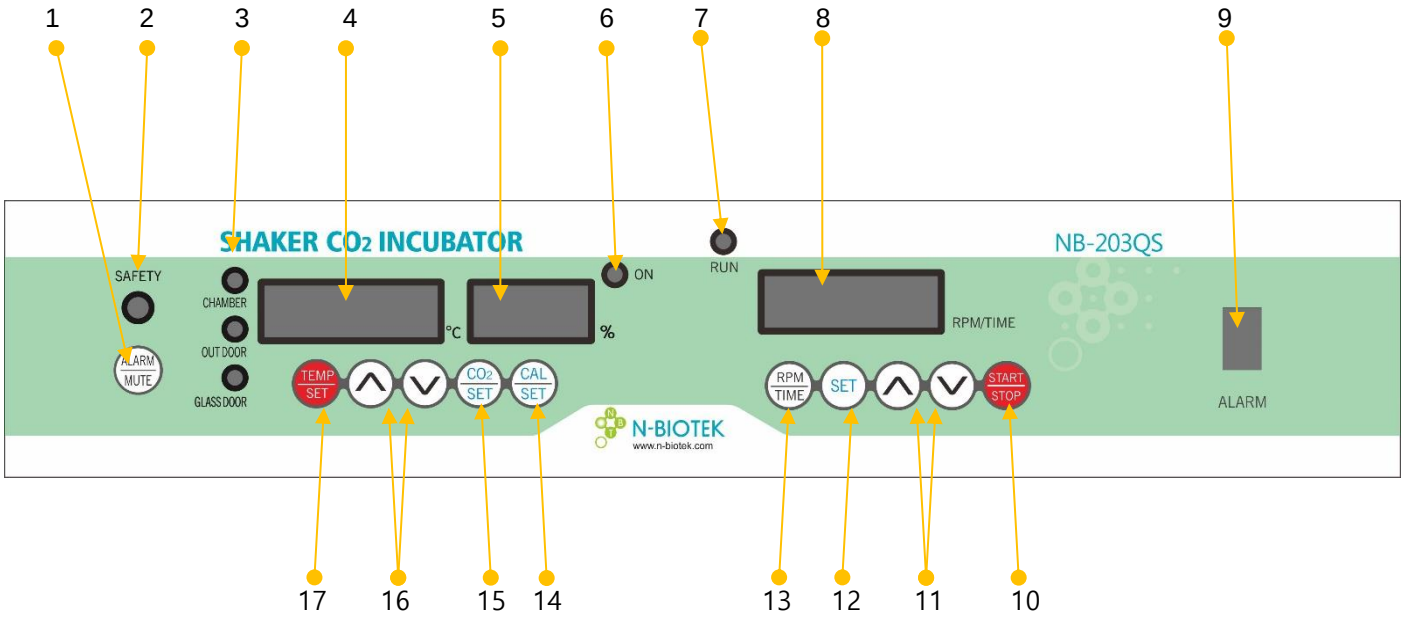
4.1 Features

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 Shaker apparatus.

4.2 Specification

Items	NB-203QS
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% / 37℃
CO2 Increment	0.1%
CO2 Sensor	IR CO2 Sensor
Shaker	
RPM	30 to 300 rpm
RPM Accuracy	±1rpm
Increment	1rpm
Orbital throw	22mm
Motor	BLDC (Plate Type Brushless DC Motor)
TIME Range	Continuous or up to 99hrs 59min
Platform	300 x 330(mm) with Silicon Rubber Pad
Outer door	Silicon Packing Magnet Door
Inner door	Tempered Safety Glass Door
Jacket type	Dry wall type (6 sides heat)
Chamber material	Stainless Steel (304)
Weight	70kg
Capacity / Shelve	179 liter / 1 shelf
Chamber dimension	473 x 528 x 710(H)mm
Overall dimension	560 x 665 x 945(H)mm
Power	110/220V, 50/60Hz, 550W

5. Control Panel



1. Alarm Mute : Alarm mute switch
2. SAFETY ACTIVATION INDICATION LAMP: If Safety is activated, it will be ON
3. Heating Display : 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. CO_2 Gas % display window
6. Pilot Lamp for CO_2 valve: Pilot lamp ON position means inflow of gas
7. Shaker activation lamp : this lamp blinks when shaker runs.
8. RPM display : RPM value display
9. Alarm button : Alarm ON OFF switch
10. Start/Stop button
11. Adjustment button
12. SET button
13. Mode key : RPM/TIME set key
14. Calibration button
15. CO_2 Gas Setting Button
16. Adjustment button
17. Temperature set button

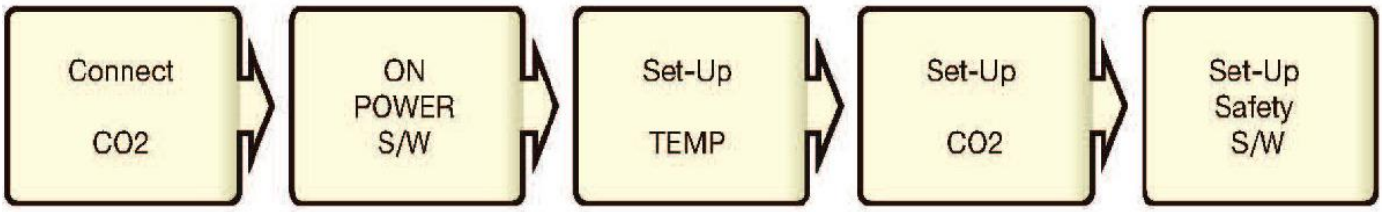
6. OPERATION

6.1 POWER S/W ON

Press the POWER S/W on the right side of the product.

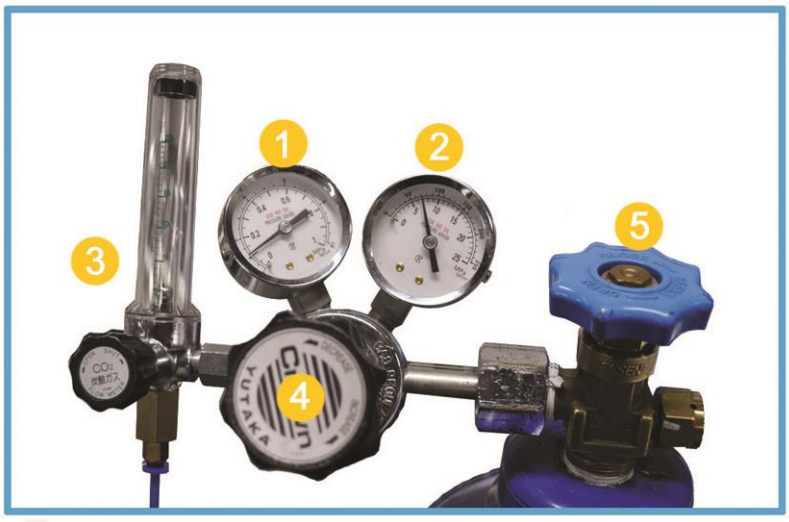
The CO2 Control Panel Display will be shown as follows

6.2 CO2 INCUBATOR



6.3 Connect CO2 Cylinder

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



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

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.

Note : The pressure gage may be difference according to its manufacturing companies respectively.
If Regulator's pressure is too high, it may cause malfunction of the CO2 control.

6.4 Turn on the power switch

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

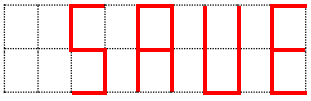
6.5 Temperature & CO_2 setup

6.5.1 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 as 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)**

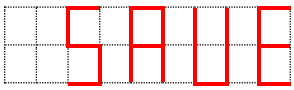
Note: The initial set point for temperature is at 37C from N-BIOTEK facility.

6.5.2 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.

6.6 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 **(Factory Setup Only, DO NOT CHANGE)**
6		CO_2 gas supply speed control **(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 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 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 stage is cleared, please press the button to save the new value.

6.7 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 “l”}, all alarm system is not worked

Alarm Activation

Temperature: ±2℃ from set point

CO2: ± 1% from set point

Door Open: 1 minute after door opening.

*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.

This is the safety device for preventing temperature from rising caused by any circumstances.
So set the temperature at 5℃ higher than operating temperature or desired point.

- ■ You can identify its activation by checking lighting of pilot lamp.
- ■ It is set at 40℃～ 45℃ when released. but it may be changed during transportation. Therefore, please check and set desired point.

8. Shaker Operation

8.1 Connecting the Shaker

After cleaning the surface of chamber or separating the shaker, please connect it as below.

(The shaker is already well fitted when released. it must be followed to turn off power when disconnect or connect the shaker as below)

8.2 RPM, TIME, PARAMETER Set up

8.2.1 TIME set up

a. Power S/W ON : Below is when turning on the main switch.

b. When you press the “RPM/TIME” button, t 00.00 is displayed
and you need to press the “SET” button and check the display flickers at this moment

c. During the display flickers, you can set the hour through pressing “(UP)▲(DOWN)▼” keys
and after setting the hour, you can set the minute through the same way with setting the hour.

d. Press the “SET” key after setting the time (hour and minute),
then the screen displays “t SAVE” as below.

8.2.2 RPM set up

a. After the time setting is completed, press the “RPM/TIME” button again,
b. then the display will show the original RPM value.

c. Press the “SET” button, then RPM display will flicker.

d. You can set the RPM through pressing “▲,▼” keys during the display is flickering.

e. After setting the desired value, press the “SET” key again then,
the screen displays “r SAVE” as below

After Setting the RPM is also completed, press the “START/STOP button”,
then the product will operate as saved time and RPM.

* NOTE

RPM MODE

- To set RPM is possible when not running.
- RPM range is from at from 30 to 300 RPM.
- Setting RPM below 30 can cause error.
- Press set button after changing setting value for saving new value.

TIME MODE

- To set TIME is possible when not running.
- TIME range is from t 00.00 or up to 99hrs 59min.
- In order to save the new value, press set button after changing value.
- Operation will stop when TIME ends. and -END- will be displayed.
- At this stage, to press START/STOP Button is to resume the TIME function same as before. If you need another TIME setup, re-arrange the setting.
- The remaining TIME will be on display when press RPM/TIME Button during RPM mode

9. How to detach the Shaker

When the product is needed for cleaning, it is hard to wipe everywhere in the chamber without detaching shakers and shelves. shaker and shelves in chamber are able to be detached easily.

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.

Manufactured by : **N-BIOTEK, Inc**
Techno park 402-803 Yakdae-Dong, Wonmi-Gu, Bucheon-si Gyeongi province Korea, Republic of
Tel : +82 32 321 2100 E-mail : export@n-biotek.com