

Panasonic®

Operating Instructions

CO₂ Incubator

MCO-5AC

MCO-5AC(UV)

MCO-5AC

MCO-5ACUV Series



Please read these instructions carefully before using this product, and save this manual for future use.
See page 47 for all Model Nos.

CONTENTS

INTRODUCTION	P. 2
PRECAUTIONS FOR SAFE OPERATION	P. 3
LABELS ON INCUBATOR	P. 7
ENVIRONMENTAL CONDITIONS	P. 7
INCUBATOR COMPONENTS	P. 8
Control panel and keypad	P. 10
Remote alarm terminal	P. 12
INSTALLATION SITE	P. 13
INSTALLATION	P. 14
Connecting a CO ₂ gas cylinder	P. 15
PREVENTING CONTAMINATION	P. 16
PRECAUTIONS FOR CULTURES	P. 17
INITIAL CLEANING METHOD	P. 18
REMOVING INNER ATTACHMENTS	P. 19
INSTALLING INNER ATTACHMENTS	P. 21
FILLING HUMIDIFYING PAN	P. 22
WATER LEVEL SENSOR	P. 23
ROUTINE MAINTENANCE	P. 24
CORRECT OPERATION	P. 24
SETTING OF CHAMBER TEMPERATURE AND CO ₂ DENSITY	P. 25
SETTING OF ALARM RESUME TIME	P. 26
Operation after power failure	P. 26
KEY LOCK FUNCTION	P. 27
AUTOMATIC CO ₂ CYLINDER CHANGEOVER	P. 28
UV LAMP	P. 30
Precautions when using the UV lamp	P. 31
Change of setting for UV lamp ON period	P. 32
Lighting the UV lamp for 24 hours	P. 33
ALARMS, SAFETY, AND SELF-DIAGNOSIS	P. 34
CALIBRATION	
Temperature calibration	P. 35
CO ₂ calibration	P. 36
TROUBLESHOOTING	P. 37
DISPOSING OF THE CO ₂ INCUBATOR	P. 39
STACKING INCUBATORS	P. 44
SPECIFICATIONS	P. 46
PERFORMANCE	P. 47
SAFETY CHECK SHEET	P. 48

INTRODUCTION

- Read this operating instruction carefully before using the Product and follow the instructions for safety operation.
- Our company disavows any responsibility for safety if the Product is used for other than the intended use or used with any procedures other than those given in this operating instruction.
- Keep this operating instruction in a suitable place so that it can be referred to as necessary.
- The contents of this operating instruction are subject to change without notice for improvement of performance or functions.
- Contact our sales representative or agent if any page of the operating instruction is lost or the page order is incorrect.
- Contact our sales representative or agent if any point in this operating instruction is unclear or if there are any inaccuracies.
- No part of this operating instruction may be reproduced in any form without the expressed written permission of our company.

CAUTION

Our company guarantees the product under certain warranty conditions. Our company in no way shall be responsible for any loss of content or damage of content.

PRECAUTIONS FOR SAFE OPERATION

It is imperative that the user complies with this operating instruction as it contains important safety advice.

Items and procedures are described so that you can use this unit correctly and safely. If the precautions advised are followed, this will prevent possible injury to the user and any other person.

Precautions are illustrated in the following way:

WARNING

Failure to observe WARNING signs could result in a hazard to personnel possibly resulting in serious injury or death.

CAUTION

Failure to observe CAUTION signs could result in injury to personnel and damage to the unit and associated property.

Symbol shows;

-  this symbol means caution.
-  this symbol means an action is prohibited.
-  this symbol means an instruction must be followed.

Be sure to keep this operating instruction in a place accessible to users of this unit.

< Label on the unit >



This mark is labeled on the cover in which the electrical components of high voltage are enclosed to prevent the electric shock.

The cover should be removed by a qualified engineer or a service personnel only.

WARNING

As with any equipment that uses CO₂ gas, there is a likelihood of oxygen depletion in the vicinity of the equipment. It is important that you assess the work site to ensure there is suitable and sufficient ventilation. If restricted ventilation is suspected, then other methods of ensuring a safe environment must be considered. These may include atmosphere monitoring and warning devices.

PRECAUTIONS FOR SAFE OPERATION

WARNING

-  **Do not use the unit outdoors.** Current leakage or electric shock may result if the unit is exposed to rain water.
-  **Only qualified engineers or service personnel should install the unit.** The installation by unqualified personnel may cause electric shock or fire.
-  **Install the unit on a sturdy floor and take an adequate precaution to prevent the unit from turning over.** If the floor is not strong enough or the installation site is not adequate, this may result in injury from the unit falling or tipping over.
-  **Never install the unit in a humid place or a place where it is likely to be splashed by water.** Deterioration of the insulation may result which could cause current leakage or electric shock.
-  **Never install the unit in a flammable or volatile location.** This may cause explosion or fire.
-  **Never install the unit where acid or corrosive gases are present** as current leakage or electric shock may result due to corrosion.
-  **Always ground (earth) the unit to prevent electric shock.** If the power supply outlet is not grounded, it will be necessary to install a ground by qualified engineers.
-  **Never ground the unit through a gas pipe, water main, telephone line or lightning rod.** Such grounding may cause electric shock in the case of an incomplete circuit.
-  **Connect the unit to a power source as indicated on the rating label attached to the unit.** Use of any other voltage or frequency other than that on the rating label may cause fire or electric shock.
-  **Never store volatile or flammable substances** in this unit if the container cannot be sealed. These may cause explosion or fire.
-  **Do not insert metal objects such as a pin or a wire into any vent, gap or any outlet on the unit.** This may cause electric shock or injury by accidental contact with moving parts.
-  **Use this unit in safe area when treating the poison, harmful or radiate articles.** Improper use may cause bad effect on your health or environment.
-  **Turn off the power switch (if provided) and disconnect the power supply to the unit prior to any repair or maintenance** of the unit in order to prevent electric shock or injury.
-  **Do not touch any electrical parts (such as power supply plug) or operate switches with a wet hand.** This may cause electric shock.

WARNING

-  **Ensure you do not inhale or consume medication or aerosols** from around the unit at the time of maintenance. These may be harmful to your health.
-  **Never splash water directly onto the unit** as this may cause electric shock or short circuit.
-  **Never put containers with liquid on the unit** as this may cause electric shock or short circuit when the liquid is spilled.
-  **Never bind, process, or step on the power supply cord, or never damage or break the power supply plug.** A broken supply cord or plug may cause fire or electric shock.
-  **Do not use the supply cord if its plug is loose.** Such supply cord may cause fire or electric shock.
-  **Never disassemble, repair, or modify the unit yourself.** Any such work carried out by an unauthorized person may result in fire, or electric shock or injury due to a malfunction.
-  **Disconnect the power supply plug if there is something wrong with the unit.** Continued abnormal operation may cause electric shock or fire.
-  **When removing the plug from the power supply outlet, grip the power supply plug,** not the cord. Pulling the cord may result in electric shock or fire by short circuit.
-  **Disconnect the power supply plug** before moving the unit. Take care not to damage the power cord. A damaged cord may cause electric shock or fire.
-  **Disconnect the power plug when the unit is not used for long periods.** Keeping the connection may cause electric shock, current leakage, or fire due to the deterioration of insulation.
-  If the unit is to be stored unused in an unsupervised area for an extended period, **ensure that children do not have access and that doors cannot be closed completely.**
-  **The disposal of the unit should be accomplished by appropriate personnel.** Remove doors to prevent accidents such as suffocation.
-  **Do not put the packing plastic bag within reach of children** as suffocation may result.

PRECAUTIONS FOR SAFE OPERATION

CAUTION

-  This unit must be plugged into a dedicated circuit protected by branch circuit breaker.
-  Use a dedicated power source as indicated on the rating label attached to the unit. A multiple-tap may cause fire resulting from abnormal heating.
-  **Never store corrosive substances such as acid or alkali** in this unit if the container cannot be sealed. These may cause corrosion of inner components or electric parts.
-  **Check the setting when starting up of operation after power failure or turning off of power switch.** The stored items may be damaged due to the change of setting.
-  **Be careful not to tip over the unit** during movement to prevent damage or injury.
-  **Prepare a safety check sheet** (copy the last page) when you request any repair or maintenance for the safety of service personnel.

LABELS ON INCUBATOR

Warning and caution labels are attached to the incubator. The following table describes the labels.

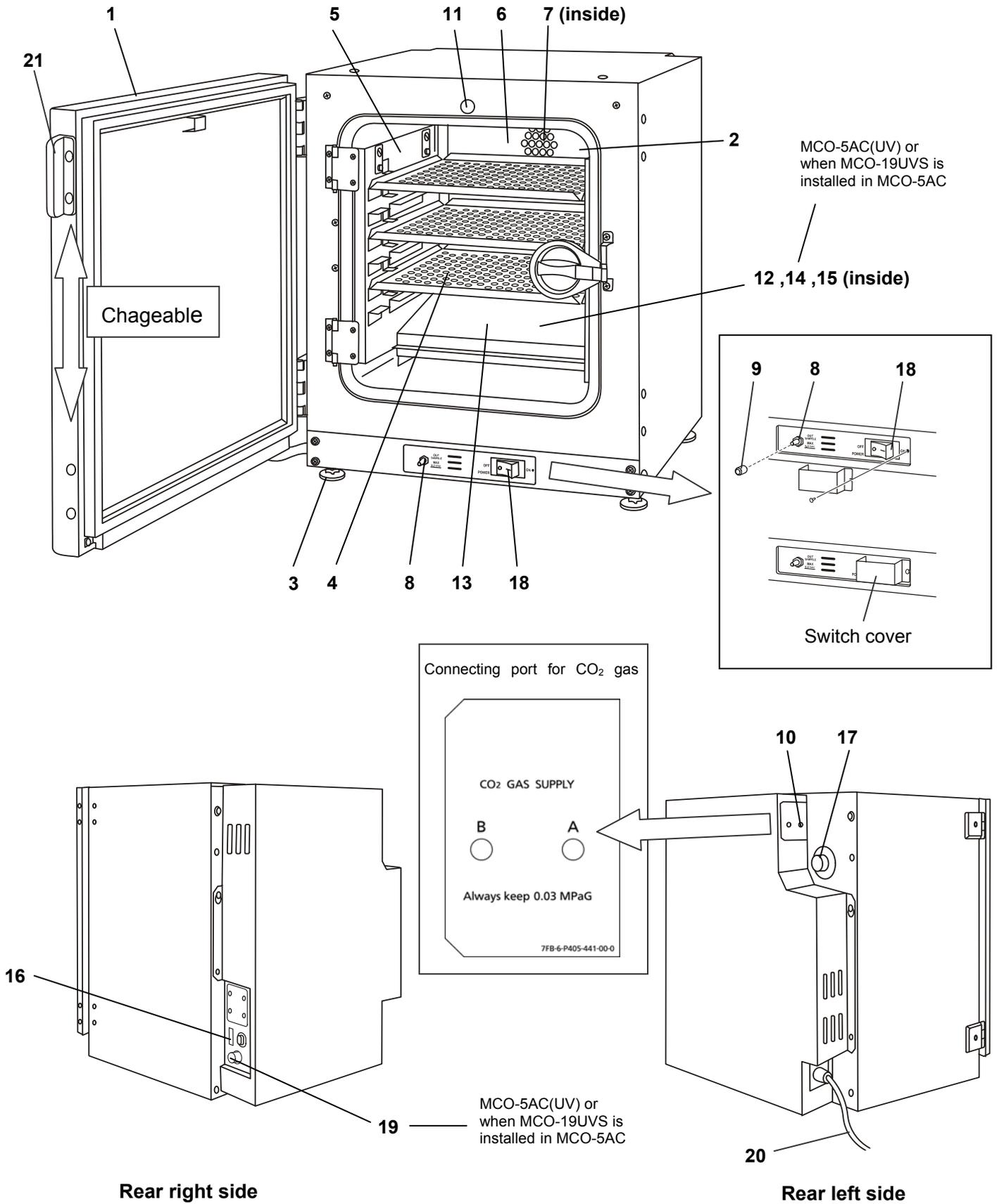
	This label is attached to covers that access high-voltage electrical components to prevent electric shock. Only a qualified engineer or service personnel should be allowed to open these covers.
	This symbol indicates an ultraviolet light (UV) caution.
	This symbol indicates that caution is required. Refer to product documentation for details.
	This symbol indicates a hot surface.
	This symbol indicates an earth.
	This symbol means "ON" for a power switch.
○	This symbol means "OFF" for a power switch.

ENVIRONMENTAL CONDITIONS

This equipment is designed to be safe at least under the following conditions (based on the IEC 61010-1):

- Indoor use;
- Altitude up to 2000 m;
- Ambient temperature 5 °C to 40 °C
- Maximum relative humidity 80 % for temperature up to 31 °C decreasing linearly to 50 % relative humidity at 40 °C;
- Mains supply voltage fluctuations not to exceed ± 10 % of the nominal voltage;
- Other supply voltage fluctuations as stated by the manufacturer;
- Transient overvoltages according to Installation Categories (Overvoltage Categories) II; For mains supply the minimum and normal category is II;
- Pollution degree 2 in accordance with IEC 60664.

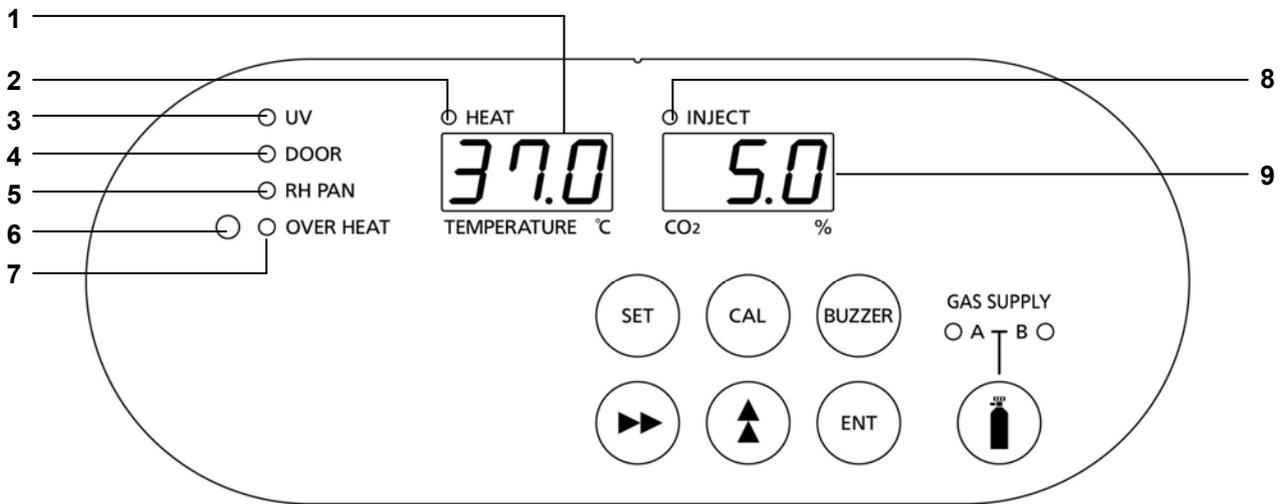
INCUBATOR COMPONENTS



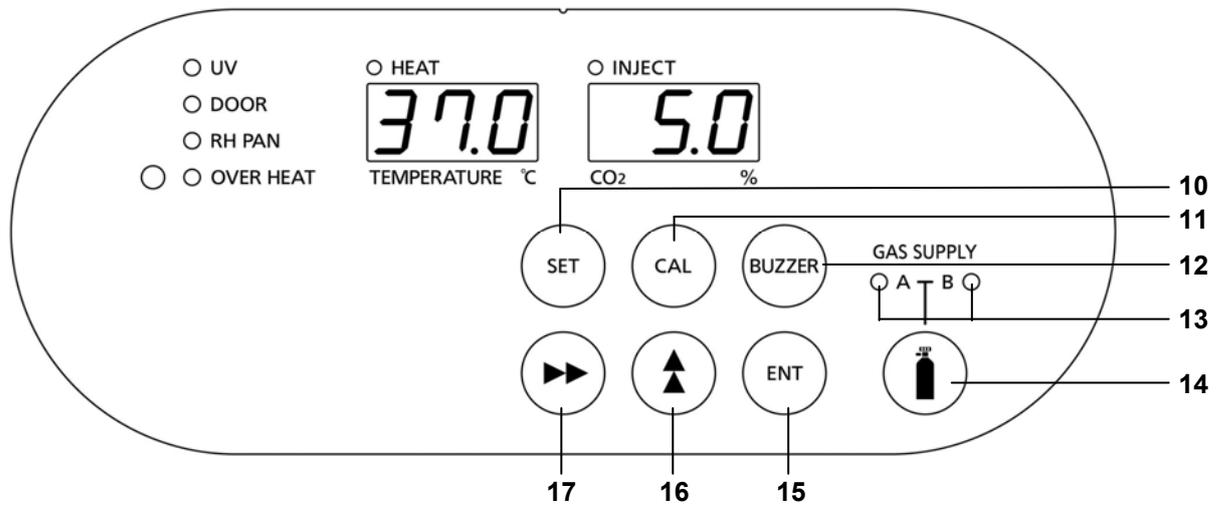
- 1. Outer door:** Sticks to frame with magnetic seal. Door heater is installed in the door panel. The door opening is reversible. Contact our sales representative or agent to change the door hinge from left to right or vice versa.
- 2. Inner door:** Made of tempered glass, however avoid excessive impact on the glass.
- 3. Leveling feet:** Screw type for adjusting the height. Adjust the feet so that the unit can be level.
- 4. Tray:** Can be pulled out.
- 5. Side support:** Right and left side supports can be removed for disinfection. See page 18 and 19.
- 6. Rear duct:** Flow path for circulating air. Removable.
- 7. Fan (inside the rear duct):** Made from polypropylene resin. Can be sterilized by an autoclave.
- 8. Sample air outlet:** This also functions as an internal gas outlet. Use only the supplied cap (9).
- 9. Sample air outlet cap:** Always attach this cap except at the time of using of sample air outlet.
- 10. Connecting port A/B for CO₂ gas pipe (rear side):** When an optional component MCO-5GC (gas auto changer) is installed, both A and B are available. If MCO-5GC is not installed, only A is available. Refer to page 15 for gas cylinder connection. Ensure that the gas pressure is set at 0.03 MPa(G) (0.3 kgf/cm²(G), 4.3 psi(G)). Refer to page 28 for automatic CO₂ cylinder changeover.
- 11. Door switch:** Detects the door opening/closing and stops the circulating fan and electromagnetic valve for CO₂ when the door is open. The UV lamp is also deactivated by the door opening (MCO-5AC(UV) or when an optional UV system set MCO-19UVS is installed in MCO-5AC).
- 12. Humidifying pan:** Use sterile distilled water to fill the humidifying pan.
- 13. Humidifying pan cover:** Prevents the UV light being exposed to the chamber. When filling the humidifying pan, lift the front side and take out the humidifying pan. See page 22 for details.
- 14. UV lamp (MCO-5AC(UV) or when an optional UV system set MCO-19UVS is installed in MCO-5AC):** This UV lamp does not generate ozone. Never look at the UV light directly. For replacement, contact our sales representative or agent.
- 15. Water level sensor:** Detects the water level in the humidifying pan. See page 23 for details.
- 16. Remote alarm terminal:** Refer to page 12.
- 17. Access port:** When not in use, cap with the silicon caps on both outside and inside.
- 18. Power switch:** Main switch of the unit. Also functions as an over-current breaker. The power switch is covered by the switch cover to prevent the accidental push. To turn on or off the power switch, remove the switch cover by loosening the screw. See figure on the page 8.
- 19. Glow starter (MCO-5AC(UV) or when an optional UV system set MCO-19UVS is installed in MCO-5AC):** For the UV lamp
- 20. Removal power supply cord**
- 21. Handle:** The outer door handle. When moving the handle from upper to a lower position remove it from original position first, then remove two cups and screws at the lower position and attach the handle there.

INCUBATOR COMPONENTS

Control panel and keypad



- 1. Digital temperature indicator (TEMPERATURE °C):** Normally, this indicator shows the chamber temperature. In the setting mode, it shows the set value of the chamber temperature. If the self diagnostic function detects any abnormality, an error code will be displayed.
- 2. Heater lamp (HEAT):** This lamp lights when the heater is energized.
- 3. UV indicator (UV):** This lamp lights when the UV lamp is ON. The blink of this indicator recommends the replacement of UV lamp. See page 30 for the details.
- 4. Door lamp (DOOR):** This lamp lights when the outer door is open.
- 5. Water level alarm lamp (RH PAN):** This lamp blinks when the water in the humidifying pan is less than approximately 0.8 L.
- 6. High limit regulator:** This regulator is used to set the high limit temperature.
- 7. Over heat lamp (OVER HEAT):** This lamp lights when the chamber temperature reaches the high limit set value.
- 8. CO₂ inject lamp (INJECT):** This lamp lights when CO₂ gas is being injected.
- 9. Digital CO₂ density indicator (CO₂ %):** Normally, this indicator shows the CO₂ density in the chamber. In the setting mode, it indicates the set value of the CO₂ density.



10. Set key (SET): Pressing this key to enter the setting mode, and the digits to be set will blink.

11. Calibration key (CAL): By pressing this key for approximately 5 seconds, the unit enters the function mode to calibrate. See page 35 for the details. Also, used to change the UV lamp ON period. See page 32 for the details.

12. Alarm buzzer stop key (BUZZER): Press this key to silence the buzzer when the alarm operates and the buzzer sounds. (The remote alarm is not canceled.)

13. CO₂ gas supply line indicator (A/B): The lamp for the CO₂ gas supply line currently in use lights up provided that a gas auto changer MCO-5GC is installed.

14. CO₂ gas supply line switching key: This key to select the CO₂ gas supply line is available only when a gas auto changer MCO-5GC (option) is installed. When one of the CO₂ cylinder is empty, the other CO₂ cylinder is supplied by the other cylinder automatically.

15. Enter key (ENT): Pressing this key memorizes the set value in the controller.

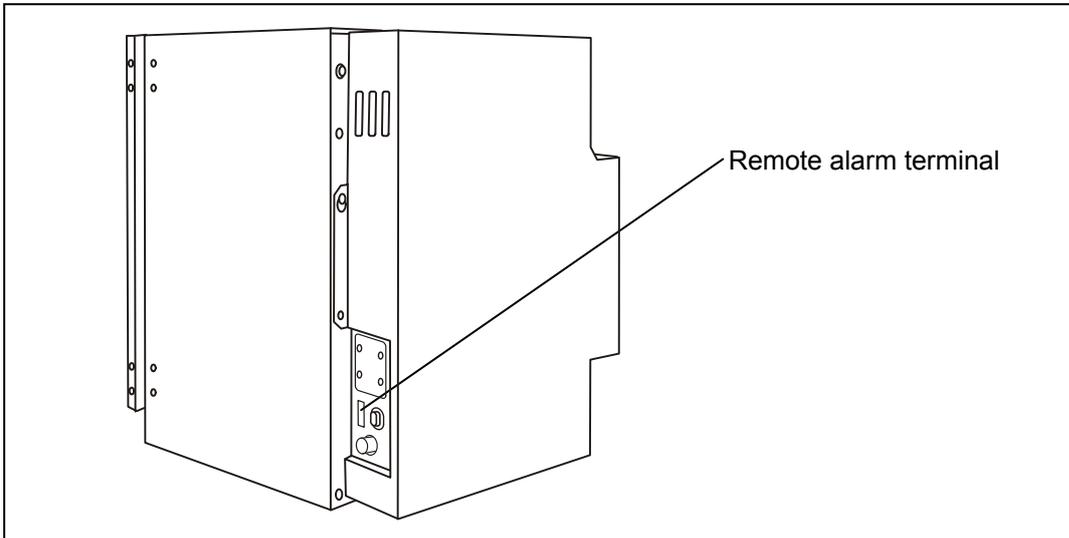
16. Numerical value shift key (▲): Pressing this key in the setting mode causes the numerical value to shift. In the key lock mode, pressing this key makes key lock ON or OFF.

17. Digit shift key (▶▶): Pressing this key in the setting mode causes the changeable digit to shift. Pressing this key more than 5 seconds enters the key lock mode. See page 27 for the key lock function.

INCUBATOR COMPONENTS

Remote alarm terminal

The remote alarm terminal is located at the rear right side of the incubator.



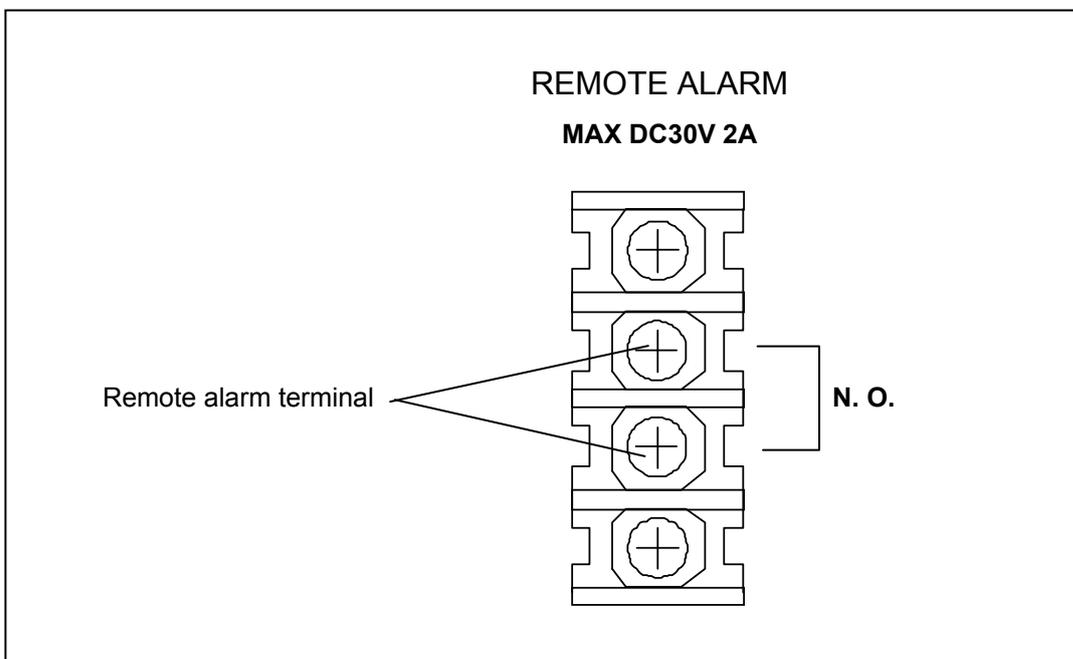
The alarm is outputted from this terminal. Contact capacity is DC 30 V, 2 A.

Normal : OPEN

Abnormal , blackout : CLOSE

Note:

- When the power switch is OFF or the power failure condition, the contact output is CLOSE.
- The remote alarm cannot be silenced by pressing the alarm buzzer stop key (BUZZER) since the remote alarm is not conjunct with the alarm buzzer stop key (BUZZER).



INSTALLATION SITE

For correct operation of the incubator, install it in a location with the following conditions.

WARNING

When using CO₂ gas for control, **make sure that there is adequate ventilation**. Using CO₂ gas in a small room without adequate ventilation may cause gas poisoning or oxygen deprivation. In addition, when opening the incubator doors, do not directly inhale the air in the chamber.

Si l'appareil est utilisé dans un endroit restreint, le niveau de la densité CO₂ de l'air peut s'élever et peut être nocif aux humains. Evitez d'aspirer l'air provenant de l'intérieur de l'appareil quand vous ouvrez la porte.

● Normal air environment

Install the incubator in an environment with normal air.

● Do not expose to direct sunlight

Do not install the incubator in a location where it will be exposed to direct sunlight. If the incubator is operated in direct sunlight, performance will be adversely affected.

● Separate from heat sources

Do not install the incubator near significant heat sources, such as heaters, boilers, ovens, or autoclaves. Heat will adversely affect the performance of the incubator.

● Ambient temperature at least 5 °C lower than set temperature

The control temperature of the incubator is at least 5 °C higher than the ambient temperature. For example, if the chamber is controlled at 37 °C, the ambient temperature must normally be no more than 32 °C. Do not allow the ambient temperature to become too high.

● Strong and level floor

Select a site with a strong and level floor. If the floor is uneven or the installation is not level, the incubator will be unstable and this may cause accident or injury. To avoid vibration and noise, always make sure that the installation is stable. An unstable surface may result in vibration or noise.

WARNING

Install the incubator at a location that can support the weight. If the floor is not strong enough or if the installation is insufficient, the incubator may fall over and cause injury.

Always make sure that the floor is strong, even, and level, and that the incubator will not tip over. An insufficient installation may result in injury due to water leakage or the incubator falling over.

● Low humidity

Select a site with a relative humidity of 80 %R.H. or lower. Using the incubator in high humidity may result in current leakage or electric shock.

WARNING

Do not use the incubator outdoors. If the incubator is exposed to rain water, it may result in current leakage or electric shock.

Never install the incubator in a moist location, such as near a sink or water line, or where it is likely to be exposed to water. In addition, **do not install it near water or steam pipes.** Moisture can cause the insulation to deteriorate, which may result in current leakage or electric shock.

● No inflammable or corrosive gas

Never install the incubator in a location where it will be exposed to inflammable or corrosive gas. Doing so may result in explosion or fire. In addition, insulation may deteriorate due to corrosion of protective casing, resulting in current leakage or electric shock.

● No falling objects

Do not install the incubator in a location where there is the possibility of objects falling from above. Doing so may result in damage or accident.

INSTALLATION

1. Remove the packing tape and clean up.

Remove all the tape that is securing the doors and the inner attachments. Open the doors for ventilation. If the outer panels are dirty, dampen a cloth with a diluted neutral detergent and wipe them. (Using an undiluted solution may damage the plastic. Follow the diluting instructions for the detergent that is used.) Wipe off the residual detergent with a wet cloth and then wipe off any moisture.

Note:

Remove the cable tie banding the power supply cord. Prolonged banding may cause the corrosion of the cord coating.

WARNING

Do not leave the plastic wrapping bags within reach of children. If the bag is placed over a child's head, it can block the mouth and nose and cause suffocation.

2. Adjust the leveling feet.

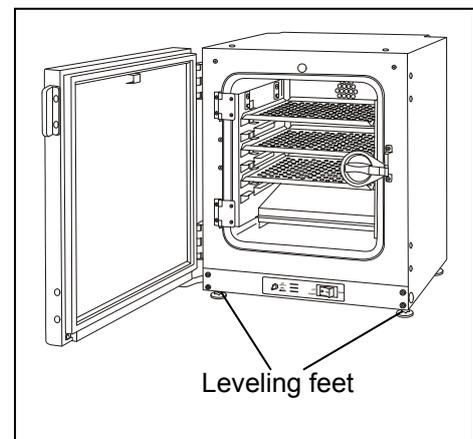
Adjust the leveling feet by turning them counterclockwise to level the incubator. (See the illustration on the right.)

3. Ground the incubator.

Ground the incubator during installation to prevent electric shock in case the insulation is not sufficient. If there is no ground wire at the location, consult with qualified service personnel.

● When a ground must be installed

If a grounded 3-pole outlet is not available, then a ground must be installed. Consult with qualified service personnel.



WARNING

To prevent electric shock, **always ground the incubator.** If grounding is not possible, then have a ground installed by qualified personnel. If the incubator is not grounded, it may result in electric shock.

Never connect the ground wire to a gas pipe, water pipe, lightning rod, or telephone ground wire. Doing so may cause electric shock.

● Installing a ground fault circuit breaker

If using the incubator in the location with moisture or humidity cannot be avoided, then it is recommended that a ground fault circuit breaker be installed in the power supply circuit (i.e., the power supply at the incubator). Have the circuit breaker installed by qualified service personnel.

CAUTION

Do not climb on the incubator or place objects on top of it. Doing so may damage it or cause it to fall over, resulting in injury. If it is to be stacked, refer to page 44 and stack it securely.

● When the incubator is not in use

Empty the water from the humidifying pan and remove moisture from the chamber. Make sure that the chamber is completely dry before closing the doors. Failure to do so may result in damage.

● Before moving the incubator

Before moving the incubator, empty the water from the humidifying pan, disconnect the power supply plug from the outlet, and make sure that the cord will not be damaged. Failure to do so may result in electric shock or fire.

Connecting a CO₂ gas cylinder

WARNING

When connecting a gas cylinder to the incubator, **confirm the gas type. Confirm that the connections are secure and that no gas will escape. Be sure to use the specified pressure.** Using an incorrect gas or pressure may result in explosion or fire, or in gas poisoning or oxygen deprivation due to escaping gas.

Install the incubator in a location with adequate ventilation. If adequate ventilation cannot be provided, then install an alarm system using CO₂ and O₂ densitometers.

1. Use a liquefied CO₂ gas cylinder (at least 99.5 % pure). The siphon (dip tube) type cannot be used.
2. Install a gas regulator rated at 25 MPa(G) (250 kgf/cm²(G), 3600 psi(G)) for the primary side, and 0.2 MPa(G) (2 kgf/cm²(G), 30 psi(G)) for the secondary side.
3. Using the gas tube that is provided, connect the gas regulator to the connecting port A/B for CO₂ gas pipe at the rear left side of the incubator.

Note:

If the CO₂ gas is supplied to multiple the CO₂ incubators from a single gas cylinder, a CO₂ solid will be formed in the gas regulator. The gas regulator safety valve will operate, and an explosive may sound.

When the MCO-5GC is not mounted

Using the gas tube that is provided, connect the gas regulator to connecting port A for CO₂ gas pipe located at the rear side of the incubator. After connecting the gas tube, check to make sure that no gas is leaking.

When the MCO-5GC is mounted

Connect a pair of CO₂ gas cylinders with the gas regulators independently. The gas supply line will be switched automatically. Connect the main cylinder to the connecting port A for CO₂ gas pipe and the reserve cylinder to connecting port B for CO₂ gas pipe. After connecting the cylinders, make sure that no gas is leaking.

- For details on installing the optional gas auto changer (MCO-5GC), refer to the MCO-5GC installation guide. For details on using the MCO-5GC, refer to page 28.

4. Set the CO₂ gas on the secondary side to 0.03 MPa(G) (0.3 kgf/cm²(G), 4.3 psi(G)) for gas injection. As the pressure increases, the CO₂ gas density control range will increase. Excessive pressure may cause gas supply lines inside the incubator to come loose, which may result in gas poisoning or oxygen deprivation due to the escaping of gas. If gas lines come loose, the incubator must be repaired.

- The gas lines connected to the incubator will degrade over time. If any deterioration or abnormalities are found during inspection, replace the lines immediately.

PREVENTING CONTAMINATION

To prevent contamination of the chamber, select a suitable installation site.

- **Avoid locations with high temperatures or humidity.**

Avoid locations with high temperatures or humidity, because of a greater presence of microorganisms in the air.

- **Avoid locations with passers-by or drafts.**

Avoid locations near doors, air conditioners, fans, etc., where passers-by or drafts can facilitate the entry of microorganisms into the chamber.

- **If possible, use a cleanroom.**

To achieve a better culture, it is recommended that a cleanroom be used if one is available.

- **Use clean containers.**

The greatest cause of contamination is dirty containers for cultures. Be careful not to get containers or trays dirty when taking them in and out.

- **Keep the chamber clean.**

Wipe off any fingerprints. If water spills from the humidifying pan, or if the doors are left open for a long time, condensation may form on the inside of the doors. If that occurs, wipe off the condensation with a dry sterile gauze. In particular, clean and disinfect the chamber if the culture medium is spilled. For details, refer to "ROUTINE MAINTENANCE" on page 24.

- **Use sterile distilled water in the humidifying pan.**

Always use sterile distilled water in the humidifying pan. Do not use ultrapure water, because it may contain red rust-like suspended particles.

The water level alarm lamp (RH PAN) on the control panel blinks when the water level is low. Quickly refill the sterile distilled water in the humidifying pan when the water level alarm lamp (RH PAN) blinks. Adding low-temperature water will significantly lower the temperature in the chamber. Clean the humidifying pan once a month.

- **Keep the incubator out of direct airflows from air conditioners or fans.**

Cool airflow from an air conditioner may cause condensation and lead to possible contamination.

PRECAUTIONS FOR CULTURES

- **Leave space between culture containers.**

Always leave space for ventilation between culture containers (Petri dishes, flasks, etc.). Inadequate spacing may result in uneven temperature distribution and CO₂ gas density.

- **Do not place harmful materials in the chamber.**

Never place samples that release acidic, alkali, or corrosive gas in the chamber. Doing so may cause damage resulting from discoloration or corrosion.

- **Close the inner door.**

Always close the inner door before closing the outer door. Failure to close the inner door will adversely affect performance even if the outer door is closed.

- **Open and close the doors gently.**

Always open and close the doors gently. Closing the doors forcefully may cause spillage of the culture medium, incomplete closing, or damage to the gasket. Before opening the inner door, check through the glass to confirm that the UV lamp is OFF (if the MCO-5AC(UV) or the optional UV system set MCO-19UVS is installed in MCO-5AC).

- **Be careful when closing the outer door.**

Use the handle when closing the outer door. Holding the door in other places may cause injury by getting fingers caught in the door. Do not lean on the outer door. Doing so may result in injury from the outer door coming loose or the incubator falling over, or it may cause current leakage or electric shock.

- **Be careful of the inside of the outer door.**

The inside of the outer door may become hot.

- **Avoid using excessive force on the inner door.**

Do not put your hand on the glass, poke it with sharp objects, or apply strong force. Doing so may result in injury from breaking the glass.

- **Check the cause of any alarm buzzer.**

If an alarm buzzer sounds while the incubator is in use, immediately check the cause of the alarm. For details on what may cause an alarm buzzer to sound, refer to page 34.

- **Thermal conductivity CO₂ sensor**

It is not abnormal that the thermal conductivity CO₂ sensor displays CO₂ density higher than the actual density when the chamber humidity temporarily goes down. And take care of the level of humidifying water because the lack of water affects the CO₂ density.

INITIAL CLEANING METHOD

Before using the incubator for the first time, clean dirt (tape residue, smear, etc.) from the chamber and the inner attachments thoroughly. To keep the chamber clean is essential to get the proper performance out of the incubator. Use the following steps to clean the incubator properly.

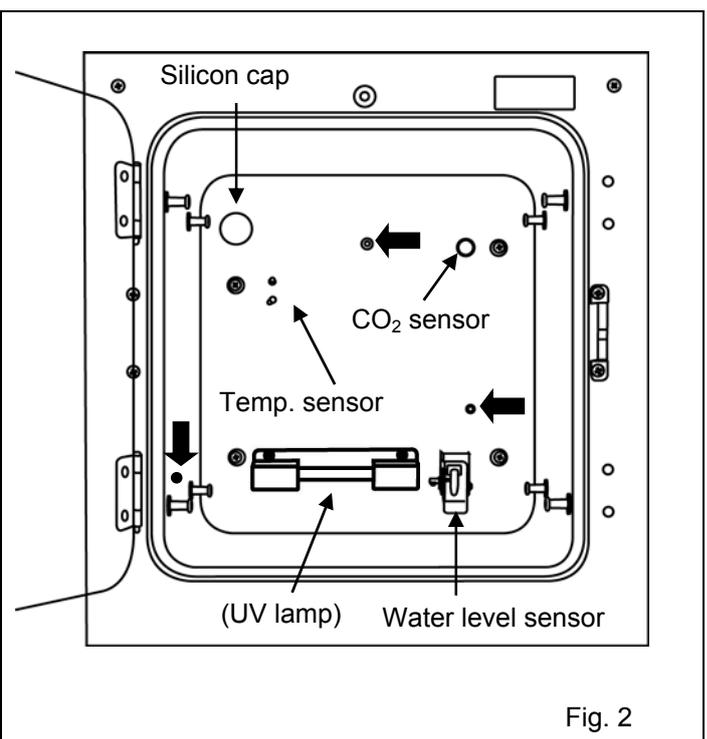
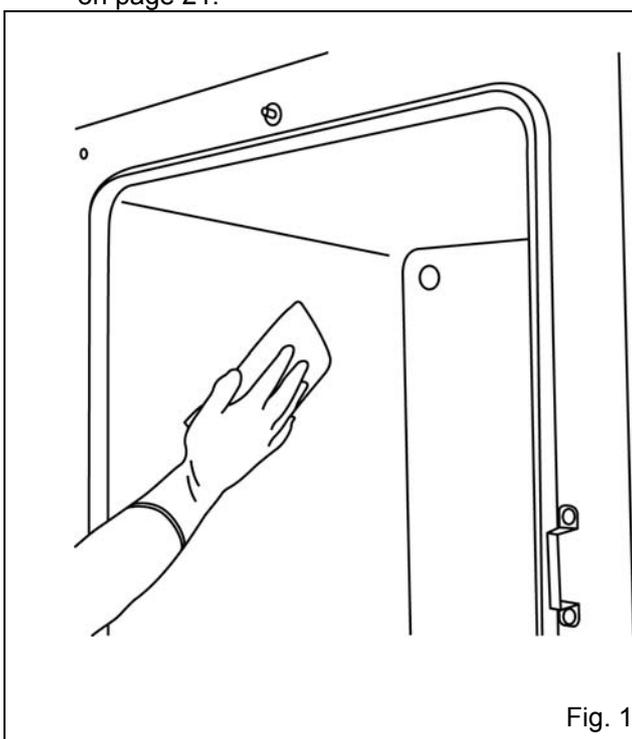
1. Remove the inner attachments, referring to “REMOVING INNER ATTACHMENTS” on page 19.
2. Clean the removed inner attachments, the chamber inside walls and the inner door gaskets with a cloth or sponge soaked in neutral detergent, diluted by 5 % or less. (Undiluted detergent can damage the plastic components. For the dilution, refer to the instruction of the detergent.) (Fig. 1)

⚠ CAUTION

Do not use detergents or antiseptic solutions with acid, alkali, or chlorine. Doing so may cause discoloration, corrosion, or rusting.

Be careful to keep the diluted detergent or water out of the temperature sensor, the CO₂ gas injection hole, the inner sample air access port, the fan motor shaft bearing, and the inner sample air outlet (Fig.2 ←). Also, do not wash the temperature sensor, the CO₂ sensor, the water level sensor and the UV lamp using detergent. Doing so may cause failure. (Fig.2)

3. Soak a gauze or unwoven cloth in distilled water and wring it tightly, and then wipe off the residual detergent thoroughly.
4. Wash the silicon caps (2 pcs) for the access port and the fan using the above mentioned detergent and rinse them with distilled water, and then autoclave them for sterilization (121 °C, 20 minutes).
5. Wipe up the inside walls, and the inner attachments like trays thoroughly with a cloth or unwoven cloth soaked in alcohol for disinfection. Be careful not to leave any residue alcohol.
6. Reinstall the inner attachments correctly and securely, referring to “INSTALLING INNER ATTACHMENTS” on page 21.



REMOVING INNER ATTACHMENTS

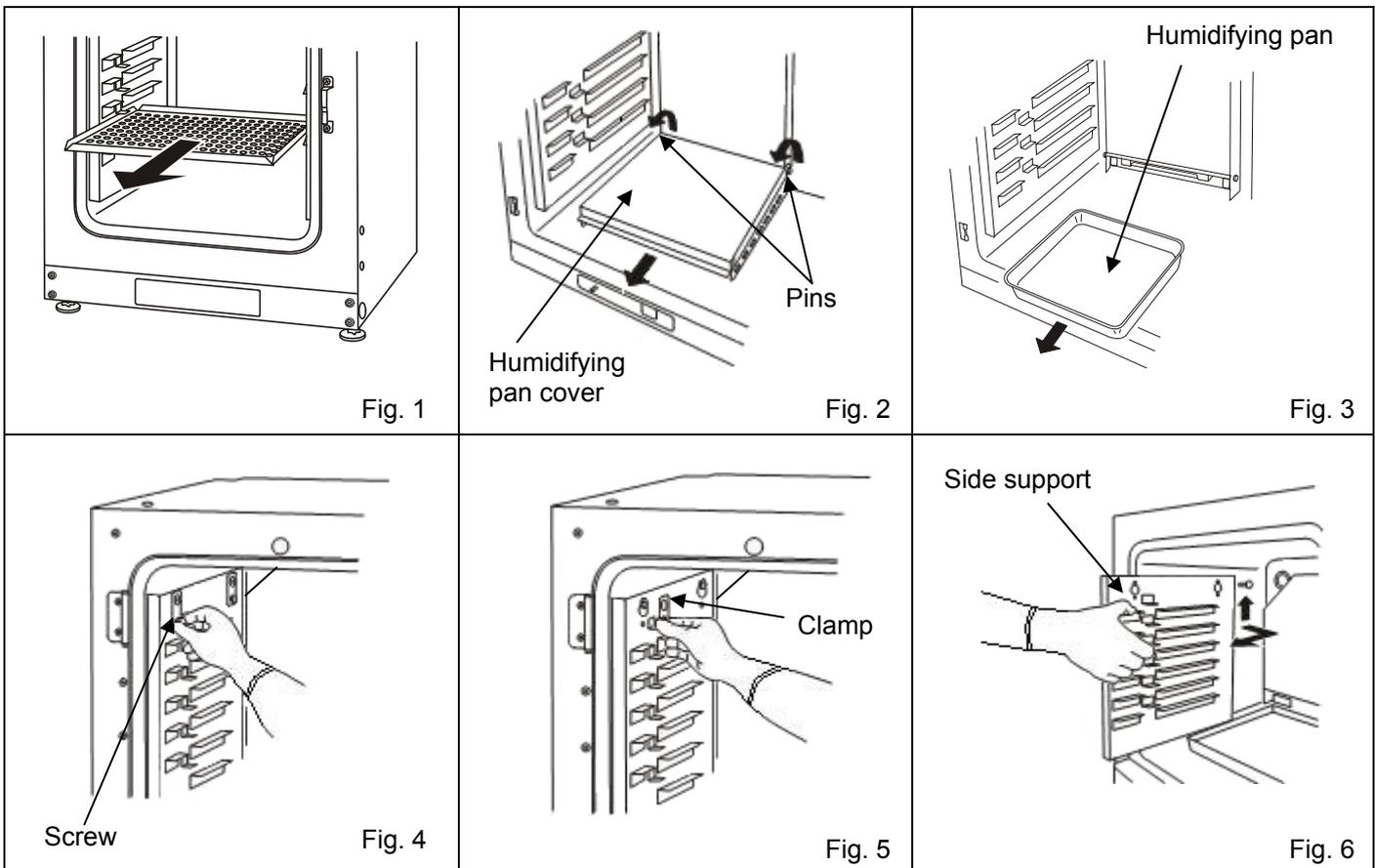
⚠ CAUTION

Wear rubber gloves when performing maintenance on the chamber. Failure to wear gloves may result in cuts or abrasions from sharp edges or corners.

Be careful not to damage the water level sensor or the UV lamp in the rear duct. (When the model is MCO-5AC(UV) or an optional UV system set MCO-19UVS is installed in MCO-5AC.)

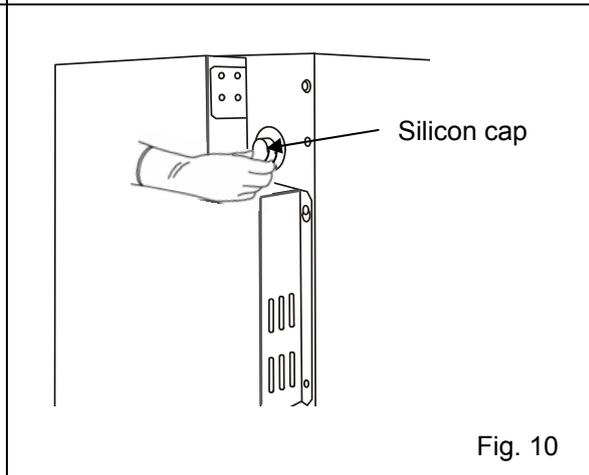
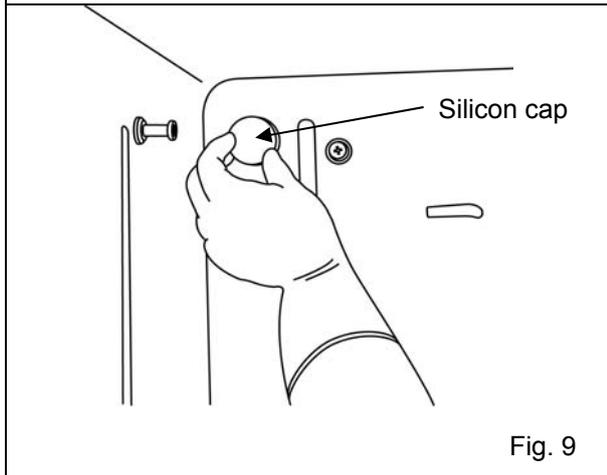
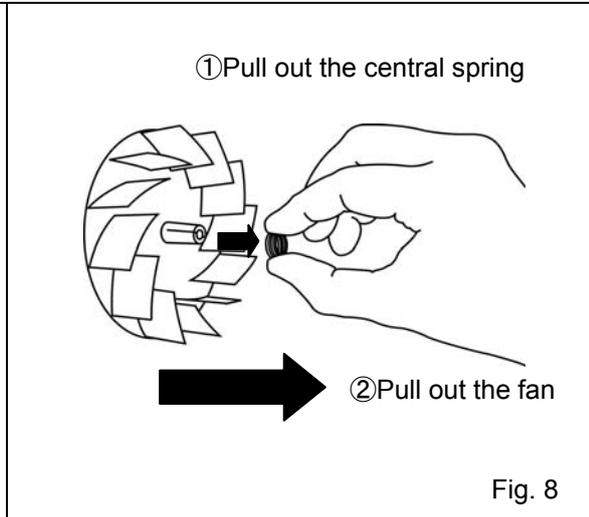
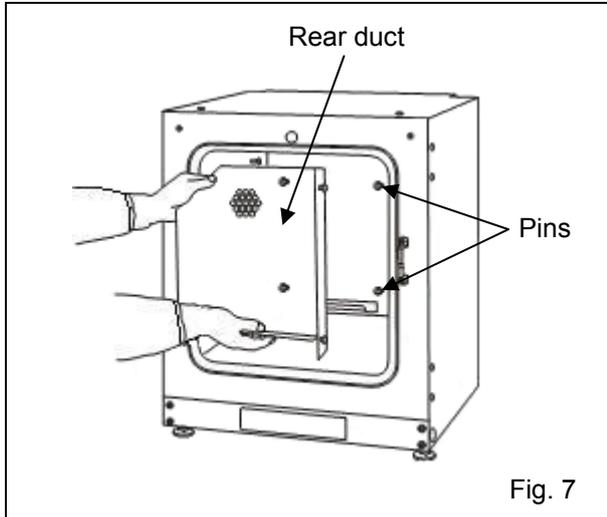
Do not use detergents or antiseptic solutions with acid, alkali, or chlorine. Doing so may cause discoloration, corrosion, or rusting.

1. Turn OFF the power switch of the incubator.
2. Open the outer and inner doors and pull out all the trays. (Fig. 1)
3. Lift the humidifying pan cover off from the pins at the rear side. (Fig. 2)
4. Pull out the humidifying pan. (Fig. 3)
5. Remove the screw securing the clamp for the side support. (Fig. 4)
6. Remove the clamp. (Fig. 5)
7. Lift the side supports off of the pins. (Fig. 6)



REMOVING INNER ATTACHMENTS

8. Lift the rear duct and remove it from the pins at the rear side. (Fig. 7)
9. Remove the fan by pulling out the central spring and then by pulling out the fan. (Fig. 8)
10. Remove the silicon caps of the access port, one each from interior (Fig. 9) and exterior (Fig. 10).



INSTALLING INNER ATTACHMENTS

Use the following steps to install the inner attachments properly.

1. To reinstall all the attachments, perform the procedure in reverse order from step 10 on page 20.

2. When installing the fan, insert it to the motor shaft securely. Lightly turn the fan manually to make sure that it does not touch the rear panel. Then install the central spring. (Fig. 1)

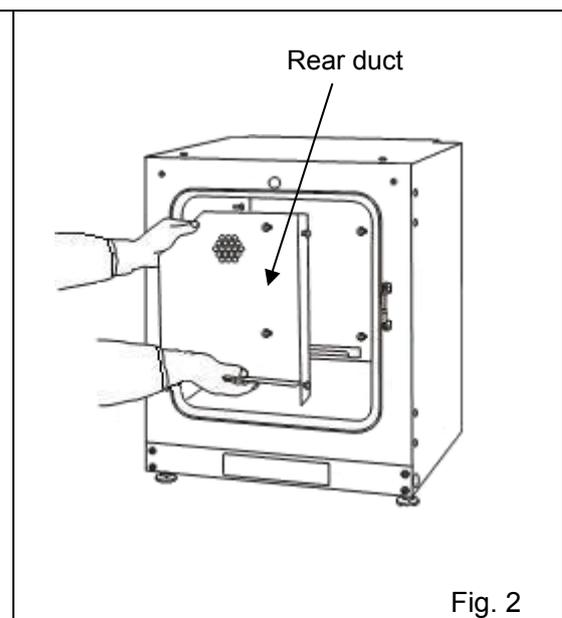
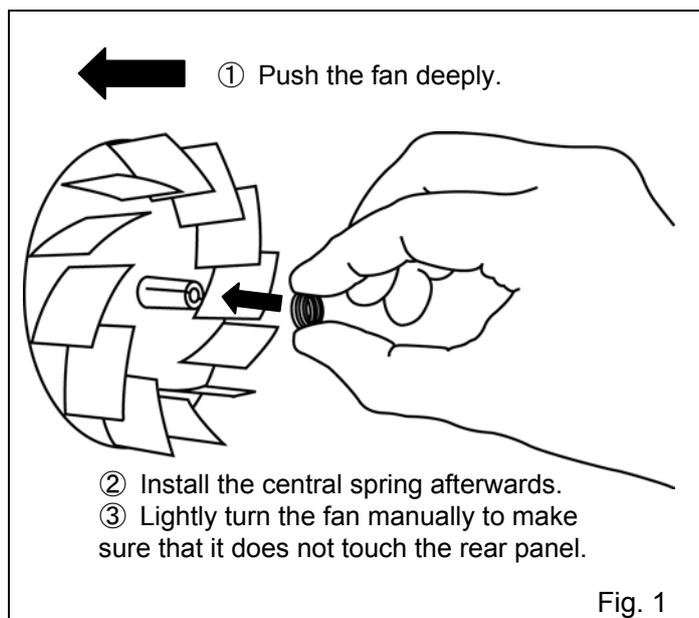
⚠ CAUTION

If the fan is not inserted deep enough, the intended velocity performance cannot be achieved, which may cause culture failure or insufficient decontamination.

3. To install the rear duct, confirm 4 pins are securely installed in the 4 holes of rear duct. (Fig. 2)

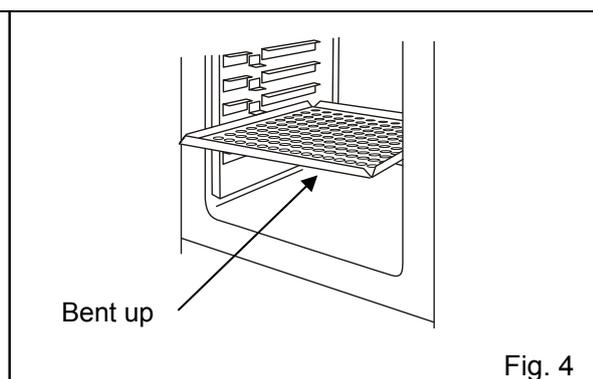
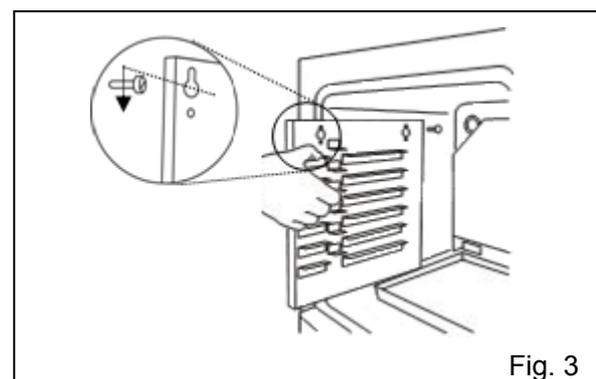
⚠ CAUTION

If the rear duct is fixed insecurely, the intended velocity performance cannot be achieved, which may cause culture failure or insufficient decontamination.



4. To install the side support, confirm the direction of fixing holes as shown in Fig. 3.

5. As shown in Fig. 4, set the tray with the edge bent up. If the tray is set in the wrong direction, it may not be level and may become unstable.



FILLING HUMIDIFYING PAN

Use the following procedure to fill the humidifying pan or to replace the water.

1. Lift the front side of the humidifying pan cover.
(Fig. 1)

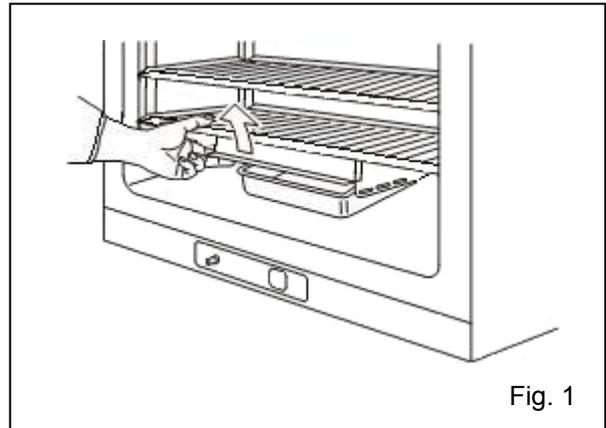


Fig. 1

2. Pull out the humidifying pan toward you. (Fig. 2)

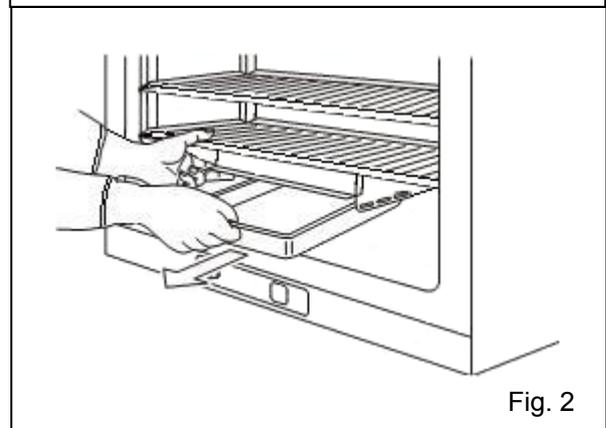


Fig. 2

3. Dispose of the remaining water in the humidifying pan and clean the humidifying pan with a diluted detergent. Then rinse it thoroughly with distilled water and wipe it with alcohol for disinfection.

4. Wipe all moisture from the bottom of the chamber.

5. Return the humidifying pan to the chamber and pour sterile distilled water (approx. 1.5 L, preheated to 37 °C). (Fig. 3)

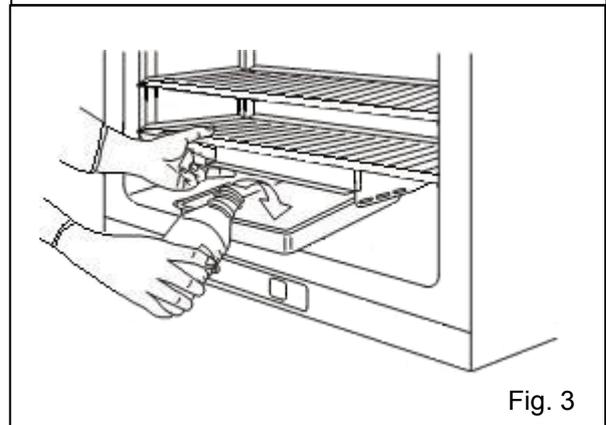


Fig. 3

6. Set the humidifying pan with the inner side flush against the back, and replace the humidifying pan cover. Close the inner door and the outer door, and confirm that the water level alarm lamp (RH PAN) on the control panel is OFF.

Note:

- Preheat to 37 °C the water to be poured into the humidifying pan. Adding low-temperature water will lower the temperature and humidity in the chamber.
- Replace the water in the humidifying pan by the above procedure when the water level alarm lamp blinks.

⚠ CAUTION

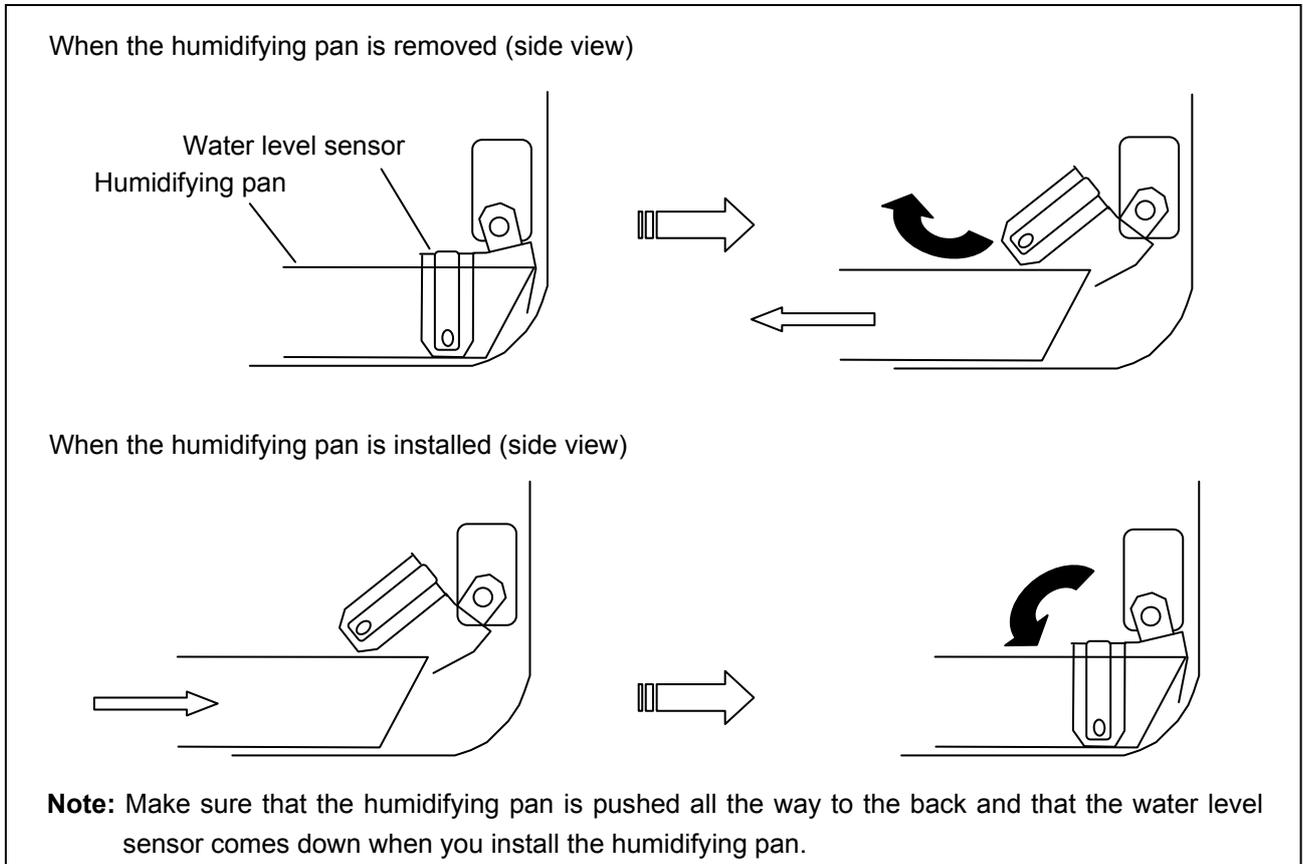
When refilling the water in the humidifying pan, **always wipe off any dirt from the water level sensor with alcohol for disinfection**. While doing that, be careful not to apply excessive force to the sensor lead wire.

Caution:

In order to adjust the humidity inside the incubator chamber optimally and prevent condensation on the chamber surface and the inner door, it is designed to create the lower temperature area underneath the humidifying pan to recondense the evaporated moisture in the humidifying pan. Although the condensation may be seen round the humidifying pan on the bottom of chamber (inside the humidifying pan cover), it is not a malfunction.

WATER LEVEL SENSOR

This incubator is equipped with a water level sensor. The water level sensor is set automatically when the humidifying pan is installed. Take care not to damage the water level sensor when removing or installing the humidifying pan.



Note:

- Lift the water level sensor before installing the humidifying pan if the water level sensor is in the lower position after maintenance.
- When installing the humidifying pan, make sure that the humidifying pan is set properly and that water level sensor comes down into the humidifying pan. The water level alarm lamp (RH PAN) blinks if the water level sensor does not come down completely. If necessary, set the humidifying pan again in the proper location.
- The water level sensor detects the water level every 30 minutes and just after the outer door is closed. It takes several seconds to detect the water level. Therefore, the water level alarm lamp may flash a few times after the outer door is closed even when the humidifying pan is full.

⚠ CAUTION

Foreign particles on the water surface can adhere to the water level sensor and fittings by capillary action because the water level sensor is always in the water. The adhered foreign particles degrade water level sensor performance and the water level alarm lamp may blink even though there is sufficient water in the humidifying pan. Be sure to wipe OFF any dirt on the water level sensor with alcohol for disinfection whenever you change the humidifying water. When cleaning the water level sensor, take care not to apply excessive force to the lead wires.

ROUTINE MAINTENANCE

To use this unit in a clean condition, clean the chamber and all the inner attachments at least once a month.

1. Remove all the inner attachments by the procedures shown on page 19.
 2. Clean the chamber and all the inner attachments by the procedures shown on page 18.
 3. Install all the inner attachments by the procedures shown on page 21.
- When there is excessive dirt, contact our sales representative or agent.

CORRECT OPERATION

Use the following procedure to start trial operation or actual operation of the incubator.

1. Install the incubator correctly, referring to “INSTALLATION” on page 14.
2. Remove the packing materials from the chamber and inner attachments. Clean and disinfect the chamber and all the inner attachments, referring to above “ROUTINE MAINTENANCE”.
3. Add approximately 1.5 L of sterile distilled water to the humidifying pan. (Refer to page 22.)
4. Connect the power supply cord to the outlet. Turn ON the power switch at the lower part of the incubator.

Note:

The humidity in the incubator chamber is adjusted to the optimum setting. To prevent condensation on the surface inside chamber and the inner door, there is a low-temperature area under the humidifying pan in the bottom of chamber to recondense evaporated moisture. Condensation may occur around the humidifying pan at the bottom of the chamber (on the inside of the humidifying pan cover), but this does not indicate a problem.

SETTING OF CHAMBER TEMPERATURE AND CO₂ DENSITY

Table below shows the basic procedure for setting the chamber temperature and CO₂ density. The high limit alarm temperature setting is also shown in the table. Perform key operations in the sequence indicated in the table. The example in the table is based on the assumption that the desired temperature is 36.5 °C and CO₂ density is 5 %. Adjustment of the high limit regulator should be executed after the chamber temperature reaches the stable condition.

Note: The unit is set at the factory so that the chamber temperature is 37 °C, CO₂ control is 0 %.

Allow at least 8 hours until the next setting after setting of desired chamber temperature and setting CO₂ density to 0 %, at the time of first start-up or start-up after no use for long period.

Basic operation (Example: Chamber temperature; 36.5 °C, CO₂ density; 5 %)

	Description of operation	Key operated	Indication after operation
1	Turn the power switch ON.	----	The current chamber temperature is displayed in digital temperature indicator.
2	Press set key.	SET	The left digit blinks. 
3	By pressing digit shift key and numerical value shift key, set the figure to 36.5.	▶▶	When pressed, the changeable digit is shifted.
		▲	When pressed, the figure of settable digit changes. 
4	Press enter key.	ENT	Set temperature is memorized. Left digit in digital CO ₂ density indicator blinks. 
5	By pressing digit shift key and numerical value shift key, set the figure to 05.0.	▶▶	When pressed, the changeable digit is shifted.
		▲	When pressed, the figure of settable digit changes. 
6	Press enter key.	ENT	Set CO ₂ density is memorized.
7	(Executed after the chamber temperature reaches the stable condition) Adjust high limit regulator so that the alarm temp. is 1 °C or more higher than chamber temperature.		In digital CO ₂ density indicator, HI is displayed. In digital temperature indicator, high limit temp. is displayed. The high limit temp. can be changed by turning high limit regulator.
8	Press enter key.	ENT	This is the end of setting mode and the indicators display current temperature and CO ₂ density.

Note:

- In each setting mode, if the change of the setting is not necessary, pressing set key (SET) skips to next setting mode.
- When the CO₂ density is set to 00.0 %, the control is OFF regardless of the chamber density.
- The high limit temperature set value will change when the high limit regulator is turned even if the unit is not in setting mode, because the alarm circuit is an independent circuit.
- In each setting mode, the indicators return to the current temperature and the CO₂ density display mode automatically when 90 seconds has passed without any key operation.

SETTING OF ALARM RESUME TIME

The alarm buzzer is silenced by pressing the alarm buzzer stop key (BUZZER) on the control panel during alarm condition. (The remote alarm is not canceled.)

The buzzer will be activated again after certain suspension if the alarm condition is continued. The suspension time can be set by following the procedure shown in the table below.

The example in the table is based on the assumption that the desired duration is 20 minutes.

Note: The duration is set in 30 minutes at the factory.

Table Changing procedure for alarm resume time (Ex: change from 30 minutes to 20 minutes)

	Description of operation	Key operated	Indication after operation
1		----	The current chamber temperature is displayed.
2	Press calibration key for 5 seconds.	CAL	The left digit blinks.
3	Set the figure to F25 with the numerical value shift key and digit shift key.	▲	When pressed, the figure of settable digit changes.
		▶▶	The settable digit is shifted.
4	Press enter key.	ENT	The current setting is displayed. The middle digit blinks.
5	Set the figure to 020 with the numerical value shift key.	▲	When pressed, the figure of settable digit changes.
6	Press enter key.	ENT	The setting is memorized and the current chamber temperature is displayed.

- The settable alarm resume time are 0, 10, 20, 30, 40, 50, or 60 minutes (The setting is 000, 010, 020, 030, 040, 050 or 060 respectively). The buzzer would not reset if the reset time is set in 000.
- The setting mode returns to the temperature display mode automatically when 90 seconds has passed without any key operation. In this case, any setting before pressing the enter key (ENT) is not memorized.

WARNING

Do not use calibration key (CAL) on the control panel in normal use. Pressing this key leads the calibration mode. Wrong key operation affects the basic performance. Never touch any other keys on the control panel in the event of pressing calibration key (CAL) accidentally. After about 90 seconds, the unit returns to the chamber temperature display mode automatically.

Operation after power failure

The set value is memorized by nonvolatile memory. Accordingly, the incubator resumes the operation with the setting before power failure.

KEY LOCK FUNCTION

This unit is provided with the key lock function. When the key lock is ON, change of temperature, CO₂ density setting through the key pad is not available.

Note: The key lock is set in OFF mode at the factory.

Display	Mode	Function
	Key lock is OFF	Enable to change of temperature and CO ₂ density setting
	Key lock is ON	Disable to change of temperature and CO ₂ density setting

Procedure for key lock setting (change from key lock OFF to key lock ON)

	Description of operation	Key operated	Indication after operation
1		----	The current chamber temperature is displayed.
2	Press digit shift key for 5 seconds.		L0 is displayed in the digital temperature indicator. 
3	Press numerical value shift key and scroll the figure to 1.		When pressed, the figure of settable digit changes. 
4	Press enter key.	ENT	The key lock is set to ON. The current chamber temperature is displayed.

Note:

- The key lock function is available for temperature and CO₂ density setting.
- To cancel the key lock, set to L0 in the above procedure.

AUTOMATIC CO₂ CYLINDER CHANGEOVER

A gas auto changer MCO-5GC is available as an optional accessory. This system switches the CO₂ gas supply line when one CO₂ gas cylinder becomes empty.

Note: The installation of MCO-5GC should be implemented by a qualified service personnel.

Install the MCO-5GC and then perform the following procedure

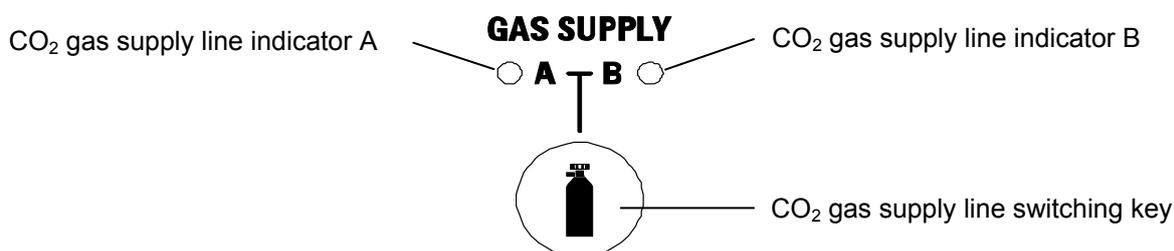
1. Connect 2 gas tubes to the connecting ports A and B for CO₂ gas pipe. The connecting ports A and B for CO₂ gas pipes are located on the left back of the incubator. (Refer to page 8).

Note: Only the port A can be used when the MCO-5GC is not installed. There will be 2 ports, the ports A and B, after the MCO-5GC is installed.

2. Connect a CO₂ gas cylinder equipped with a gas regulator to each gas tube. Refer to page 15 for information on connecting the gas cylinders. ("Gas cylinder A" is the CO₂ gas cylinder connected to the connecting port A for CO₂ gas pipe, and "gas cylinder B" is the CO₂ gas cylinder connected to the connecting port B for CO₂ gas pipe.)

3. Open the valve of both gas cylinders.

4. The CO₂ gas supply line indicator of CO₂ gas supply line currently used is ON. (Only when MCO-5GC is installed.)



	CO ₂ gas supply line indicator A	CO ₂ gas supply line indicator B
Current CO ₂ gas supply line is A.	ON	OFF
Current CO ₂ gas supply line is B.	OFF	ON

5. CO₂ gas supply line switches when one gas cylinder is empty.

The notice of change of gas supply line is as follows:

	Digital temperature indicator	CO ₂ gas supply line indicator
When CO ₂ gas supply line A is switched to B automatically.	Current chamber temperature and E01 is displayed alternately.	CO ₂ gas supply line indicator A blinks. CO ₂ gas supply line indicator B is ON.

• By pressing the alarm buzzer stop key (BUZZER), the alarm is canceled and the incubator returns to the normal operation.

6. When the gas cylinder A is switched to the gas cylinder B, remove the CO₂ gas cylinder A and replace it with new one.

Note: Be careful when handling the empty CO₂ gas cylinder. Some gas may still be left in the cylinder.

• When the gas cylinder B becomes empty, the line is switched to the gas cylinder A again.

The MCO-5GC detects that there is no more CO₂ gas in a CO₂ gas cylinder when the CO₂ density in the chamber does not increase for a while even after opening the CO₂ gas valve in the incubator. The CO₂ supply line may also be switched for other reasons even though there is CO₂ gas left in the CO₂ gas cylinder: blocking or restricting of gas tube, reduction of CO₂ gas pressure, or improper opening of CO₂ gas cylinder. Always check the gas quantity in the cylinder before disconnecting it.

Following shows the procedure to change the CO₂ gas supply line manually. (Only when MCO-5GC is installed.)

(Example: Change of CO₂ gas cylinder from B to A)

	Operation	Key operated	Indication after operation	CO ₂ gas supply line indicator	
				A	B
1	(Gas cylinder B is currently used.)		CO ₂ gas supply line indicator A is ON.	○	☀
2	Press CO ₂ gas supply line switching key once. (Pressing the key again selects gas cylinder B)		The CO ₂ gas supply line indicator A changes OFF, The CO ₂ gas supply line indicator B changes ON.	☀	○
3	(Gas cylinder A is currently used.)		CO ₂ gas supply line indicator B is ON.	☀	○

☀ : indicator ON ○ : indicator OFF

UV LAMP

The clauses below are applicable when the model is MCO-5AC(UV) or an optional UV system set MCO-19UVS is installed in MCO-5AC.

A UV lamp is located inside the rear duct to sterilize the water in the humidifying pan and air circulating in the chamber.

- The UV light is exposed only to the inside of the rear duct and the humidifying pan cover when all chamber components are installed properly.
- During cultivation, ensure all components are located adequately and never turn on the UV light without the humidifying pan cover.
- Even if the unit is operating without turning on the UV lamp, the humidifying pan cover should be installed properly. An operation without humidifying pan cover will affect the temperature distribution and humidify recovery.
- When checking the UV lamp operation, open the outer door and push the door switch with the inner door closed. The visible blue light can be checked under the humidifying pan cover.

WARNING

Never expose the eyes directly to UV light as UV light can cause permanent damage to eyes. Never remove humidifying pan cover when UV light is ON (MCO-5AC(UV) or when an optional UV system set MCO-19UVS is installed in MCO-5AC).

Hazardous UV light. Do not press door switch when the inner door is opened.

- The UV lamp is ON for a predetermined period after the outer door is closed, or every 12 hours when the outer door is not opened more than 12 hours continuously. The period of factory setting is 5 minutes. The period can be changed when necessary as shown in the page 32.
- The recommended timing of lamp replacement (the ratio of UV output is less than 70 % of initial value) is when the accumulated ON time is over about 1,000 hours. The blink of the UV indicator when the UV lamp is OFF means the accumulated time has exceeded about 1,000 hours and recommends the replacement of the lamp. When replacing the UV lamp, contact our sales representative or agent.
- E18 is displayed on the digital temperature indicator when the UV lamp is burned out. In this case, replace the UV lamp immediately. At the time of replacement, also replace the glow starter (Type; FG-7P). For the replacement of UV lamp and glow starter, contact our sales representative or agent.

Precautions when using the UV lamp

The cautions below are applicable when the model is MCO-5AC(UV) or an optional UV system set MCO-19UVS is installed in MCO-5AC.

- **Always use humidifying pan and humidifying pan cover**

The humidifying pan and humidifying pan cover prevent the UV light from escaping. Make sure they are installed even if you do not need humidity.

- **Location of UV lamp**

The UV lamp is located in the rear duct. Take care not to damage the UV lamp at the time of installation/removal of attachments or humidifying pan.

UV LAMP

Change of setting for UV lamp ON period

The clauses below are applicable when the model is MCO-5AC(UV) or an optional UV system set MCO-19UVS is installed in MCO-5AC.

Follow the procedure below when changing the setting for UV lamp ON period.

Basic operation sequence (Example: change of UV lamp ON period from 5 minutes to 3 minutes)

	Description of operation	Key operated	Indication after operation
1	Press calibration key for 5 seconds.	CAL	The left digit in the digital temperature indicator blinks. 
2	By pressing numerical value shift key and digit shift key, set the figure to F01.	▲	When pressed, the figure of settable digit changes.
		▶▶	When pressed, the changeable digit is shifted.
3	Press enter key.	ENT	The current setting is displayed in the digital CO ₂ density indicator. 
4	By pressing numerical value shift key, set the figure to 003.	▲	When pressed, the figure of settable digit changes.
5	Press enter key.	ENT	Set value is memorized and the display return to normal display mode.

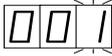
- The available set range for the UV lamp is between 0 minute and 30 minutes (000 to 030). The default setting is for 5 minutes. When set to 000, the UV lamp is not turned on.
- The UV lamp is turned off during ON period when the outer door is opened. After closing the outer door, the lamp turns on during predetermined period.
- Condensation will occur and/or temperature distribution may be affected due to the heat of the UV lamp when the setting of the lamp operation is longer than 5 minutes or if only the outer door is opened repeatedly.
- For the replacement of UV lamp, contact our sales representative or agent.

Pressing calibration key (CAL) for about 5 seconds leads the calibration mode. In the calibration mode, the calibration of temperature and CO₂ density is possible. Wrong key operation affects the basic performance. Never touch any other keys on the control panel in the event of pressing calibration key (CAL) accidentally. After about 90 seconds, the unit returns to chamber temperature display mode automatically.

Lighting the UV lamp for 24 hours

Follow the procedure below when lighting UV lamp for 24 hours.

Before sterilization by UV lamp, remove all attachments in the chamber (tray, side support, rear duct, fan, humidifying pan, humidifying pan cover) and clean the interior, inner door and UV lamp thoroughly.

	Description of operation	Key operated	Indication after operation
1	Press calibration key for 5 seconds.	CAL	The left digit in the digital temperature indicator blinks. 
2	By pressing numerical value shift key and digit shift key, set the figure to F02.		When pressed, the figure of settable digit changes.
			When pressed, the changeable digit is shifted. 
3	Press enter key.	ENT	"000" is displayed in the digital CO ₂ density indicator. (unit: min) 
4	By pressing numerical value shift key, set the figure to 001.		When pressed, the figure of settable digit changes. 
5	Press enter key.	ENT	Set value is memorized and the display returns to normal display mode.

- This setting should be executed with the outer door closed and the UV lamp off.
- The UV lamp keeps on for 24 hours after the setting. The setting is canceled when the outer door is opened. Follow the above procedure to set the UV 24-hour mode again.
- The unit keeps running with set temperature and CO₂ density during UV lighting.

Pressing calibration key (CAL) for about 5 seconds leads the calibration mode. In the calibration mode, the calibration of temperature and CO₂ density is possible. Wrong key operation affects the basic performance. After about 90 seconds, the unit returns to chamber temperature display mode automatically. In this case, the set value that has not been fixed pushing enter key (ENT) is not changed.

ALARMS, SAFETY AND SELF-DIAGNOSIS

This unit has the alarms and safety functions shown in table below, and also self diagnostic functions.

Alarms, safety and self-diagnosis for culture operation

Alarm & Safety	Situation	Indication	Buzzer	Safety operation
High limit temperature alarm	If the chamber temperature exceeds the high limit alarm temperature set value.	Over heat lamp lights. E12 or E16 and chamber temperature are displayed alternately.	Continuous tone	Heater OFF Remote alarm
Automatic set temperature alarm	If the chamber temperature deviates from the set temperature by ± 1 °C or more.	All digits on the digital temperature indicator blink.	Intermittent tone with 15 minutes delay.	Remote alarm with 15 minutes delay
Automatic set CO ₂ density alarm	If the chamber CO ₂ density deviates from the set value by ± 1 % or more.	All digits on the digital CO ₂ density indicator blink.	Intermittent tone with 15 minutes delay.	Remote alarm with 15 minutes delay
Auto-return	When there is no key pressing in each setting mode for 90 seconds.	Normal display mode.	----	The setting mode is canceled.
Key lock	When the key lock is "ON".	----	----	The setting is disabled.
CO ₂ gas cylinder empty	If the CO ₂ density does not increase when the CO ₂ gas valve is opened.	E01 is displayed alternately with the temperature on the digital temperature indicator.	Intermittent tone	Remote alarm
CO ₂ gas line changeover	When the CO ₂ gas supply line is switched. (only when MCO-5GC is installed)	E01 is displayed alternately with the temperature on the digital temperature indicator. The empty CO ₂ gas supply line indicator blinks.	Intermittent tone	Remote alarm Gas supply line is altered.
Chamber temperature sensor abnormality	If the temperature sensor is disconnected.	E05 is displayed alternately with the temperature on the digital temperature indicator.	Intermittent tone	Heater OFF Remote alarm
	If the temperature sensor is short circuited.	E06 is displayed alternately with the temperature on the digital temperature indicator.		
Ambient temperature sensor abnormality	If the ambient temperature sensor is disconnected.	E09 is displayed alternately with the temperature on the digital temperature indicator.	Intermittent tone	Remote alarm
	If the ambient temperature sensor is short circuited.	E10 is displayed alternately with the temperature on the digital temperature indicator.		
CO ₂ sensor abnormality	If the output voltage of the CO ₂ sensor is abnormal.	E11 is displayed alternately with the temperature on the digital temperature indicator.	Intermittent tone	CO ₂ valve closes. Remote alarm
Main heater abnormality	If the high limit alarm temperature alarm operates, or if the main heater is open circuit, or the main heater relay is short circuited.	E12 is displayed alternately with the temperature on the digital temperature indicator.	Intermittent tone	Remote alarm
Bottom heater abnormality	If the bottom heater goes open circuit, or the bottom heater relay is short circuited.	E13 is displayed alternately with the temperature on the digital temperature indicator.	Intermittent tone	Remote alarm
Door heater abnormality	If the door heater goes open circuit, or the door heater relay is short circuited.	E14 is displayed alternately with the temperature on the digital temperature indicator.	Intermittent tone	Remote alarm
Disconnection of S.S.R for each heater	If the relay of main heater, bottom heater or sensor box heater goes open circuit.	E16 is displayed alternately with the temperature on the digital temperature indicator.	Intermittent tone	Remote alarm
Low humidifying water	If the water in the humidifying pan is about 0.8 L.	Water level alarm lamp (RH PAN) blinks.	----	----
UV lamp failure	[MCO-5AC(UV) or when MCO-19UVS is installed in MCO-5AC] When the UV lamp is burned out.	E18 is displayed alternately with the temperature on the digital temperature indicator.	Intermittent tone	Remote alarm
Recommendation of new UV lamp	[MCO-5AC(UV) or when MCO-19UVS is installed In MCO-5AC] The accumulated ON time is over about 1,000 hours.	UV indicator blinks when UV lamp is OFF.	----	----

- The alarm can be canceled by pressing the alarm buzzer stop key (BUZZER), but the remote alarm cannot be silenced. And the high limit temperature alarm cannot be silenced with the alarm buzzer stop key (BUZZER).
- E01 is cleared automatically when the new CO₂ gas cylinder is connected correctly and the buzzer is silenced with the alarm buzzer stop key (BUZZER). When MCO-5GC is installed, press the alarm buzzer stop key (BUZZER) to silence the alarm after changeover of gas supply line.
- If one of E05 to E18 (except for E12, E13, and E14) is displayed, contact our sales representative or agent.

CALIBRATION

Temperature calibration

1. Press the calibration key (CAL) for approximately 5 seconds.
2. The left digit of the digital temperature indicator blinks, and the digital CO₂ density indicator goes out.
3. Set the present correct temperature with the digit shift key (►►) and numerical value shift key (▲), then press the enter key (ENT).
4. The unit automatically reverts to the display mode.

[Example]

If the displayed chamber temperature is 37.0 °C (set value) and the actual temperature is 36.8 °C.

1. Press the calibration key (CAL) for about 5 seconds.
2. The “3” on the digital temperature indicator blinks, and the digital CO₂ density indicator goes out.
3. Adjust the set value to the actual value of 36.8 °C with the digit shift key (►►) and numerical value shift key (▲), then press enter key (ENT).
4. The unit automatically reverts to the display mode.

Note:

It is important to accurately measure the temperature inside the unit when performing temperature calibration. Particularly, the temperature gauge used must have an accuracy of 0.5 class or better. The temperature must be measured at several points.

The temperature setting must not change by more than ± 1.0 °C during calibration. If it exceeds this, an error tone is emitted, the input data is ignored, and the unit reverts to the display mode. Consequently, if it is necessary to change the temperature by more than 1.0 °C, perform calibration in several stages over a period of time.

CALIBRATION

CO₂ calibration

[Zero setting]

Zero setting should be done when CO₂ has not been injected yet and the stable condition (about 8 hours) of temperature/humidity inside the unit has been attained.

1. Press the calibration key (CAL) for 5 seconds.
2. The left digit on the digital temperature indicator blinks, and the digital CO₂ density indicator goes out.
3. Press the calibration key (CAL) once again.
4. The left digit on the digital CO₂ density indicator blinks, and the digital temperature indicator goes out.
5. Set 00.0 with the digit shift key (►►) and numerical value shift key (▲), then press the enter key (ENT).
6. The unit automatically reverts to the display mode.

[Span setting]

Span setting should be done under stable condition of temperature, humidity, and CO₂ density.

1. Press the calibration key (CAL) for about 5 seconds.
2. The left digit on the digital temperature indicator blinks, and the digital CO₂ density indicator goes out.
3. Press the calibration key (CAL) once again.
4. The left digit on the digital CO₂ density indicator blinks, and the digital temperature indicator goes out.
5. Set the present correct CO₂ density with the digit shift key (►►) and numerical value shift key (▲), then press the enter key (ENT).
6. The unit automatically reverts to the display mode.

Note:

This calibration is available when the present correct CO₂ density is 2 % or more.

[Example]

For an internal CO₂ density of 5.0 % (setting) and a measured value of 4.5 %.

1. Press the calibration key (CAL) for about 5 seconds.
2. The left digit on the digital temperature indicator blinks, and the digital CO₂ density indicator goes out.
3. Press the calibration key (CAL) once again.
4. The left digit on the digital CO₂ density indicator blinks, and the digital temperature indicator goes out.
5. Set the present correct CO₂ density (4.5 %) with the digit shift key (►►) and numerical value shift key (▲), then press the enter key (ENT).
6. The unit automatically reverts to the display mode.

TROUBLESHOOTING

If the unit malfunctions, check out the following before calling for service.

Malfunction	Check/Remedy
The unit does not operate at all	<ul style="list-style-type: none"> • The unit is not plugged correctly into a power outlet. • The circuit breaker at the power source is active or a power failure has occurred. • The removal power supply cord is connected to the port attached on the rear of the cabinet.
The key operation is disabled	<ul style="list-style-type: none"> • The key lock function is set in ON mode.
If the alarm function operates	<p>[At the beginning of operation]</p> <ul style="list-style-type: none"> • The chamber temperature is not equal to the set value. • The chamber CO₂ density is not equal to the set value. <ol style="list-style-type: none"> a. The secondary pressure of the gas regulator is not equal to the set value (0.03 MPa(G), 0.3 kgf/cm²(G), 4.3 psi(G)). b. The gas tube is not connected securely between the gas regulator and the unit. <p>[During operation]</p> <ul style="list-style-type: none"> • The high limit alarm temperature is not set at least 1 °C higher than the set chamber temperature. • The set temperature value was changed, or the door was left open for a long period. Or a low temperature load was placed inside the unit. In this case, if the unit is left as it is, the alarm will eventually clear itself. • The gas tube has slipped off or the gas leaks. • The set value of the gas density was changed. • The gas cylinder is empty. Check the primary pressure of the CO₂ cylinder once a week. (The primary pressure of less than 3.8 MPa(G) (38 kgf/cm²(G), 551 psi(G)) means a little gas in the cylinder. Replace the cylinder soon.)
If the chamber temperature is not equal to the set temperature	<ul style="list-style-type: none"> • The ambient temperature must always be at least 5 °C less than the set temperature. • The outer door was closed while the inner door was left open.
If the CO ₂ gas density does not coincide with the set value	<ul style="list-style-type: none"> • The secondary pressure is not set to 0.03 MPa(G) (0.3 kgf/cm²(G), 4.3 psi(G)). • The gas tube is clogged or chinked. • The humidifying pan is not filled with sterile distilled water. (Always use sterile distilled water.)
If the chamber humidity does not rise	<ul style="list-style-type: none"> • The humidifying pan is not filled with sterile distilled water. (Always use sterile distilled water.)
If the CO ₂ gas consumption is too much	<ul style="list-style-type: none"> • The outer and the inner doors are opened frequently. • There is any gas leakage at the connection or pin hole on the gas tube. It is recommended to replace the gas tube once a year. • The gasket of the inner door is not completely sealed. • The access port at the upper left corner is opened.

TROUBLESHOOTING

Malfunction	Check/Remedy
If normal cultivation cannot be done and chamber gas density is suspect	• The environment around the unit is not normal. The source of the contaminated gas is nearby.
If it takes much time to recover the CO ₂ gas density	• HEPA filter is provided in the CO ₂ gas piping. If it takes much time to recover the CO ₂ gas density even though the CO ₂ gas pressure is normal, it may be that dust on the HEPA filter prevents the CO ₂ gas flow. Consult our sales representative or agent.
If CO ₂ gas is not injected	• The control method for the CO ₂ density is ON-OFF method. The CO ₂ gas is intermittently injected as CO ₂ gas density in the chamber approaches the set value. Injections may be stopped for periods of approximately 15 seconds, but that is not an error.

Note:

If the malfunction is not eliminated after checking the above items, or the malfunction is not shown in the above table, contact our sales representative or agent.

DISPOSING OF THE CO₂ INCUBATOR

When disposing of the CO₂ incubator, contact our sales representative or agent.

 **WARNING**

The CO₂ incubator must be dismantled and disposed of by qualified personnel only. If the CO₂ incubator is left where outsiders enter, it may result unexpected accident (for example, children to become locked inside).

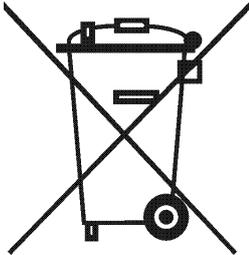
Before disposing the CO₂ incubator with biohazardous danger, decontaminate the CO₂ incubator to the extent possible by the user.

DISPOSING OF THE CO₂ INCUBATOR

Note:

This symbol mark and recycle system apply only to EU countries. They do not applied to the countries in other areas of the world.

Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC



(English)

This Panasonic product is designed and manufactured with high-quality materials and components that can be recycled and reused.

This symbol means that the electrical and electronic equipment, at their end-of-life, should be disposed of separately from household wastes.

Dispose of this product at your local community waste collection/recycling center.

In the European Union there are separate collection systems for used electrical and electronic products.

Please help us to conserve the environment we live in.

(German)

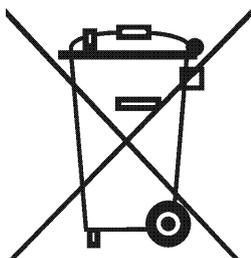
Ihr Panasonic Produkt wurde entworfen und hergestellt mit qualitativ hochwertigen Materialien und Komponenten, die recycelt und wiederverwendet werden können.

Dieses Symbol bedeutet, daß elektrische und elektronische Geräte am Ende ihrer Nutzungsdauer von Hausmüll getrennt entsorgt werden sollen.

Bitte entsorgen Sie dieses Gerät bei Ihrer örtlichen kommunalen Sammelstelle oder im Recycling Centre.

In der Europäischen Union gibt es unterschiedliche Sammelsysteme für Elektrik- und Elektronikgeräte.

Helfen Sie uns bitte, die Umwelt zu erhalten, in der wir leben!



(French)

Votre produit Panasonic est conçu et fabriqué avec des matériaux et des composants de qualité supérieure qui peuvent être recyclés et réutilisés.

Ce symbole signifie que les équipements électriques et électroniques en fin de vie doivent être éliminés séparément des ordures ménagères.

Nous vous prions donc de confier cet équipement à votre centre local de collecte/recyclage. Dans l'Union Européenne, il existe des systèmes sélectifs de collecte pour les produits électriques et électroniques usagés.

Aidez-nous à conserver l'environnement dans lequel nous vivons !

Les machines ou appareils électriques et électroniques contiennent fréquemment des matières qui, si elles sont traitées ou éliminées de manière inappropriée, peuvent s'avérer potentiellement dangereuses pour la santé humaine et pour l'environnement.

Cependant, ces matières sont nécessaires au bon fonctionnement de votre appareil ou de votre machine. Pour cette raison, il vous est demandé de ne pas vous débarrasser de votre appareil ou machine usagé avec vos ordures ménagères.

(Spanish)

Los productos Panasonic están diseñados y fabricados con materiales y componentes de alta calidad, que pueden ser reciclados y reutilizados.

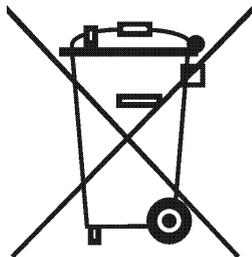
Este símbolo significa que el equipo eléctrico y electrónico, al final de su ciclo de vida, no se debe desechar con el resto de residuos domésticos.

Por favor, deposite su viejo "televisor" en el punto de recogida de residuos o contacte con su administración local.

En la Unión Europea existen sistemas de recogida específicos para residuos de aparatos eléctricos y electrónicos.

Por favor, ayúdenos a conservar el medio ambiente!

DISPOSING OF THE CO₂ INCUBATOR



(Portuguese)

O seu produto Panasonic foi concebido e produzido com materiais e componentes de alta qualidade que podem ser reciclados e reutilizados.

Este símbolo significa que o equipamento eléctrico e electrónico no final da sua vida útil deverá ser descartado separadamente do seu lixo doméstico.

Por favor, entregue este equipamento no seu ponto local de recolha/reciclagem.

Na União Europeia existem sistemas de recolha separados para produtos eléctricos e electrónicos usados.

Por favor, ajude-nos a conservar o ambiente em que vivemos!

(Italian)

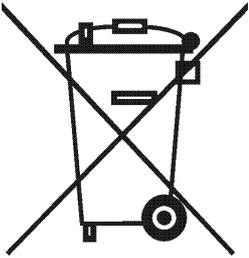
Il vostro prodotto Panasonic è stato costruito da materiali e componenti di alta qualità, che sono riutilizzabili o riciclabili.

Prodotti elettrici ed elettronici portando questo simbolo alla fine dell'uso devono essere smaltiti separatamente dai rifiuti casalinghi.

Vi preghiamo di smaltire questo apparecchio al deposito comunale.

Nell'Unione Europea esistono sistemi di raccolta differenziata per prodotti elettrici ed elettronici.

Aiutateci a conservare l'ambiente in cui viviamo!



(Dutch)

Panasonic producten zijn ontwikkeld en gefabriceerd uit eerste kwaliteit materialen, de onderdelen kunnen worden gerecycled en weer worden gebruikt.

Het symbool betekent dat de elektrische en elektronische onderdelen wanneer deze vernietigd gaan worden, dit separaat gebeurt van het normale huisafval.

Zorg ervoor dat het verwijderen van de apparatuur bij de lokaal erkende instanties gaat gebeuren. In de Europese Unie wordt de gebruikte elektrische en elektronische apparatuur bij de daarvoor wettelijke instanties aangeboden.

Alstublieft help allen mee om het milieu te beschermen.

(Swedish)

Din Panasonic produkt är designad och tillverkad av material och komponenter med hög kvalitet som kan återvinnas och återanvändas.

Denna symbol betyder att elektriska och elektroniska produkter, efter slutanvändande, skall sorteras och lämnas separat från Ditt hushållsavfall.

Vänligen, lämna denna produkt hos Din lokala mottagningstation för avfall/återvinningsstation.

Inom den Europeiska Unionen finns det separata återvinningsystem för begagnade elektriska och elektroniska produkter.

Vänligen, hjälp oss att bevara miljön vi lever i!

STACKING INCUBATORS

Use the following procedure to stack incubators. This work is potentially dangerous, so contact our sales representative or agent.

CAUTION

- **Select a floor that is strong enough to support the stacked incubators.**
- **Never stack 4 or more incubators.** Doing so is dangerous.

(When stacking 2 incubators)

1. Take out 2 stacking plates A, 2 stacking plates B, 4 protective stickers, and 4 screws from accessory bag.
2. Unplug both of the incubators that are to be stacked.
3. Remove the caps at the 2 places in the front of the top surface of the incubator that is to be on the bottom, attach the protective stickers to the 4 corners on the top surface of the incubator that is to be on the bottom. (Fig. A)
4. Secure stacking plate A with the screws that are provided.
5. Remove the front panel (4 screws, 3 connectors, 1 ground wire, 1 gas tube) from the incubator that is to be on the top.
6. Place the upper incubator on top of the lower one, being careful not to pinch your fingers.
7. Make the lower incubator level by adjusting the leveling feet, and then level the upper incubator in the same way.
8. Secure the stacking plate A fixed to the lower incubator to the upper incubator with the accessory screws.
9. Remove from the back of the lower incubator the 2 hooks (4 screws) and remove from the upper incubator the 2 screws on the lower rear panel.
10. Use the 6 screws that were removed in step 9 to secure stacking plate B to the rear panels of the upper and lower incubators.
11. Replace the front panel (4 screws, 3 connectors, 1 ground wire, 1 gas tube) to the upper incubator.
12. Use the hooks on the back of the upper incubator to prevent the incubators from falling over.

(When stacking 3 incubators)

13. Perform again the procedure from step 3

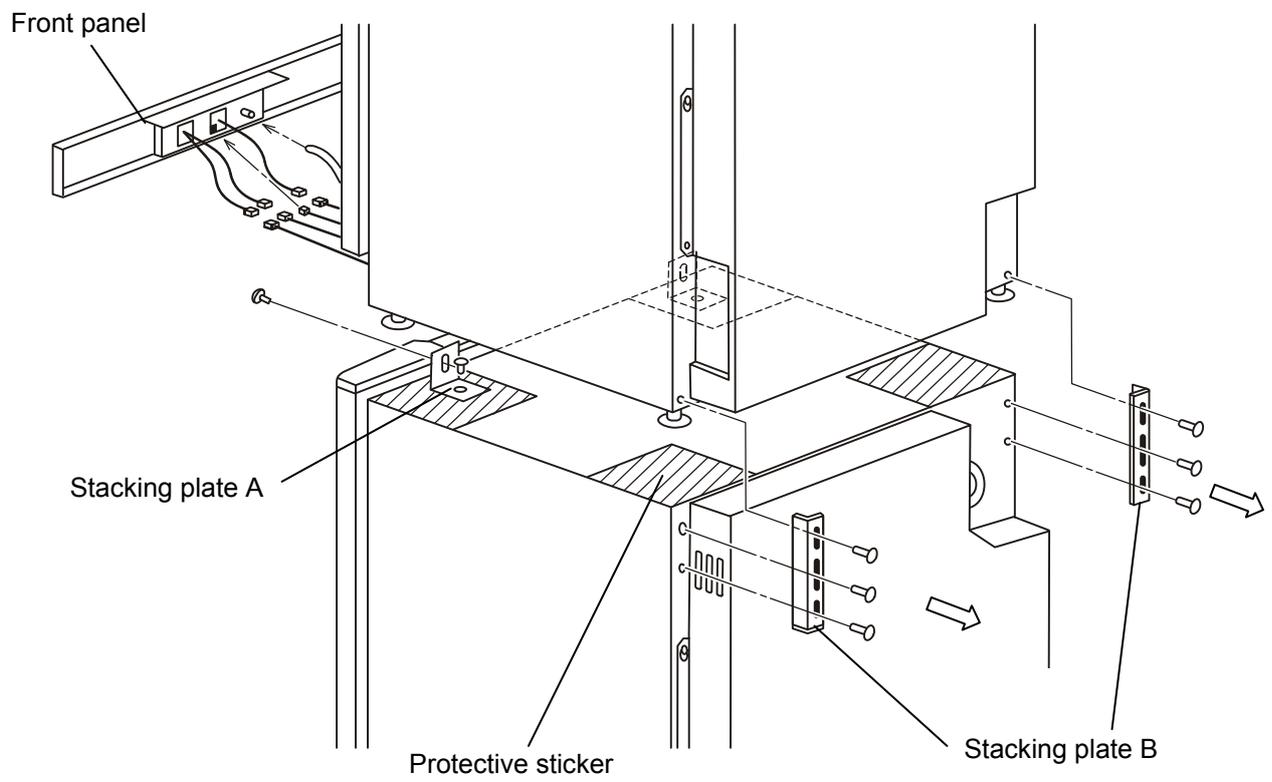


Fig. A <View from quarter rear side>

SPECIFICATIONS

Product name	CO ₂ Incubator MCO-5AC	CO ₂ Incubator MCO-5AC(UV)
External dimensions	W480 mm x D548 mm x H575 mm (W18.9 inch x D21.6 inch x H22.6 inch)	
Internal dimensions	W350 mm x D378 mm x H375 mm (W13.8 inch x D14.9 inch x H14.8 inch)	
Interior volume	49 L (1.73 cu.ft.)	
Exterior	Painted steel	
Interior	Stainless steel containing copper (R corner structure)	
Outer door	Painted steel, Reversible support (selectable right or left-hand door)	
Inner door	Tempered glass	
Trays	Made of stainless steel containing copper (standard 3 trays, maximum 6 trays) W310 mm x D310 mm x H12 mm (W12.2 inch x D12.2 inch x H0.47 inch) Maximum load; 4 kg/tray	
Access port	Inner diameter; 30 mm (1.18 inch), On the back side	
Insulation	Rigid polyurethane foamed-in place	
Heating system	Direct Heat & Air (DHA) jacket system	
Heater	180 W	
Humidifying system	Natural evaporation with humidifying pan	
Temperature controller	PID control system	
Temperature display	Digital display	
CO ₂ controller	ON-OFF control system/TC sensor(direct detection in chamber)	
CO ₂ density display	Digital display	
Air circulation	Fan assisted	
Air filter	0.3 µm, Efficiency; 99.97 % or higher	
UV lamp	-----	4 W x 1 (ozone-free emission)
Water level sensor	Optical type	
Alarms	Automatic set temperature alarm, Automatic set CO ₂ density alarm High limit temperature alarm, CO ₂ gas, various sensor/heater alarms	
Remote alarm contacts	Allowable contact capacity: DC 30 V, 2 A	
CO ₂ inlet connection	4 mm to 6 mm (0.157 inch to 0.236 inch) diameter tube can be connected	
CO ₂ inlet pressure	0.03 MPa(G) (0.3 kgf/cm ² (G), 4.3 psi(G))	
Accessories	1 removal power supply cord, 3 trays, 1 gas tube, 1 humidifying pan 2 pair of stacking plates A and B, 4 protective stickers, 2 tube bands	
Weight	49 kg	
Optional accessories	UV system set (MCO-19UVS)	UV system set is a standard equipment.
	Gas regulator (MCO-100L), Gas auto changer (MCO-5GC) Tray (MCO-30ST), Roller base (MCO-5RB) Data acquisition system (MTR-5000), Interface board (MTR-L03) Interface board (MTR-480), Interface board (MCO-420MA, USA only)	

Note: Refer to the updated catalog when ordering an optional component.

Designs and specifications are subject to change without notice.

PERFORMANCE

Product name	CO ₂ Incubator MCO-5AC MCO-5AC(UV)			
Model No.	MCO-5AC-PT MCO-5ACUV-PT	MCO-5AC-PA MCO-5ACUV-PA	MCO-5AC-PK MCO-5ACUV-PK	MCO-5AC-PE MCO-5ACUV-PE
Temperature control range	Ambient temperature+5 °C to 50 °C (ambient temperature; 5 °C to 35 °C)			
Temperature distribution	±0.25 °C (ambient temperature; 25 °C, setting; 37 °C, CO ₂ : 5 %, no load)			
Temperature variation	±0.1 °C (ambient temperature; 25 °C, setting; 37 °C, CO ₂ : 5 %, no load)			
CO ₂ control range	0 % to 20 %			
CO ₂ variation	±0.15 % (ambient temperature; 25 °C, setting; 37 °C, CO ₂ : 5 %, no load)			
Chamber humidity	95 %R.H. ±5 %R.H.			
Applicable environment condition	Temperature; 5 °C to 35 °C, Humidity; equal or less than 80 %R.H. (The designed performance may not be obtained when the ambient temperature is equal or less than 15 °C)			
Noise level	24 dB (A scale)			
Power consumption	Max. 205 W			
Heat emission	Max. 740 kJ/h			
Related voltage, frequency	110 V to 120 V, 60 Hz		220 V, 60 Hz	220 V to 240 V, 50 Hz
Amperage	Max. 1.8 A		Max. 0.9 A	Max. 0.9 A

Note: The unit with CE mark complies with EC directives.
Based on our measuring method.

⚠ CAUTION

**Please fill in this form before servicing.
Hand over this form to the service engineer to keep for his and your safety.**

Safety check sheet

1. Unit contents

- Risk of infection: Yes No
Risk of toxicity: Yes No
Risk from radioactive sources: Yes No

(List all potentially hazardous materials that have been stored in this unit.)

Notes :

2. Contamination of the unit

Unit interior

- No contamination Yes No
Decontaminated Yes No
Contaminated Yes No

Others:

3. Instructions for safe repair/maintenance of the unit

- a) The unit is safe to work on Yes No
b) There is some danger (see below) Yes No

Procedure to be adhered to in order to reduce safety risk indicated in b) below.

Date :

Signature :

Address, Division :

Telephone :

Product name : CO ₂ incubator	Model No. MCO-	Serial number :	Date of Installation :
---	-------------------	-----------------	------------------------

Please decontaminate the unit yourself before calling the service engineer.

Panasonic Healthcare Co., Ltd.

1-1-1, Sakata Oizumi-Machi Ora-Gun, Gunma 370-0596, Japan

© Panasonic Healthcare Co., Ltd. 2012

Printed in Japan
7FB6P15136400
S0412-0