

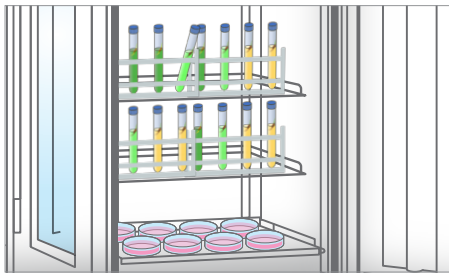
PHCbi Growth Chamber that expands the range of testing.



WHITE PAPER

PHCbi's Growth Chamber is used in,

- Food** | Research and development of various food and food products such as rice, Spirulina, comparison of germination rates, chemical control methods for potatoes, edible seaweeds, genetic research on drought-resistant and insect-resistant crops, etc.
- Plants** | Plant acclimatization and cultivation of cells and tissue. Evaluation of seedling resistance, sterilization effects of dry heat treatment of seeds, optimal temperature studies, chromatin immunoprecipitation using rotators (CHIP), and germplasm-related research.
- Industry** | Biodiesel, short-term biomass storage, cyanobacteria and algae.
- Bacterial culture** | Bacterial culture experiments using agar medium, including E. coli culture, transformation, colony production, drug selection, and bacterial tests such as Vibrio parahaemolyticus.
- Other** | We have been able to meet various experimental research needs such as toxic algae, contaminated water, contaminated soil and disease development tests, degradation tests of medicine, feed improvement, and others.



Examples: inspection process (images)



image



Night time

Day time

image

Optimal equipment placement based on functions and characteristics

Programmable temperature, illumination and humidity functions

Intuitive Operation by Graphic LCD panel

Microprocessor PID and Refrigeration Capacity Control

Security & Alarm systems

- Wide range of applications
- Password

Programmable temperature, illumination and humidity functions

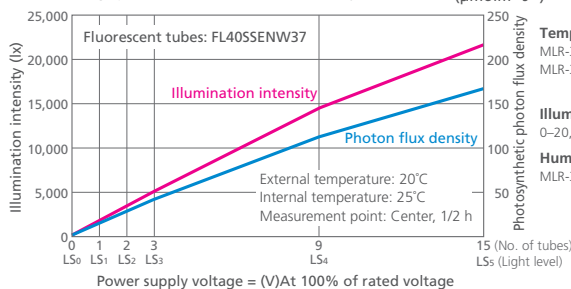
Programmable Temperature, Illumination, and Humidity Functions

Illumination program function suited for photomorphogenesis or photosynthesis research. Fifteen 40 W fluorescent tubes are mounted on the front, left, and right doors, providing illumination intensity in the range of 0 to 20,000 lx* (photon flux density 0–150 $\mu\text{mol m}^{-2} \text{s}^{-1}$), automatically adjusted to 6 levels. Operations can be programmed with up to 12 levels.

* When power supply voltage is 100% or higher.

* Use FL40S5ENW37 fluorescent tubes in this unit.

* Refer to the graph below for the illumination intensity at each level. ($\mu\text{mol m}^{-2} \text{s}^{-1}$)



Temperature regulation range:
MLR-352: 0–50°C
MLR-352H: 5–50°C (fluorescent tubes OFF)
10–50°C (fluorescent tubes ON)

Illumination regulation range:
0–20,000 lx

Humidity regulation range:
MLR-352H: 60–90% RH (fluorescent tubes OFF and Temperature: +15 °C to +45 °C)
55–85% RH (fluorescent tubes ON and Temperature: +15 °C to +45 °C)

Constant temperature culture of plants, cells, and bacteria

Known cells or bacteria (e.g., E. coli, yeast, Arabidopsis, etc.) can be cultured at their optimal temperatures.

Investigation of optimal culture conditions

Useful for examining the optimal culture conditions for unknown organisms (e.g., new species of bacteria, cells, plankton, genetically modified plants, etc.). More advanced studies can be performed by changing various parameters such as temperature or illumination intensity, as well as their cycles.

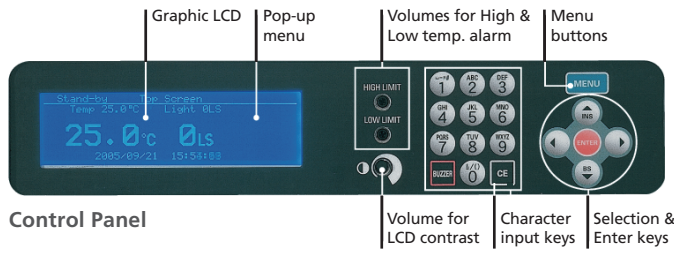
Basic and Hi-Spec models available

Humidity control function suitable for plant breeding (model H only)



Spacious, high-capacity interior

Intuitive Operation by Graphic LCD panel



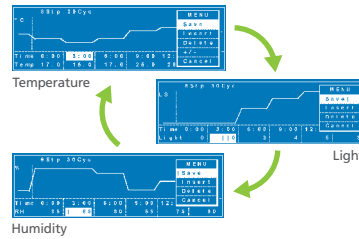
Graphic LCD panel with pop-up menu function on control panel provides more visual display and allows intuitive operation.

- **Programmable temperature function is perfect for temperature cycle and vernalisation treatment research.**
 - 12-step programs x 10 patterns can be memorized.
 - Selectable clock mode or timer mode
 - Multiple programs can be linked (Join mode).
 - Starting day and time of operation can be programmed.
- **Operation data of approximately last 2 weeks (6-minute intervals) can be automatically recorded.**
 - Data can be retrieved on the control panel.
 - Data can be transmitted to a PC (CSV data via Ethernet (LAN) Interface MTR-L03 or RS232C/RS485 Interface MTR-480).

Program Setting Screen

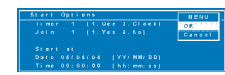
1. Selection of menu

Temperature light and humidity pages scroll with down key



2. Various ways of starting programs

Selection from Clock mode & Timer mode. Setting of Join mode and Start time available.



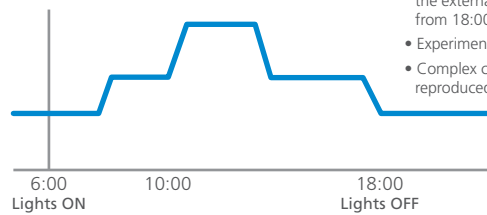
3. Data logging function

Operation data can be recorded



- **Small and lightweight, high-molecular membrane-type humidity sensor also boasts a high degree of accuracy and reproducibility. Of the newest high-molecular membrane type, the humidity sensor accurately measures chamber humidity (MLR-352H only).**

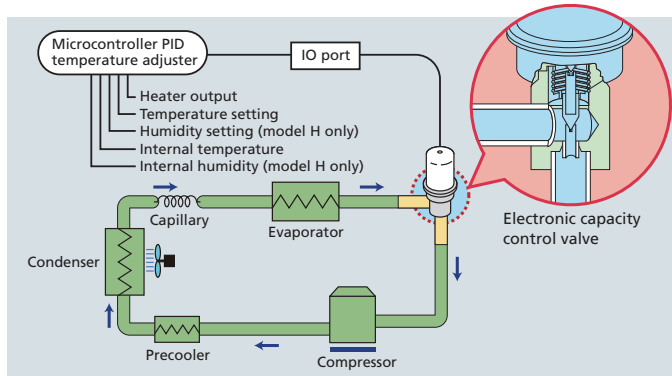
Plant cultivation program (example)



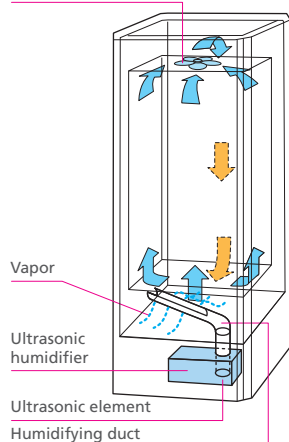
- Reproduce day and night conditions of the external environment with lights off from 18:00 to 06:00, etc.
- Experiments with temperature changes
- Complex cultivation conditions reproduced automatically

Microprocessor PID and Refrigeration Capacity Control

Microprocessor PID and Refrigeration Capacity Control eliminate temperature fluctuations and thereby improve temperature control. This allows superior precision experiments plus energy and electricity savings.



Circulation fan



Wide range of applications

■ Humidity Control (H Type)

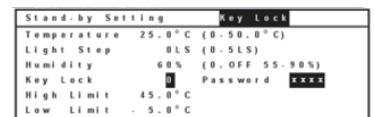
This holds an ultrasound humidifier controlled by a PID controller, making it able to control the humidity of an area of 60 — 90% RH (fluorescent light off). Furthermore, it is able to humidify the chamber with the L-shaped humidifying pipe installed at the bottom of the chamber.

Security & Alarm Systems

To protect experimental materials from any possible trouble, the system is equipped as standard with full safety protection and alarms, such as an automatic set temperature alarm, independent overtemperature/overcooling prevention alarm, program memory backup mechanism, and self diagnostic functions.

■ A password protected Keylock to prevent unauthorized access

A keylock protected with a 4-digit password helps to prevent unauthorized access



Password setting screen

- The time of power outages or malfunctions can be ascertained.
- By checking the log, the user can find out how many hours earlier the malfunction occurred and investigate the effect on the test or experiment.
- The accuracy of the temperature setting can be checked, which is ideal for reproducibility experiments (experiments to see if the same result is always obtained).

■ Easy handling and Maintenance

Suitable for a wide range of applications

All three illuminated doors can be opened and closed for easy maintenance of the fluorescent lamps. The structure is designed to be impervious to outside light. The internal dimensions are 520 mm (W) x 490 mm (D), allowing the use of most shakers, rotators, and stirrers. A convenient access port for cables and cords is provided on the upper left side of the main unit. Note: No power outlet is provided inside the instrument in anticipation of high temperature and humidity.