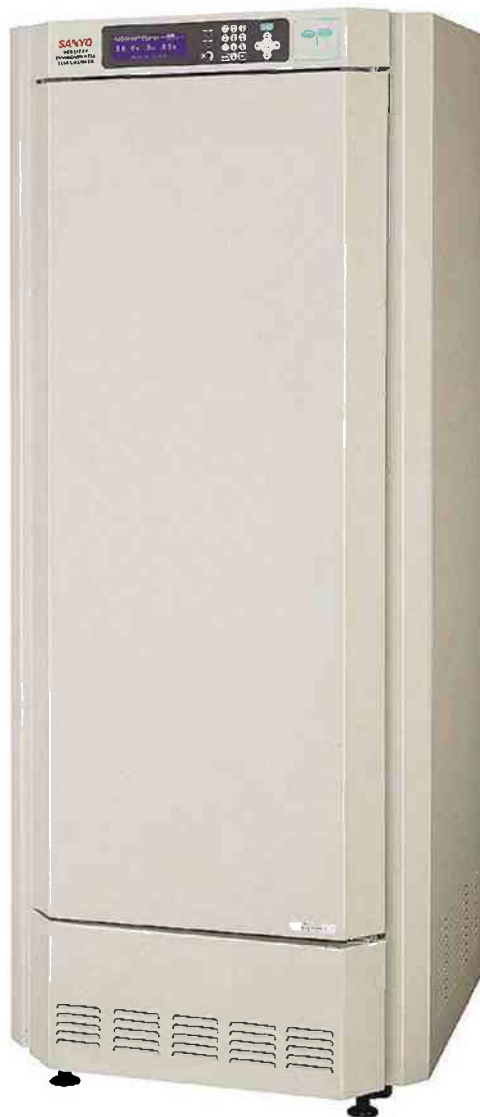


## INSTRUCTION MANUAL

# MLR-351 MLR-351H

## Versatile Environmental Test Chamber



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# INTRODUCTION

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- Read this manual carefully before using the appliance and follow the instructions for safety operation.
  
- Sanyo never guarantee any safety if the appliance is used for any objects other than intended use or used by any procedures other than those mentioned in this manual.
  
- Keep this manual in an adequate place to refer to it as necessary.
  
- The contents of the manual will be subjected to change without notice due to the improvement of performance or functions.
  
- Contact Sanyo sales representative or agent if any page of the manual is lost or page order is incorrect.
  
- Contact Sanyo sales representative or agent if any point in this manual is unclear or if there are any inaccuracies.
  
- No part of this manual may be reproduced in any form without the expressed written permission of Sanyo.

# PRECAUTIONS FOR SAFE OPERATION

**It is imperative that the user complies with this manual 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 manual 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.














# 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.







# PRECAUTIONS FOR SAFE OPERATION

## **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

-  **Use a dedicated power source** (a dedicated circuit with a breaker) as indicated on the rating label attached to the unit. A branched circuit may cause fire resulting from abnormal heating.
-  **Connect the power supply plug to the power source firmly after removing the dust on the plug.** A dusty plug or improper insertion may cause a heat or ignition.
-  **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** when you request any repair or maintenance for the safety of service personnel.

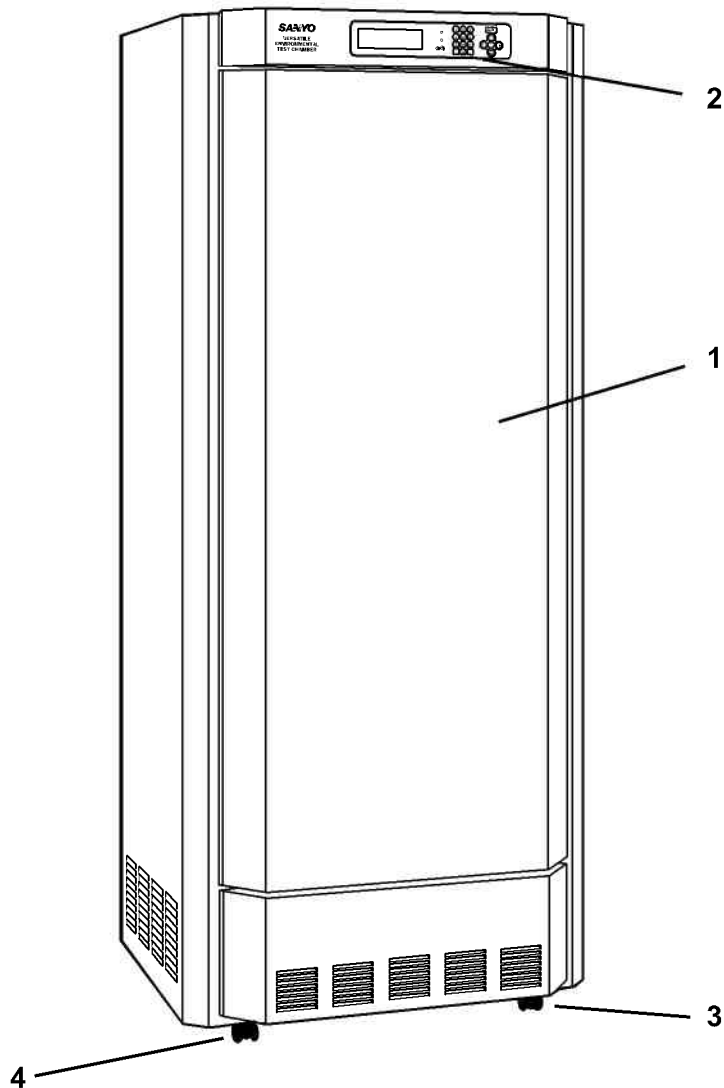
# ENVIRONMENTAL CONDITIONS

This equipment is designed to be safe at least under the following conditions (based on the IEC-1010-1):

- 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  $\pm 10\%$  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 664.



# CHAMBER COMPONENTS



## 1. Door

5 fluorescent lamps and 5 glow starters are incorporated inside the door. When the door is closed, it forms a perfect seal with the aid of a magnetic gasket.

## WARNING

These fluorescent lamps are incorporated inside the door and side doors directly without cover. Do not damage the fluorescent lamps when open or close the doors and replace the fluorescent lamps.

## 2. Control panel

The control panel has setting for temperature, humidity (MLR-351H only), light program and alarm. For the details, see page 12.

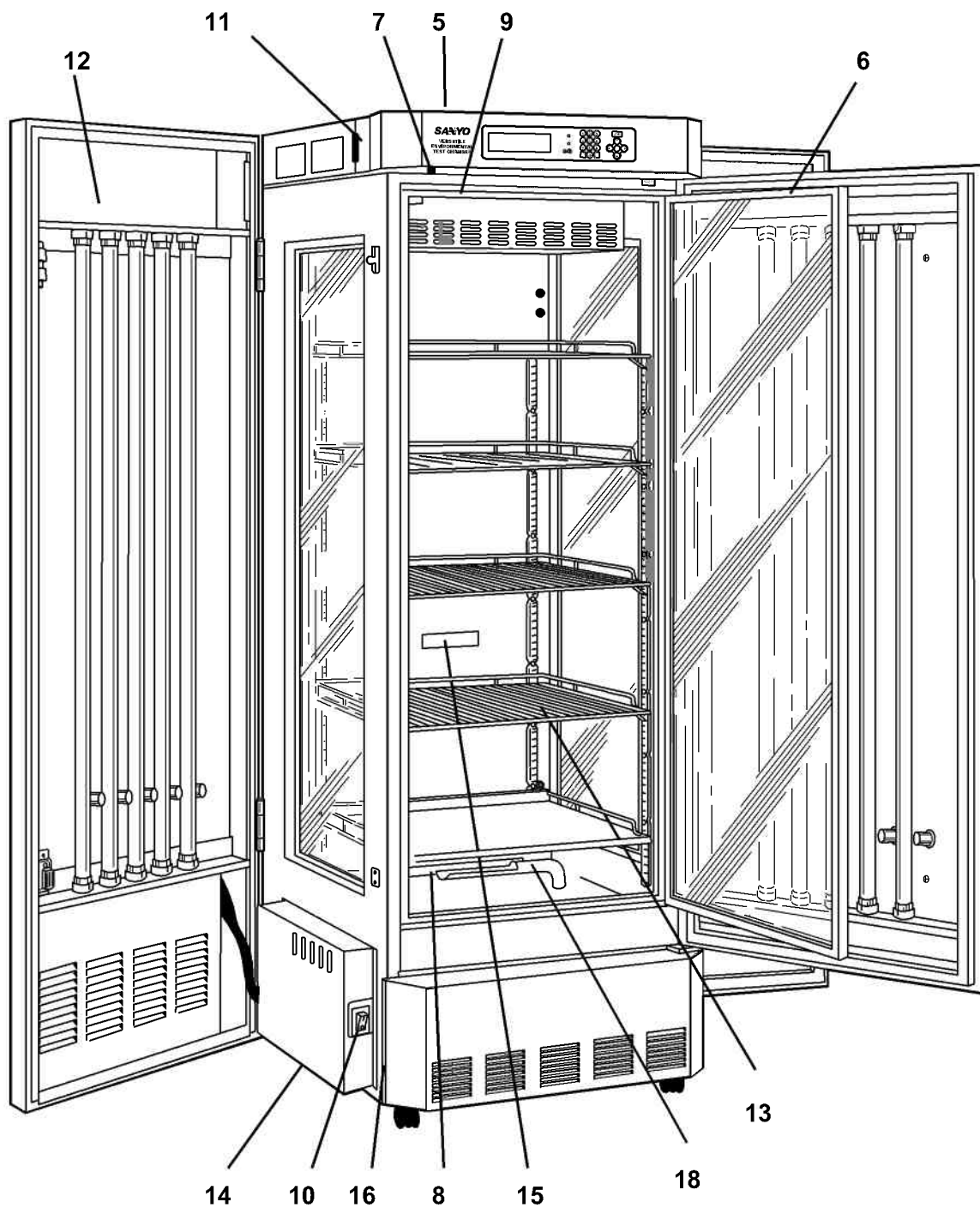
## 3. Caster

There are four casters. These casters are used to move the unit. In installation, keep the front two casters away from the floor by leveling feet.

## 4. Leveling foot

To secure the unit, turn the leveling feet, which are mounted beside the caster, counterclockwise until they rest securely on the floor.

# CHAMBER COMPONENTS



# CHAMBER COMPONENTS

**5. Remote alarm terminal** (Back side of the unit)

**6. Inner door**

This glass inner door minimizes the escape of cool air when the cabinet door is opened. The loss of cool air may cause fluctuation of chamber temperature.

**7. Door switch**

When the door is opened, the air circulation fan stops to minimize the escape of cool air.

**8. Air exhaust vent**

**9. Air intake vent**

**10. Power switch with circuit breaker**

This switch is for all electric sources. When the operation of the unit is stopped by this breaker, contact a dealer or a service station after disconnecting the power supply plug.

**11. Switch box** (Refer to page 11)

**12. Side door**

5 fluorescent lamps are mounted inside of the side doors (right and left). Open the door to replace a fluorescent lamp or a glow starter.

**13. Shelf**

The shelf position can be adjusted vertically.

**14. Evaporating tray**

The tray catches defrosted water and allows it to be evaporated. (Fig. 1)

**Note:**

Before start to use the unit, set the evaporating tray on the rail, which extends from the left side of the frame at the bottom. Improper setting may result in spillage of water.

**15. Frost check window**

**16. Filter** (Refer to page 49)

**17. Water supply tank** (MLR-351H only) (Fig.2)

**18. Duct for humidifying** (MLR-351H only)

The edge should be located left side.

**19. Water supply inlet** (MLR-351H only) (Fig.2)

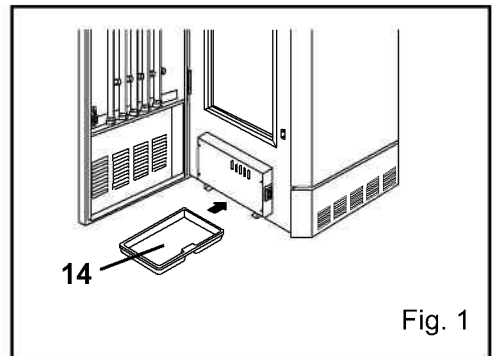


Fig. 1

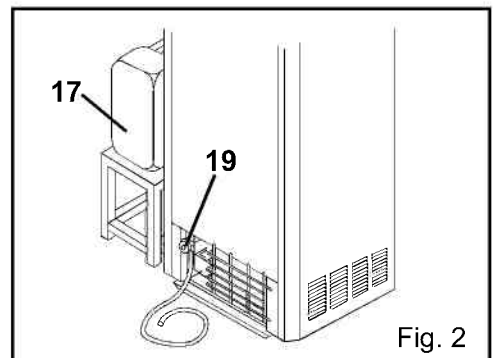
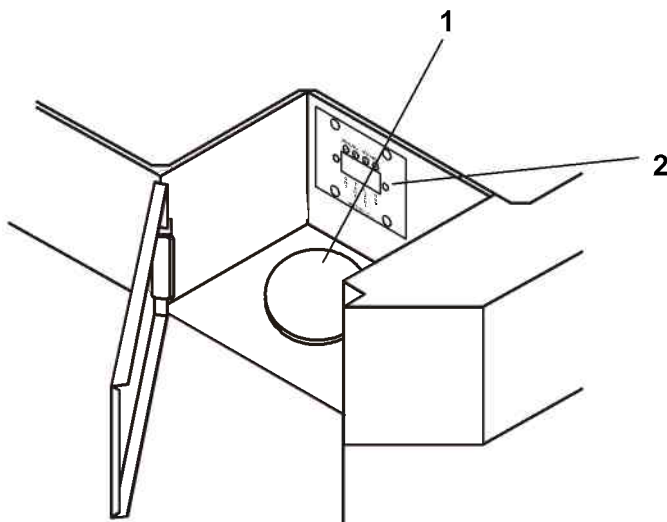


Fig. 2

# CHAMBER COMPONENTS

## Switch box

Inside the switch box, there are the access port and the remote record terminal.



### 1. Access port

When an instrument that requires a measuring cable and power cord is placed inside the cabinet, the cable and cord can be led through this access port. When a cord is led through, use the cap to prevent air from coming in or out.

### **⚠ CAUTION**

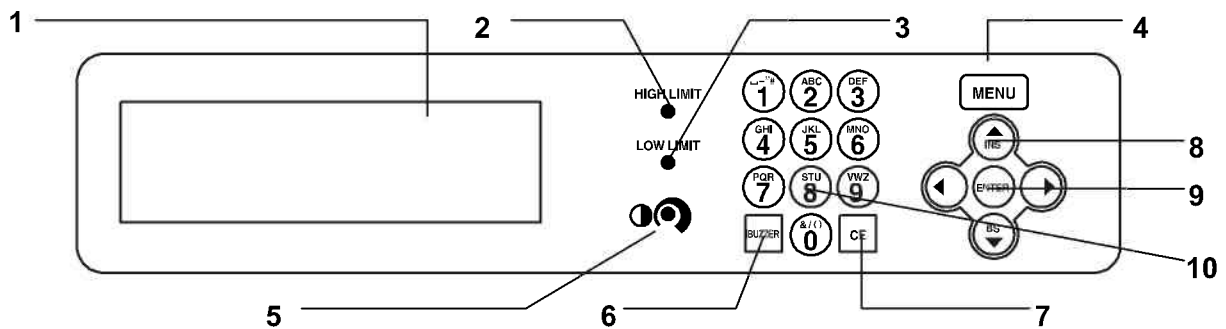
Always plug the access port with the cap. Failure to plug the port may disturb the refrigerating performance or cause condensation outside the port.

### 2. Remote record terminal

Refer to "Remote record terminal" on page 13 for usage.

# CHAMBER COMPONENTS

## Control panel



### 1. LCD panel

### 2. High limit temperature alarm volume (HIGH LIMIT)

To set the temperature of high limit temperature alarm.

### 3. Low limit temperature alarm volume (LOW LIMIT)

To set the temperature of low limit temperature alarm.

### 4. Menu button (MENU)

To open the menu window.

### 5. LCD contrast adjusting knob

To adjust the contrast of graphic LCD.

### 6. Alarm buzzer stop key (BUZZER)

To silence the alarm buzzer temporarily.

### 7. Clear key (CE)

To clear the input value during editing of program.

### 8. Shift key (Upward, downward, rightward, leftward)

To move the cursor on the LCD panel.

### 9. Enter key (ENTER)

To determine the selection of menu. In editing of program, pressing this key causes moving to next article.

### 10. Character input key

# CHAMBER COMPONENTS

## Remote record terminal

The terminal output of remote recorder is temperature (°C) 0~100 mV, light step (LS) 0~100 mV, relative humidity (%RH) 0~100 mV. Please refer below for each control element.

Terminal

No.1	Common (-)
No.2	Temperature (°C) (+)
No.3	Light step (LS) (+)
No.4	Relative humidity (%) (+)

	Range	Output
Temperature	0~50°C	2 mV/°C
Light step	0~5LS	20 mV/LS
Relative humidity	0~100%	1 mV/%RH

(Example)

Output of temperature 37°C :

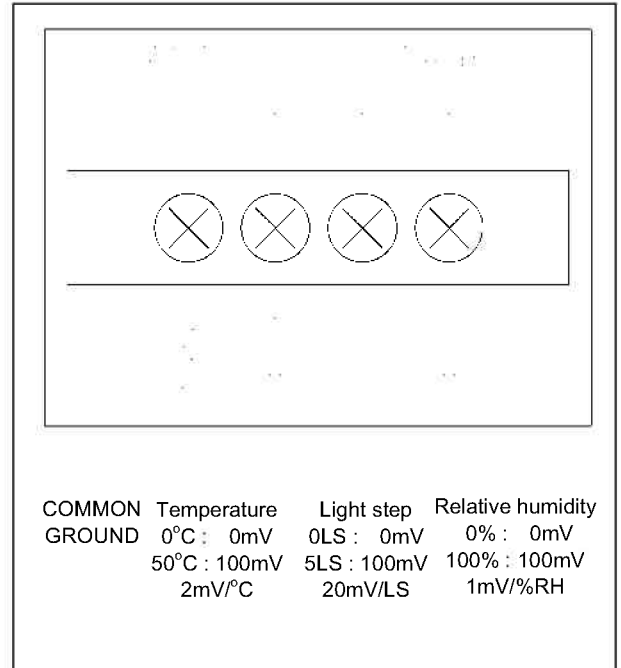
$$37^{\circ}\text{C} \times 2 \text{ mV}/^{\circ}\text{C} = 74 \text{ mV}$$

Output of light step :

$$3\text{LS} \times 20 \text{ mV}/\text{LS} = 60 \text{ mV}$$

Output of relative humidity 80% :

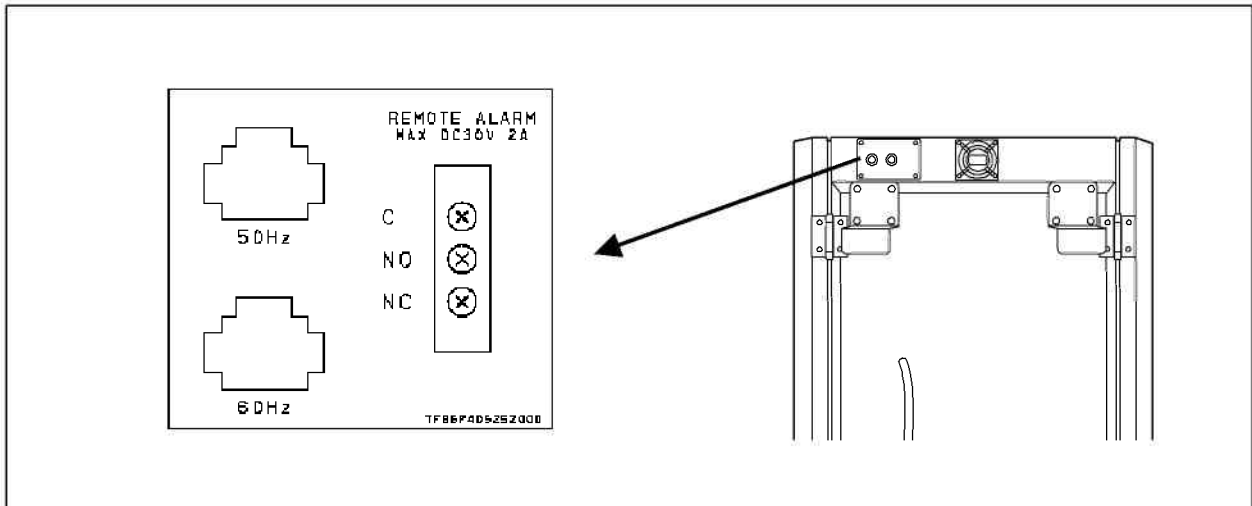
$$80\% \times 1 \text{ mV}/\% \text{RH} = 80 \text{ mV}$$



# CHAMBER COMPONENTS

## Remote alarm terminal

The terminal for the remote alarm is located in the data input/output port at the rear top of the frame (Refer to the figure below). To access the terminal, remove four screws on the rear frame by a screw driver and take out a cover.



The remote alarm terminal is a contact output. Contact capacity is or 2 A (DC 30 V).

- 1) Output: Normal open, abnormal close; connect to C and N.O.
- 2) Output: Normal close, abnormal open; connect to C and N.C.

Power failure: C and N.O. terminal are closed.

# INSTALLATION SITE

To operate this unit properly and to obtain maximum performance, install the unit in a location with the following conditions:

■ **A location not subjected to direct sunlight**

Do not install the unit under direct sunlight. Installation in a location subjected to direct sunlight cannot obtain the intended performance.

■ **A location with adequate ventilation**

Leave at least 10 cm around the unit for ventilation. Poor ventilation will result in a reduction of the performance and consequently the failure.

■ **A location away from heat generating sources**

Avoid installing the unit near heat-emitting appliances such as a heater or a boiler etc. Heat can decrease the intended performance of the unit.

■ **A location with little temperature change**

Install the unit under stable ambient temperature. The allowable ambient temperature is between 5 and +35°C.

■ **A location with a sturdy and level floor**

Always install the unit on a sturdy and level floor. The uneven floor or tilted installation may cause failure or injury. Install the unit in stable condition to avoid the vibration or noise. Unstable condition may cause vibration or noise.

 **WARNING**

**Install the unit on a sturdy floor.** 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.

**Select a level and sturdy floor for installation.** This precaution will prevent the unit from tipping. Improper installation may result in water spillage or injury from the unit tipping over.

■ **A location not prone to high humidity**

Install the unit in the ambient of 80% R.H. or less humidity. Installation under high humidity may cause current leakage or electric shock.

 **WARNING**

**Do not use the unit outdoors.** Current leakage or electric shock may result if the unit is exposed to rain water.

**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.

■ **A location without flammable or corrosive gas**

Never install the unit in a flammable or volatile location. This may cause explosion or fire or may result in the current leakage or electric shock by the corrosion of the electrical components.

■ **A location without the possibility of anything fall**

Avoid installing the unit in the location where anything can fall down onto the unit. This may cause the breakdown or failure of the unit.



# INSTALLATION SITE

## Caution for installation environment

### ■ Suitable temperature range

The acceptable ambient temperature range for this chamber is 5 to 35°C. Avoid operating the chamber with an ambient temperature lower than 5°C. This may cause failure by freezing.

### ■ Location convenient for supply/drain the water (MLR-351H only)

MLR-351H needs water supply and drain. Select the location for easy access to supply/drain provision.

### ■ Caution for frost (In the case of pattern 1 for the automatic defrost.)

Operating the chamber with chamber temperature of lower than 10°C (15°C; for MLR-351H), gets frost on the evaporator. The cooling capacity is degraded and the chamber temperature rises when the evaporator is clogged by frost. Start the manual defrost when a lot of frost between cooling fins is found through the frost check window. For the manual defrost, see page 36. The frost is formed in short time when the article including much moisture is stored.

## Prevent contamination

To prevent contamination of the chamber, select an appropriate location for installation as well as the complete disinfection of the chamber components.

### ■ Avoid hot and humid location

Avoid location with high temperature and/or humidity as the presence of bacteria in the air is greater than in normal environment.

### ■ Avoid drafty location and location with many passers-by

Avoid locations near doors, air conditioners, fans, etc., where slight breezes can facilitate the entry of bacteria into the chamber.

### ■ Installation in a sterile room

To get the cultivation more efficiently, install the unit in a sterile room.

### ■ Use clean containers

The contamination is mainly caused by the containers such as Petri dishes or bottles stored in the chamber. Always keep the containers clean.

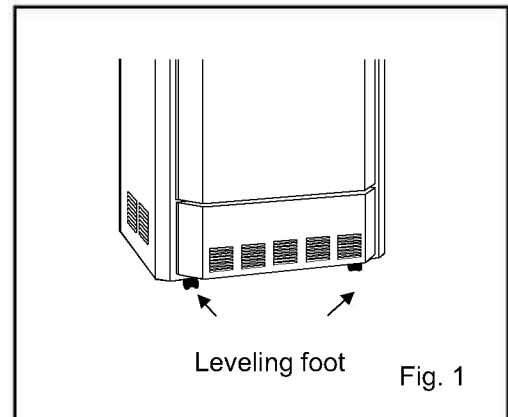
# INSTALLATION

## 1. Removing the packaging materials and tapes

Remove all transportation packaging materials and tapes. Open the doors and ventilate the unit. If the outside panels are dirty, clean them with a diluted neutral dishwashing detergent. (Undiluted detergent can damage the plastic components. For the dilution, refer to the instruction of the detergent.) After the cleaning with the diluted detergent, always wipe it off with a wet cloth. Then wipe off the panels with a dry cloth.

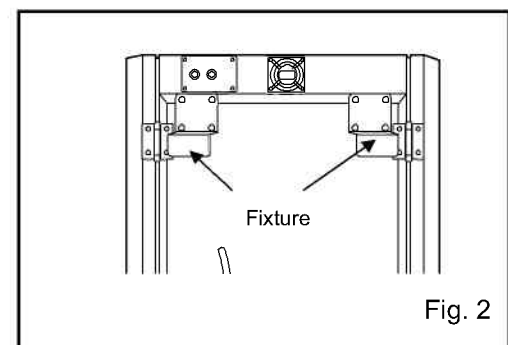
## 2. Adjusting the leveling foot

Extend the leveling feet by rotating them counterclockwise to contact them to the floor. Ensure the unit is level. See Fig. 1.



## 3. Fixing the unit

Two fixtures are attached to the rear of the frame. See Fig. 2. Fix the frame to the wall with these fixtures and rope or chain.



## 4. Ground (earth)

The ground (earth) is for preventing the electric shock in the case of the electrical insulation is somehow degraded. Always ground the unit at the time of installation.

### **⚠ WARNING**

**Use a power supply outlet with ground (earth) to prevent electric shock.** If the power supply outlet is not grounded, it is 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.

### **⚠ WARNING**

In case of being obliged to install the unit near a watery or humid location, consult sales or representative or agents so that need to set a earth leakage breaker. Earth leakage may cause electric shock. (Use a specified earth leakage breaker.)

### **⚠ WARNING**

**Do not put the packing plastic bag within reach of children** as suffocation may result.

# BEFORE COMMENCING OPERATION

Before first start-up of the unit, prepare to run as follows.

1. Remove all transportation packaging materials and tapes. Open the doors and ventilate the unit. (Refer to page 17) Then remove tapes for preventing dropout of door and both ends of side fluorescent lamps.

2. Set the evaporating tray enclosed in the chamber under the unit from the left side of the unit. (see Fig. 1 on page 11)

3. Preparation of water supply (MLR-351H only)

- Fill the water supply tank with either ion exchange processed water or distilled water. The tank should be installed at a height of 50 cm or more from the floor.
- Connect the water supply tube with one-touch joint between the tank outlet and water supply inlet on the unit.
- Open the tank cock.

4. Drain treatment (MLR-351H only)

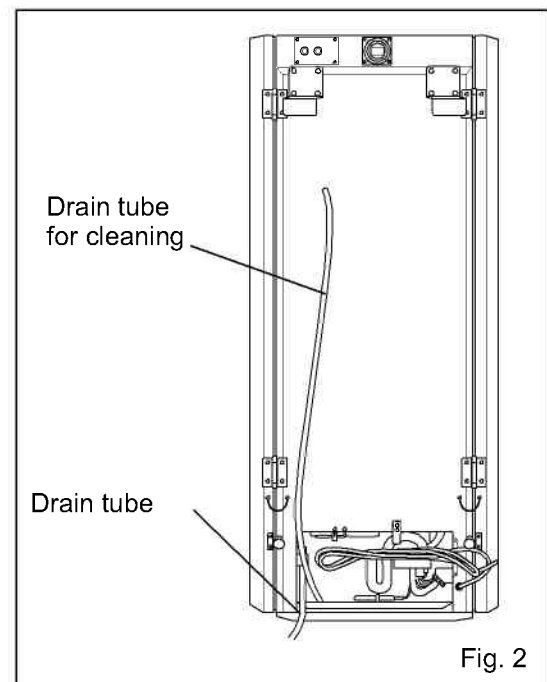
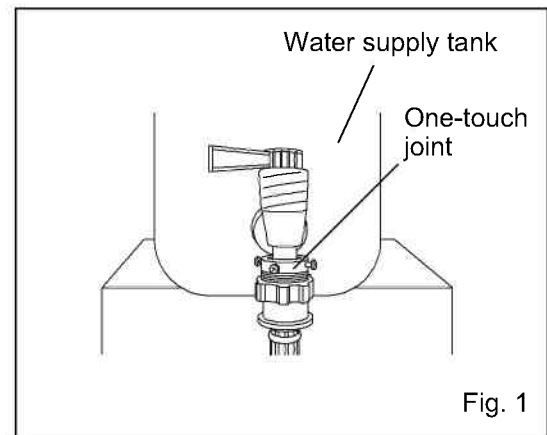
Arrange the drain tube (See Fig. 2) so that the water could be drained properly in the tube. Use a container for drained water if there is no suitable site for drainage around the unit. In this case, be sure to set the container inlet at lower position than the drain tube outlet. (lower than 20 cm is recommended.)

**Note:**

The drain tube for cleaning is used only when cleaning the chamber. After cleaning the chamber with water, drain the water with this tube.

5. Check the grounds.

6. Connect the power supply cord to the appropriate power source, and turn on the power switch.



**⚠ CAUTION**

MLR-351H requires a water supply. The enclosed water supply tank supplies water by gravity, and should be installed at height of 50 cm or more. The water supply tank should be filled with either ion exchange processed water or distilled water. Never connect the water main to the unit directly.

**⚠ CAUTION**

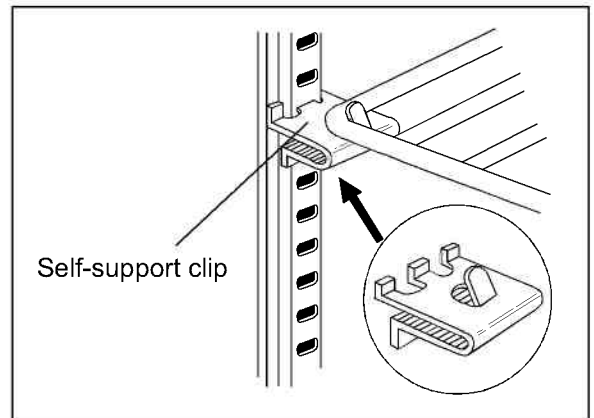
When the unit is not used, remove the moisture in the chamber completely. Check the chamber is completely dry before closing the doors. Remained moisture may cause condensation resulting in the failure of the unit.

# ADJUSTMENT OF SHELVES

The shelves can be adjusted to the height of items placed inside. To adjust the height, insert the self-support clips (4 per shelf) into the slots at the desired height.

**Note:**

Always place the stainless plate on the lowest shelf. Without this plate, the distribution of chamber temperature is degraded.



**⚠ CAUTION**

The chamber temperature is controlled by the forced air circulation. Do not block the air intake vent and air exhaust vent with the stored items or equipment. Blocking of these vents may cause unstable chamber temperature.

# SETTING OF AN EQUIPMENT IN CHAMBER

■ **When too much heat emission from the equipment in the chamber**

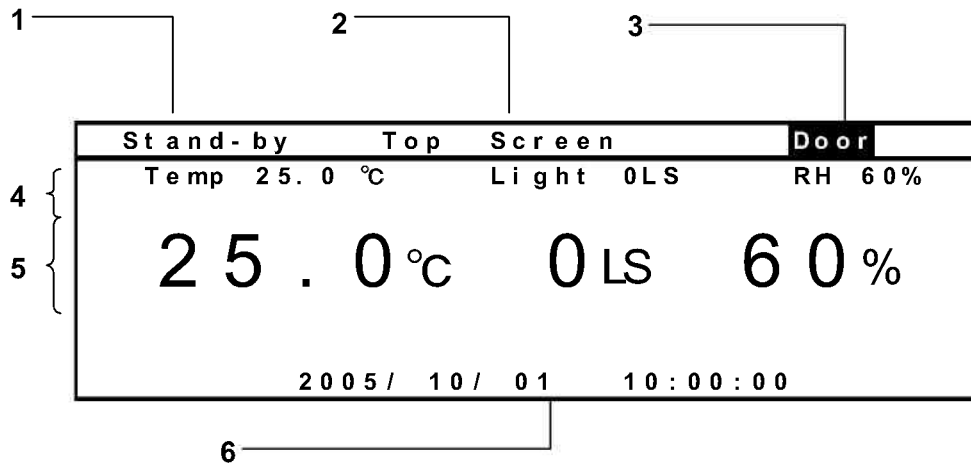
The chamber temperature may deviate from the setting temperature when a heat generator (heater, motor, etc.) is energized in the chamber. Use an accurate thermometer to check the chamber temperature and control the chamber temperature when any heat generating equipment is installed in the chamber.

■ **Maximum heat load**

The maximum heat load for the chamber is shown on page xx "PERFORMANCE". The excessive heat load may cause failure or malfunction of the unit.

# TOP SCREEN

The top screen below is displayed when turning on the power switch. The default is; temp. 25.0°C, Light 0LS, and RH 60% (MLR-351H only). The date and time are preset at the factory. Refer to page 39 when more accurate setting is needed.



## 1. Display of running status

The current running status is displayed. At the power-on, “stand-by” is displayed and constant running with default setting is started. “Running” is displayed at the time of programmed running.

## 2. Display of program name

A program name under operation is displayed. “Top Screen” is displayed during standby operation.

## 3. Display of door status

“Door” is highlighted when the door is open.

## 4. Display of setting

Set values of temperature, light, and relative humidity (MLR-351H only) are displayed. For MLR-351, the location for the relative humidity is blank.

## 5. Display of current value

Current values of temperature, light, and relative humidity (MLR-351H only) are displayed. For MLR-351, the location for the relative humidity is blank.

## 6. Display of date and time

The current date and time is displayed.

### CAUTION

The relative humidity (RH) is settable between 55% and 90% (MLR-351H only). MLR-351 has no humidity control. For MLR-351, the display location of relative humidity (setting and current value) is always blank.

# FUNCTIONS THROUGH CONTROL PANEL

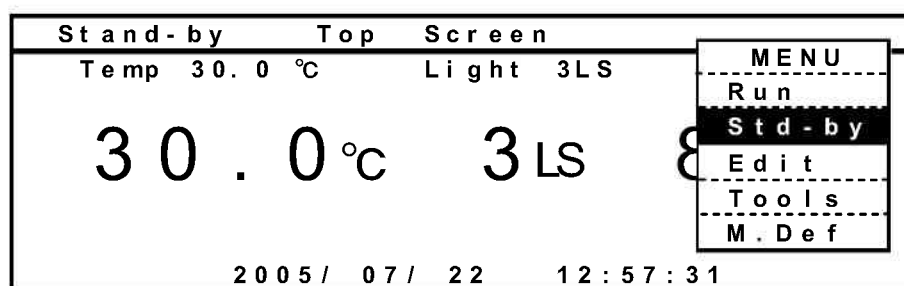
The following functions are available through control panel:

- **Setting of standby operation:** To set a running condition at the start-up or completion of programmed running. (refer to P.21)
- **Programming and edit:** To set a new program (P.23), or to edit (P.29), or delete (P.42) an user program.
- **Programmed running:** To start (P.30), skip (P.33) or stop (P.34) a programmed running.
- **Setting of defrost:** To set the automatic defrost (P.35) and to start the manual defrost. (P.36)
- **Setting of log cycle and sending to PC:** To set a log cycle of running data and to send a running log to PC. (P.37)
- **Setting of date and time:** To set the date and time shown on the top screen. (P.39)
- **Setting of alarm:** To set temperature alarm (humidity alarm: MLR-351 only) (P.40), and a high limit (or low limit) temperature alarm. (P.22)
- **Default setting:** To set the default for LCD panel and communication (DAQ) speed etc. (P.41)

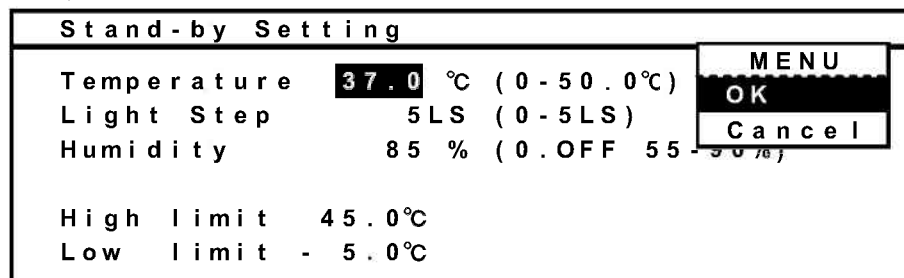
## STANDBY OPERATION (MENU/Std-by)

This product automatically operates with standby operation setting (temperature, light step, humidity (MLR- 351H only)), when power ON and programmed running is finished. The setting can be changed as necessary.

1. With the top screen displayed, press the menu button (MENU) to show the menu window. Select "Std-by", and press the enter key (ENTER).



2. Stand-by Setting screen is displayed. Set each parameter. Press the menu button (MENU) at the completion of parameter setting. The menu window is shown. Select "OK" and press the enter key (ENTER). The parameter is memorized.



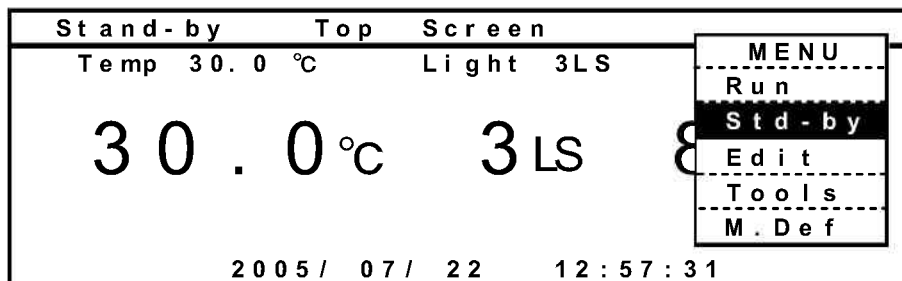
The settable range of each parameter:

- Temperature : 0~50°C
  - Light step : 0~5 LS
  - Humidity : OFF or 55~90% (MLS-351H only)
- Set the humidity to 0 (OFF) when the humidity control is not needed in MLR-351H.

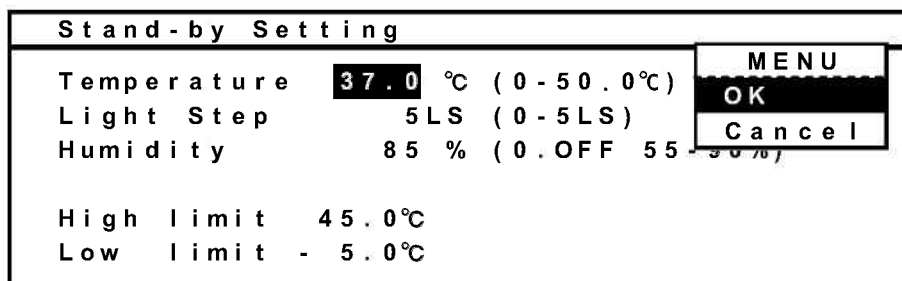
# HIGH LIMIT/LOW LIMIT ALARM (MENU/Std-by)

A high limit alarm and low limit temperature alarm are provided with this product. The alarm temperature can be changed as follows:

1. With the top screen displayed, press the menu button (MENU) to show the menu window. Select "Std-by", and press the enter key (ENTER).



2. Stand-by Setting screen is displayed.



3. Set the desired high limit temperature alarm by turning the high limit temperature alarm volume (HIGH LIMIT) at the center of the control panel by using a small screw driver. The settable alarm temperature is between 15.0°C and 55.0°C.

**Note:**

Set the high limit temperature alarm (High Limit) 5°C higher than the maximum temperature in a program.

4. Set the desired low limit temperature alarm by turning the low limit temperature alarm volume (LOW LIMIT) at the center of the control panel by using a small screw driver. The settable alarm temperature is between -10.0°C and 25.0°C.

**Note:**

Set the low limit temperature alarm (Low Limit) 5°C lower than the minimum temperature in a program.

5. Press the menu button (MENU) at the completion of setting. The menu window is shown. Select "OK" and press the enter key (ENTER). The alarm temperature is memorized.

Refer to alarms and safety functions of page 47 for details.

**Note:**

These high limit temperature alarm (High Limit) and low limit temperature alarm (Low Limit) are effective during a programmed running as well.

# PROGRAMMING (MENU/Edit)

This product has two modes, which are clock mode and timer mode. The clock mode is used to set a change time to the next step in a day time (24 hours). The timer mode is used to set a time for each step directly and the remained time is displayed.

The selection of either mode is available on the running mode selection screen at the starting of the program.

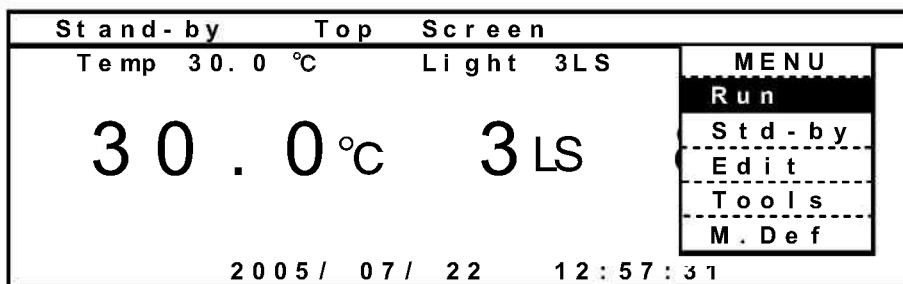
Example 1:

Following shows the procedure to create a new program "Oze" of which cycle is 31 with clock mode. The details of "Oze" is as follows:

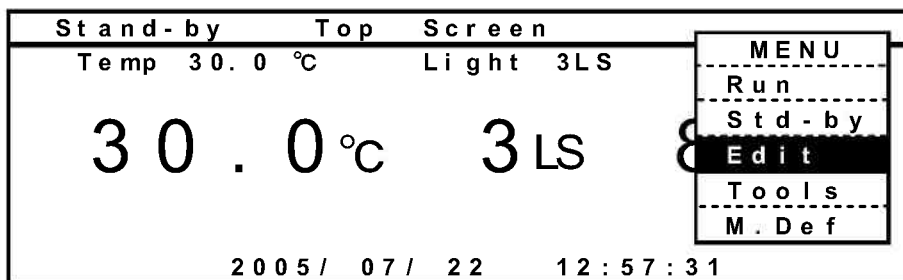
STARTING TIME	6:00	9:00	11:00	13:00	14:00	15:00	17:00	19:00	22:00	23:00	6:00
Temperature(°C)	12	15	20	25	20	18	15	15	12	10	
Humidity(%)	80	80	60	60	60	70	75	80	80	80	
Light step(LS)	1	2	3	5	4	3	1	0	0	0	

Humidity setting is for MLR-351H only.

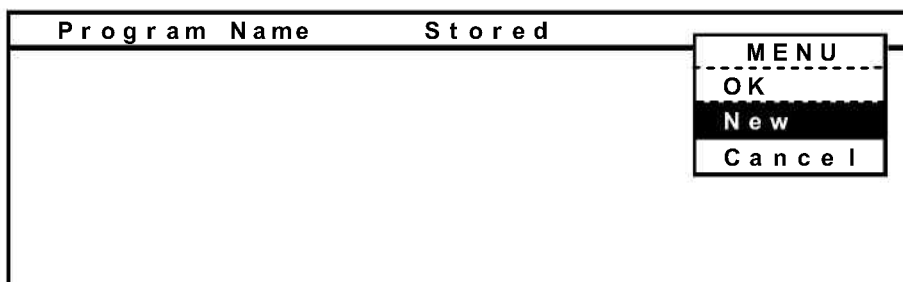
1. With the top screen displayed, press the menu button (MENU) to show the menu window.



2. Select "Edit", and push the enter key (ENTER).



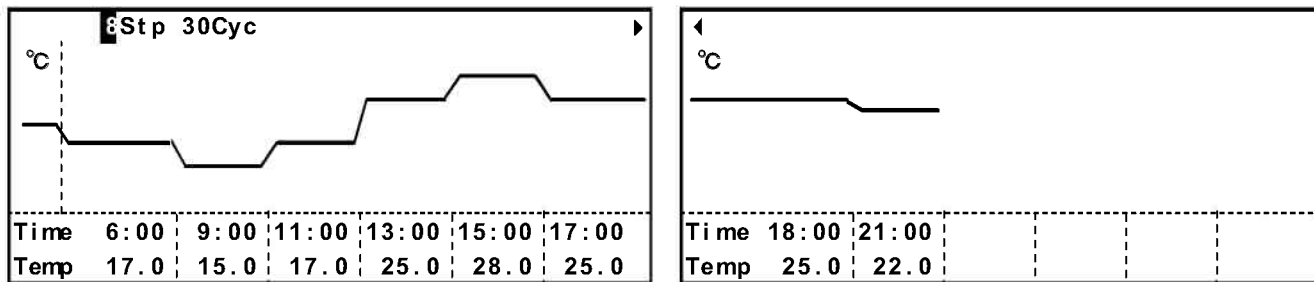
3. The Program Name Stored screen is opened. Press the menu button (MENU) and select "New", and press the enter key (ENTER). The program names are displayed when some programs have already been saved.



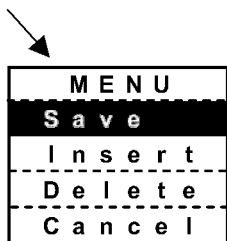
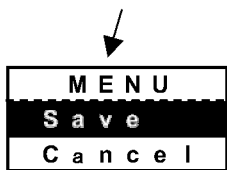
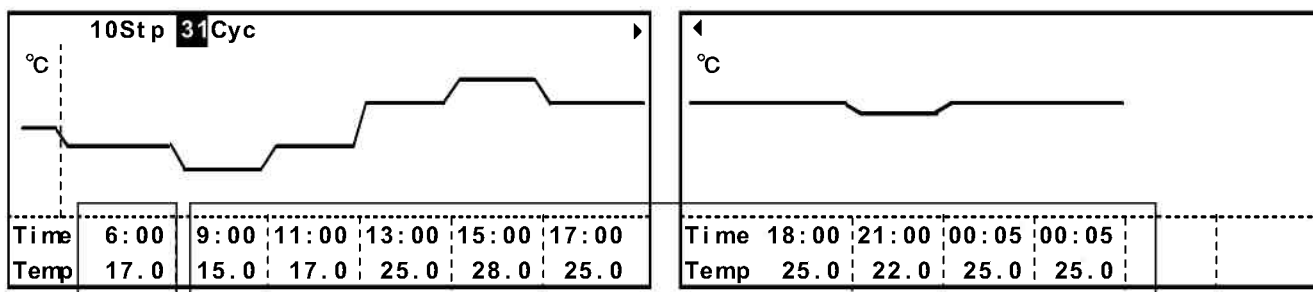


# PROGRAMMING (MENU/Edit)

4. A model program is displayed. The screen is scrolled to the next page by using the rightward shift key.



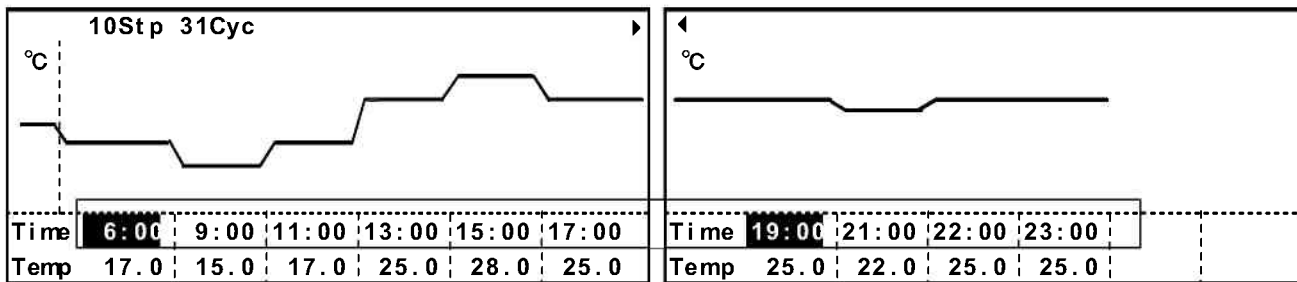
The step number (Stp :step) and cycle number (Cyc :repeat number) can be changed on the top left corner (8Stp 30Cyc) of the screen. Highlight the numerical value by shift key, and input 10Stp 31Cyc by character input key. The step number and cycle number are changed.



The step number (Spt) can be changed by “Insert” or “Delete” on the menu window. Press the menu button (MENU), to open the menu window. The menu window for a first section has no “Insert” or “Delete”. Therefore, neither insert nor delete is effective for the first section. The maximum step number is 12. The cycle number is 1 when the step number is 1. The settable cycle number is up to 98. The cycle number 99 means limitless repeat.

# PROGRAMMING (MENU/Edit)

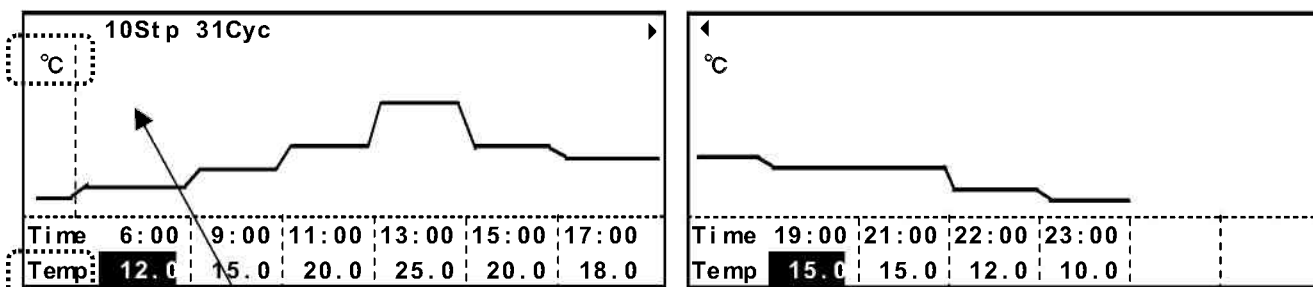
5. Highlight the numerical value of each time section (Time) by shift key, and input as below by character input key.



## ⚠ CAUTION

The time setting value depends on each mode, clock mode and timer mode. In the case of clock mode, the setting range is between 00:00 and 23:59. If the setting is larger than 24:00, the step of immediately before is repeated limitlessly. Set the step with timer order. In the case of timer mode, setting range is between 00:01 and 99:59. The setting of "99:99" causes limitless repeat.

6. Shift a cursor downward by the downward shift key. Set the temperature as follows. The setting range is between 0.0°C and 50.0°C.



During temperature setting, "°C" is displayed at upper left.

## ⚠ CAUTION

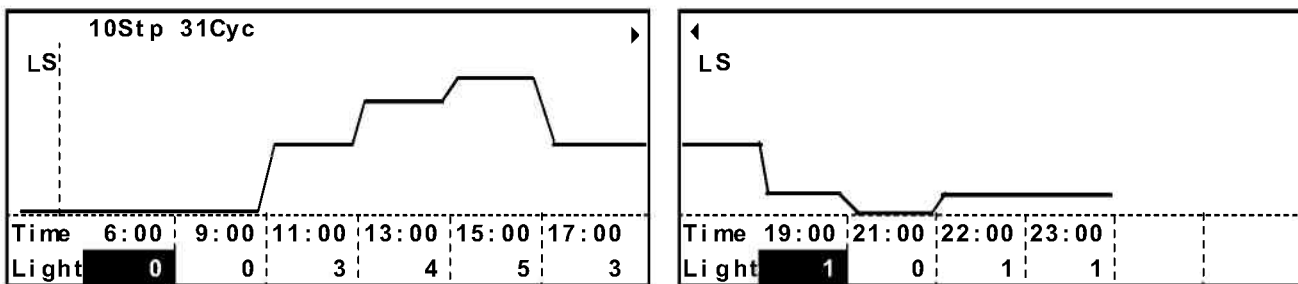
The settable temperature is between 0.0°C and 50.0°C, but the temperature control range for MLR-351H is between 5°C and 50.0°C. The temperature control range is between 10°C and 50.0°C when the light is ON (for MLR-351 and MLR-351H).

## ⚠ CAUTION

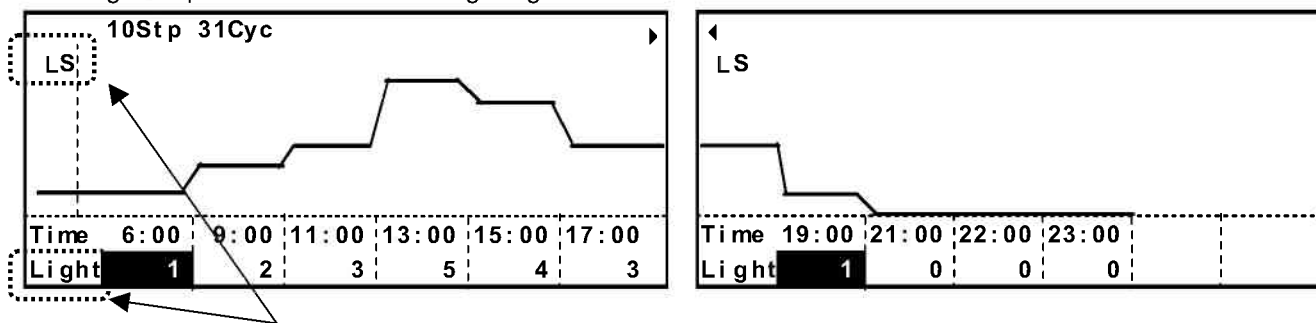
The unit continues to run with a step just before the step having time setting of over 24:00 when a program is run in clock mode.

# PROGRAMMING (MENU/Edit)

7. Shifting a cursor downward by downward shift key moves to the next edit "Light" (light step).

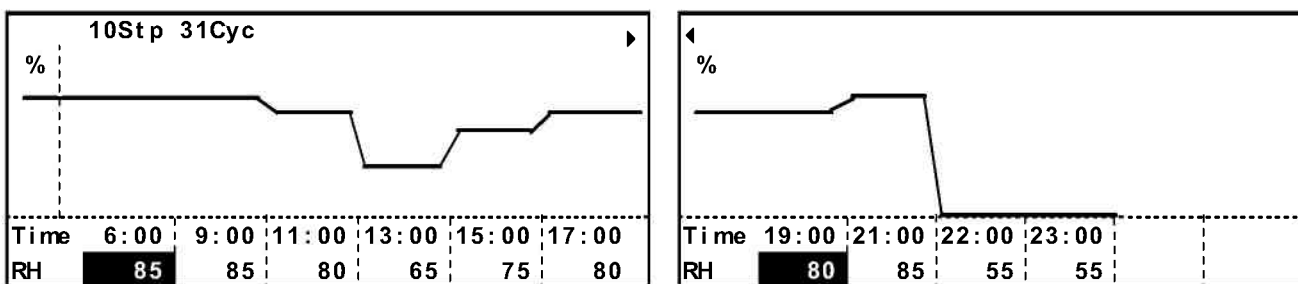


Set a light step as below. The setting range is between 0 and 5.

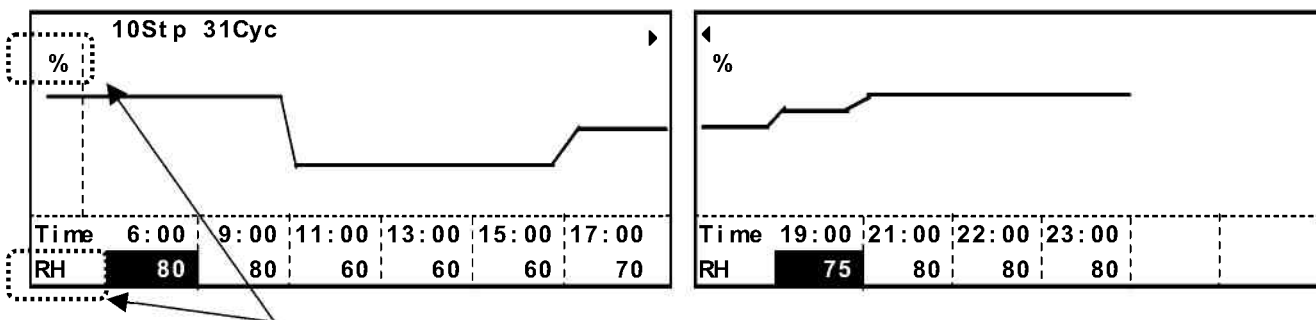


During light step setting, "LS" is displayed at upper left.

8. For MLR-351H, shifting a cursor downward further by the downward shift key moves to the next edit "RH" (relative humidity). For MLR-351, shifting moves to the edit "Temp".



Set a relative humidity as below. The setting range is between 55% and 90%.



During relative humidity setting, "%" is displayed at upper left.

## Note:

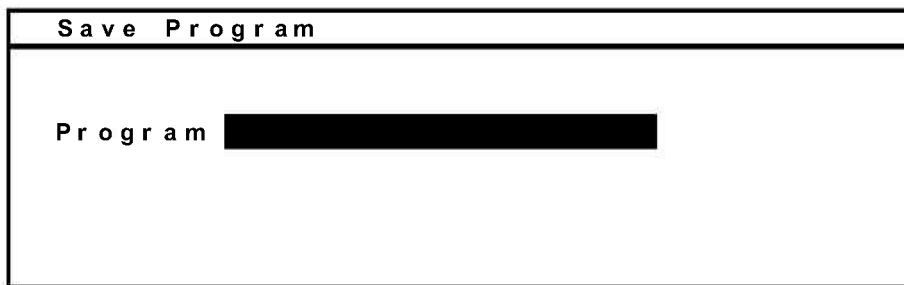
The edit item is shifted with the following order by pressing the downward shift key:

MLR-351: Temperature (Temp), light step (LS), temperature (Temp)

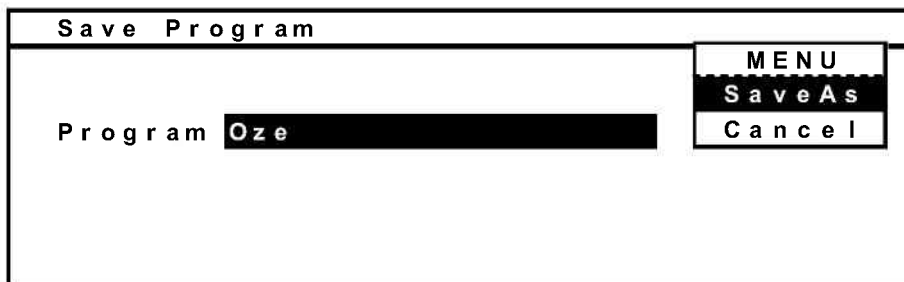
MLR-351H: Temperature (Temp), light step (LS), relative humidity (LH), temperature (Temp)

# PROGRAMMING (MENU/Edit)

9. At the completion of all input, press the menu button (MENU) to show the menu window. Select "Save", and press the enter key (ENTER). Save Program screen is opened.



10. Input a program name (Oze), and press the menu button (MENU) to show the menu window. Select "Save As", and press the enter key (ENTER). The program is entered. The maximum numbers of character for program name is 16. Refer to edit function of characters described below. Up to 10 programs are created and saved.



## Edit function of characters

### Shift key

- **Upward shift key** : Space insertion
- **Downward shift key** : backspace
- **Leftward shift key** : Move a cursor left
- **Rightward shift key** : Move a cursor right

### Character input key

- |                                  |                              |                                  |
|----------------------------------|------------------------------|----------------------------------|
| <b>1 key</b> : space,-,"#, @,1   | <b>2 key</b> : A,B,C,a,b,c,2 | <b>3 key</b> : D,E,F,d,e,f,3     |
| <b>4 key</b> : G,H,I,g,h,i,4     | <b>5 key</b> : J,K,L,j,k,l,5 | <b>6 key</b> : M,N,O,m,n,o,6     |
| <b>7 key</b> : P,Q,R,S,p,q,r,s,7 | <b>8 key</b> : T,U,V,t,u,v,8 | <b>9 key</b> : W,X,Y,Z,w,x,y,z,9 |
|                                  |                              | <b>0 key</b> : &,/, (,),.,0      |

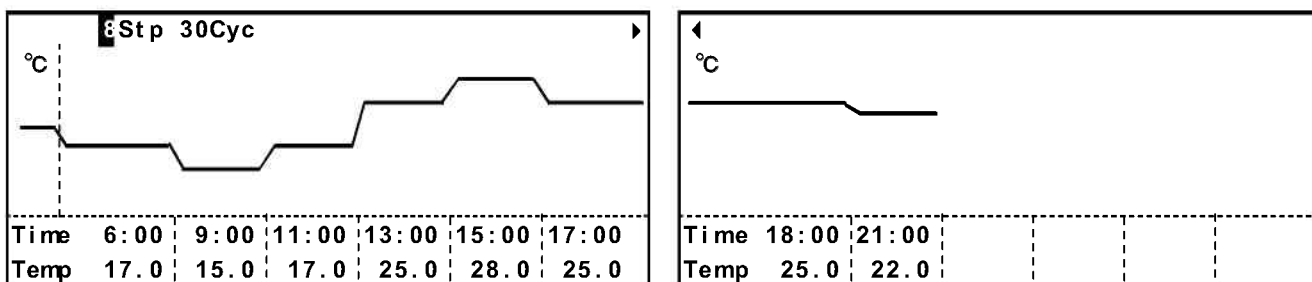
# PROGRAMMING (MENU/Edit)

Example 2:

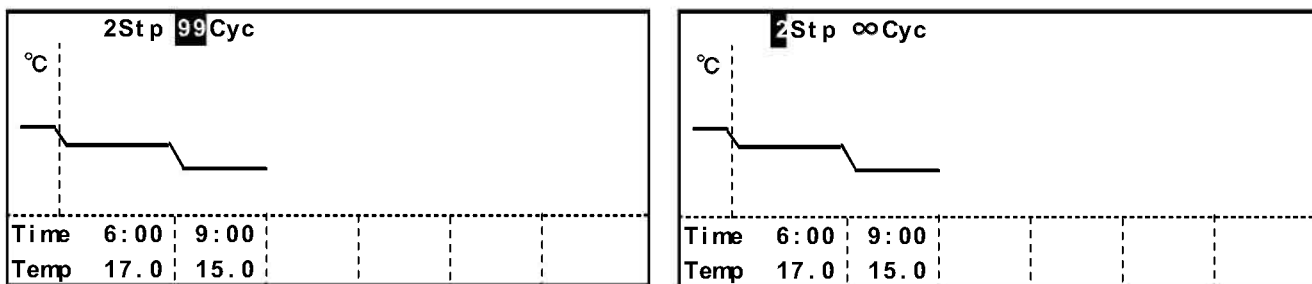
To create the following program with timer mode and name "NIKKO". The cycle is 99, that is limitless repeat.

STEP TIME	48	36
Temperature (°C)	20	30
Humidity (%)	80	60
Light step (LS)	3	5

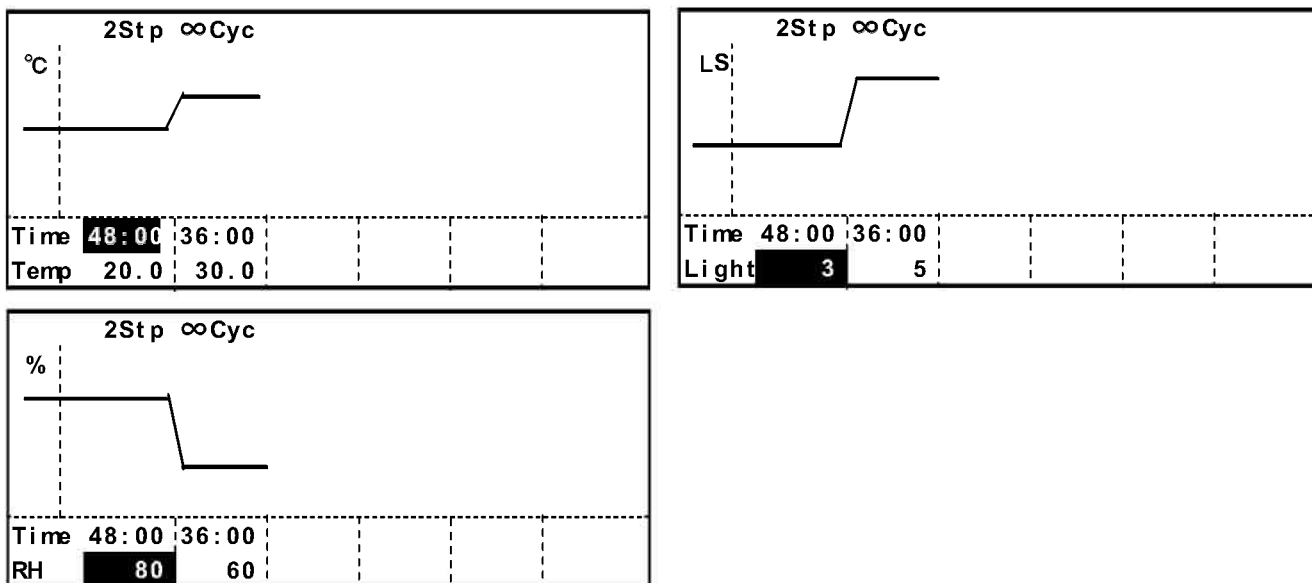
1. Display a model program as shown on page 23.



Change the step number and cycle number to 2Stp and 99Cyc by character input key. Only one page is displayed and 99 is changed into ∞. Display of ∞ changes 99 when lapped by a cursor.



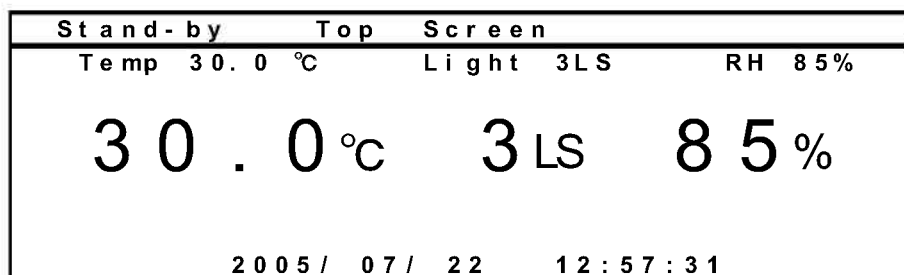
2. Set a time, temperature and relative humid (MLR-351H only) as same as Example.1.



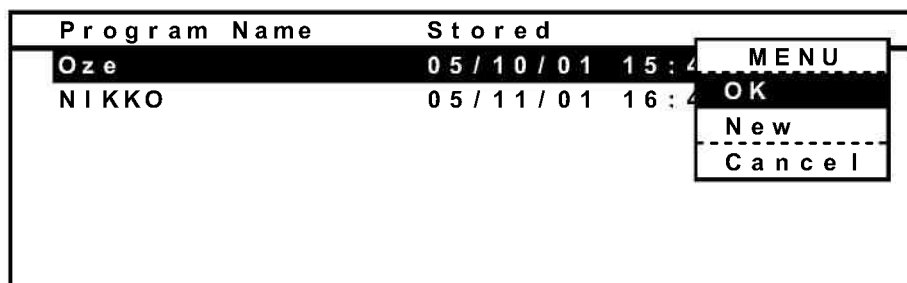
3. Input a program name (NIKKO), pres the menu button (MENU) to show the menu window. Select "Save As", and press the enter key (ENTER) to save the program as same as Example.1.

# EDIT OF SAVED PROGRAM (MENU/Edit)

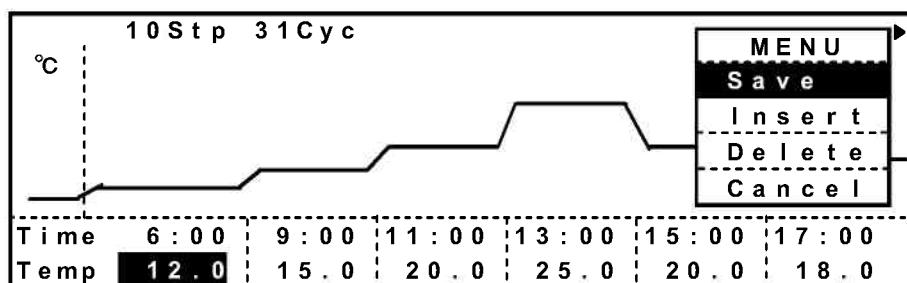
1. With the top screen displayed, press the menu button (MENU) to show the menu window. Select "Edit", and press the enter key (ENTER).



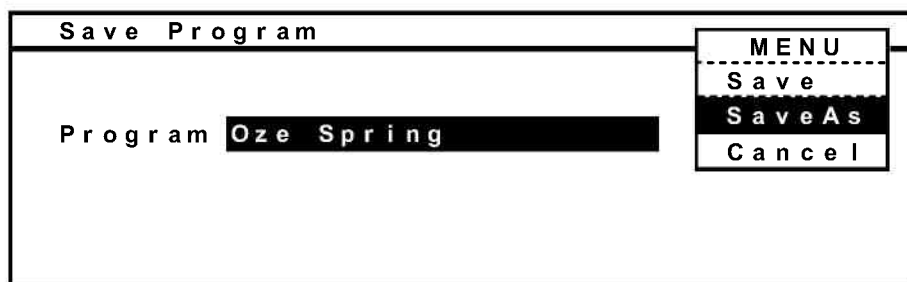
2. The saved programs are shown. Select a program (for example : Oze) to be edited and press the menu button (MENU). The menu window is opened. Select "OK", and press the enter key (ENTER).



3. The program "Oze" is displayed. After changing the setting, press the menu button (MENU) to show the menu window. Select "Save", and press the enter key (ENTER).

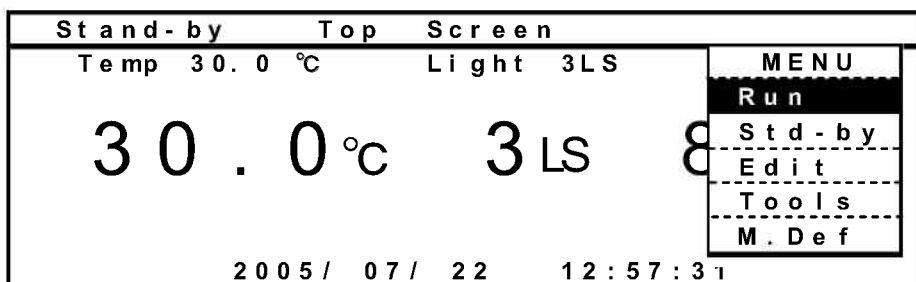


4. Save Program screen is opened. Input program name, and press the menu button (MENU) to show the menu window. Select "SaveAs" when saving by overwriting, or select "Save" when saving with another program name. Press the enter key (ENTER). The edited program is entered. Do not select "SaveAs" with same program name as another program.

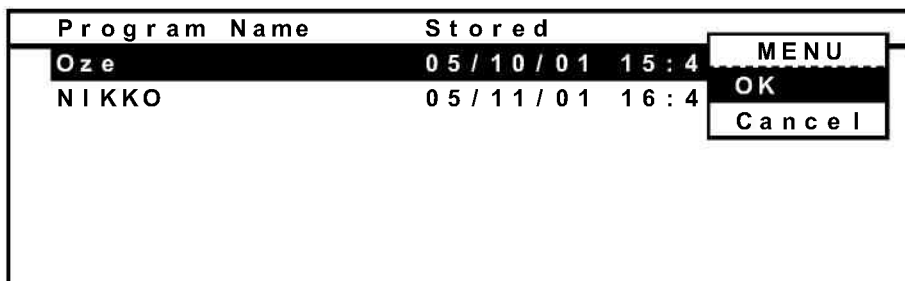


# START OF PROGRAM (MENU/Run)

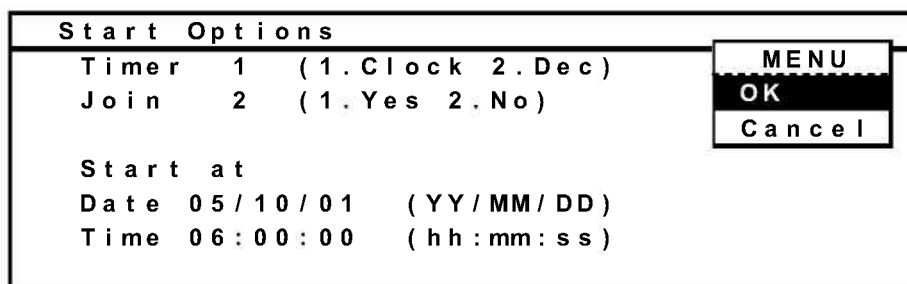
1. With the top screen displayed, press the menu button (MENU) to show the menu window. Select "Run", and press the enter key (ENTER).



2. Program Name Stored screen is opened. Select "Oze" and press the menu button (MENU) when starting "Oze" program. Select "OK" on the menu window, and press the enter key (ENTER).



3. Start Options screen is opened. On this screen, setting of Timer (selection of Clock mode or Timer mode), Join (Joining some programs), and start date is available. As the "Oze" is for clock mode, select 1 (Clock) for Timer. For join, select 2 (No : not join) since the Oze does not have joined program. Input the start date (2005 10 01) and time (06:00:00), and press the menu button (MENU) to show the menu window. Select "OK", and press the enter key (ENTER).



- Timer (selection of Clock mode or Timer mode)

1. Clock (Clock mode): Displays start time of each steps.
2. Dec (Timer mode): Displays the remaining time up to a next step.

- Join (Joining some programs)

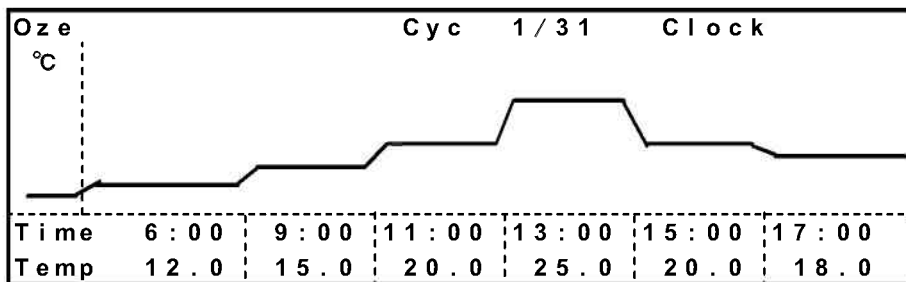
Join 1.Yes: The joined programs are operated when a selected program is set as a join program. Refer to page 32 for details.

- Start at (desired start date)

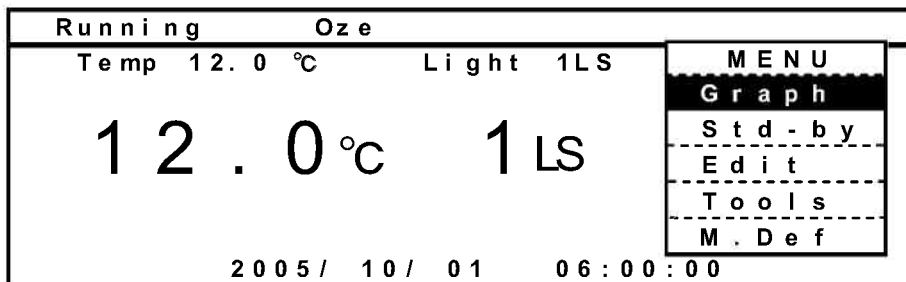
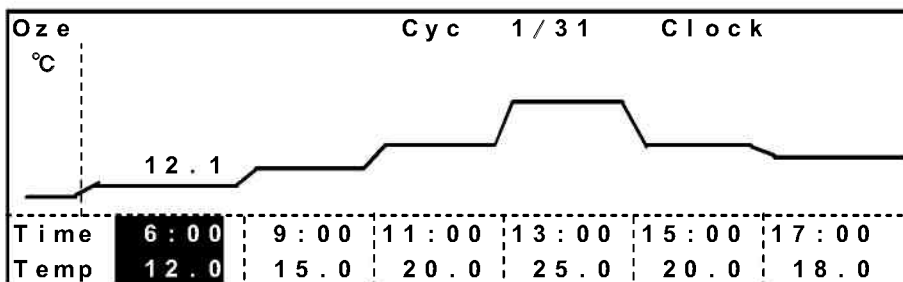
First, date and time when the window is opened is displayed. Input the desired start date and time.

# START OF PROGRAM (MENU/Run)

4. The selected program is displayed. Check the program and press the menu button (MENU) to show the menu window. Select "Start", and press the enter key (ENTER).



5. The program is started at desired date and time. During the programmed running, the graphic screen as below is displayed. To change the graphic screen to the top screen, press the menu button (MENU) to show the menu window. Select "Top" and press the enter key (ENTER). To change to the graphic screen, press the menu button (MENU) to show the menu window. Select "Graph" and press the enter key (ENTER).





# JOIN FUNCTION

The unit has join function to run several programs continuously. The maximum program to be joined is 9. The setting of join function is as follows:

1. When joining three programs Spring, Summer and Autumn, input the same character string, # , and one digit figure (joined order) before the each program name. Each program operates as a special program for join function. Any character or figure is permitted for a string on the top. The program cannot be joined when the character string is not same.

**Note:** The characters after one digit figure have no effect on the join function.

Ex.1: When joining the program Spring, Summer and Autumn with this order and top character string is "Oze" the input for the join function is as follows:

Oze#1 Spring    Oze#2 Summer    Oze#3 Autumn

Ex.2: When joining in the order of Autumn, Spring and Summer and input "NIKKO" as the same character string, the input for the join function is as follows:

NIKKO#2 Spring    NIKKO#3 Summer    NIKKO#1 Autumn

2. When running the joined program in Ex.1, select the program Oze#1 Spring on the Program Name Stored screen in MENU/Run (Refer to page 30).

**Note:** The program Oze#2 Summer is selected, the program Oze#2 Summer and Oze#3 Autumn are performed. Oze#1 Spring is not joined.

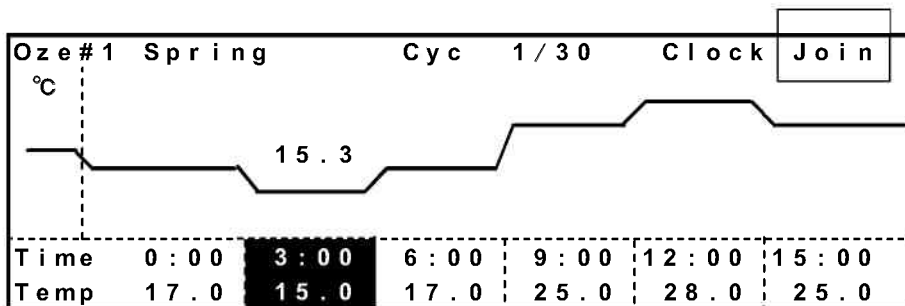
3. Select 1.Yes for the join function on the Start Options screen. Press the menu button (MENU) to show the menu window. Select "OK" and press the enter key (ENTER).

**Note:** The joined function is not effective if select 2. No on the Start Options screen.

4. Press the menu button (MENU) to show the menu window. Select "Start" and press the enter key (ENTER). The joined program is started.

## 5. Running result

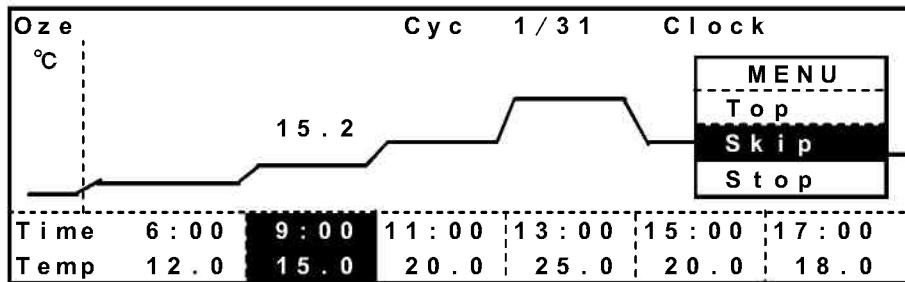
Run in the order of Oze#1 → Oze#2 → Oze#3. During the running of joined program, "Join" is displayed at the upper right on the screen.



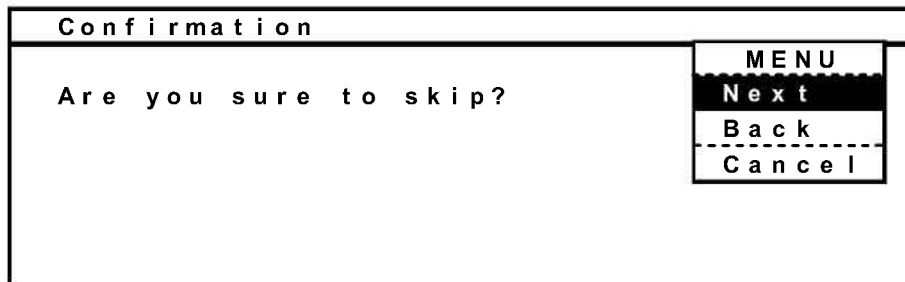
# SKIP OF STEP (MENU/Skip)

During the programmed running, the skip function is effective to skip a current step in the program.

1. Press the menu button (MENU) to show the menu window and select "Graph" when the top screen is displayed. Then press the enter key (ENTER).
2. Press the menu button (MENU) under program running and the menu window is opened. Select "Skip", and press the enter key (ENTER).



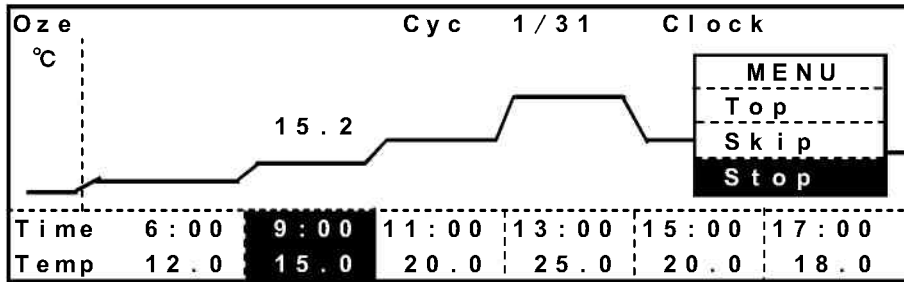
3. The Confirmation screen is displayed. Press the menu button (MENU). Selecting "Next" causes the skip to the next step. Selecting "Back" causes the skip to the previous step. After selecting "Next" or "Back", press the enter key (ENTER).



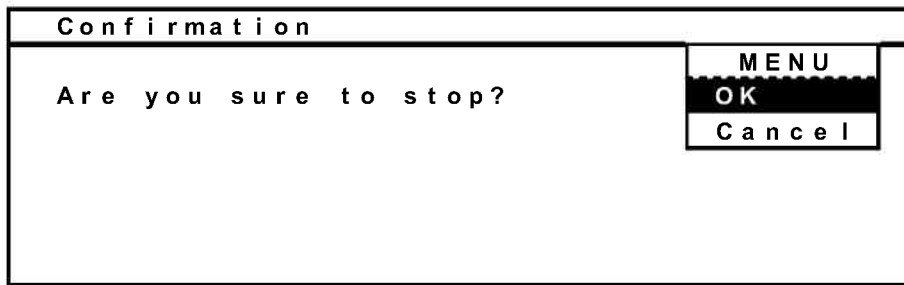
# STOP OF PROGRAM (MENU/Stop)

During the programmed running, it is possible to stop the running at any step.

1. Press the menu button (MENU) to show the menu window and select "Graph" when the top screen is displayed. Then press the enter key (ENTER).
2. Press the menu button (MENU) under program running and the menu window is opened. Select "Stop", and press the enter key (ENTER).



3. The Confirmation screen is displayed. Press the menu button (MENU). Selecting "OK" and press the enter key (ENTER) to stop the program.



4. After stopping the program, the unit continues to run with the setting of standby operation.

# AUTOMATIC DEFROST (MENU/Tools)

This product has a main evaporator to lower chamber temperature and a sub evaporator to lower chamber humidity. Automatic defrost function defrosts the frost on the main and sub evaporators automatically at 3:00 a.m. and 3:00 p.m. in a day. Following 3 defrost patterns are selectable. It is not possible to stop the starting of automatic defrost. The default setting is pattern 2 (recommendation). In case the setting temperature is lower than 10°C, select pattern 2 or 3.

**Warning:** During defrosting, the chamber humidity is unstable. (MLR-351H only)

	AM 3:00	PM 3:00
1	Sub evaporator	Sub evaporator
2	Main evaporator + Sub evaporator	Sub evaporator
3	Main evaporator + Sub evaporator	Main evaporator + Sub evaporator

1. Press the menu button (MENU) to show the menu window and select "Tools" when the top screen is displayed. Then press the enter key (ENTER).
2. Select "Date Time" on the Select Tools screen, and press the menu button (MENU) to show the menu window. Select "OK" and press the enter key (ENTER).

Select Tools MLR-351H
Log
<b>Date Time</b>
Alarm Setting
Reserved
Default Setting
Delete User Data

2. The Date Time screen is displayed. Input the defrost timer pattern (1, 2, or 3).

Date Time
Date 05/11/28 (YY/MM/DD)
Time 14:30:00 (hh:mm:ss)
Log Interval 6min (2-30)
Def Timer <b>2</b> (1-3)

## CAUTION

A sub evaporator tends to get much frost than a main evaporator. Therefore, the automatic defrost is applied to the sub evaporator twice a day.

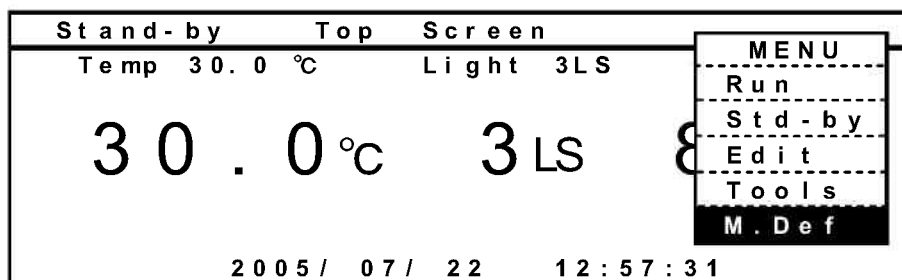
The manual defrost for the main evaporator is needed when the automatic defrost is not sufficient to remove the frost. For the manual defrost, refer to page 36.

# MANUAL DEFROST (MENU/M.def)

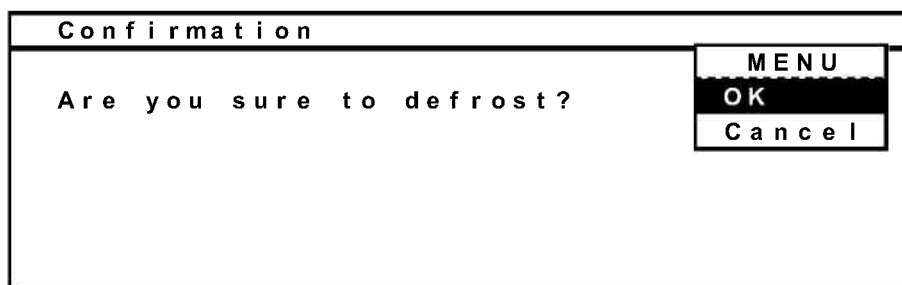
The manual defrost function is for defrosting the frost on the main evaporator at any time. The manual defrost can be started during programmed running, standby operation, or automatic defrosting. The manual defrost function is applied to the sub evaporator too.

When a lot of frost on the main evaporator is found, start the manual defrost.

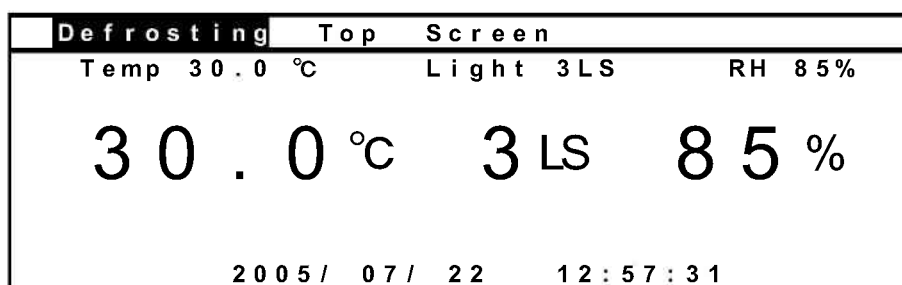
1. Press the menu button (MENU) to show the menu window. Select "M.Def" and press the enter key (ENTER).



2. The Confirmation screen is displayed. Press the menu button (MENU) to show the menu window. Select "OK", and press the enter key (ENTER).



3. The manual defrost is started. During defrosting, "Defrosting" is displayed at the upper left on the top screen.

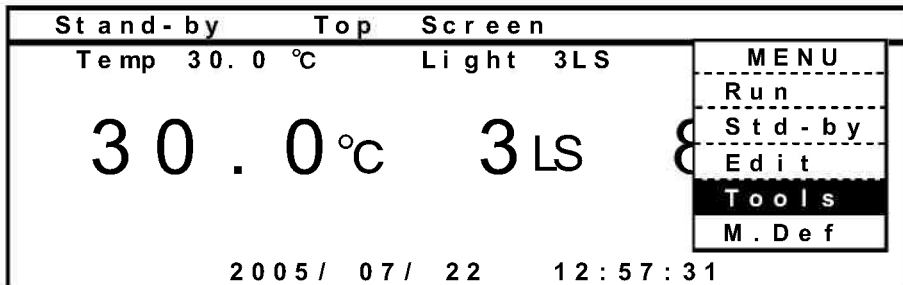


4. The manual defrost is finished automatically. The defrosting time depends on the amount of frost on the evaporator.

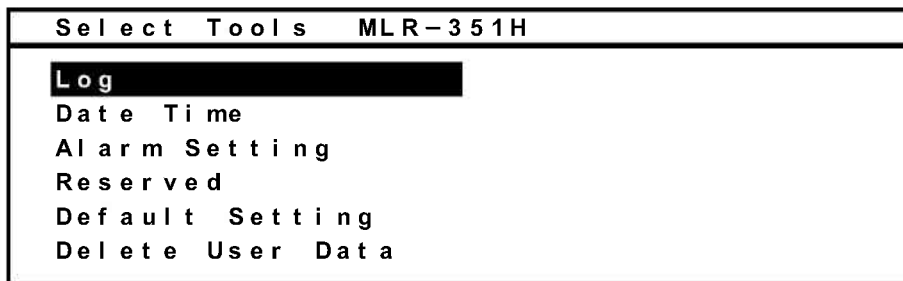
# VARIOUS SETTING (MENU/Tools)

The log can be displayed and various setting can be changed by using "Tools" menu.

1. Press the menu button (MENU) with the top screen displayed to show the menu window. Select "Tools, and press the enter key (ENTER).

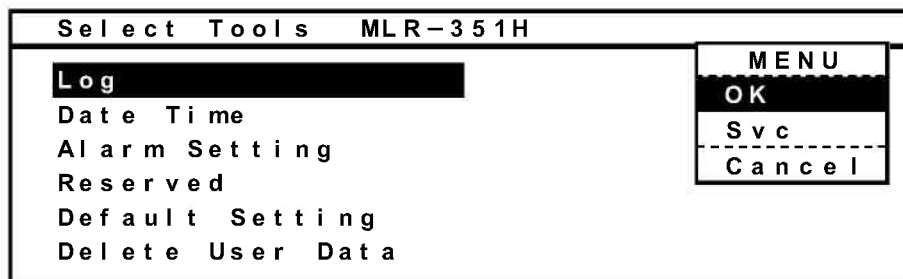


2. The Select Tools screen is as follows.

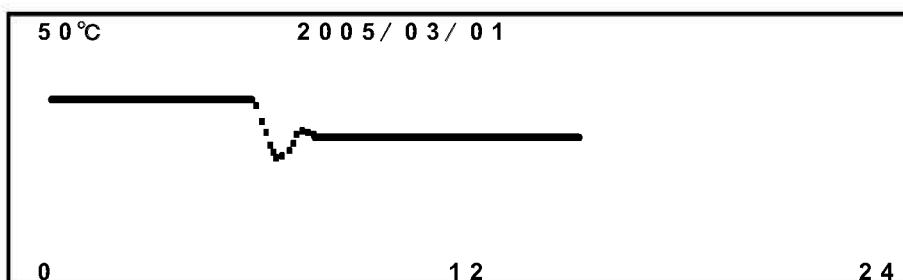


## Display of log (Tools/Log)

1. Select "Log" in the Select Tools screen. Press the menu button (MENU) to show the menu window. Select "OK", and press the enter key (ENTER).



2. The log is presented with dot. By pressing the upward shift key or downward shift key, the log to be displayed is changed; temperature, light step, and humidity (MLR-351H only). The displayed date is scrolled by pressing the leftward or rightward shift key. (leftward shift key; older date, rightward shift key; newer date.)

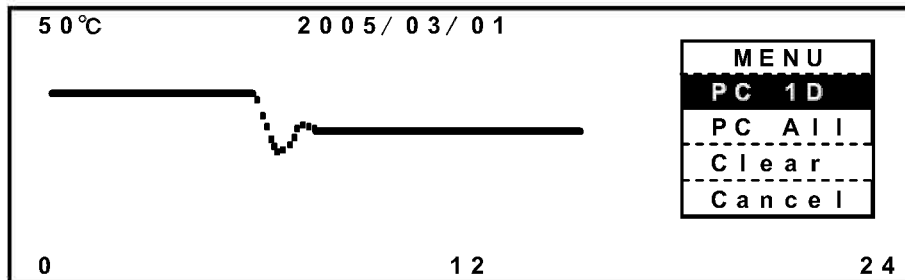


# VARIOUS SETTING (MENU/Tools)

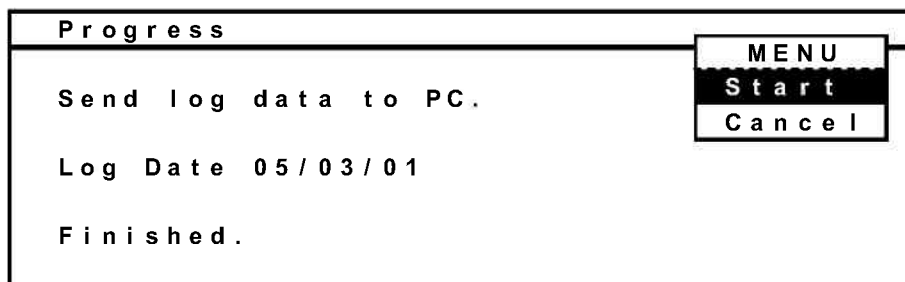
## Data transmission

The procedure to transmit the log data to a PC is as follows.

1. Press the menu button (MENU) to show the menu window. Select "PC 1D", and press the enter key (ENTER) when the log for one day is necessary. Select "PC All", and press the enter key (ENTER) when all data recorded is necessary.



2. The Progress screen is displayed. Specify a transfer, capture of text and retention file by operation of hyper terminal on PC. Apply "txt" or "csy" as an extension of retention file. Press the menu button (MENU) to show the menu window. Select "Start", and press the enter key (ENTER). The transmission is started. "Finished" display means the end of transmission.



## Setting in PC side for transmission of log data (For Windows 2000, and Windows XP)

1. From start button, start the hyper terminal (start button → program → accessory → communication -hyper terminal).  
(when not registered in the start menu, C:\Program Files\Windows NT\hypertm.exe)
2. Through the hyper terminal display, set a new connection, a name (for example: Sanyo), a connection, a connecting method, COM1, property of COM1, and a port.  
bit/sec; 9600, data bit; 8, parity; no, stop bit; 1, flow control; Xon/Xoff.  
(Communicating condition of MLR-351 side is set as above automatically when the Progress screen is displayed.)

### Note:

For the data transmission, an optional communication terminal MTR-480 (see page 57) and a 9 pin cable of Dsub cross type for RS232C are needed.

# VARIOUS SETTING (MENU/Tools)

## Setting of date, time, log (Tools/Date Time)

1. Select "Date Time" in the Select Tools screen. Press the menu button (MENU) to show the menu window. Select "OK", and press the enter key (ENTER).

Select Tools MLR-351H	
Log	MENU OK Svc ----- Cancel
<b>Date Time</b>	
Alarm Setting	
Reserved	
Default Setting	
Delete User Data	

2. The Date Time screen is displayed. Set date, time, or log cycle.

Date Time	
Date	<b>05/11/28</b> (YY/MM/DD)
Time	14:30:00 (hh:mm:ss)
Log Interval	6min (2-30)
Def Timer	2 (1-3)

■ Date input (Ex: November 28, 2005)

Input 051128 in the date cell.

■ Time input (Ex: half past 2:00 p.m.)

Input 143000 in the time cell.

■ Log cycle input (Ex: 10 minutes)

Input 10 in log Interval cell. The acceptable range is between 2 and 30 minutes. The default is 6 minutes.

■ Relation between the log interval and spans that can be memorized

1: Log interval 2 min About 5 days

2: Log interval 6 min About 14 days

3: Log interval 30 min About 70 days

After passing the memory limit, the older data is deleted and newer data is memorized.

■ Setting of automatic defrost (defrost of main and sub evaporator per a day)

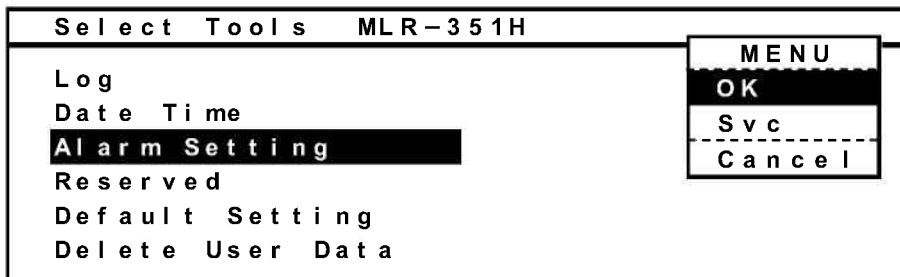
Select a one of three defrosting patterns (1, 2, or 3). The default is 2. For the details of automatic defrost, refer to page 35.



# VARIOUS SETTING (MENU/Tools)

## Alarm setting (Tools/Alarm Setting)

1. Select "Alarm Setting" in the Select Tools screen. Press the menu button (MENU) to show the menu window. Select "OK", and press the enter key (ENTER).



2. The Alarm Setting screen is displayed. On this screen, the temperature alarm, the humidity alarm (MLR-351H only), and alarm resume time (ring back) can be set.

<Ring Back>

The alarm buzzer is silenced by pressing the alarm buzzer stop key (BUZZER) during alarm condition. The buzzer will be activated again after certain suspension if the alarm condition continues. The suspension time (ring back) can be set. The ring back is applicable to the temperature alarm only. Refer to page 47 for details.

Alarm Setting		
Temp Alarm	±2.5°C	(±1.0°C - ±10.0)
RH Alarm	±10%	(±3% - ±15%)
Ring Back	30min	(0.OFF 1-99min)

The settable range:

- Temperature alarm (Temp Alarm): ±1.0~±10.0°C.
- Humidity alarm (RH Alarm): ±3~±15%.
- Suspension time (Ring Back): 1~99 minutes, or OFF

## Display of top screen (Tools/Reserved)

Select "Reserved" in the Select Tools screen. Press the menu button (MENU) to show the menu window. Select "OK", and press the enter key (ENTER).

This procedure shows the top screen.

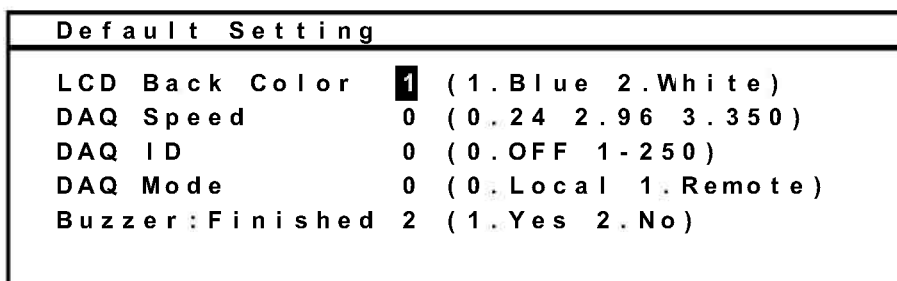
# VARIOUS SETTING (MENU/Tools)

## Default setting (Tools/Default Setting)

1. Select "Default Setting" in the Select Tools screen. Press the menu button (MENU) to show the menu window. Select "OK", and press the enter key (ENTER).



2. The Default Setting screen is displayed. Set the default for each parameter as necessary.



**LCD Back Color:** Setting of background color (1. Blue 2. White)

**DAQ Speed:** Setting of DAQ speed. Select 0. 24 (2400) that is a normal command mode. 3. 350 is a special command mode for old model MLR-350.

**DAQ ID:** Set a no repeating ID number between 1 and 250 when an optional communication terminal.

**DAQ Mode:** When selecting 0.Local, the set value can be changed through Stand-by Setting and can not be changed from PC side. When selecting 1.Remote, set value can be changed from PC side and can not be changed though Stand-by Setting. DAQ mode is valid when DAQ speed is 0. 24 or 2. 96.

**Buzzer: Finished:** Select of buzzer activation (1: Yes) or no activation (2: No) at the time of completion of a programmed running. (The buzzer activates 6 times when a program is finished.)

### Note:

DAQ is an external monitoring system of chamber status. Refer to DAQ manual for details.

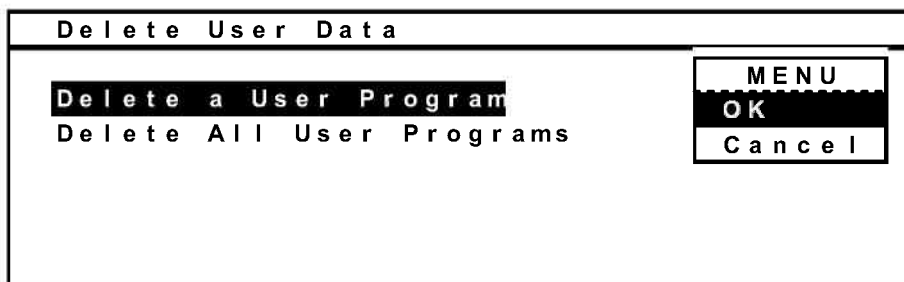
# VARIOUS SETTING (MENU/Tools)

## Delete of program (Tools/Delete User Data)

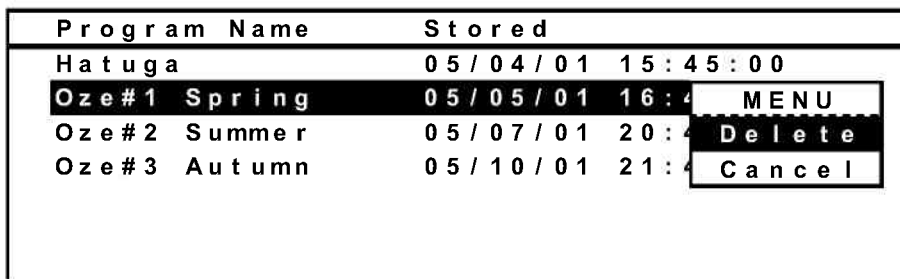
1. Select "Delete User Data" in the Select Tools screen. Press the menu button (MENU) to show the menu window. Select "OK", and press the enter key (ENTER).



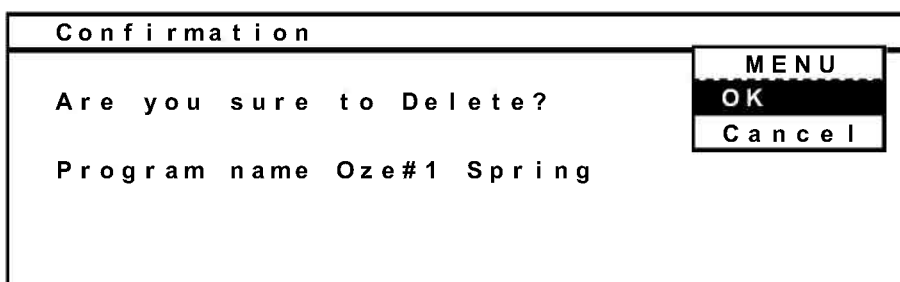
2. The Delete User Data screen is displayed. To select a program to be deleted, select "Delete a User Program" and press the menu button (MENU) to show the menu window. Select "OK" and press the enter key (ENTER).



3. A list of saved programs is displayed. Select a program (Ex: Oze#1 Spring) to delete, press the menu button (MENU) to show the menu window. Select "Delete" and press the enter key (ENTER).

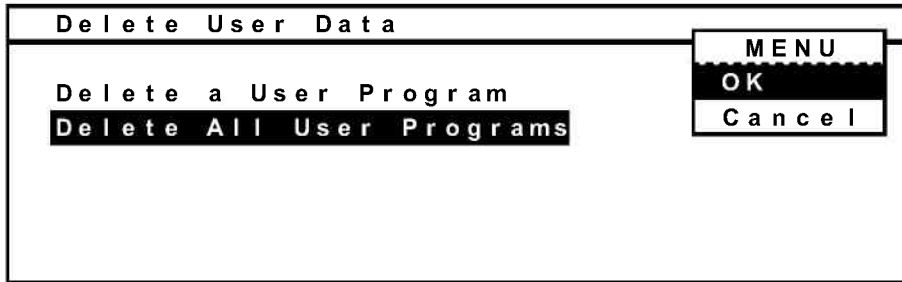


4. The Confirmation screen is displayed. Press the menu button (MENU) to show the menu window. Select "OK", and press the enter key (ENTER). The program (Oze#1 Spring) is now deleted.

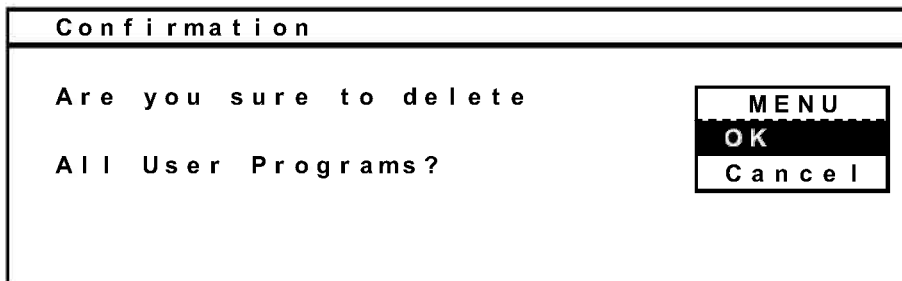


# VARIOUS SETTING (MENU/Tools)

5. To deleting all programs, select "Delete All User Programs" in Delete User Data screen and press the menu button (MENU) to show the menu window. Select "OK" and press the enter key (ENTER).



6. The Confirmation screen is displayed. Press the menu button (MENU) to show the menu window. Select "OK", and press the enter key (ENTER). All of the programs are now deleted.



# LIGHT STEP (ILLUMINANCE SETTING)

The light step is for maintaining a constant illuminance within the chamber.

The relationship between the light step (LS) and a number of fluorescent lamps to be lit is as follows:

Light step 0:	All lamps OFF
Light step 1:	1 lamp ON
Light step 2:	2 lamps ON
Light step 3:	3 lamps ON
Light step 4:	9 lamps ON
Light step 5:	15 lamps ON

The graph below shows the relationship between the light step setting, illuminance, and photosynthesis photon flux density characteristics.

**Caution:**

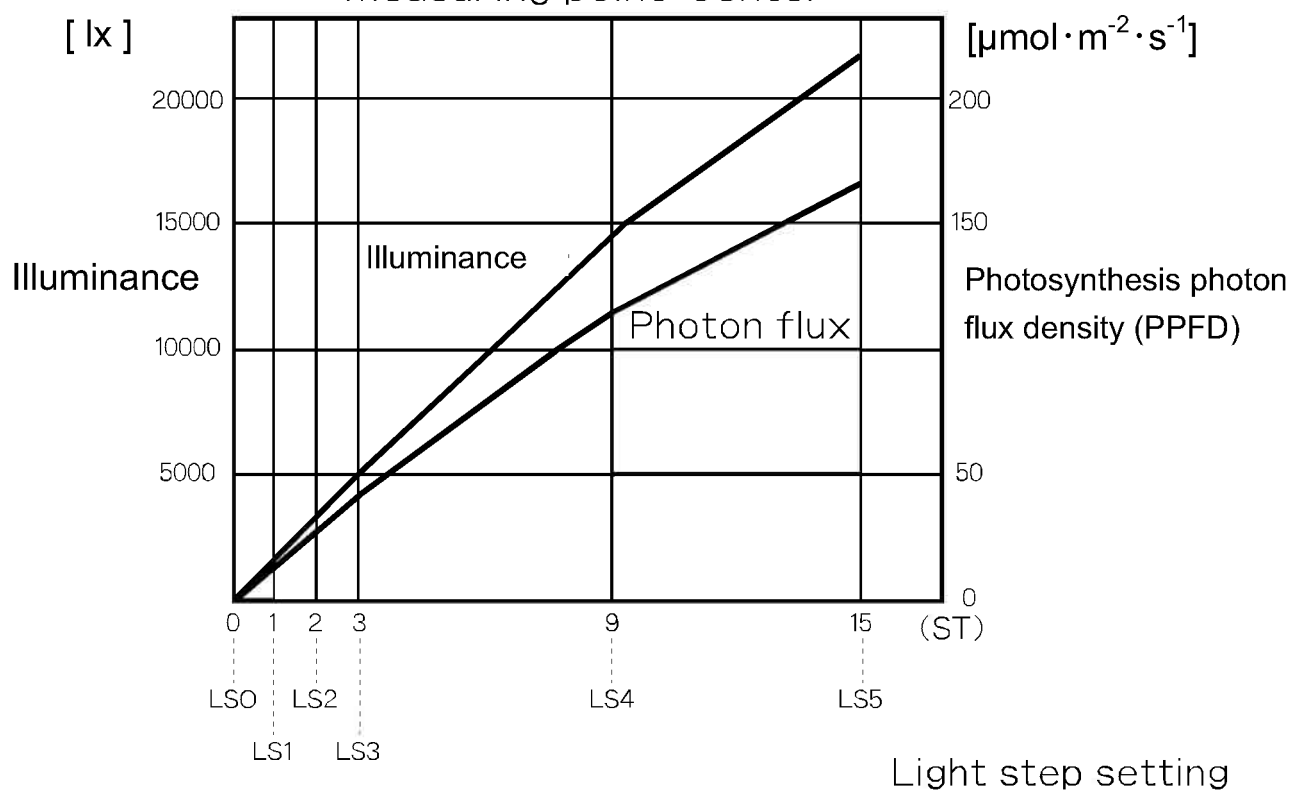
Type of the fluorescent lamp should be FL40SS W/37. Other type of lamp will affect on the power consumption and/or brightness.

conditions External temperature: 20°C

Internal temperature: 25°C

New fluorescent lamps (FL40SS-W/37)

Measuring point: center

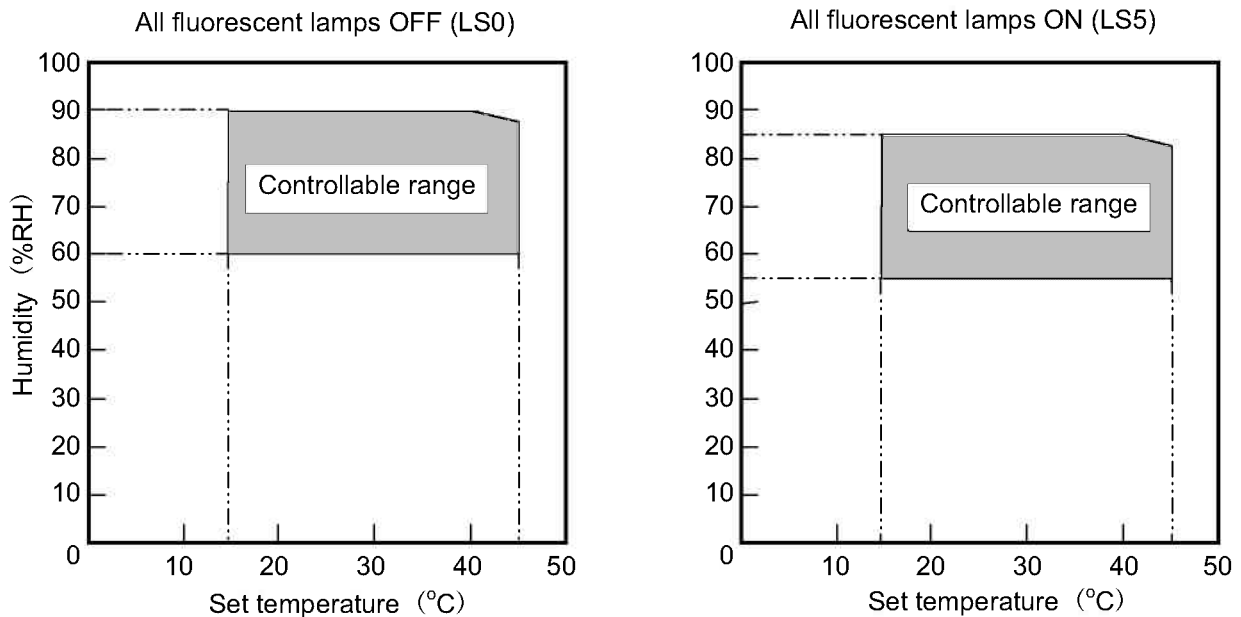


# HUMIDITY CONTROL (MLR-351H ONLY)

The chamber humidity can be set to any value within the range of 55 to 90% RH though the keys on the control panel. Input of any value outside of this range is invalid.

The humidity control operates when the temperature setting is between the range 15 and 45°C. The desired humidity may not be obtained if the temperature setting is outside of this range. Refer to the humidity control range below. To disable the humidity control, enter a value of 00% RH as the humidity setting.

The humidity control range



## **⚠ CAUTION**

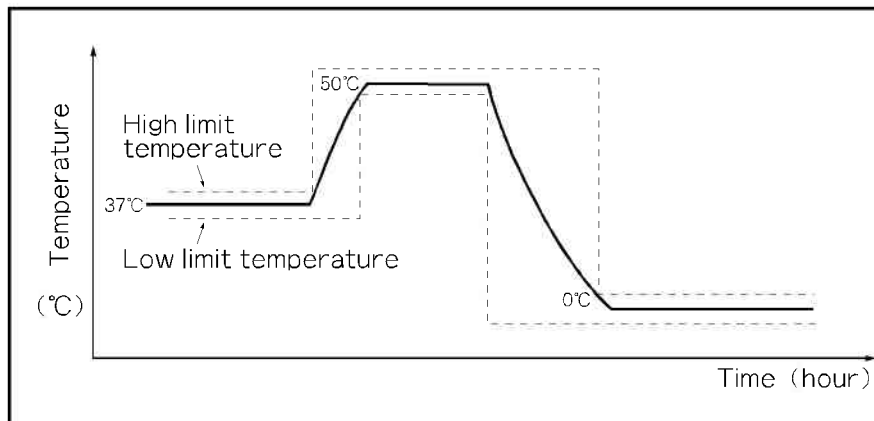
The humidity control is effective after the chamber temperature is stabilized between  $-1.5^{\circ}\text{C}$  and  $+2.5^{\circ}\text{C}$  of the temperature setting. The humidity display shows a value greater than the humidity setting if the chamber temperature is outside of the range. This is not a malfunction.

It takes much to reach the desired humidity if the chamber is wet or a large amount of load including humidity is placed in the chamber during low humidity operation.

# ALARMS & SAFETY FUNCTIONS

## Temperature alarm

The alarm functions incorporated in this unit include temperature alarm other than high/low limit temperature alarm. This function operates when the chamber temperature deviates from the set value by more than the alarm temperature ( $\pm 1.0 \sim 10.0^\circ\text{C}$  changeable). This temperature alarm activates as follows during the programmed running as well. For the details, see page 47.



## Humidity alarm

For MLR-351H, the humidity alarm is operated when chamber humidity deviates from the set value by more than the alarm humidity ( $\pm 3.0 \sim 10.0\%$  changeable). For the details, see page 47.

## Safety functions

The unit has not only some alarm functions but also safety functions to keep the desired chamber condition. The details of the safety functions, see page 47.

## Operation after power failure

The set value is memorized by nonvolatile memory. Accordingly, the chamber resumes the operation with setting before power failure. During the power failure, the clock function is operating.

- In the clock mode, the operation resumes from the step (date and time) when power is recovered. Accordingly, the running step may be shorter than program.
- In the timer mode, the operation resumes with remained time before power failure. The time during power failure is not counted.

# ALARMS & SAFETY FUNCTIONS

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

Alarms & safety	Situation	Indication	Buzzer	Safety operation
Temperature alarm	Chamber temp. exceeds the alarm temp. ( $\pm 1.0\sim 10.0^{\circ}\text{C}$ changeable) Chamber temp. exceeds $20^{\circ}\text{C}$ in during defrosting	Chamber temperature flashes	Intermittent tone with 15 minutes delay	Remote alarm with 15 minutes delay High alarm; heater OFF Low alarm; compressor OFF
Humidity alarm	Chamber humidity exceeds the alarm humidity ( $\pm 3.0\sim 10.0\%$ changeable)	Chamber humidity flashes	-----	-----
High limit temperature alarm	Chamber temp. exceeds over-heat limit temp. ( $15\sim 55^{\circ}\text{C}$ changeable)	-----	Intermittent tone	Heater, fluorescent amp, fan motor OFF Remote alarm
Low limit temperature alarm	Chamber temp. exceeds over-cool limit temp. ( $-10\sim 25^{\circ}\text{C}$ changeable)	-----	Intermittent tone	Compressor OFF Remote alarm
Door alarm	The door is open during more than 2 minutes	"Door" is flashed	Intermittent tone	-----
Thermal fuse	Chamber temp. exceeds $70^{\circ}\text{C}$	-----	-----	Fusing Heater, fan motor OFF
Thermal sensor abnormality	Input voltage is lower than suitability of $-25^{\circ}\text{C}$	"Error 01: Temp sensor is opened." is displayed	Intermittent tone	Heater, fluorescent lamp, fan motor compressor OFF Remote alarm
	Input voltage is higher than suitability of $70^{\circ}\text{C}$	"Error 02: Temp sensor is shorted" is displayed		
Humidity sensor abnormality (MLR-351H only)	Input voltage is lower than suitability of 5% RH.	"Error 03: RH sensor level is low." is displayed	Intermittent tone	Humidity control OFF
	Input voltage is higher than suitability of 120% RH.	"Error 04: RH sensor level is over" is displayed		
Auto MENU erase	With top screen or run screen, there is no key operation for more than 1 minute	-----	-----	Disappear of menu screen
Running program back-up	During power failure	-----	-----	Nonvolatile memory Resumes running after power recovery
Clock function back-up	During power failure	-----	-----	Continuous running by a battery (CR2032)
Ring back	The alarm condition of temp. continues after silencing the alarm buzzer. Default time: 30min (1~99 min changeable)	-----	-----	-----

**Note:**

- By the alarm buzzer stop key (BUZZER), the buzzer of temperature alarm, disconnected or short-circuited sensor alarm can be silenced, but the key cannot stop the buzzer of high limit/low limit temperature alarm.



# ROUTINE MAINTENANCE

## **⚠ WARNING**

**Always disconnect the power supply to the unit prior to any repair or maintenance** of the unit in order to prevent electric shock or injury.

**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.

## Cleaning of unit

- Clean the unit once a month. Regular cleaning keeps the unit looking new.
- Use a dry cloth to wipe off small amounts of dirt on the outside and inside of the unit and all accessories. After cleaning, wipe away the cleaner completely with a cloth washed in clean water.
- Never splash water directly onto the unit. Deterioration of the insulation may result which could cause failure.
- The compressor and other mechanical part are completely sealed. This unit requires absolutely no lubrication.

## Replacement of fluorescent lamp

Total 15 fluorescent lamps and glow starters are provided to this unit. The glow starter is located beside the each fluorescent lamp.

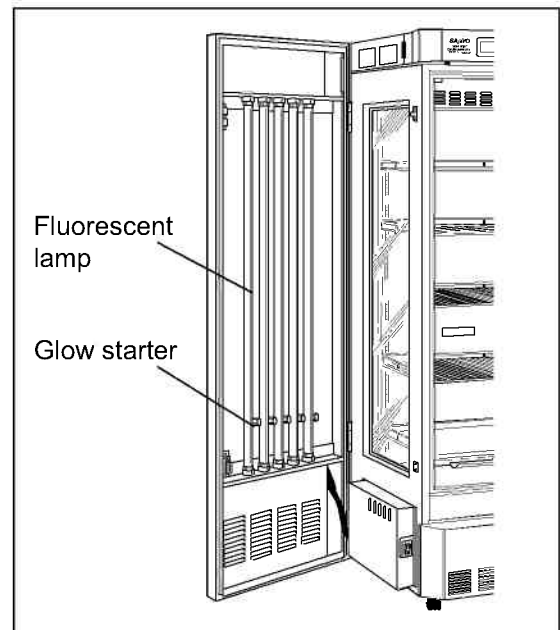
Type of the fluorescent lamp is FL40SS W/37. Another type of lamp will affect on the power consumption and/or brightness.

1. Turn off the power switch, and disconnect the power supply.
2. Open the doors (front and side), take off blown lamp or glow starter.

### **Caution:**

Take care not to injure the fingers as the bulb can be hot!

3. Set the a fluorescent lamp or glow starter.
4. Connect the power supply, and turn on the power switch.



## Cleaning of evaporating tray

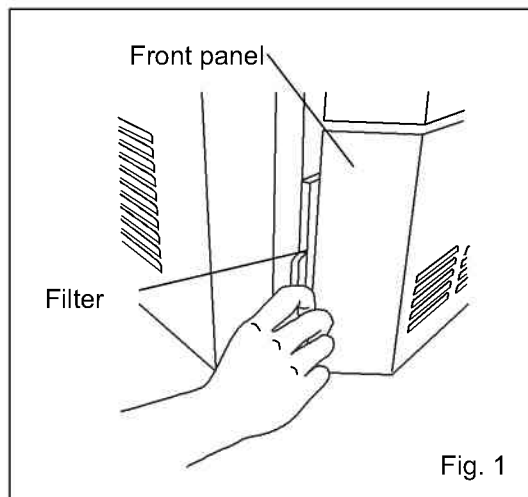
This tray catches defrosted water from evaporator and evaporates the water. Clean the tray with water twice or 3 times a year. Refer to page 10 for taking out or replacing of the tray.

# ROUTINE MAINTENANCE

## Cleaning of filter

This product is provided with a condenser filter in the lower front. Clean the filter once a month since a clogged filter may cause shorter compressor life as well as the poor cooling.

1. The filter is located in the left back of the front panel as shown in Fig. 1.

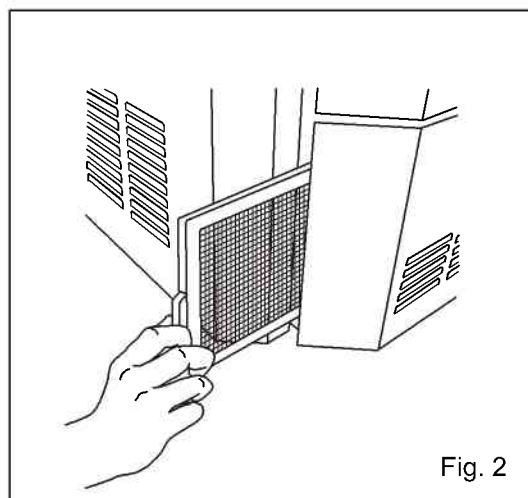


2. Takeout the filter. (Fig. 2)

3. Clean the filter by a vacuum cleaner and replace to the original position.

**Caution:**

Take care to set the filter all the way seated.



# TROUBLESHOOTING

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

Malfunction	Check/Remedy
Nothing operates even when switched on	<ul style="list-style-type: none"> <li>▪ The unit is not connected to the power supply or capacity of power source is not enough.</li> <li>▪ There is a power failure, the fuse is blown, or the circuit breaker is activated.</li> </ul>
Alarm is activated	<ul style="list-style-type: none"> <li>▪ Chamber temperature exceeds high limit/low limit temperature alarm temperature. In this case, check the chamber temperature setting, and high/low limit temperature alarm. When the chamber temperature is not set between high and low limit temperature alarm, it is necessary to reset either high or low limit alarm temperature.</li> <li>▪ A lot of heat load is placed in the chamber at once. In this case, the alarm is eliminated when the chamber temperature goes down.</li> <li>▪ There is a excessive heat source in the chamber. Refer to Figure 2 for the acceptable limits for heat load in the chamber.</li> </ul>
The temperature is not changed according to a program	<ul style="list-style-type: none"> <li>▪ The programmed temperature variation is over the pull up/pull down performance of the unit. The performance of the unit is shown on page 51. It takes much time to pull up/pull down when some items are placed in the chamber. Set a program taking the performance into consideration.</li> <li>▪ The setting of high/low limit temperature alarm is not correct.</li> </ul>

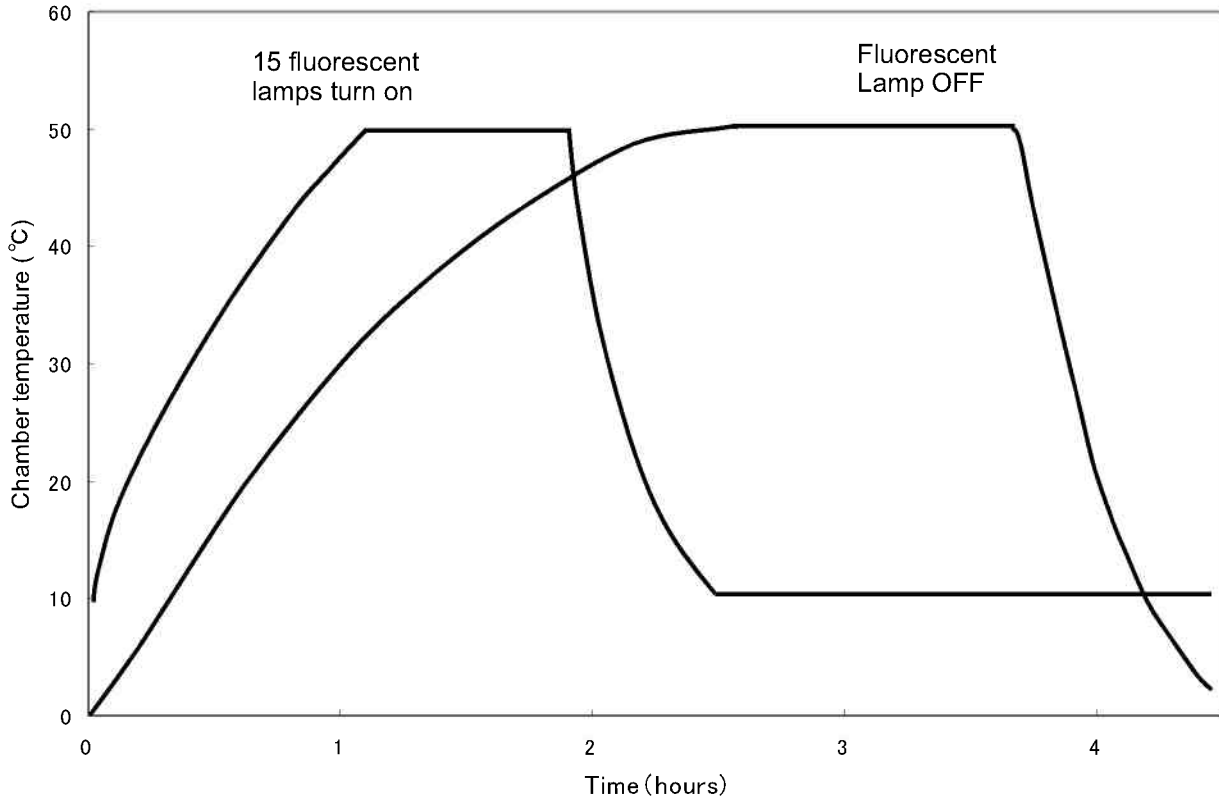
**Note:**

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

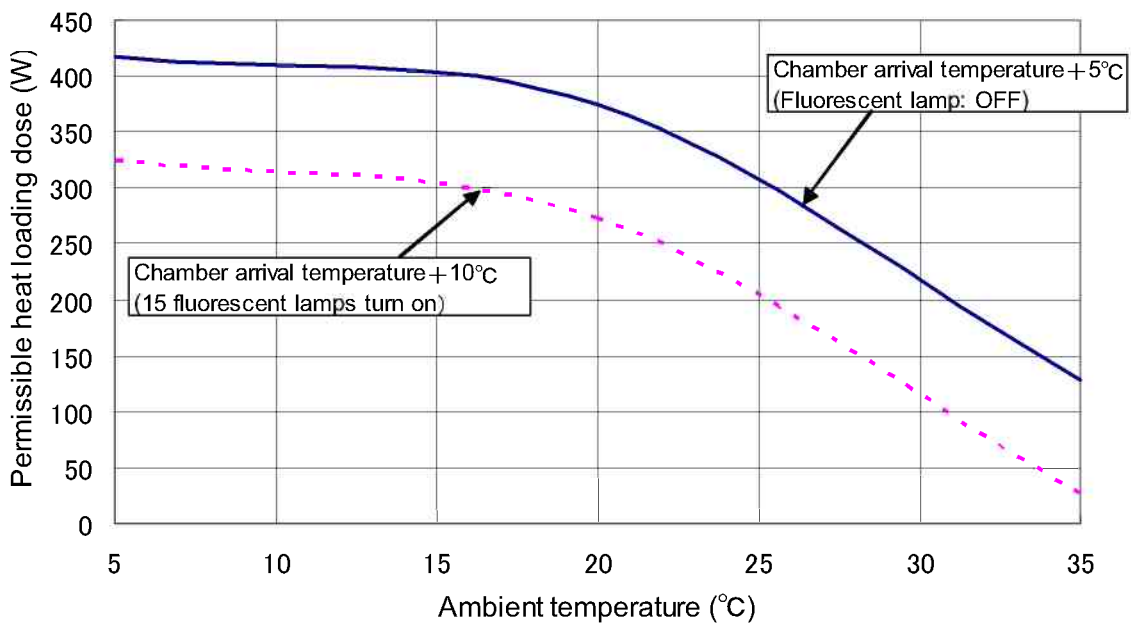
# PERFORMANCE DATA

## 1. Pull down, Pull up performance (The chamber temperature of center)

Ambient temperature: 20°C POWER: AC100V, 50Hz



## 2. Chamber arrival temperature



# DISPOSAL OF UNIT

## **WARNING**

If the unit is to be stored unused in an unsupervised area for an extended period **ensure that children do not have access and doors cannot be closed completely.**

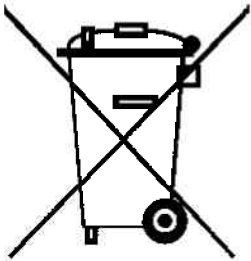
**The disposal of the unit should be accomplished by appropriate personnel. Always remove doors** to prevent accidents such as suffocation.

# DISPOSAL OF UNIT

**Note:**

This symbol mark and recycle system are applied only to EU countries and not applied to the countries in the other area of the world.

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



**(English)**

Your SANYO product is designed and manufactured with high quality materials and components which can be recycled and reused.

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

Please dispose of this equipment at your local community waste collection/recycling centre.

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

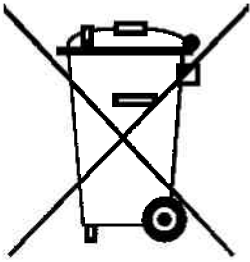
Dieses Symbol bedeutet, daß elektrische und elektronische Geräte am Ende ihrer Nutzungsdauer von Hausmüll getrennt entsorgt werden sollen.

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!

# DISPOSAL OF UNIT



## **(French)**

Votre produit Sanyo 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 SANYO 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!

# DISPOSAL OF UNIT



## **(Portuguese)**

O seu produto SANYO 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 SANYO 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.

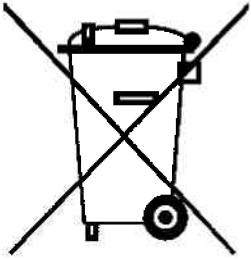
Vi preghiamo di smaltire questo apparecchio al deposito comunale.

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

Aiutateci a conservare l'ambiente in cui viviamo!



# DISPOSAL OF UNIT



## **(Dutch)**

Sanyo 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 SANYO 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.

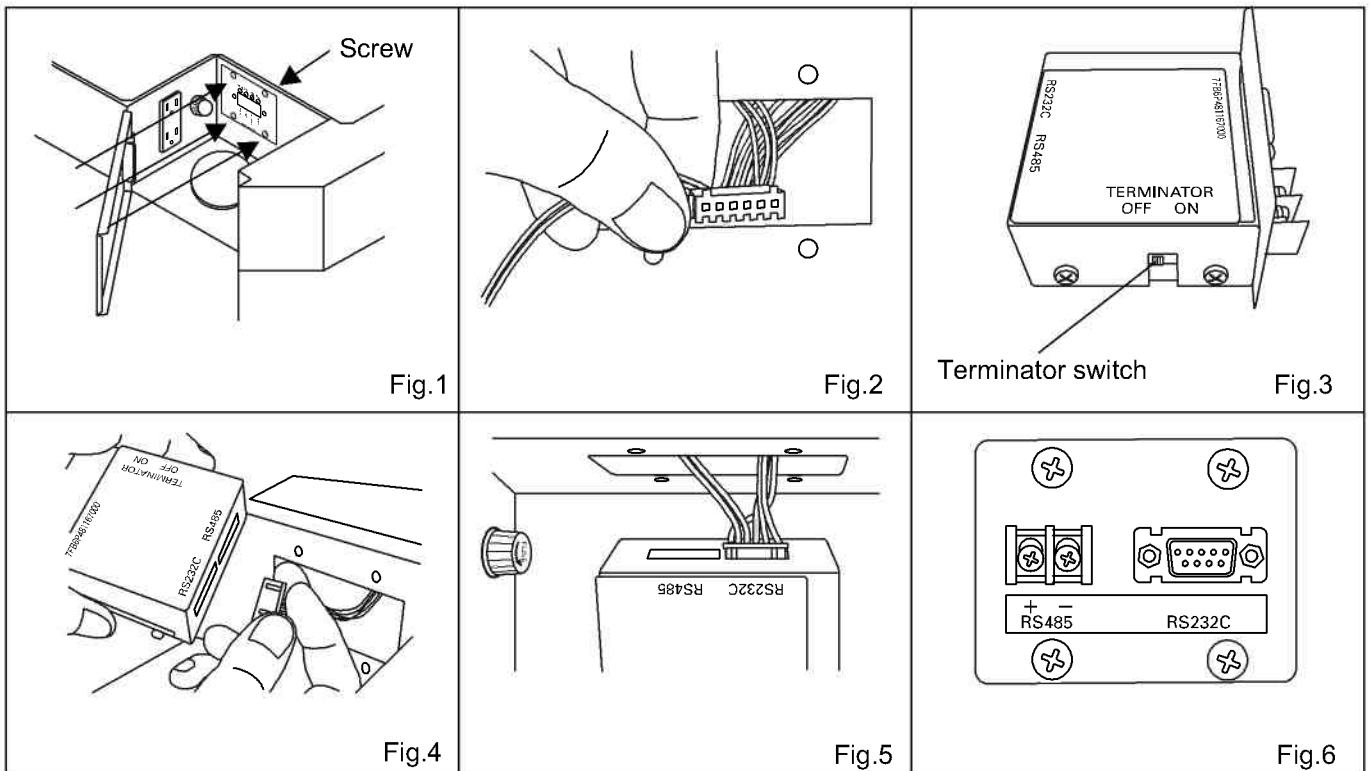
Inom den Europeiska Unionen finns det separata återvinningssystem för begagnade elektriska och elektroniska produkter.

Vänligen, hjälp oss att bevara miljön vi lever i!

# INTERFACE BOARD (OPTION)

By installing an interface board (MTR-480), the log data can be transmitted to a PC. The mounting procedure is as follows:

1. Unscrew 4 screws and disconnect the cord to remove the terminal for remote recorder in the switch box as shown in Fig. 1.
2. Take out the cord for interface board (Fig.2).
3. Refer to the manual of interface board about setting of terminator switch. (Fig.3).
4. Connect the cord for interface board into connector for RS-232C on the interface board as shown in Fig. 4 and Fig. 5.
5. Put the interface board in the space where the terminal for remote recorder has been mounted and secured the interface board with four screws. (Fig. 6)



# SPECIFICATIONS

Name	Versatile Environmental Test Chamber	
Model	MLR-351	MLR-351H
External dimensions	W760 x D700 x H1835 (mm)	
Internal dimensions	W520 x D490 x H1135 (mm)	
Effective capacity	294 L	
Exterior	Painted steel	
Interior	Stainless steel, Paired glass window on right and left side (370 x 1110 mm)	
Door	Painted steel, front, left, and right side	
Inner door	Paired glass	
Insulation	Rigid polyurethane foamed-in place	
Shelf	Hard steel wire on polyester coating, 4 pcs. Inner dimension; W465 x D450 mm, Maximum load; 25 kg/shelf Hard steel wire on polyester coating with stainless cover, 1 pc. (bottom) Inner dimension; W355 x D395 mm, Maximum load; 25 kg/shelf	
Access port	Inner diameter; 40 mm, Top left side	
Heating and cooling method	Forced air circulation	
Compressor	Hermetic type, Rotary type, Output; 325 W	
Evaporator	Fin and tube type	
Condenser	Fin and tube type	
Refrigerant	R404A + 4pt	
Defrosting	Automatic defrost (3 patterns), Manual defrost	
Heater	340 W	
Temperature controller	Electric heat apparatus: PID control, Condenser: Capacity control	
Temperature display	Digital display	
Alarms and safety functions	Temperature alarm, Humidity alarm (MLR-351H only) High/Low limit temperature alarm, Thermal fuse, Sensor alarm, Memory back-up	
Remote alarm contact	DC 30 V, 2 A	
Lighting	Fluorescent light: 40 W x 15 (FL40SS W/37) Grow starter x 15 (FG-4P)	
Program function	12 steps (10 patterns), 98 cycle or limitless Clock mode: 00:00~23:59, Timer mode: 00:01~99:59	
Overcurrent protector	Rated current: 30A	
Accessories	5 shelves, 1 stainless cover	5 shelves, 1 stainless cover 1 water supply tank, 1 drain hose, 1 supply hose
Weight	220 kg	230 kg
Option	Mounting plate for recorder (MLR-S144), Interface board (MTR-480)	

**Note:** Design or specifications will be subject to change without notice.

The unit with CE mark complies with EC directives 73/23/EEC, 89/336/EEC, and 93/68/EEC.

# PERFORMANCE

Model	MLR-351						MLR-351H					
Temperature control range	+10 to +50°C (light ON) 0 to +50°C (light OFF)						+10 to +50°C (light ON) +5 to +50°C (light OFF)					
Temperature distribution	±2.5°C (light ON), ±1.0°C (light OFF) (Set temperature: 25°C, ambient temperature: 20°C, no load)											
Temperature fluctuation	±0.3°C (Set temperature: 25°C, ambient temperature: 20°C, no load)											
Brightness control range	0~20000 Lx (Photosynthetically active photon flux: 150 μmol m <sup>-2</sup> S <sup>-1</sup> ), 6 steps changeable											
Humidity control range	-----						60 to 90% RH (at LS: 0 and Temperature: +15°C to +45°C) 55 to 85% RH (at LS: 5 and Temperature: +15°C to +45°C)					
Usable ambient temperature	+5 to +35°C, Less than 80% RH											
Noise level	45 dB (A scale)											
Maximum pressure	2770 kPa											
Rated voltage	AC 110 V	AC 115 V	AC 220 V		AC 230 V	AC 240 V	AC 110 V	AC 115 V	AC 220 V		AC 230 V	AC 240 V
Rated frequency	60 Hz			50 Hz			60 Hz			50 Hz		
Power consumption	1390 W	1500 W	1390 W	1310 W	1410 W	1390 W	1420 W	1540 W	1420 W	1340 W	1450 W	1560 W

**Note:** Design or specification will be subject to change without notice.

The unit with CE mark complies with EC directives 73/23/EEC, 89/336/EEC, 93/68EEC.

## **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. Chamber contents : Yes No  
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 Yes No  
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  
b) There is some danger (see below) Yes No  
Yes No

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

Date :

Signature :

Address, Division :

Telephone :

Product name: Versatile Environmental Test Chamber	Model: MLR-351 MLR-351H	Serial number:	Date of installation:
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Please decontaminate the unit yourself before calling the service engineer.

**SANYO**

## Service Manual

FILE No.

Versatile Environmental  
Test Chamber

**MLR-351**

**MLR-351H**

SANYO Electric Co., Ltd.



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