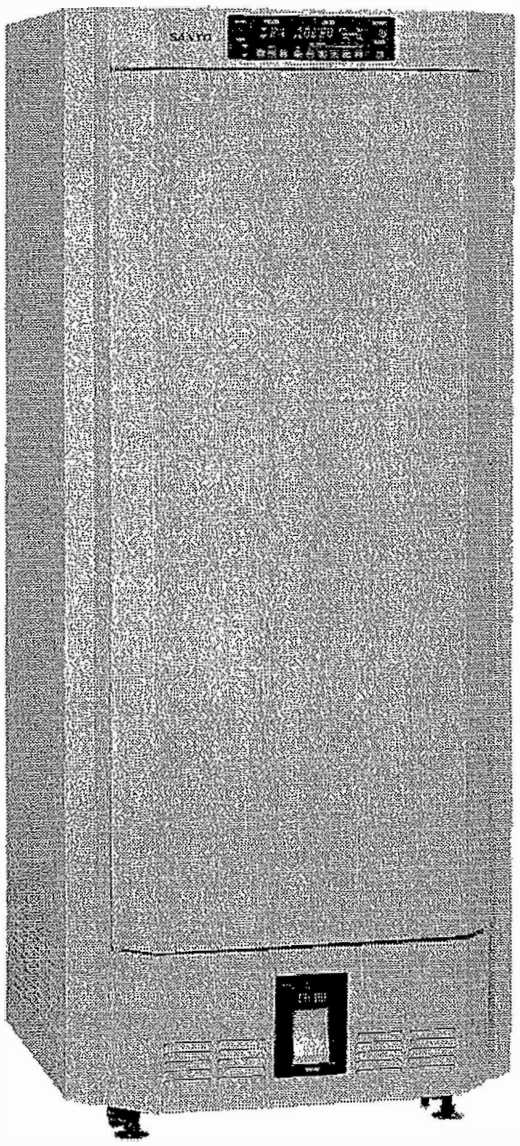
SANYO

# INSTRUCTION MANUAL

# MLR-350 /MLR-350T
# MLR-350H/MLR-350HT

## Versatile Environmental Test Chamber

DV1012



Sanyo Growth Cabinet 1.
S/N: 50502766
Model: MLR-350H
S.502-330

Sanyo Growth Cabinet 2.
S/N: 50401843
Model: MLR-350H
S.502-330

Sanyo Growth Cabinet 3.
S/N: 51106905
Model: MLR-350H
S.502-330

Sanyo Growth Cabinet 4.
S/N: 60402779
Model: MLR-350H
S.502-330

**Note:**

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2. The contents of this manual are subject to change without notice.

3. Please contact SANYO if any point in this manual is unclear or if there are any inaccuracies.

## CONTENTS

# 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.

# PRECAUTIONS FOR SAFE OPERATION

## ⚠CAUTI ON

**Do not put a container with water or heavy articles on the unit.** It may cause injury if the articles fall. Current leakage or electric shock may be resulted form the deterioration of insulation by spilled water.

**Do not climb onto the unit or do not put articles on the unit.** This may cause injury by tipping or damage to the unit.

**Do not put bottles and cans in when used this unit at setting temperature less than 0°C.** It may cause injury by breaking the bottles due to freezing contents.

**Do not touch a thing in the chamber ( a thing made by metal in particular) with wet hand when used this unit at setting temperature less than 0°C.** It may cause frostbite.

**Always hold the handle when closing the door.** This will reduce the likelihood of a trapped finger.

**Never lean or press on the glass.** Excessive force may cause injury if the glass breaks.

**Do not hang the door.** It may cause injury by falling off of a door or turning over of the unit.

**Put on the gloves in repairing this unit.** It may cause injury by corner/edge of interior parts.

**Always disconnect the power supply plug** before moving the unit during transit. Take care not to damage the power cord. A damaged cord may cause electric shock or fire.

**Dispose of water in the evaporation tray completely** before moving the unit. Spilled water or splashed water may cause current leakage or electric shock.

**Be careful not to tip over the unit** during movement to prevent damage or injury.

**Always disconnect the power plug** when the unit is not used for long periods.

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

# 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.

**Be sure to 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.

**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.

**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.

**Make sure to remove dust from the power supply plug** before inserting in a power source. A dusty plug or improper insertion may pose a hazard.

**Use a power supply outlet with ground (earth)** 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.

**Do not insert metal objects such as a pin or a wire into any vent, gap or any outlet** for inner air circulation. This may cause electric shock or injury by accidental contact with moving parts.

**Never store volatile or flammable substances** in this unit. This may cause explosion or fire.

If this unit is to be used for storing poisons, radioactive material or other harmful products **ensure that it is in a safe area**. Failure to do so may lead to an adverse effect on the health of personnel in the area and the local environment.

**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.

**Never splash water directly onto the unit** as this may cause electric shock or short circuit.

**Never disassemble, repair, or modify the unit yourself.** Any such work carried out by an unauthorized person may result in fire or injury due to a malfunction.

# PRECAUTIONS FOR SAFE OPERATION

## ⚠WARNING

**Make sure that the power supply to the unit is disconnected when the fluorescent light is replaced** as this will prevent electric shock.

**Disconnect the power supply plug if there is something wrong with the unit.** Continued abnormal operation may cause electric shock or fire.

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. Always remove doors** to prevent accidents such as suffocation.

**Make sure to prepare a safety check sheet** when you request any repair or maintenance for the safety of service personnel.

## ⚠CAUTI ON

**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.

**Do not put a thing more than 30 kg on the shelf and do not throw a thing into the chamber.** Falling may cause injury.

**Make sure a dedicated power source is used** as indicated on the rating label attached to the unit.

**Fix the shelves securely.** Incomplete installation may cause injury or damage.

**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.

**Never damage or break the power supply plug or cord. Do not use the supply plug if its cord is loose.** This may cause fire or electric shock.

**Do not touch any electrical parts** such as the power supply plug or any switches with a wet hand. This may cause electric shock.

**Confirm the setting point if resume operation after power failure or turning off.** Changing of setting point may cause injury (harming) to contents.

# CAUTIONS FOR USAGE

**1.** If the unit is unplugged or the power to the unit is interrupted, do not restart the unit for at least 5 minutes. This protects the compressor.

**2.** This inner cabinet is refrigerated by forced circulation of cooled air inside the chamber. Ensure that the intake and exhaust air vents are not blocked.

**3.** Adequate space should be provided between the items inside the unit to allow air circulation.

**4.** The temperature alarm may be operated at the time of first start-up. The alarm will be canceled automatically when the chamber temperature will reach the set temperature.

**5.** Always open and close the door gently. Rough door operation may lead fall down of stocked items, incomplete closing, or damage of door gasket.

**6.** Once the chamber temperature has stabilized, put the items into the chamber in small batches to minimize the temperature increase.

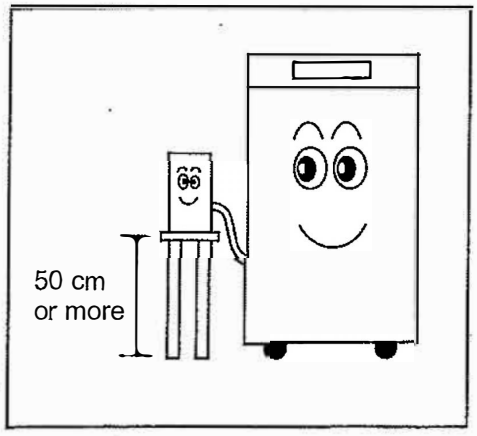
**7.** Fix the shelves securely and make sure to place any materials on the shelves Do not place items on the floor of the chamber.

**8.** In case condensation forms on the front glass or frame due to a high humidity environment, wipe if off with a soft and dry cloth.

**9.** Do not clean the unit with scrubbing brushes, acid, thinner, solvents powdered soap, cleanser or hot water. These agents can scratch the paint or cause it to peel. Plastic and rubber parts can be easily damaged by these materials, especially solvents. When a neutral detergent is used to clean the unit, rinse thoroughly with a cloth soaked in clean water.

**10.** The maximum heat load capacity acceptable to this chamber is shown in under the heading "PERFORMANCE". If this limit should be exceeded, it may cause the unit to malfunction.

**11.** The H/HT models require a water supply apparatus. The supplied water supply tank operates by gravity, and must therefore be kept at height of 50 cm or more. The water supply tank should be filled with either iron exchange processed water or distilled water.




**12.** Turn the key lock switch off before inputting the setting value in the control panel. The key lock switch is in the switch box. When the setting value is input, turn this switch on. This prevents the setting value from being changed by accident.

**13.** If the temperature control is set for below 10°C (MLR-350T) or 15°C (MLR-350H), the chamber could frost up. If the cooler is obstructed by the accumulation periodically through the observation window. If an excessive amount of frost has accumulated, defrost. Any material high in water content that is kept in the chamber will contribute to the accumulation of frost. The defroster, however, cannot be actuated unless the evaporator temperature is below -5°C.

**14.** Any heat load placed in the unit and switched on can cause a deviation of the inside temperature from the set value. If this is the case, measure the inside temperature with a precision thermometer placed in the center of the cavity and adjust the temperature control dial accordingly.

**15.** For some time after the unit has been started or when the temperature is fairly high, the cabinet walls may heat up. This doesn't indicate a malfunction. It indicates that that condensation preventative/power economy function is performing satisfactorily. Hot gases are piped from the motor compressor along the front edge of the cabinet to prevent condensation.

**16.** When it is desired to place an instrument requiring measuring cable and power cord in the cabinet, the cable and cord can be led through the access hole provided on the left side wall on the cabinet. After installation, a rubber plug should be provided as an insulation device. Failure to use a rubber plug can interfere with the proper lowering of temperature and lead to condensation on the outside of the hole.

* New T. H Sensors

**17.** The acceptable ambient temperature range for this chamber is -10°C to +35°C (MLR-350/350T). However, MLR-350H/350HT should not be operated when the ambient temperature is 0°C or below, nor should be internal temperature thermostat be set to 0°C or below. Doing so could cause ice to from inside the unit, damaging it.

# ENVIRONMENTAL CONDITIONS

This equipment is designed to be safe at least under the following conditions:

**1.** Indoor use;

**2.** Altitude up to 2000 m;

**3.** Ambient temperature 5°C to 40°C

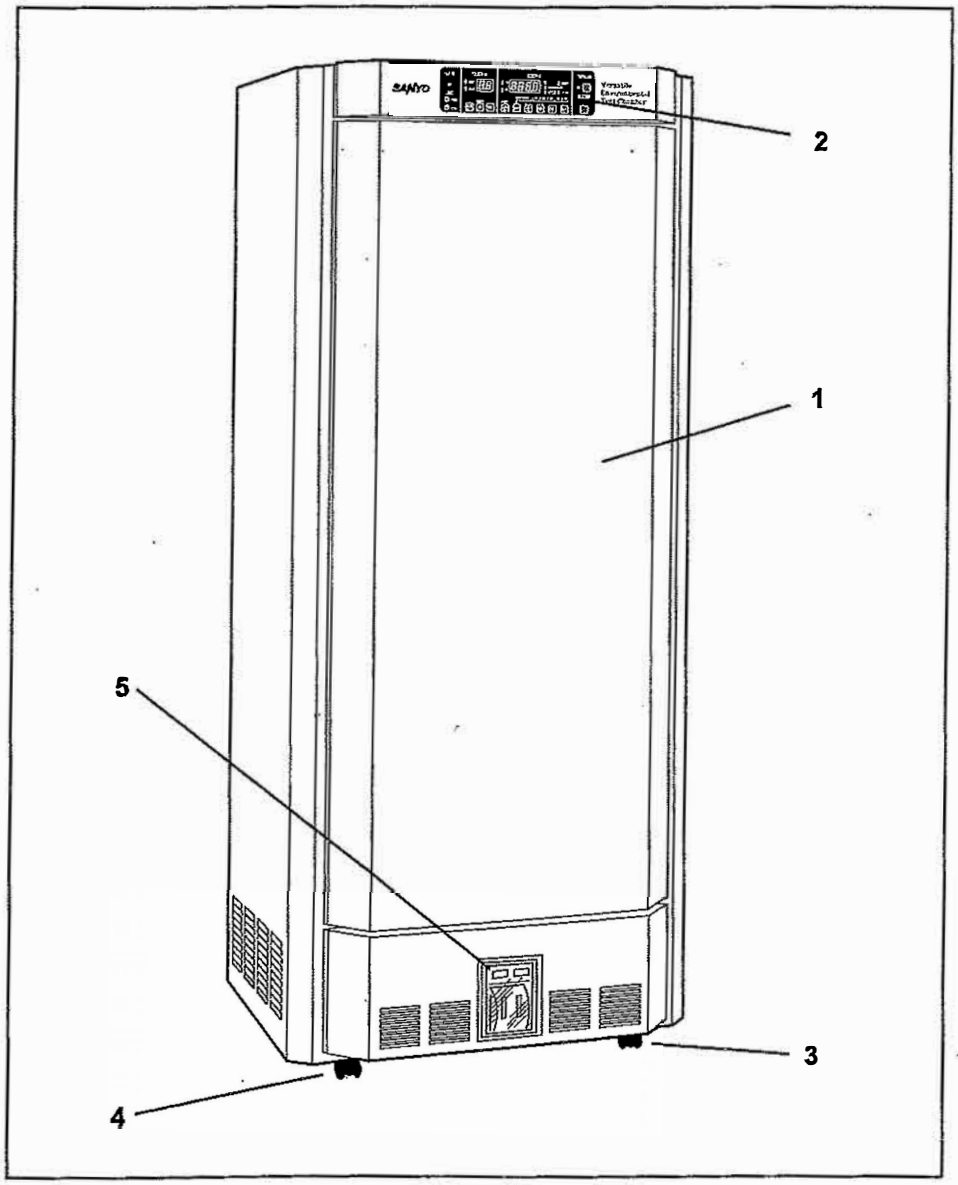
**4.** Maximum relative humidity 80% for temperature up to 31°C decreasing linearly to 50% relative humidity at 40°C;

**5.** Mains supply voltage fluctuations not to exceed ±10% of the nominal voltage;

**6.** Transient overvoltages according to Installation Categories (Overvoltage Categories) II; For mains supply the minimum and normal category is II;

**7.** Pollution degree 2 in accordance with IEC 664.

# NAME AND FUNCTION OF PARTS




**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.

**2. Control panel**

The control panel has setting for temperature, humidity (MLR-350H and MLR-350HT only), light program and alarm.

**3. Caster**

**4. Height adjusting screw**

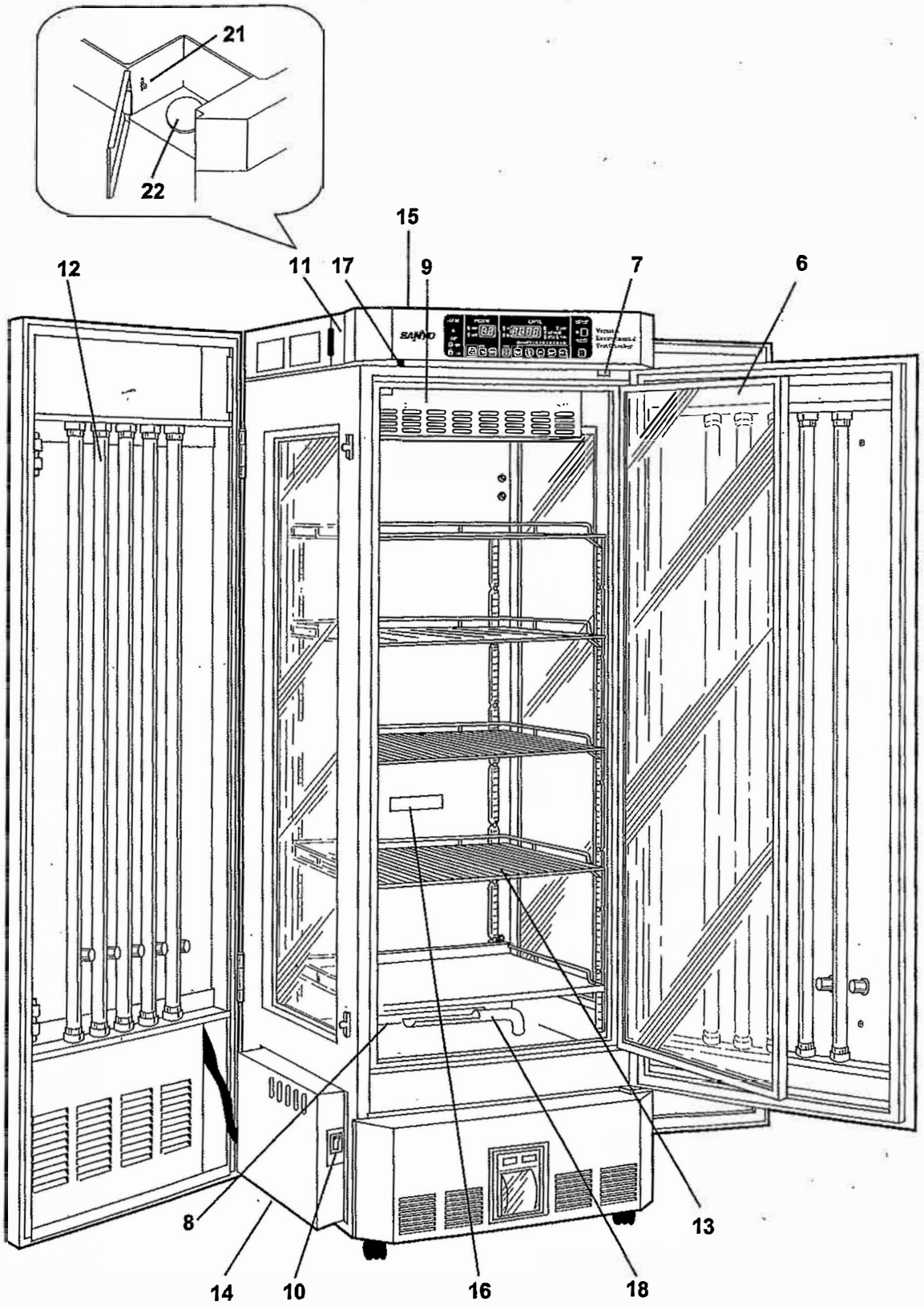
To secure the unit, turn the screws, which are mounted beside the caster, counterclockwise until rests securely on the floor.

**5. Recorder (MLR-350T, MLR-350HT only)**

This records the temperature, humidity (MLR-350H, MLR-350HT only) and light step in the chamber.

# NAME AND FUNCTION OF PARTS

**Model with CE mark**



# NAME AND FUNCTION OF PARTS

**6. Inner door**

This glass inner door minimizes the outflow of air when the cabinet door is opened.

**7. Door switch**

When the door is opened, the chilled air circulation fan stops, minimizing the outflow of chilled air.

**8. Air exhaust vent**

**9. Air intake vent**

**10. Power switch (model without CE mark)**

ON/OFF switch for all electric sources including outlet.

**10. Power switch with circuit breaker (model with CE mark)**

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

## ⚠WARNING

**Never disassemble, repair, or modify the unit yourself.** Any such work carried out by an unauthorized person may result in fire 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.

## ⚠CAUTION

**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.

**11. Switch box**

**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. Shelves**

The shelves can be adjusted vertically.

**14. Evaporating tray**

Catches water from automatic defrosting and allows it to evaporate.

**Note:**

Before using the unit, fasten the evaporating tray on the rail, which extends from the left side of the frame at the bottom. If the trap is not properly fastened, water may drip. (Refer to the figure.)

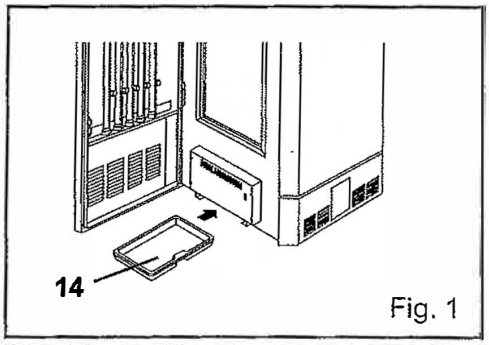


Fig. 1

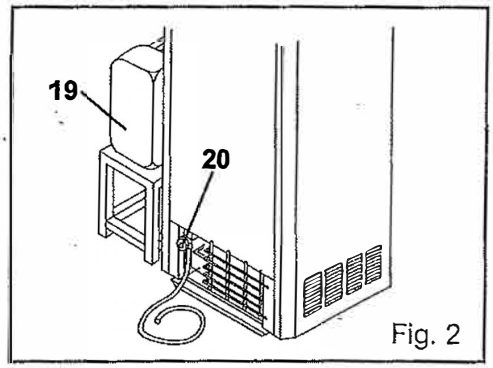


Fig. 2

**15. Data input/output port** (Back side of the unit)

**16. Frost observation window**

**17. Dehumidifier mode switch**

**18. Humidifier duct** (MLR-350H, MLR-350HT only)

**19. Water supply tank** (MLR-350H, MLR-350HT only)

**20. Water supply inlet** (MLR-350H, MLR-350HT only)

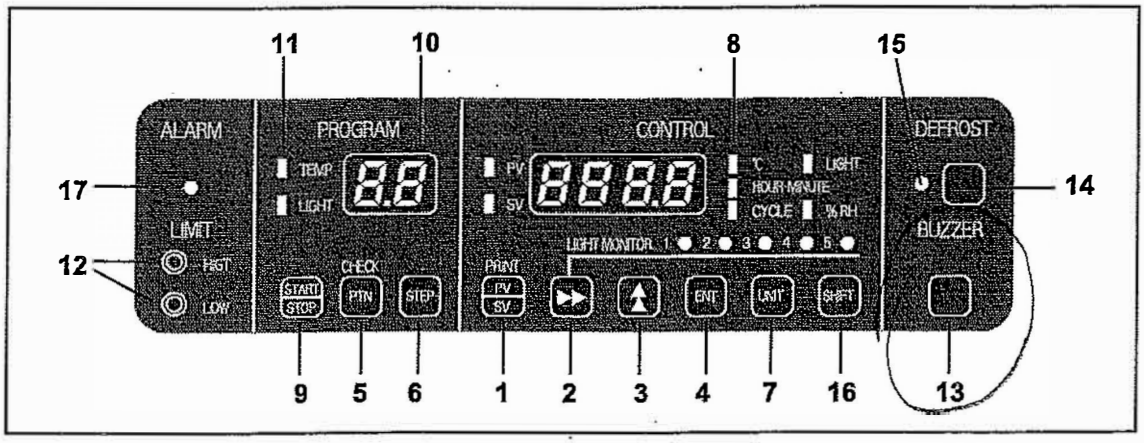
**21. Key lock switch**

Turn this key lock switch off before inputting the setting value in the control panel. When the setting value is input, turn this key lock switch on. This prevents the setting value from being changed by accident.

**22. Access hole**

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 hole. When a cord is led through, use the cap to prevent air from coming in or out.

## Control panel




**1. Present/setting value display mode select key (PV/SV):** Used for display switching for present (PV) and setting value (SV). The status of the unit is transmitted to the recorder (outside) by pressing this key together with the shift key.

In PV mode, PV lamp is lit and present chamber temperature is displayed and in mode, SV lamp is lit and set vale is displayed.

**2. Digit shift key ( ▶▶ ):** In PV mode, pressing this key enables to change the brightness in the chamber. The current brightness can be checked with the light monitor lamp. (The brightness cannot be changed during brightness programmed operation.) In SV mode, the digit (flashing) of the figure in which the set value is inputted can be shifted using this key. The flashing digit is shifted to right by pressing this key.

**3. Numerical value shift key ( ▲ ):** In PV mode, the digitally displayed figure (flashing) can be changed by pressing this key. Pressing the key causes the increasing of the figure (flashing).

**4. Entry key (ENT):** In SV mode, the set value is memorized in the controller by pressing this key.

**5. Program pattern select key (PTN):** The program pattern is selected with this key. The available patterns are follows:

| | |
|---|---|
| 1) Operation with fixed value | ( ) |
| 2) Temperature program 1 | (11) |
| 3) Temperature program 2 | (21) |
| 4) Temperature program 3 | (31) |
| 5) Brightness program | (L1) |
| 6) High limit temperature alarm setting | (OH) |
| 7) Low limit temperature alarm setting | (OL) |

In PV mode, the program pattern under programmed operation is selected. In SV mode, the program pattern you desire to start or to change its setting is selected. Furthermore, pressing this key together with the shift key in SV mode enters to the check mode.

**6. Program step select key (STEP):** In SV mode, pressing this key selects the step of the selected programmed pattern. Pressing this key once causes the increasing of the step value by 1.

**7. Display items select key (UNIT):** This key is used to switch the unit to be displayed. The items to be displayed as follows:

1) Temperature (°C)
2) Brightness (LIGHT)
3) Time (HOUR, MINUTE)
4) Repeated cycle (CYCLE)
5) Humidity (%RH) (MLR-350H, MLR-350HT only)

**8. Unit indicator:** The indicator shows the unit for displayed value. The indicator is shifted by pressing unit key.

**9. Programmed operation start/stop key (START/STOP):** To start or stop the displayed programmed pattern, press this key. In PV mode, pressing this key causes the displayed programmed pattern to stop. In SV mode, pressing this key causes the displayed programmed pattern to start.

**10. Programmed pattern and step display section:** Indicator for program pattern and step. During the programmed operation, the program pattern or step under operation is displayed.

**11. Temperature and light program operation lamp (TEMP, LIGHT):** During the programmed operation, the lamp is lit to indicate that the temperature program and/or light program is operating.

**12. High and low limit temperature setting knobs (HIGH, LOW):** When these knobs are turned with a small driver, the set temperature is changed at the time of setting of high and low alarm temperature.

**13. Alarm buzzer stop key (BUZZER):** When the alarm activates, the buzzer sounds. To silence the buzzer temporarily to check the cause, press this key. Pressing the key again restarts the sound.

**14. Defrost key (DEFROST):** When this key is pressed, defrost begins. Please note that the defrost is activated only when the temperature of the evaporator is below 5°C.

**15. Defrost operation lamp:** Lamp is on during defrosting.

**16. Shift key (SHIFT):** This key has two functions; a) Under normal condition, when this key and the PV/SV key are simultaneously pressed, the value digital displayed is sent outside with a signal. When the digital display is in the PV mode, this value is sent, and when the digital display is in the SV mode the setting value is sent to outside. b) In the SV mode, when this key and the display item selection key (PTN) are simultaneously pressed, this unit changes to the self diagnostic function (Check mode). See the check mode functions listed below.

**17. Alarm lamp:** Lamp is on with alarm activation.

**Key operation and function**

| Key | Key function | In PV mode | In SV mode | | | In check mode |
|---|---|---|---|---|---|---|
| | | | PTN = | PTN = 1, 2, 3, L | PTN = OH, OL | |
| PV/SV | Switches for present/setting value display | Switched to SV mode | Switched to PV mode | Switched to PV mode | Switched to PV mode | Switch to PV mode (specific operation is not released) |
| ▶▶ | Alters digit | Change the brightness | Figure changeable digit is altered | Figure changeable digit is altered | ----- | Shift of digits (Not available according to the STEP) |
| ▲▲ | Alters figure | ----- | Figure of changeable digit is increased | Figure of changeable digit is increased | ----- | The figure is increased (Not available according to the STEP) |
| ENT | Inputs figure | ----- | Displayed figure is input | Displayed figure is input | ----- | Specific operation is started or figure is input |
| PTN | Alters PATTERN (display item) | Change of display of running programmed pattern | Item of SV mode is changed | Item of SV mode is changed | Item of SV mode is changed | ----- |
| STEP | Alters STEP (programmed step) | ----- | ----- | Next step value is displayed | ----- | Next step value is displayed |
| UNIT | Alters UNIT (display unit) | Display unit (UNIT) of PV mode is changed | Displayed unit of SV mode is changed | Displayed unit of SV mode is changed | ----- | Not available according to the STEP |
| START/STOP | Stops and starts programmed operation | Displayed programmed operation is stopped | ----- | Displayed programmed operation is started | ----- | ----- |
| DEFROST | Defrost operation start/stop | Defrost operation starts/stops | Defrost operation starts/stops | Defrost operation starts/stops | Defrost operation starts/stops | Defrost operation start/stop |
| BUZZER | Buzzer stop/ Release of stop | Buzzer stop/ Release of stop | Buzzer stop/ Release of stop | Buzzer stop/ Release of stop | Buzzer stop/ Release of stop | Buzzer stop/ Release of stop |
| SHIFT+PV/SV | Dispatches direct print signal | Direct print signal of PV value is dispatched | Direct print signal of SV value is dispatched | Direct print signal of SV value is dispatched | ----- | ----- |
| SHIFT+PTN | Enters to and exits from check (Self diagnosis) mode | ----- | Shift to check mode | Shift to check mode | Shift to check mode | Shift to PV mode |
| No key operation for one minute | | ----- | Shift to PV mode | Shift to PV mode | Shift to PV mode | ----- |

# BEFORE COMMENCING OPERATION

## Installation site

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

**1. A location not subjected to direct sunlight**

Installation in a location subjected to direct sunlight may lead to inadequate cooling.

**2. Location with adequate ventilation**

Leave at least 10cm around the unit for ventilation. Poor ventilation will result in a reduction of the refrigeration capacity.

**3. A location away from heat generating sources**

Avoid installing the unit near heat-emitting appliances such as gas ranges or stoves. Heat can cause inefficient refrigeration.

**4. A location with a sturdy and level floor**

Install the unit on a sturdy floor to avoid vibration and noise. Placing the unit on an unsteady floor may cause vibration and noise.

**⚠WARNING**

**Be sure to 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.

**⚠CAUTION**

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

**5. A location not prone to high humidity**

**⚠ WARNING**

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

**Do not install the unit under water pipes or steam pipes.** Deterioration of the insulation may result which could cause current leakage or electric shock.

**6. A location without a flammable or corrosive gas**

**⚠WARNING**

**Never install the unit near 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.

# Installation

**1. Remove 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 neutral detergent and rinse with clean water.

**2. Adjust the height adjusting screws**

Extend the height adjusting screws by rotating them counterclockwise to contact them to the floor. Ensure the unit is level.

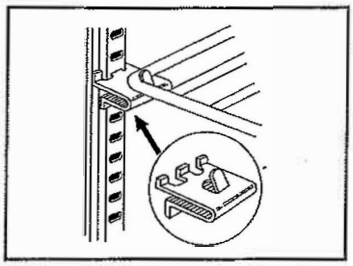
**3. Fix the unit**

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

If holes can be opened on the wall, open a hole with a 10.5mm diameter and fix the frame by using the special bolt-nut supplied with this unit. This bolt-nut can be used only on concrete walls.

**4. Setting of the 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.



5. **Ground (earth)**

**⚠WARNING**

**Use a power supply outlet with ground (earth)** 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.

# START-UP OF UNIT

**1.** Set the evaporating try under the unit from the left side of the unit. See Fig.1 on page 11.

**2.** Set the shelves in the chamber. 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.

**3.** Fill the water supply tank with either: on exchange processed water or distilled water. The tank should be installed at a height of 50 cm or more. (MLR-350H, MLR-350HT only)

**4.** Connect the water supply tube between the tank inlet and water supply inlet on the unit. (MLR-350H, MLR-350HT only)

**5.** Open the tank cock. (MLR-350H, MLR-350HT only)

**6.** Arrange the drain tube as fat as if pass through down-grade. If there is no suitable site for drainage around the unit, use a container for drained water. In this case, be sure to set the container inlet lower position than the tube outlet. (MLR-350H, MLR-350HT only)

**7.** Connect the power, and turn the power on.

# Operation of control panel

In this section, temperature setting for the chamber, high/low limit temperature settings, temperature program, lighting program setting, and start/stop for programmed operation is explained. This unit's alarm function is also described.

### 1. Before using control panel

(1) Digital display section

Table 1 shows the signal and meaning of the digital display section on the control panel.

(2) When the key understands the input message, a signal will sound to indicate that the value input has been set.

**Table 1 Major display and explanation of control panel** ※H/HT model only

| PTN STEP | | | | When PV lamp is lit | When SV lamp is lit |
|---|---|---|---|---|---|
| ☐TEMP ☐LIGHT | ☐☐ | ☐ PV ☐ SV | 25.0 ■ °C | Present temperature in chamber 25.0°C | Setting temperature 25.0°C |
| ☐TEMP ☐LIGHT | ☐☐ | ☐ PV ☐ SV | 12.35 ■ HOUR·MIN | Present time 12 : 35 | Present time 12 : 35 |
| ☐TEMP ☐LIGHT | ☐☐ | ☐ PV ☐ SV | 60 ※ ■ %RH | Present humidity in chamber ※ 60%RH | Setting humidity ※ 60%RH |
| ☐TEMP ☐LIGHT | 11 | ☐ PV ☐ SV | 25.0 ■ °C | Present temperature in chamber Programmed operation PTN=1, STEP=1, TEMP LED lit. | Temperature program Setting temperature at PTN=1, STEP=1. |
| ☐TEMP ☐LIGHT | 19 | ☐ PV ☐ SV | 12.35 ■ HOUR·MIN | Elapsing time at present step (PTN=1, STEP=9) | Setting time at temperature program (PTN=1, STEP=9) |
| ☐TEMP ☐LIGHT | 25 | ■ PV ☐ SV | 30 ■ CYCLE | Programmed operation at pattern 2 Cycle number | |
| ☐TEMP ☐LIGHT | L1 | ☐ PV ☐ SV | 3 ■ LIGHT | Present value of light step =3 PTN=L, STEP=1 LAMP LED lit | Light program, light step setting value=3 PTN=L, STEP=1 |
| ☐TEMP ☐LIGHT | L9 | ☐ PV ☐ SV | 12.35 ■ HOUR·MIN | Elapsing time at the present step (PTN=L, STEP=9) | Light program Setting time at PTN=L, STEP=9 |
| ☐TEMP ☐LIGHT | L1 | ☐ PV ■ SV | 9.30 ■ CYCLE | | Last step at light program STEP=1 and setting value of cycle. |
| ☐TEMP ☐LIGHT | OH | ☐ PV ■ SV | 45.5 ■ °C | | High limit temperature 45.5°C |
| ☐TEMP ☐LIGHT | E3 | ☐ PV ☐ SV | 2F.01 | | Check mode Present position of stepping motor |

When PV mode is displayed, zero of the highest digit is not lit.

When SV mode is displayed, zero of the highest digit is displayed and the changeable figure digit is flashed.

**2. Key operation method**

(1) Setting the constant operation temperature (CONTROL)

Set the temperature for the chamber according to the procedure shown in Table 3. In this condition, this unit can be used as a constant temperature system chamber.

**Note:**

After programmed operation has ended or stopped, it automatically operates with constant value. The setting range in the chamber varies from –12°C to 52°C. Temperatures outside of this range cannot be set.

**Table 3 (ex. Temperature 25oC, Time 12:00, Humidity 60%RH)**

| | Operation | Key operation | Display after operation | Unit display |
|---|---|---|---|---|
| 1 | Power source switch ON | | Present temperature is displayed 1) 26.5 | °C |
| 2 | Press the key for switching present/setting value | PV/SV | setting temperature is displayed the highest digit is flashed (initial setting value: 23.0 °C) 23.0 | °C |
| 3 | Set the desired temperature by pressing digit and figure shift keys. | ▶▶ | When the keys are pressed, the settable digit moves. | °C |
| | | ▲ | When the keys are pressed, the figure of the settable digit increases. 25.0 | |
| 4 | Press entry key. | ENT | The flashing digit stops temporarily and the buzzer sounds for a second. After that, it changes to time display. 2) 00.02 | °C→ HOUR, MIN |
| 5 | Set the present time by pressing digit and figure shift keys. | ▶▶ | When the keys are pressed, the settable digit moves. | HOUR, MIN |
| | | ▲ | When the keys are pressed, the figure of the settable digit increases. 12:00 | |
| 6 | Press entry key. | ENT | The flashing digit stops temporarily and the buzzer sounds for a second. After that it changes to humidity display. (initial setting value: 00%) 00 | HOUR, MIN →%RH |
| 7 3) | Set the desired humidity by pressing digit and figure shift keys. | ▶▶ | When the keys are pressed, the settable digit moves. | %RH |
| | | ▲ | When the keys are pressed, the figure of the settable digit increases. 60 | |
| 8 | Press entry key. | ENT | The flashing digit stops temporarily and the buzzer sounds for a second. After that, it changes to setting temperature display. 25.0 | %RH→ °C |
| 9 | Press the key for switching present setting values. | PV/SV | PV (Present value) 26.5 | °C |

**Note:**

1) The display shows " OFF" when power is turned on for the first time or after the unit has been inactive for an extended period of time.

2) After the temperature setting is input, the display shows the amount of time that has elapsed since the power was turned on.

3) Setting the humidity is on (possible on the MLR-350H and MLR-350HT only ).

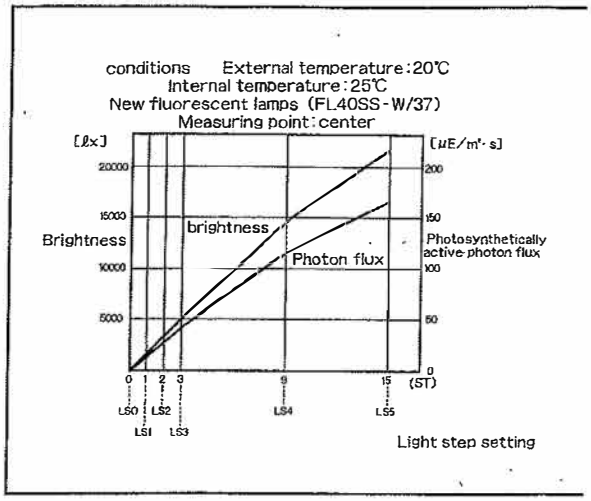
### 3. Brightness setting

To maintain a constant brightness within the chamber, perform the following setting using the keys on the control panel.

When the unit is in PV status (the display shows the present value within the chamber and the PV lamp is lit), press the digit shift key (▶▶). The number 1 light monitor lamp lights and one fluorescent lamp lights within the chamber.

Additional presses on the digit shift key (▶▶) cause the light monitor lamp display to change in the following sequence: 2, 3 ----- 5, OFF 1, 2,-----. In this way the brightness within the chamber can be set to the desired level.

The graph below illustrates the relationship between the light step (light monitor lamp) setting, brightness and photosynthetically active photon flux characteristics.




### 4. Humidity control (MLR-350H and MLR-350HT only)

The unit has no humidity program operation function.

The internal humidity in the chamber can be set to any value within the range 30% RH to 90% RH using the keys on the control panel. It is not possible to set the internal humidity to a value outside of this range.

The humidity control function operates when the humidity setting is within the range 15°C to 45°C. If the unit is operated with a setting it outside of this range, there may be cases where the actual humidity is lower than the setting.

The dehumidifier mode switch should be set to W if the humidity setting is 75% RH or greater and to D if the humidity setting is lower than 75% RH. (Refer to the humidity control adjustment range chart below.)

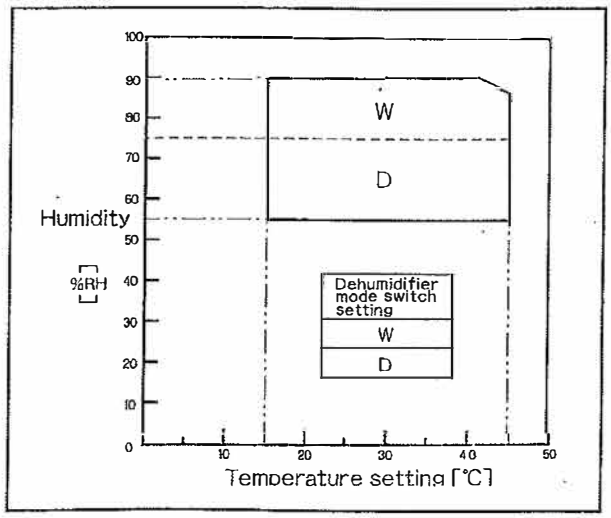
To disable the humidity control function, enter a value of 00% RH as the humidity setting.

**Note:**

Humidity control does not begin until the temperature within the chamber has stabilized to within 1.3°C of the temperature setting. If the temperature within the chamber is outside of the 1.3°C of temperature setting range, there may be cases where the humidity display shows a value greater than the humidity setting. This is not a malfunction. (This often happens when the temperature within the chamber is changing [rising or falling] during temperature program operation.)

Moisture may condense inside the chamber if the humidity setting is high.

If the humidity setting is very low, a considerable amount of time may be required for the actual humidity to reach the set value if the interior of the chamber is wet or very humid to start with.



### 5. Setting high and low limit temperature (LIMIT)

This chamber's temperature controller incorporates an automatic temperature alarm. The setting method for high and low limit temperature is shown in the table below. Adjust the setting knob with a small screw driver.

**Note:**

The high limit temperature should be set at a minimum of 5°C above the setting temperature of the chamber, and low limit temperature, set at a minimum of 5°C lower than the chamber.

While in the programmed operation and when the temperature is automatically varied, the high and low limit temperatures should be set 5°C higher and 5°C lower, respectively, than the highest and lowest temperature of the programmed operation.

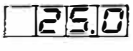
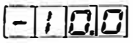
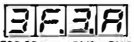
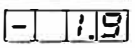
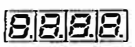
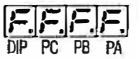
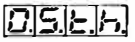
| | Operation | Key operation | Display after operation | Unit display |
|---|---|---|---|---|
| 1 | Press the key for switching present/ setting values | PV/SV | Alters to SV (Setting value) display | — |
| 2 | Press PTN key and set PTN. STEP to OH | PTN | PTN, STEP DISP<br>PTN, STEP display will be changed to OH (High limit) setting temperature. | °C |
| 3 | Set the desired temperatue by turning the setting knob. | ⊗HIGH | HIGH When the knob is turned, the high limit setting temperature will be changed. OH 030.0 | °C |
| 4 | Press PTN key and set PTN, STEP to OL | PTN | PTN, STEP display becomes OL (Low limit) setting temperature | °C |
| 5 | Set the desired temperature by turning the setting knob. | ⊗LOW | When the knob is turned, the low limit setting temperature will be changed. OL 020.0 | °C |
| 6 | Press PTN key and set PTN, STEP to □□ | PTN | PTN, STEP display will be changed to constant value temperature setting. | °C |
| 7 | Press the key for switching present/ setting values and set to PV (present value). | PV/SV | PV (present value) | — |

**Note:**

When PTN STEP are in OH or OL modes, PV will not be displayed even when PV/SV keys are pressed. If more than one minute passes without key operation, it will not return to PV mode.

### 6. Check mode function

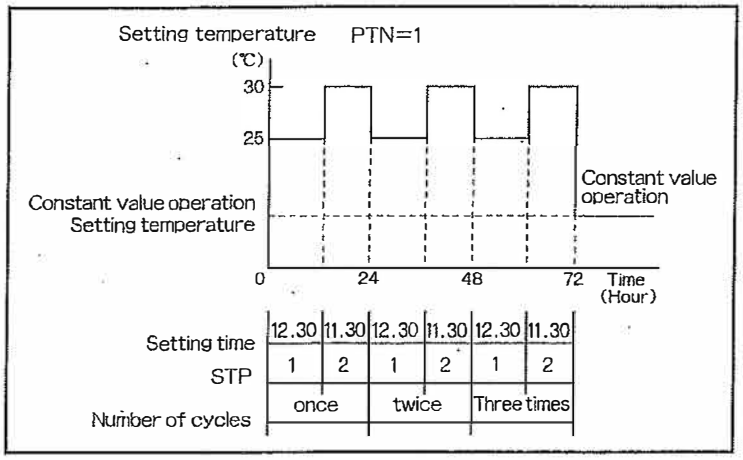
In SV mode, when this key and the display item selection key (PTN) are simultaneously pressed, this unit changes to the self diagnostic function (Check mode). See the check mode functions listed below.

| No. | PTN STEP | Display and Setting Function | Function of Specific Operation |
|---|---|---|---|
| 1 | E 1 | Auxiliary input display 0 ~ 2000(1~5V) or high and low limit sensor temperature display (°C LED lit)  | |
| 2 | E 2 | PID output value is displayed. Temperature heater FH ON, Time value HONT=00 ~ FFH Temperature heater ON=°C LED lit  {HONT} {HONH} | |
| 3 | E 3 | Present position of stepping motor MOTCNTA=00~3EH=62D (Motor driven control value) MOTSTPD=00~3EH  {MOTCNTA} {MOTSTPD} | ENT key 1st time: Control valve is fully closed. 2nd time: Control valve is fully opened. After 3rd time, not accepted. PV LED flashes. |
| 4 | E 4 | Defrosting sensor temperature display While defrosting=DEF LED lit  | ENT key acceptable only once. Continuous operation of compressor. Temperature and humidity heater OFF. SV LED flashes. |
| 5 | E 5 | Serial communication check ERROR CODE Controller mode, CMD (DIPSW) Controller NO setting display CNO  ERROR CODE , CMD, CNO DIPSW | ENT key ( ▲ key) Controller NO setting |
| 6 | E 6 | Zero adjustment of read-in value of temperature and humidity sensor  Temperature±1.9°C humidity ±19% | ENT key ( ▶▶ , ▲ key) Zero shift value setting (use UNIT key to alter humidity) |
| 7 | E 7 | All LED light check Alternative display of all lighting on and OFF  | |
| 8 | E 8 | 80C31 port condition (P0, P1, P2, P3) bit 7, 6, 5, 4, 3, 2, 1, 0 7seg h, g, f, e, d, c, b, a  {P3} {P2} {P1} {P0} | |
| 9 | E 9 | 81C55 port condition (PA, PB, PC) DIP SW condition (DIP SW)  DIP SW PC PB PA | |
| 10 | E A | Alarm condition display .=OSth without alarm O.=Over high and low alarm S.=Sensor alarm t.=Temperature alarm h.=Humidity alarm  | |

# Program setting

## 1. Programmed temperature setting

First predetermine the following figures before setting the program: The number of patterns, the number of steps and the number of cycles. Also, predetermine the time at each step. This unit allows the setting of 3 patterns, 9 steps, and a maximum of 99 cycles. The following table shows the procedure for key operations for one pattern, 2 steps and 3 cycle operations.




(Sample: PTN 1, 2 steps, 3 cycles)

| | Operation | Key operation | Display after operation | Unit display |
|---|---|---|---|---|
| 1 | Press the key for switching present/setting values | PV/SV | Alters to SV (setting value) | — |
| 2 | Press PTN key and set PTN to 1. | PTN | PTN, STEP display will change to 11. 0230 | ℃ |
| 3 | Set to the desired temperature by pressing digit shift and figure shift keys. | ▶▶ | When pressed, the settable digit will move. | ℃ |
| | | ▲ | When pressed, the figures of settable digit will increase. 0250 | |
| 4 | Press entry key. | ENT | The flashing digit is temporarily stopped and the buzzer sounds for a second. After that, the altered setting time of PTN. STEP=11 is displayed. 0000 | ℃→ HOUR, MIN |
| 5 | Set to the desired time by pressing digit and figure shift keys. | ▶▶ | When pressed, the settable digit will shift. | HOUR, MIN |
| | | ▲ | When pressed, the figure of settable digit will increase. 1230 | |
| 6 | Press entry key. | ENT | The flashing digit stops temporarily and the buzzer sounds for a second. After that, the cycle is displayed. 9 00 | HOUR, MIN ↓ CYCLE |
| 7 | Set the desired final step and number of cycles by pressing the digit shift and figure shift keys. | ▶▶ | When pressed, the settable digit will shift. | CYCLE |
| | | ▲ | When pressed, the figure of the settable digit will increase. Set the final step to 2 and number of cycles to 3. 2 03 | |
| 8 | Press entry key. | ENT | The flashing digit stops temporarily and the buzzer sounds for a second. After that, the altered setting temperature of PTN. STEP=12 is displayed. 0230 | CYCLE ↓ ℃ |
| 9 | Set to the desired temperature by pressing digit shift and figure shift keys. | ▶▶ | When pressed, the settable digit will move. | ℃ |
| | | ▲ | When pressed, the figure of settable digit will increase. 0180 | |
| 10 | Press entry key. | ENT | The flashing digit is temporarily stopped and the buzzer sounds for a second. After that, the altered setting time of PTN. STEP=12 is displayed. 0000 | ℃ ↓ HOUR, MIN |
| 11 | Set to the desired setting time by pressing digit shift and figure shift keys. | ▶▶ | When pressed, the settable digit will move. | ℃ |
| | | ▲ | When pressed, the figure of settable digit will increase. 0800 | |
| 12 | Press entry key. | ENT | The flashing digit temporarily stops and the buzzer sounds for a second. After that, the altered setting temperature of PTN. STEP=12 is displayed. 0230 | HOUR, MIN ↓ ℃ |
| 13 | Press the key for switching present/setting values. | PV/SV | Alter to PV (Present value). | — |

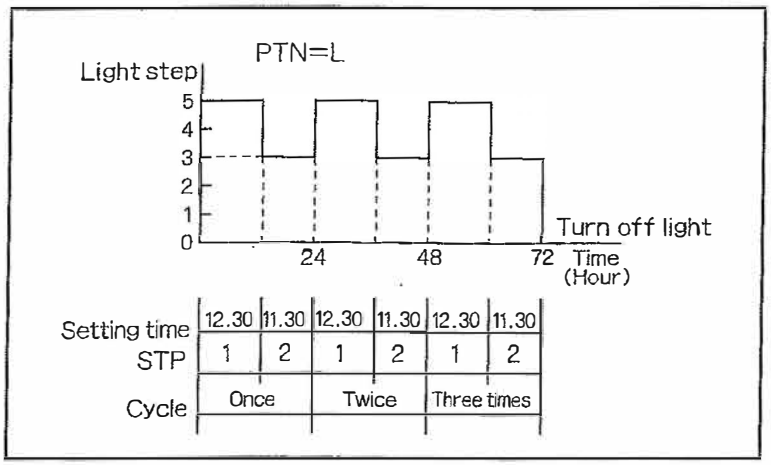
**Note:**

When continuous cycles is required, se the cycle number to 00.

When only one setting value needs to be changed, press PTN, STEP, and UNIT keys to display corresponding PTN, STEP, and UNIT. Then set the desired figure through the use of ▶▶ and ENT key. When the time setting is 00:00, this step is automatically skipped.

## 2. Lighting program setting

This unit allows programmed operation for 6 lighting steps. The lighting program can be set independently of the temperature program. The table below is a sample case to demonstrate the lighting program.




(Sample: PTN 1, 2 steps, 3 cycles)

| | Operation | Key operation | Display after operation | Unit display |
|---|---|---|---|---|
| 1 | Press key for switching present/ setting value | PV/SV | Alters to SV (Setting Value) | — |
| 2 | Set PTN to L by pressing PTN key. | PTN | PTN, STEP display becomes L1. 0 | LIGHT |
| 3 | Set desired light step by pressing figure shift key. | ▲ | When pressed, the figure of settable digit will increase. 5 | |
| 4 | Press entry key. | ENT | The flashing digit is temporarily stops and the buzzer sounds for a second. After that, setting time of PTN. STEP=L1 is displayed. 0000 | LIGHT ↓ HOUR, MIN |
| 5 | Set to the desired figures by pressing digit. | ▶▶ | When pressed, the settable digit will move.. | HOUR, MIN |
| | | ▲ | When pressed, the figure of settable digit will increase. 12:30 | |
| 6 | Press entry key. | ENT | The flashing digit temporarily stops and the buzzer sounds for a second. After that, the number of cycles are displayed. 9.00 | HOUR, MIN ↓ CYCLE |
| 7 | Set the desired final step and number of cycles by pressing digit shift and figure shift keys. | ▶▶ | When pressed, the settable digit will moves. | CYCLE |
| | | ▲ | When pressed, the figure of the settable digit increases. Set the final step to 2 and the number of cycles to 3. 2.03 | |
| 8 | Press entry key. | ENT | The flashing digit temporarily stops and the buzzer sounds for a second. After that, the setting light step of PTN. STEP=L2 is displayed. 0 | CYCLE ↓ LIGHT |
| 9 | Set the desired light step by pressing figure shift key. | ▲ | When pressed, the figure of settable digit will increase. 3 | LIGHT |
| 10 | Press entry key. | ENT | The flashing digit temporarily stops and the buzzer sounds for a second. After that, setting time of PTN. STEP=L2 is displayed. 0000 | LIGHT ↓ HOUR, MIN |
| 11 | Set the desired setting time by pressing digit shift and figure shift keys. | ▶▶ | When pressed, the settable digit will move. | HOUR, MIN |
| | | ▲ | When pressed, the figure of settable digit will move. 0800 | |
| 12 | Press entry key. | ENT | The flashing digit temporarily stops and the buzzer sounds for a second. After that, the setting light step of PTN.. STEP=L3 is displayed. 0 | HOUR, MIN ↓ LIGHT |
| 13 | Press the key for switching present/setting values. | PV/SV | Alter to PV (Present Value). | — |

### 3. Starting and stopping programmed operation

When the programmed operation starts or when operation stops in midway, use START/STOP key. When this key is pressed, the buzzer sounds and the LED of TEMP lights up, indicating the start of programmed operation. If the fluorescent lamp lighting program is active in the chamber, LED of LAMP is lit. When the programmed operation stops, LED of TEMP or LIGHT will turn off.

**Start and stop of programmed operation**

| | Operation | Key operation | Display after operation | Unit display |
|---|---|---|---|---|
| 1 | Press the key for switching present/setting values | PV/SV | Operation start; alters to SV (setting value)<br>Operation stop; Alters to PV (present value) | ----- |
| 2 | Press PTN key to select PTN for operation start or stop | PTN | In case of temp. program; PTN=1, 2 or 3<br>In case of lighting program; PTN=L | ----- |
| 3 | Press the STEP key to make desired STEP at operation start | STEP<br>(Not required when the operation stops) | When pressed, STEP moves from 1 to 2 ---- 9 – 1 | ----- |
| 4 | Press START/STOP key | START/STOP | The buzzer sounds for a seconds.<br>In case of operation start, LED of TEMP or LIGHT will turn off | ----- |

# Defrosting

1. Main evaporator

Defrost should be started manually if frost can be seen through the frost observation window. When the defrost key is pressed, defrost begins. Be sure that the defrost will be activated only when the temperature of the evaporator is below 5°C. The melt water will evaporate automatically from the drain.

2. Sub evaporator (MLR-350H and MLR-350HT only)

If the dehumidifier mode switch is in W side, the defrosting is started about every 12 hours (in 50Hz area) and 10 hours (in 60Hz area) automatically. During the defrosting, the chamber temperature gets higher but it is a temporary status, not malfunction.

# Remote alarm

The terminal for the remote alarm is located in the data input/output port at the rear top of the frame. The remote alarm terminal is a contact output. Contact capacity is 0.4 A (AC 125 V) or 2 A (DC 30 V).

1) Output: Normal open connect with C and NO
2) Output: Normal close connect with C and NC

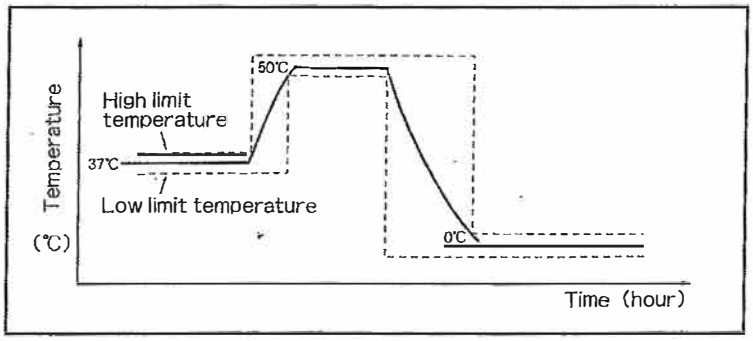
# Alarm and security functions

### 1. Alarm function

The alarm functions incorporated in this unit include automatic alarm functions other than over high and over low temperature settings described in 2.2 (page 12). This function operates when the temperature variation in the chamber exceeds 2.5°C from that set. This function operates even during programmed operation, in which case it will operate as shown in figure at right.

### 2. Security function

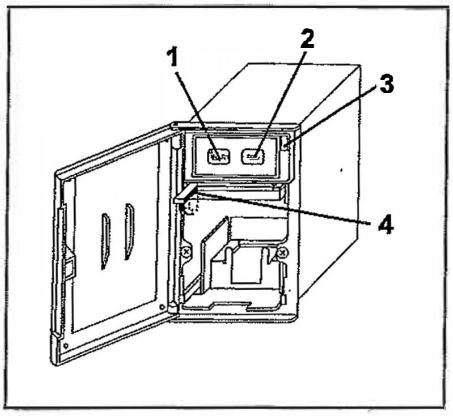
Not only is there an alarm to signify that the chamber temperature is abnormal, but there is also a security system to prevent such a situation from occurring. The table below shows a summary of the alarm and security functions.




**Alarm and security function**

| Alarm & Security | Condition | Display | Buzzer | Remote alarm contact | Security operation |
|---|---|---|---|---|---|
| Automatic alarm and security temp. setting | Chamber temp. variation exceeds 2.5°C | Alarm LED flashed °C LED flashes | Intermittent buzzer with 5 minutes delay | Operates with 5 minutes delay | High temp.; heater off Low temp.; compressor off |
| High limit temp. | When chamber temp. exceeds high limit temp. | Alarm LED lit | Continuous buzzer | Operates | Heater, receptacle, fluorescent lamp off |
| Low limit temp. | When chamber temp. exceeds low limit temp. | Alarm LED lit | Continuous buzzer | Operates | Compressor off |
| Thermal fuse | When chamber temp. exceeds 70°C | ----- | ----- | ----- | Fusing; heater, fan motor off |
| Thermal sensor is short circuited | When display temp. Exceeds 65°C | Alarm LED flashed °C LED flashes | Intermittent buzzer | Operates | Heater, fluorescent lamp, receptacle, fan motor and compressor off |
| Disconnection of thermal sensor | When display temp. Exceeds -25°C | Alarm LED flashed °C LED flashes | Intermittent buzzer | Operates | Heater, fluorescent lamp, receptacle, fan motor and compressor off |
| Memory back-up | Memory is erased (when the power source is turned off for more than 6 hours) | Alarm LED flashed OFF flashes | Intermittent buzzer | Operates | All off except controller |
| | Power failure, power Source is cut by mistake | ----- | ----- | ----- | Protect stored contents and continue operation after restoring |
| Dip switch alteration | When power source is Temporarily cut and dip switch setting is changed | 4-digit LED display flashes | ----- | ----- | Protect stored contents and continue operation with new dip switch mode after restoration |
| Key lock switch | Turn key lock switch ON | ----- | ----- | ----- | Stop receiving key input |
| Auto PV | In SV mode and when any key is not pressed for more than approx. 1 min. | ----- | ----- | ----- | Automatically restore to present value display mode from setting mode |

# Name and function of parts




**1. RECORD key**
Turns record ON or OFF on the recorder. When the recorder is turned on, LED is lit.

**2. FEED key**
Conducts paper feeding. When the recorder is in OFF mode, and the FEED and RECORD keys are pressed simultaneously for approximately 2 seconds, test printing starts.

**3. AD changeover switch**
Allows switching between analog and digital printing.

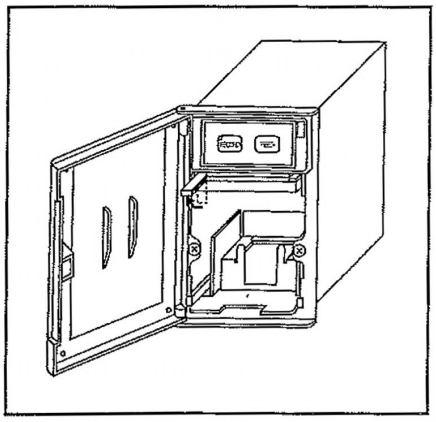
**4. Printer lever**

# Paper setting

**⚠ WARNING**

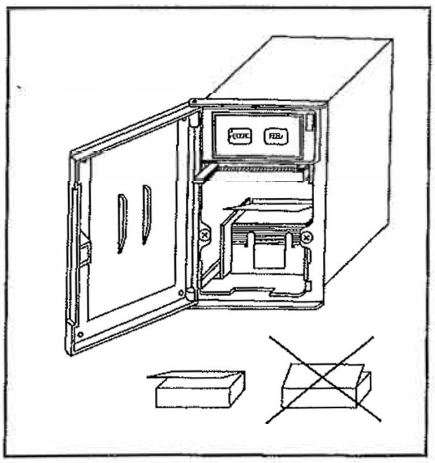
**Always disconnect the power supply plug** before setting the recording paper in the recorder to prevent electric shock or injury.

Conduct setting of recording paper according to the following procedure:



**1.** Hook the printer lever with the right forefinger. Then turn 90° in the direction of the arrow in the upper figure.

**2.** As shown in the figure, make sure that the recording surface of the recording paper is face up. Set the unrecorded papers in the receiver with the top end toward you. Do not place as shown with the mark of cross (X) in the lower figure.



**3.** Manually remove the recording paper from the recording paper receiving tray and put it through the paper thrusting section of the printer (shown by the slant line in the figure). Continue pressing the FEED key, while slightly pressing the recording paper with both hands, until recording paper is inserted.

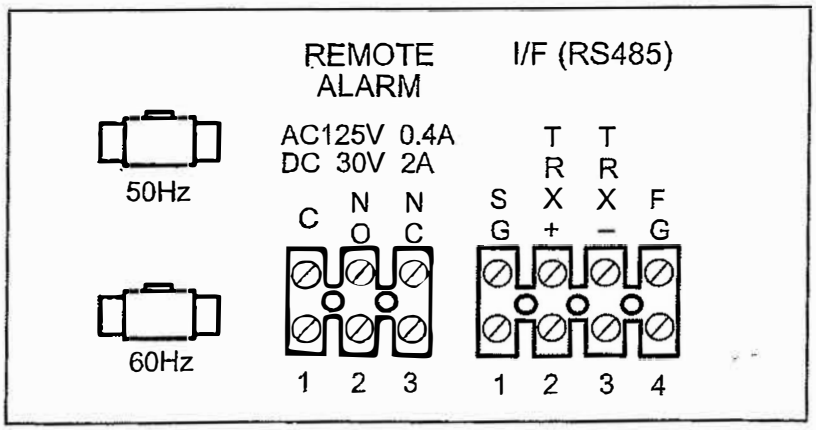
**4.** When the recording paper is inserted, release both hands and return the printer lever to the original place at a 90° angle. Continuously press the FEED key until the top end of the recording paper comes out again.

**5.** Manually remove 3 pages of the recording paper.

**6.** Place the recording paper drawn out on the receiving section of already recorded papers.

# DATA COMMUNICATION

The data in this chamber can be transmitted as the signal from input/output port terminal located at rear upper part of the unit.




**Transmission frame format**

| No. | Name of signal frame | Frame format | Categories of signals that can receive and send | |
|---|---|---|---|---|
| | | | CA=0, 1, 2 | CA=3 |
| 1 | Range recording signal | *Ya, CBf,d1-de, d1-dn ------, CRLF | Sending | Sending |
| 2 | Data recording signal | *Xa, t1t2t3t4, B, d1-dn, ------, CRLF | Sending | Sending |
| 3 | Direct printing signal | SPSPCRLF ------ CRLF --- CRLF --- SPCRLF | Sending | Sending |
| 4 | Recorder response signal | *Ar, CRLF ; *Nc, CRLF | Receiving | |
| 5 | Data report requiring signal | *Qa, mf, CRLF | | Receiving |
| 6 | Data requiring signal | *Ra, mf, d1d2d3d4d5d6, CRLF | | Sending |
| 7 | Data write requiring signal | *Wa, mf, d1d2d3d4d5d6, CRLF | | Receiving |
| 8 | Controller response signal | *Aa, CRLF ; *Na, CRLF | | Sending |

# 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.

For the evaporation tray, it should be water-washed 2 or 3 times a year.

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 lamps are provided to this unit. The glow lamp is located beside the each fluorescent lamp.

Type of the fluorescent is FL40SSW/37. Another type of lamp will affect on the power consumption and/or brightness.

Open the door (or side door) to replace the fluorescent or glow lamp.

# 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.

# TROUBLE SHOOTING

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

**1.** If nothing operates even when switched on

1) Is there a power failure?
2) Is the fuse blown or the circuit breaker inactivated?
3) Is unit connected to the power supply?

**2.** When no key operation is available

1) Is the key lock set in OFF (L 0)?

**3.** When alarm lamp is lit and alarm buzzer sounds

1) Chamber temperature exceeds over high or over low temperature
   In this case, check chamber temperature setting, and high and low limit temperature once more. When the temperature of the chamber is not set between high and low limit temperature, it is necessary to reset either high or low limit temperature.
2) Did you place a lot of heat load in the chamber at once?
   The security system is activated shortly after the load has been placed.
3) Is there a surplus heat source inside the chamber?
   Refer to Figure 2 for the acceptable limits for heat load inside the chamber.

**4.** When programmed operation is not conducted smoothly

1) Did you set the temperature expecting temperature variation in a shorter period than capable given the value of the pull up and pull down performance of this chamber?
   The performance of this chamber shows page 21. When the items are placed in the chamber, the performance will be delayed. Taking into consideration, set the time and temperature.
2) Are high/low limit temperature setting correct?
   These temperature should be set 5°C higher and lower than the highest and lowest temperature in all temperatures varied in all procedures. Once high/low limit temperature have been determined, the operation temperatures cannot be changed significantly owing to the existence of the limits for temperature extremes. For this reason, the high/low limit temperature should be set at a wide range when the programmed operation is set.

# SPECIFICATIONS

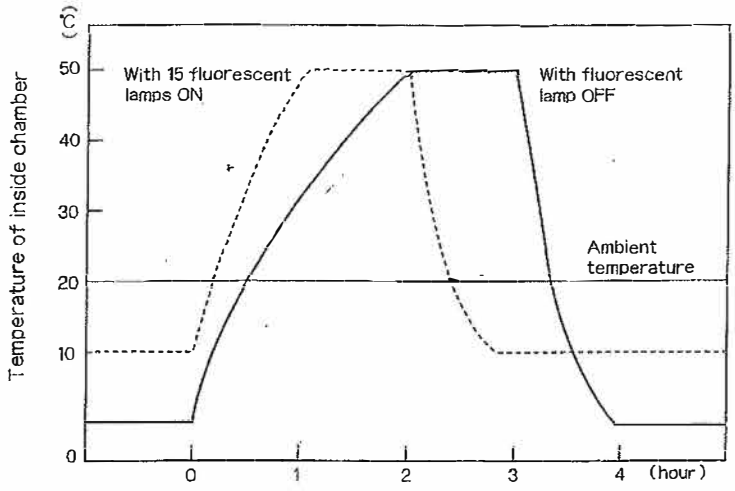
| Name | Versatile Environmental Test Chamber | |
|---|---|---|
| Model | MLR-350/MLR-350T | MLR-350H/MLR-350HT |
| External dimensions | W760 x D700 x H1835 (mm) | |
| Internal dimensions | W520 x D490 x H1135 (mm) | |
| Effective capacity | 294 L | |
| Exterior | Acrylic finish baked on zinc galvanized steel | |
| Interior | Stainless steel, Left and right wall paired glass window (370 x 1110 mm) | |
| Door | Acrylic finish baked on zinc galvanized steel, Front, left, and right side | |
| Inner door | Paired glass | |
| Insulation | Rigid polyurethane foamed-in place (CFC-FREE) | |
| Shelves | Hard steel wire on polyester coating, 4 pcs.<br>Hard steel wire on polyester coating with stainless cover, 1 pc. (bottom)<br>Allowable load; 30 kg/shelf | |
| Access hole | Inner diameter; 40 mm, Upper left side | |
| Cooling method | Forced cool air circulation | |
| Compressor | Hermetic type, Output; 325 W, 1 pc. | |
| Evaporator | Fin tube type | |
| Condenser | Fin tube type | |
| Refrigerant | R-509 (HCFC) | |
| Defrosting | Manually start, Automatically finish | |
| Heater | 280 W | |
| Temperature controller | PID control | |
| Thermometer | Digital thermometer | |
| Fluorescent light | 40 W x 15 (FL40SSW/37) | |
| Alarm | High temp., Low temp., Set temp., Set humidity | |
| Safety function | Thermal fuse, Sensor abnormality, Memory back-up, Key lock, Auto-return | |
| Remote alarm contact | DC 30 V, 2 A | |
| Program function | Temp,: 9 steps (3 patterns) 99 cycle or continuous, 1 step: up to 99 min. 59 sec.<br>Humidity,: 9 steps (1 pattern) 99 cycle or continuous, 1 step: up to 99 min. 59 sec. | |
| Accessories | Shelf; 5, Stainless cover; 1 | Shelf; 5, Stainless cover; 1<br>Water supply tank, Drain hose, Supply hose |
| Weight | 220 kg | 230 kg |

**Note**: . Design or specifications will be changed without notice.

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

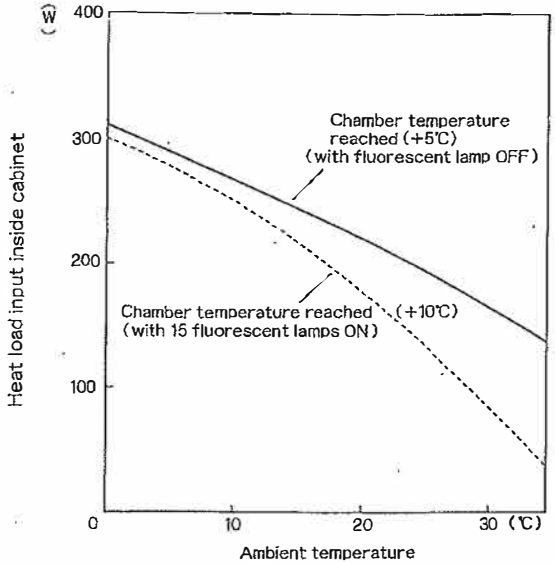
# PERFORMANCE

| Model | MLR-350/MLR-350T | | | MLR-350H/MLR-350HT | | |
|---|---|---|---|---|---|---|
| Temperature control range | +10°C to +50°C (light ON)<br>0°C to +50°C (light OFF) | | | +10°C to +50°C (light ON)<br>+5°C to +50°C (light OFF) | | |
| Humidity control range | ----- | | | 55% to 90% RH (at +15°C to +45°C) | | |
| Usable ambient temperature | -5°C to +35°C, Less than 80% RH | | | | | |
| Noise level | 48dB (A scale) | | | | | |
| Maximum pressure | 2648 kPa | | | | | |
| Rated voltage | AC 110 V to AC 115 V | AC 220 V | AC 220 V to AC 240 V | AC 110 V to AC 115 V | AC 220 V | AC 220 V to AC 240 V |
| Rated frequency | 60 Hz | 60 Hz | 50 Hz | 60 Hz | 60 Hz | 50 Hz |
| Power consumption | 1360 W | 1360 W | 1290 W | 1400 W | 1400 W | 1330 W |




Pull-down and Pull-up curve

Fig.1




Relation ship between heat load inside cabinet and chamber temperature reached

Fig.2

## ⚠ 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. Refrigerator 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 ☐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: Pharmaceutical Refrigerator | Model: MLR-350, MLR-350T MLR-350H, MLR-350HT | Serial number: | Date of installation: |
|---|---|---|---|

Please decontaminate the unit yourself before calling the service engineer.

SANYO

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