

Operating Instructions

Tall Plant Growth Chambers

Arabidopsis Growth Chambers

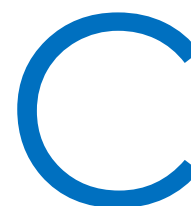
Climatic Chambers/Germinators

UXP8401-PG280/PG480/PG880

UXP8401-AR280/AR480/AR880

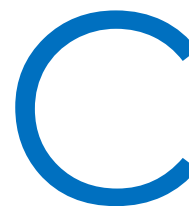
UXP8401-CC280/CC480/CC880





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Preface

Preface

In order to make the equipment fully functional and ensure safety of the operator, the equipment, property and specimen, read this manual carefully and completely. When you have any question that cannot be explained by this manual, consult your local distributors or supporting technicians. It is our pleasure to provide service for you.

General safety notes

Hazard exists if the equipment is used to heat, cool and condition specimen containing or treated with toxic chemicals or hazardous microorganisms; and hazard arises if the specimen within the equipment should be treated at periodic or aperiodic intervals with toxic chemicals or hazardous microorganisms; and hazard develops if specimen liberates hazardous substance under refrigerated and heating conditions with or without additive humidity and light radiation, where hazardous substance may be exhausted in the air by exhaust opening or operating of the door or, drained through liquid connections or drain device to cause risks.

There exist general hazards related to the application of electrical energy and machine. It is not possible to cover all possibilities; they remain largely within the responsibility and the judgment of the operator!

The equipment must only be used as intended and described in these Operating Instructions. This includes operation by suitably trained qualified personnel.

The maximum temperature deviation both in normal condition and in electro-magnetic interference field according to IEC 61326-1 is ± 0.5 °C.

Classes of the EMC standard IEC 61326-1

Class A: Equipment for operation only on networks without connected domestic areas;

Class B: Equipment for operation on networks with connected domestic areas.

Valid for Europe

The equipment is designed in accordance with EMC requirements of EN 61326-1 Class B. Class B equipment is suitable for operation on networks with connected domestic areas.

Valid for USA

Instructions for Class A digital devices as follows:

“This equipment has been tested and found to comply with the limits for Class A digital device, pursuant to Part 15 of the FCC (Federal Communication Commission) Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and

Preface

can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense."

"This device complies with Part 15 of the FCC (Federal Communication Commission) Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation."

Valid for Canada

"This Class A digital apparatus complies with Canadian ICES-003" (ICES=Interference Causing Equipment Standards).

«Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada».



Caution, Class A equipment must not be operated on power networks with connected domestic areas!

Important symbols

For your safety, pay attention to these important symbols as follows, during moving, installing operating and maintenance. The equipment is designed for safe operation because of your attention!



Warning, possibility of electric shock!
Inappropriate operation may cause hazard of electric shock and result in serious personal injury or death!



Caution, important note, and always refer to Operating Instructions (this document) for detailed information!
The equipment must be operated by well-trained qualified personnel only!
Wrong operation may cause personal injury, damage and/or mal-function of the equipment!

Symbols on the equipment

Preface



Observe operating instructions!

Warranty

Requirements for warranty

Xtemp Environments warrants the operational safety and functions of the equipment only under the conditions that:

- the equipment is operated and serviced exclusively in accordance with its intended purpose and as described in these operating instructions;
- the equipment is not modified;
- only original spare parts and accessories that have been approved by Xtemp Environments are used;
- inspections and maintenance are performed at the specified intervals.

The warranty is valid from the date of delivery to the operator.

Chapter 1 Safety Warning and Instructions

Chapter 1 Safety Warning and Instructions

1.1 Normal operating environment

The equipment is designed for safe operation under ambient conditions as follows:

- indoor use;
- altitude up to 2,000 m;
- temperature 5 °C to 40 °C;
- maximum relative humidity 80 % for temperatures up to 31 °C decreasing linearly to 50 % relative humidity at 40 °C;
- mains supply voltage fluctuations up to ± 10 % of the nominal voltage;
- transient overvoltage up to the levels of overvoltage category II;
- temporary overvoltages occurring on the mains supply;
- Pollution degree 2 or less of the intended environment;
- Wet location



Excessive high or low temperature and/or humidity will significantly degrade electric safety of the equipment!

1.2 Safety warning



Not applicable for heating, cooling, conditioning or storage of specimen which is intrinsically explosive, flammable or toxic or, which may liberate hazardous substances under normal operating temperature conditions! Caution: Explosive or flammable hazards!



The dielectric strength of the equipment may be degraded if after transport or storage in humid conditions. The equipment shall be powered as for normal use and conditioned at its maximum operating temperature or 45°C, whichever is smaller, for at least 1h before commissioned for normal use. Warning, hazard of electric shock during the dry-out!

Chapter 1 Safety Warning and Instructions

1.3 Caution

	Pull the operating temperature of the equipment as close as possible to the ambient before attempting to open the door or shut down the equipment.
	The minimum distance away from the back of the equipment to the wall, furniture or other installations shall be 300mm!
	Reduce the frequency of door operating and keep the door opening as short as possible! It takes time for the equipment to recover the Temperature and temperature distribution! The temperature difference may result in condensing and dripping of the specimen!
	<p>Caution: Risk of biological and chemical hazards!</p> <p>When hazardous substance may be exhausted in the air by exhaust opening or operating of the door or, drained through liquid connections or drain device for condensate:</p> <ol style="list-style-type: none"> hazard exists if the equipment is used to heat, cool and condition specimen containing or treated with toxic chemicals or hazardous microorganisms; hazard arises if the specimen within the equipment should be treated at periodic or aperiodic intervals, with toxic chemicals or hazardous microorganisms; hazard develops if specimen liberates hazardous substance under refrigerated and heating conditions with or without additive humidity.
 	<p>Caution: Hazard of strong optical radiation!</p> <p>Lamp canopies incorporated either at both sides, or within the cabinets generate strong visual radiation which could cause a hazard. Use special care when trying to get access to the cabinet interior:</p> <ol style="list-style-type: none"> Use glass ware or equivalent PPE as appropriate; Check functionality of dimming capability of the lamp canopies once door opened, and confirm that the light intensity within safe limit; Access to the side lamp canopies only the well-trained personnel and with appropriate PPE against optical radiation, electric shock and burn hazard ; Never disable the dimming sensor for safe light intensity.

Chapter 1 Safety Warning and Instructions

	<p>Caution, Risk of burn hazard!</p> <p>Do not touch or approach parts or area with high temperature, for example, surface of the lamp tube or metal enclosure!</p>
	<p>The swivel casters shall be locked once the equipment is seated and leveled so that it doesn't move or travel during operation which otherwise may result in hazard from imbalance or side skid!</p>
	<p>The humidifier shall be connected to purified water mains with stable pressure of 1 bar \pm 0.2 bar. The conductivity of the water shall be no more than 10μs/cm.</p> <p>Tape water, distilled water or purified water of general process with conductive ions (TDS in general), including contaminant of bacteria, microorganisms and organic substances will degrade the service life of the piezoelectric element of the humidifier.</p> <p>Unstable supply pressure will affect water level of the humidifier, thus the hysteresis for mist generating and humidifier efficiency. The piezoelectric element may be damaged if low water level triggered from time to time.</p>
	<p>Equipped with a refrigerant condensing unit, never tilt the equipment beyond 30 degrees during movement or transport! In case the equipment arrives upside down, rollover or tilted conditions, the dielectric strength of the equipment may be degraded. The equipment must be kept standstill for at least 24h before commissioned for normal use!</p> <p>The inlets of fresh air and outlets of exhausting air for the condensing unit shall be kept clear of any obstacles!</p>
	<p>Keep the equipment away from hot-air emitting source, direct sunshine, strong magnetic field and electric sparks!</p> <p>Neither contamination of high concentration dust or corrosive gas, nor strong airflow surrounds!</p>
	<p>Voltage, frequency and current for power supply must meet the requirements as designated on the nameplate! Use power socket matching the power plug of the equipment. Hot line(L)and neutral line(N)for single phase equipment must not be reversed!</p>
	<p>Socket for power supply must be equipped with protective ground (PE) to prevent against hazard of possible electric shock!</p>

Chapter 1 Safety Warning and Instructions

	Connect the power from behind the equipment. Plug in and remove the cable by directly holding the plug. No dragging of cable in any part. Protect the cable from being damaged by contacting with the hot surface of the equipment or mouse etc!
	Keep clear of inlets and outlets of back plenum for the circulating hot air. Excessive hoarding of specimen or blockage of the air circulating may cause frost accumulation on surface of the evaporator, localized temperature distribution and degraded performance!
	Install a flexible tubing to the extraction system, if the operating of the equipment could lead to liberation of hazardous air or gas mixture, for example the application of chemicals to treat specimen under growth!
	<p>Do not disassemble or exchange assembly parts and electric circuits by unauthorized personnel! Hazard of possible electric shock! In case of repairing, contact authorized local distributor or maintenance engineer.</p> <p>Always remove the mains plug from the socket before cleaning, moving, maintenance or repairing!</p>
	If you come in touch with the PCB's of the equipment please take care that you follow the electro-static discharge (ESD) guidelines and use ESD protection kit to prevent any damage on the electronic components.
	<p>Perform regular check or maintenance for the following at designated internals:</p> <ul style="list-style-type: none"> Clean the cabinet interior weekly or where necessary! Decontaminate cabinet interior and wire shovels on case-by-case bases if necessary! Check the air tightness of the door seal at six months internals! Check and clean the condenser at six months internals or where necessary! Check cabinet Klixon at six months intervals or more frequently when necessary! Check low level cut-out switch LLCO for the humidifier at three months intervals or as necessary!

Chapter 2 Installing and Operating

Chapter 2 Installing and Operating

2.1 Installing

2.1.1 Unpacking

Unpack the equipment and sort the accessories respectively and carefully. The packing carton, pallet, packing buffering stuffs etc., are designed for one shipment only. For future shipment, prepare the packing materials as well as the way of packing as received.

Check the equipment and accessories for potential transport damages. If there is any damage visible on the equipment, a claim must be filled in writing with the freight forwarder; a notification to the freight forwarder is obligatory so that the shipment can be examined.

Inform your local distributor or supplier for any missing accessories and servicing or repairing.

Accessories lists (UXP8401-PG)

Part Number	Qty	Descriptions	Remarks
DSEO0711-2	1	Operating Instructions	This document
ERSG0202	1	Fuse (250V~/15A), D5L20	Breaking capacity : 1500A
BJEW1802	1	Perforated shelves , 280	PG280
BJEW1803	1	Perforated shelves , 480	PG480
BJEW1804	1	Perforated shelves , 880	PG880
BJKA0332	4	Shelf clips	
BJEZ1801	1	PG Lamp canopy , PG280	PG280
BJEZ1802	1	PG Lamp canopy , PG480	PG480
BJEZ1803	1	PG Lamp canopy , PG880	PG880
BJEW1805	2	Canopy supports , PG/AR280	PG280
BJEW1806	2	Canopy supports , PG/AR480	PG480
BJEW1807	2	Canopy supports , PG/AR880	PG880
BJEF1801	1	PG Floor cassette , PG280	PG280
BJEZ1821	1	PG Floor cassette , PG480	PG480
BJEZ1831	1	PG Floor cassette , PG880	PG880
BCOA4201	1	Temperature and humidity aspirator	

Accessories lists (UXP8401-CC)

Part Number	Qty	Descriptions	Remarks
DSEO0711-2	1	Operating Instructions	This document
ERSG0202	1	Fuse (250V~/15A), D5L20	Breaking capacity : 1500A

Chapter 2 Installing and Operating

BJEW1802	3	Perforated shelves , 280	CC280
BJEW1803	4	Perforated shelves , 480	CC480
BJEW1804	4	Perforated shelves , 880	CC880
BJKA0332	12	Shelf clips	CC280
BJKA0332	14	Shelf clips	CC480、CC880
BCOA4201	1	Temperature and humidity aspirator	

Accessories lists(UXP8401-AR)

Part Number	Qty	Descriptions	Remarks
DSEO0711-2	1	Operating Instructions	This document
ERSG0202	1	Fuse (250V~/15A), D5L20	Breaking capacity : 1500A
BJEW1802	2	Perforated shelves , 280	AR280
BJEW1803	2	Perforated shelves , 480	AR480
BJEW1804	2	Perforated shelves , 880	AR880
BJKA0332	8	Shelf clips	
BJEZ1801	2	AR Lamp canopy , AR280	AR280
BJEZ1802	2	AR Lamp canopy , AR480	AR480
BJEZ1803	2	AR Lamp canopy , AR880	AR880
BJEW1805	4	Canopy supports , PG/AR280	AR280
BJEW1806	4	Canopy supports , PG/AR480	AR480
BJEW1807	4	Canopy supports , PG/AR880	AR880
BCOA4201	1	Temperature and humidity aspirator	

Accessories lists (UXP8401-GE)

Part Number	Qty	Descriptions	Remarks
DSEO0711-2	1	Operating Instructions	This document
ERSG0202	1	Fuse (250V~/15A), D5L20	Breaking capacity : 1500A
BJEW1811	4	Seed tray , GE280	GE280
BJEW1812	5	Seed tray , GE480	GE480
BJEW1813	5	Seed tray , GE880	GE880
BJEW1814	8	Seed tray supports , GE280	GE280
BJEW1815	10	Seed tray supports , GE480	GE480
BJEW1816	10	Seed tray supports , GE880	GE880
BCOA4201	1	Temperature and humidity aspirator	

Chapter 2 Installing and Operating



Do not disassemble or exchange assembly parts and electric circuits by unauthorized personnel! Hazard of possible electric shock! In case of repairing, contact your local distributors or supporting technicians.

In case of damaged shipment and dent, deformation or distortion of the enclosure, contact authorized local distributor or personnel.

2.1.2 Installing

Install the equipment on a rigid, nonflammable surface and well-ventilated place. If the equipment is installed on an unstable surface or floor, abnormal noise may be generated. Keep enough space between wall and back of the equipment for better ventilation.

The voltage, frequency and current of the power supply must be rated at least the same as those designated on the name plate of the equipment. The switch board is recommended to be on the back right side of the equipment and equipped with outlet matching the power plug of the equipment with protective ground (PE).

For possible wet location conditions, where cycle of evaporating and condensing, overflowing or spillage may occur and for protection against hazard of possible electric shock, use power socket with appropriate IP protection and additional residual current circuit breaker (RCD) with rated breaking capacity!

Power socket, switchboard with circuit breaker or residual current circuit breaker for the equipment shall be located closest to the equipment with good clearance for easy access, so that immediate interruption is possible under emergent circumstance.

The humidifier shall be connected to a water mains of stable pressure $1 \text{ bar} \pm 0.2 \text{ bar}$, and a pressure regulator shall be used where necessary. When tap water is used, a water softener or purifier of $10 \mu\text{s/cm}$ or less is mandatory. The flexible tubing or hose between water source and liquid connection of the equipment shall be fixed and protected from mechanical, thermal and chemical stresses for performance and safety. For specifications and requirements for a pump booster, pressure regulator, water softener and purifier, consult Xtemp or local authorized distributor.



The minimum distance away from the ventilating holes at the back of the equipment to the wall, furniture or other installations shall be 300mm! The inlets of fresh air and outlets of exhausting air at the back of the equipment shall be kept clear of any obstacles.



Keep the equipment away from hot-air emitting source, direct sunshine, strong magnetic field and electric sparks!

Neither contamination of high concentration dust or corrosive gas, nor strong airflow surrounds!

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Chapter 2 Installing and Operating



Voltage, frequency and current for power supply must meet the requirements as designated on the nameplate! Use power socket matching the power plug of the equipment. Hot line (L) and neutral line (N) for single phase equipment must not be reversed!



The equipment shall be secured by locking the swivel casters or adjusting of the levelers once it is in place and before being commissioned, to mitigate noise, protect it from accidental movement and fall down from imbalance, and ease draining.

The flexible tubing or hose between water source and liquid connection of the equipment shall be fixed and protected from mechanical, thermal and chemical stresses for performance and safety

Keep water supply pressure stable and constant.



Socket for power supply must be equipped with protective ground (PE) to prevent against hazard of possible electric shock.



Install a flexible tubing to the extraction system, if the operating of the equipment could lead to liberation of hazardous air or gas mixture, for example the application of chemicals to treat specimen under growth!

Chapter 2 Installing and Operating

2.2 Descriptions

2.2.1 Front view



Fig 1 Front view

- 01 Power SW with lock
- 02 HMI touch screen
- 13 Lamp canopy (CC/GE)
- 14 Perforated shelves
- 17 Interior glass
- 18 Front door
- 19 The levelers
- 34 Ventilator
- 35 Glass door alarm switch
- 42 Temperature and humidity aspirator
- 58 Sockets for PAR and Lux transmitter
- 71 Ultrasonic humidifier
- 72 USB socket (Optional)
- 123 Drip pan
- 145 Cable socket for portable T/H aspirator
- 150 Connection for air sampling tube
- 226 Proximity switch for dimming of lamp canopy



The first time powering up after repairing or standstill for long period, or at designated intervals under normal use, check the functionality of the following parts or components:

- Check the air tightness of the door seal at six months internals!
- Check and clean the condenser at six months internals or where necessary!
- Clean the cabinet interior weekly or where necessary!
- Decontaminate cabinet interior and wire shovels on case-by-case bases if necessary!



Keep clear of inlets and outlets of back plenum for the circulating air. Excessive hoarding of specimen or blockage of the air circulating may cause frost accumulation on surface of the evaporator, localized temperature distribution and degraded performance!

Chapter 2 Installing and Operating



Perform regular check or maintenance for the following at designated intervals:

Clean the cabinet interior weekly or where necessary!

Decontaminate cabinet interior and wire shovels on case-by-case bases if necessary!

Check the air tightness of the door gasket at three months intervals or the first time application after storage of service!

Check and clean the condenser at six months intervals or where necessary!



Caution: Hazard of strong optical radiation!

Lamp canopies incorporated either at both sides, or within the cabinets generate strong visual radiation which could cause a hazard. Use special care when trying to get access to the cabinet interior:



a) Use glass ware or equivalent PPE as appropriate;

b) Check functionality of dimming capability of the lamp canopies once door opened, and confirm that the light intensity within safe limit;



c) Access to the side lamp canopies only the well-trained personnel and with appropriate PPE against optical radiation, electric shock and burn hazard ;

Never disable the dimming sensor for safe light intensity.

2.2.2 Back view

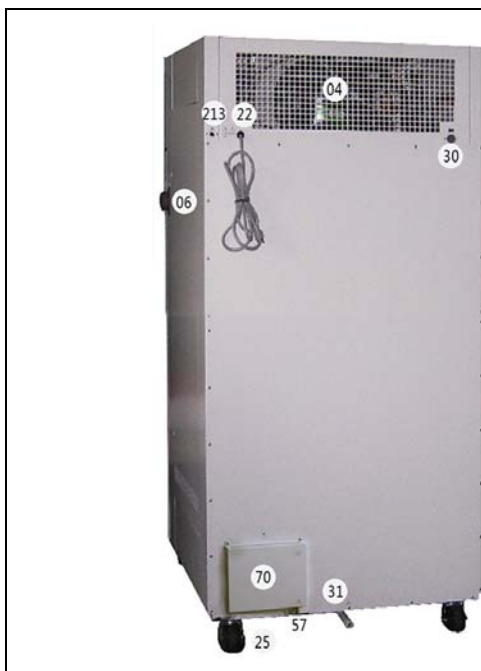


Fig 2 Back view

04 Exhausting-air outlets

06 Hatch/Access port

22 Power cable

25 Fixed casters

30 Connection for exhaust opening

31 Condensate outlet

57 Water inlet for humidifier

70 Humidifier control module

213 Ethernet interface (optional)

Chapter 2 Installing and Operating

Use flexible hose of appropriate size to connect the condensate outlet (Fig 2-31) to drainage system, the height of the drainage shall be lower than that of the outlet.

The humidifier shall be connected to purified water mains with stable pressure of 1 bar \pm 0.2 bar. The conductivity of the water shall be no more than 10 μ s/cm. Use 1/4" PU pneumatic hose to connect the humidifier inlet to a purified water source.

The USB is used to update software version, update temperature and humidity data for PC processing. Use Ethernet interface for internet access and remote control or monitoring.



The minimum distance away from the back of the equipment to the wall, furniture or other installations shall be 300mm!



Voltage, frequency and current for power supply must meet the requirements as designated on the nameplate! Use power socket matching the power plug of the equipment. Hot line(L)and neutral line(N)for single phase equipment must not be reversed!



Socket for power supply must be equipped with protective ground (PE) to prevent against hazard of possible electric shock.

2.2.3 Humidifier



Fig 3 Humidifier

- 40 Piezoelectric element module
- 41 Water supply float valve
- 56 Low level switch
- 237 Humidifier cover

Chapter 2 Installing and Operating



The humidifier shall be connected to purified water mains with stable pressure of 1 bar \pm 0.2 bar. The conductivity of the water shall be no more than 10 μ s/cm.

Tape water, distilled water or purified water of general process with conductive ions (TDS in general), including contaminant of bacteria, microorganisms and organic substances will degrade the service life of the piezoelectric element of the humidifier.

Unstable supply pressure will affect water level of the humidifier, thus the hysteresis for mist generating and humidifier efficiency. The piezoelectric element may be damaged if low water level triggered from time to time.



Check the function of the water supply float valve and low level switch at 3 months intervals to avoid overflow, performance of the humidifier and low level protection.

Check and clean the ultra-sonic module at 1 week intervals or where necessary so that no dirt buildup or corrosion occurs.

For normal use, the cover of the humidifier (Fig3-237) shall be kept in place with correct orientation as designated on the marking, to keep the bath tank clean, smooth flow and distribution of the humidity mist.

2.2.4 Portable temperature/humidity aspirator

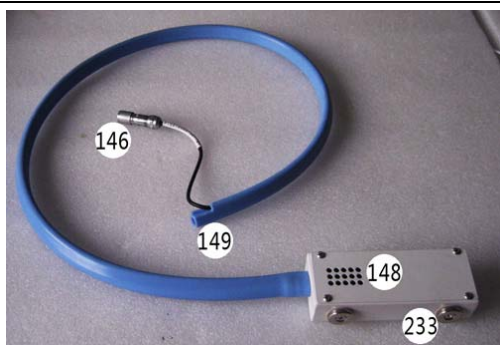


Fig 4 Portable temp/humidity aspirator

- 146 Cable plug
- 148 Air suction holes
- 149 Sampling tube
- 233 Fixing magnetic coins

The portable temperature/humidity aspirator is recommended to be fixed at back side of the middle shelf. If any this position is not possible for easy operation of the sample or test, the aspirator may be fixed at any part over shelves, back plenum, left or right wall of the cabinet, provided that specifications for stability and uniformity are confirmed by testing or calibration based on the applicable use case. For reliability and long-term operation, note the following:

- Air sampling tube (149) not to be squeezed or folded;
- Free air flow around, or no coverage of the air suction holes (148);
- No condensation, dripping or spillage of the assembly (42);

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Chapter 2 Installing and Operating

- No direct heat or light on the assembly (42);
- Reliable connection of the cable plug (146) and air sampling tube (149) (Fig 1-145, 150).

In case unstable temperature or humidity control, or significant temperature or humidity deviation, check above points by points first, and then connection of the cable connector (146) and air sampling tube (147) first. Follow steps of checking (4.5) and replacement (4.4) in case of damage or malfunction.

3

Chapter 3 Controller Descriptions and Operation

Chapter 3 Controller Descriptions and Operation

3.1 Power up

Turn on the power SW (01) , system boost up and perform self diagnosis. The HMI touch screen (02) shows the company LOGO and banner (Fig 5).



Fig 5

For ease of explanation, note the following general rules:

Use a rectangular frame for display window, for example **HOME** ;

Use square brackets for a key button, for example [SET /START];

Use underline for data input, for example Working temperature, Working humidity etc.

3.2 HOME Screen

After system boost up and self diagnosis, the HMI touch screen (2) turns automatically to screen for **HOME** (Fig 6).



Fig 6

3

Chapter 3 Controller Descriptions and Operation

Based on equipment functions, the message displayed in the **HOME** screen may be different and mainly includes as follows:

- CT**, Cabinet Temperature, standard function module, including actual temperature and working temperature. Before temperature control starts up, the working temperature is displayed 0.00, while after start-up, working temperature correspondences to the actual setting. For [CONSTANT] operation, the working temperature is a fixed value, while for [PROGRAM] operation, the working temperature will change if the successive two values are set to ramp.
- RH**, standard function module, including actual humidity and working humidity. Before humidity control starts up, the working humidity is displayed 0.00, while after start-up, working humidity correspondences to the actual setting. For [CONSTANT] operation, the working humidity is a fixed value, while for [PROGRAM] operation, the working humidity will change if the successive two values are set to ramp.

Humidity control is possible when temperature comes within ± 5 °C of the setting. Otherwise the humidifier will not work, and the **OUTPUT** for **HUMD** will be 0 as illustrated in screen of **Details for Immediate Constant** (Fig 14).

- VL**, Visual Light, standard function module, including visual light setting and actual dimming output. Light intensity can be set from 0~100%, where 0% means no light, 1~100% means dimming between 1~100%. Once light radiation is enabled, or the light intensity is changed from one to another, a smooth and comfortable light change is achieved according to a set and editable dimming rate. Once outside door open and the operator exposed to strong optical light, if the active light intensity is higher than a safety value, the light intensity will be dimmed automatically to the safe value. The set value will be resumed once the door closed.

The Light intensity may be measured by optional light sensors, including quantum sensor for PPF, photometric sensor for lux illuminance, and ultraviolet sensor for UVA measurements. The display can be instant radiation or accumulative radiation, including $\mu\text{mol}/\text{m}^2.\text{s}$, klux, W/m^2 , $\text{mol}/\text{m}^2.\text{d}$ (DLI), klux.h and $\text{W}/\text{m}^2.\text{h}$ for different purpose. The accumulative radiation measurements have the advantage of more accurate result to compensate instability of the light intensity as affected by voltage fluctuation, temperature and service life of the light. With the setting of an accumulative radiation, visual and audible alarm can be used for precise radiation control, for example for compliance with ICH Q1B.

The trend chart is used for record and presentation of temperature and relative humidity changes with the time, including actual temperature (Pv), set temperature (Sv), actual humidity (Pv) and set humidity (Sv). The left Y axis is temperature (°C), the right Y axis is relative humidity (%RH), while the X axis is time. The chart start from left and develop to the right, and will pan automatically to the left once the chart tends to be full. The scroll bar at the bottom of the chart makes review of the temperature and humidity trend vivid and convenient. By touching

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Chapter 3 Controller Descriptions and Operation

any part of the curve, Pv and Sv of the temperature and relative humidity along with the time of the data can be displayed. For details of the trend chart, refer to 3.8.

Below the trend chart are frame for event status, button for [LOCK SCREEN], [LIGHT] and [SET /START], as follows

EVENT STATUS frame with yellow back ground shows status of equipment operation, and/or warning message as detailed in the table, wherein color of WHITE for message only, BLUE for schedule event, YELLOW for warning and RED for emergency. In case of warning and emergency message, try to source the cause of the event, clear the warning message and press [RESET] button to continue.

Event Status Message

Category	Class	Event Message	Cause of Event	Warning Record
3	Emergency	Cabinet temperature exceeding the independent STB limiter	Cabinet Klixon triggered	Y
3	Emergency	Compressor discharge and/or suction pressures beyond the setting of the pressure switch	Dual pressure switch triggered	Y
3	Emergency	Water supply tank low level	No water in the supply tank	Y
3	Emergency	Humidifier pan low level	No water in the humidifier bath tank	Y
2	High	Accumulative radiation LUX exceeding maximum setting	Over radiation	
1	Middle	Lamp canopy radiation automatically adjusted to a safe level	Outside door open	
1	Middle	Cabinet door in unclosed condition	Glass door open	
1	Middle	Equipment standby for schedule constant operation ...	Schedule constant operation initiated	
1	Middle	Equipment standby for schedule program operation ...	Schedule program operation initiated	
0	Low	Equipment in constant operation		
0	Low	Equipment in program operation ...		
0	Low	Equipment in standby status ...		

[LOCK SCREEN]: To lock the **HOME** screen to avoid un-authorized access and operation of the equipment. To lock the screen, tap the button to pop up a query window, and tap [Proceed] to continue, and [Cancel] to escape. Once the screen is locked, tap [HOME] to pop up a keypad and input password to come back.

[LIGHT]: To turn on or off operator light for illumination. Tap the button for more than 2 sec for light and tap another 2 sec for light off. If the light is on for more than 60 sec, the light will be turned

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off automatically. The light intensity of the operator light is the same as for safe level as activated by door operation.

[SET/START]: To start the operation of circulating fan and control of temperature, humidity and light as set in constant mode or program mode, or to set t working parameters or review working details of the equipment.

3.3 Start the equipment operation

Tap [SET/START] to enter screen for constant operation or program operation (Fig 7). Select either [CONSTANT] to screen Fig 8 or [PROGRAM] to screen Fig 21.

Use [ESC] to escape and come back to **HOME** (Fig 6, Fig 11).

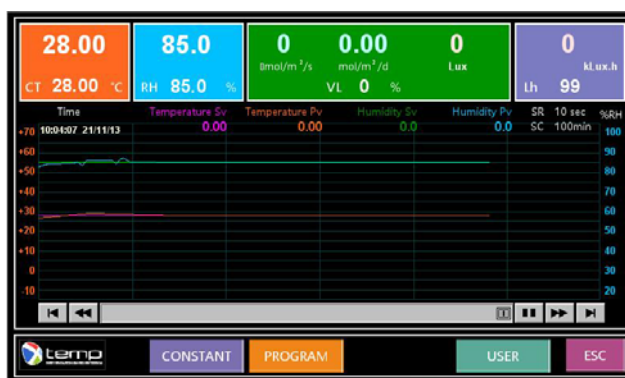


Fig 7

3.4 Constant operation

Tap [CONSTANT] to enter screen for temperature, humidity, visual light and maximum radiation limit (Fig 8). Touch the respective fields to pop up digital keypad to set target values. If the value is not changed at [ENT], the data is not accepted for either lower than or higher than the allowable range limit. Modify the data and confirm the input by [ENT].



Fig 8

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Check and make sure the settings are correct. Confirm the input by using [START NOW] for immediate operation or [SCHEDULE] for schedule operation. [START NOW] will start the control of temperature, humidity and light immediately (Fig 10), while [SCHEDULE] will start the control at the time determined for a scheduled date and time (Fig18).



Fig 9

Use [CAN] to cancel the operation and come back to **HOME** (Fig 6, Fig 11).

[USER] is entry button for setting of user parameters (3.14).

3.5 Start Now

For immediate constant temperature operation, start the equipment by using [START NOW] to show screen of Fig 10. Press [NO] to come back to Fig 9 for modification of values, or use [YES] to continue and turns to the screen **HOME** (Fig 11).

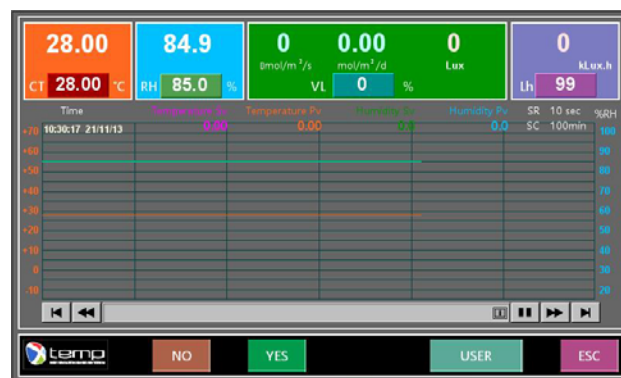


Fig 10

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Fig 11

3.6 Termination of equipment operation

With the equipment started and during normal operation in Fig 11, press [SET/STOP] to show screen of Fig 12

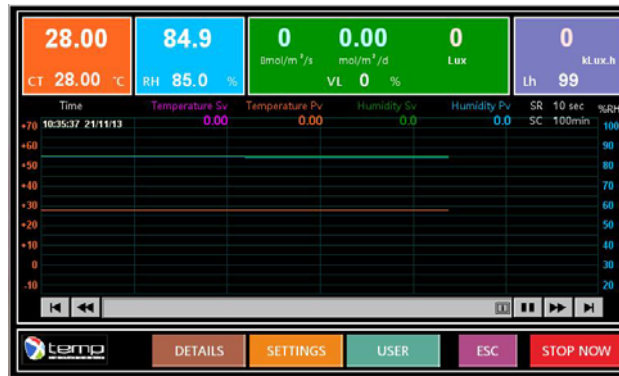


Fig 12

Tap [DETAILS] for details of equipment operation, and refer to 3.7; Tap [SETTINGS] to modify setting of working temperature and maximum radiation limit, refer to 3.2. Tap [ESC] to cancel the [SET/STOP] operation and come back to the **HOME** screen (Fig 11).

Tap [STOP NOW] to terminate the equipment operation, as confirmed by the following:

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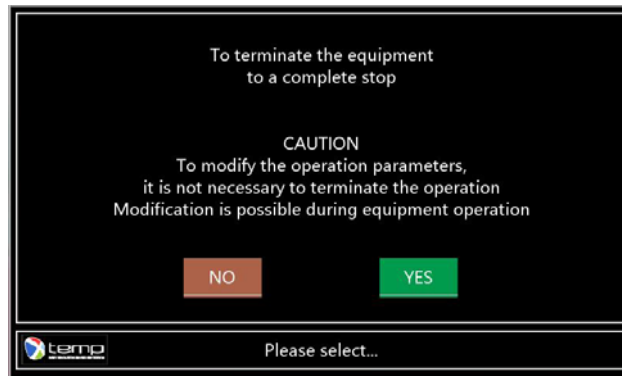


Fig 13

Use [NO] to escape **HOME** (Fig 11) , use [YES] to terminate the equipment operation completely.

3.7 Details for immediate Constant

Tap [DETAILS] in Fig 12 for screen of **Details for Immediate Constant** for display of PV and SV for TEMP and HUMD, Sv for Visual Light and, if optional light sensors are incorporated, measurements of Photosynthetic Photon Flux (PPF) and/or photometric illuminance (lux) and OUTPUT for PID temperature and humidity control, level of visual light intensity, including heater percentage, hot-gas bypassing valve steps, humidifying percentage and LED current , as well as accumulative operating hours after started-up (Fig 14), once equipment started up.

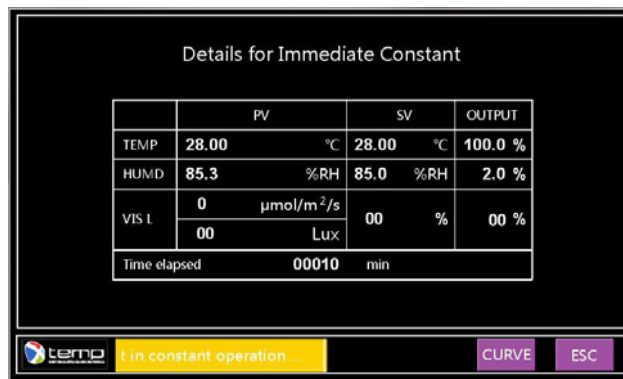


Fig 14

The normal values for OUTPUT of PID temperature, humidity and light control shall be ranged between 10%~90%. Use [ESC] to escape and come back to **HOME** (Fig 11).

3.8 Display in curve or table

With different versions for temperature and humidity range of the equipment, the Y axis of the temperature curve may be different to match the maximum and minimum temperatures.

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During normal operation and at screens of **DETAILS** (Fig 14), tap **[CURVE]** to display as follows (Fig 15):

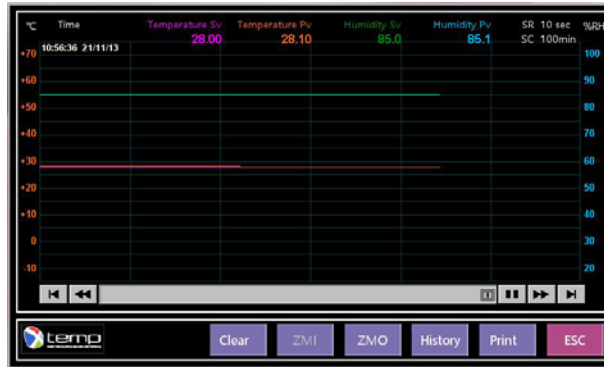


Fig 15

Header from left to right: **Sampling time**, **Temperature Sv**, **Temperature Pv**, **Humidity Sv** and **Humidity Pv**;

Left Y axis: Temperature in °C;

Right Y axis: Humidity in %RH;

X axis : Time slide to move left and right for display time range, in sec, min or hr dependent on the scale setting.

Sampling rate (SR) means the interval between successive samplings, total time in one screen (SC) means the time zone from left to right in sec, min or hr.

[CLEAR] is intended for clearing of the current data and display so that the new display starts from the clearance.

Use **[ZMI]** or **[ZMO]** to shift between screens with different **SR** and **SC**. For example, Fig 15 show **SR** of 10 sec and **SC** of 100 min. **[ZMI]** for lower **SR**, **SC** but higher resolution, while **[ZMO]** for higher **SR** and **SC** but lower resolution. Fig 16 shows the result of **[ZMO]** and **SR** of 30 sec and **SC** of 100 min.

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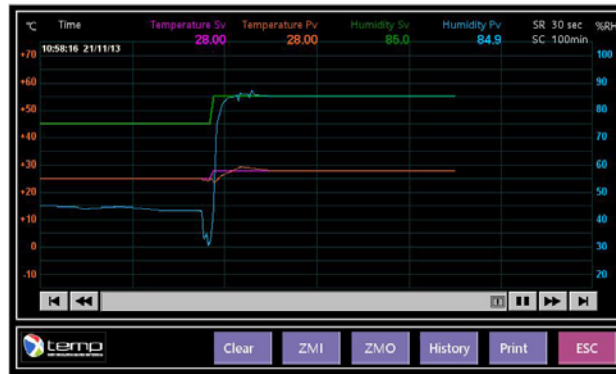


Fig 16

[HISTORY] is used for display of the curve from the previous recording.

[PRINT] is used for printing of the curve for the current display.



Note that [HISTORY] and [PRINT] are possible with USB options

Use [ESC] to shift the screen from **CURVE** back to **HOME** (Fig 11).

At the screen of **CURVE**, tap the screen anywhere on the curve to show a vertical, white line for data of temperature and humidity at the designated time (Fig 17), including : **Sampling time**, **Temperature Sv**, **Temperature Pv**, **Humidity Sv** and **Humidity Pv**; Move the white line horizontally for different time and correspondence values. At control equilibrium, the deviation from the set point means stability.

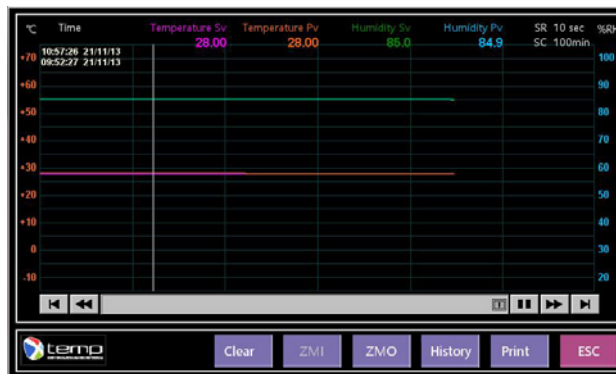


Fig 17

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3.9 Schedule a constant operation

At screen of **CONSTANT** operation as in Fig 9, Tap [SCHEDULE] to show the following:

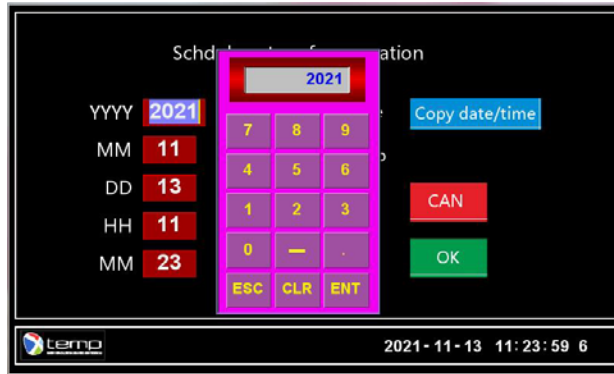


Fig 18

Key in YYYY-MM-DD for date, and HH-MM for time to schedule a future equipment operation. Set the values and use [ENT] to accept, or [CLR] to clear error or [ESC] to exit. Use [Copy date/time] for copying of the current date and time.

Use [CAN] to cancel and [OK] to continue to the next page as follows:

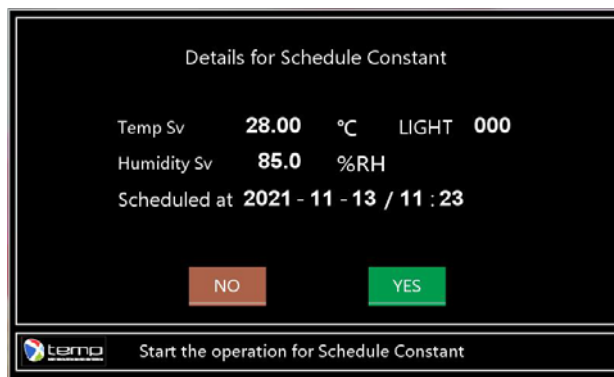


Fig 19

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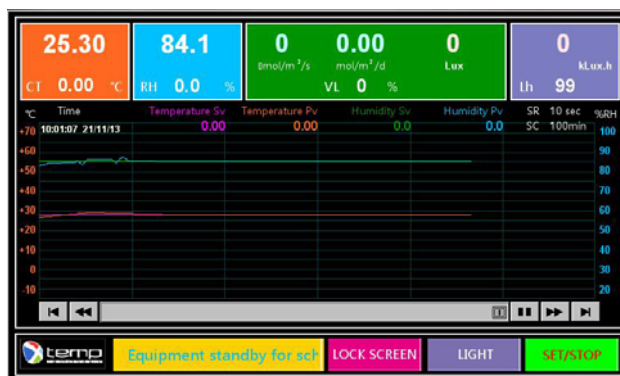


Fig 20

Use [NO] to cancel a schedule plan and come back to **HOME**; Use [YES] to initiate a **Schedule Constant** operation as shown in Fig 20. Once the schedule date and time arrives, the equipment will start constant operation automatically.

3.10 Edit a Program

At screen of Fig 9, Tap [PROGRAM] to show **Program List** as in Fig 21 for editing a program, with functions as follows:

List of program: default screen is 01~10 with 10 programs. Use [11-20], [21-30] or [31-40] to select programs of 11~20, 21~30, or 31~40, with total 40 programs:



Fig 21

[EDIT]: Edit a program of temperature, humidity and light of a program number been selected.

Note the color difference of the program number selected or non-selected.

[COPY]: Copy a selected **source program number** to a **target program number**.

[DELETE]: Delete a selected **source program number**.

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[U DISK]: Applies to equipment with USB option only. Save program data from a selected program number, or download program data into a selected program number.

[START NOW]: Initiate the operation of a selected program number immediately.

[SCHEDULE]: Enable the operation of a selected program number to start at a designated date and time as scheduled.

[ESC]: Escape to the screen of **HOME**.

Procedures to edit a program as follows:

Tap the program number to be edited, for example program number **01**, when **01** becomes highlighted.

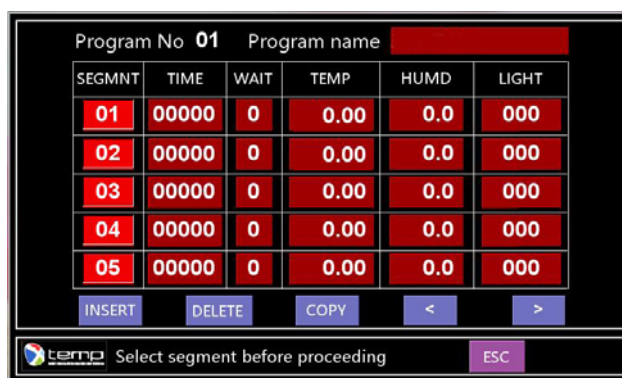


Fig 22

Tap [EDIT] to enter the editing of program number **01** as shown in Fig 22 as follows:

Tap field of Program name to pop up a key pad as shown in Fig 23. Key in program name as expected. Confirm the input and exit by [OK].



Fig 23

The basic information required for program editing includes **SEGMENT**, **TIME**, **WAIT**, **TEMP**, **HUMD** and **LIGHT**.

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SEGMNT: Segment of a program, sequence of the program operation, range 01~99, generated automatically by the system;

TIME: The time in min to be executed by one program segment. Tap the input field to pop up a keypad for time input;

WAIT: The time in min to wait before count-down for the time of a particular program segment. This is intended to start a new segment before temperature and humidity are stabilized. Tap the input field to pop up a keypad for time input; For easy of time calculation, use 0 for no waiting.

TEMP: Target temperature in °C for a particular program segment. If the target temperature is different from the current temperature, the ramping rate will be calculated based on the temperature difference and the time in a linear way. Tap the input field to pop up a keypad for temperature input;

HUMD: Target humidity in %RH for a particular program segment. If the target humidity is different from the current humidity, the ramping rate will be calculated based on the humidity difference and the time in a linear way. Tap the input field to pop up a keypad for humidity input;

LIGHT: Intensity level of the lamp canopy, 0~100%, for a particular program segment. Tap the input field to pop up a keypad for percentage of the dimming.

Example of a temperature, humidity and light program as follows:

Example 1, rectangular program (maximum speed ramping)for temperature, humidity and light.

SEGMNT	TIME (min)	WAIT (min)	TEMP (°C)	HUMD (%RH)	LIGHT (%)	Descriptions
			20.00	70.0	000	Starting condition before program initiated, whether stabilized or not.
01	00001	0	25.00	75.0	000	Change the setting in 1 min for temperature from 20.00 °C to 25.00 °C, and humidity from 70.0 %RH to 75.0 %RH (maximum).
02	00239	0	25.00	75.0	000	Keep the temperature at 25.00 °C and humidity at 75.0 %RH for 239 min. As a result, the ramping for temperature and humidity is at maximum possible rate and the total time for ramping and stable stage is 4 hours (1+239=240 min).
03	00001	0	28.00	85.0	000	Change the setting in 1 min for temperature from 25.00 °C to 28.00 °C, and humidity from 75.0 %RH to 85.0 %RH (maximum).
04	00239	0	28.00	85.0	000	Keep the temperature at 28.00 °C and humidity at 85.0 %RH for 239 min. As a result, the ramping for temperature and humidity is at maximum possible rate and the total time for ramping and stable stage is 4 hours (1+239=240 min).
05	00001	0	10.00	0.0	000	Change the setting in 1 min for temperature from 28.00 °C to 10.00 °C, and humidity from 85.0 %RH to 0.0 %RH, which means

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						humidity control off.
06	00479	0	10.00	0.0	000	Keep the temperature at 10.00 °C for 479 min. As a result, the ramping for temperature is at maximum possible rate and the total time for ramping and stable stage is 8 hours (1+479=480 min).
07	00001	0	25.00	75.0	000	Change the setting in 1 min for temperature from 10.00 °C to 25.00 °C, and humidity from a random value to 75.0 %RH.
08	00479	0	25.00	75.0	000	Keep the temperature at 25.00 °C and humidity at 75.0 %RH for 479 min. As a result, the ramping for temperature and humidity is at maximum possible rate and the total time for ramping and stable stage is 8 hours (1+479=480 min).

Further explanation to the result of the program operation as follows:

Starting condition before program initiated, temperature 20.00 °C, humidity 75.0 %RH;

Result of segments 01-02: Ramp the temperature from 20.00 °C to 25.00 °C, and humidity from 70.0 %RH to 75.0 %RH at maximum rate and keep the target temperature and humidity stable for total of 4 hours;

Result of segments 03-04: Ramp the temperature from 25.00 °C to 28.00 °C, and humidity from 75.0 %RH to 85.0 %RH at maximum rate and keep the target temperature and humidity stable for total of 4 hours;

Result of segments 05-06: Pull the temperature from 28.00 °C to 10.00 °C at maximum rate and keep the target temperature stable for total of 8 hours without humidity control;

Result of segments 07-08: Ramp the temperature from 10.00 °C to 25.00 °C, and humidity from a random value to 75.0 %RH at maximum rate and keep the target temperature and humidity stable for total of 8 hours;

Returned to second cycle for successive segments 01-02 for constant control of temperature at 25.00 °C and humidity at 75.0 %RH.

Example 2, triangular program (linear speed ramping)for temperature, humidity and light.

SEGMNT	TIME (min)	WAIT (min)	TEMP (°C)	HUMD (%RH)	LIGHT (%)	Descriptions
			20.00	70.0	000	Starting condition before program initiated, whether stabilized or not.
01	00050	0	25.00	75.0	000	Change the setting in 50 min for temperature from 20.00 °C to 25.00 °C, and humidity from 70.0 %RH to 75.0 %RH, with linear rate 0.1 °C/min and 0.1 %RH/min.
02	00190	0	25.00	75.0	000	Keep the temperature at 25.00 °C and humidity at 75.0 %RH for 190 min.
03	00030	0	28.00	85.0	000	Change the setting in 30 min for temperature from 25.00 °C to 28.00 °C, and humidity from 75.0 %RH to 85.0 %RH, with linear rate 0.1 °C/min and 0.1 %RH/min.

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04	00210	0	28.00	85.0	000	Keep the temperature at 28.00 °C and humidity at 85.0 %RH for 210 min.
05	00060	0	10.00	0.0	000	Change the setting in 60 min for temperature from 28.00 °C to 10.00 °C, with linear rate 0.3 °C/min. No humidity required
06	00420	0	10.00	0.0	000	Keep the temperature at 10.00 °C for 420 min, no humidity required.
07	00060	0	25.00	75.0	000	Change the setting in 60 min for temperature from 10.00 °C to 25.00 °C, with linear rate 0.3 °C/min, and humidity from a random value to 75.0 %RH in a linear rate according to the humidity difference and in 60 min.
08	00420	0	25.00	75.0	000	Keep the temperature at 25.00 °C and humidity at 75.0 %RH for 420 min.

Compare example 1 and example 2 for ease of understanding.

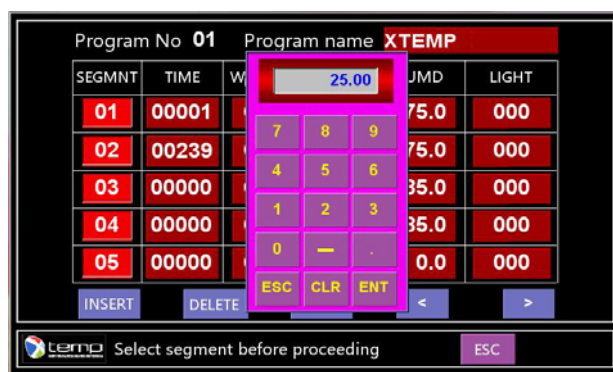


Fig 24

At screen of **Program editing**, other functional keys as follows:

[INSERT]: Allow an inclusion of a program segment between two existing program segments for editing. Select a segment number, and the new segment will be inserted before the selection with all data of 0 for editing. The selected segment and all thereafter increase a segment number automatically.

[DELETE]: Delete a selected program segment for removal. The selected segment and all thereafter decrease a segment number automatically.

[COPY]: Copy a selected **source program segment** to **target program segment**.

[<], [>]: Move up and down between **Segments**, or move among **TIME**, **WAIT**, **TEMP**, **HUMD** and **LIGHT**.

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SEGMENT	TIME	WAIT	TEMP	HUMID	LIGHT
01	00001	0	25.00	75.0	08
02	00239	0	25.00	75.0	08
03	00001	0	28.00	85.0	15
04	00239	0	28.00	85.0	15
05	00001	0	10.00	0.0	000

Fig 25

[ESC]: Escape the screen of **Program editing** back to previous screen.

Based on the examples, test requirements, and the functional keys, a program can be added and edited as shown in Fig 24 and Fig 25.

Confirm the setting and the data. Use [ESC] to the **Save** screen as follows:

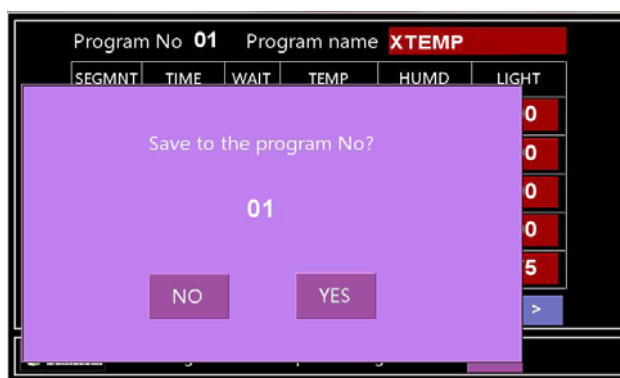


Fig 26

Use [YES] to save and [NO] to discard the setting of the program.

Return the screen to **Program List** once the program is saved. The name of the program number **01** is XTEMP (Fig 27). For ease of operation, more program numbers can be edited and later used for application.

3.11 Start a program operation now

At screen of **Program list** as in Fig 27, select the program number to be executed, for example **01**, tape [START NOW] to start the program operation immediately as shown in Fig 28:

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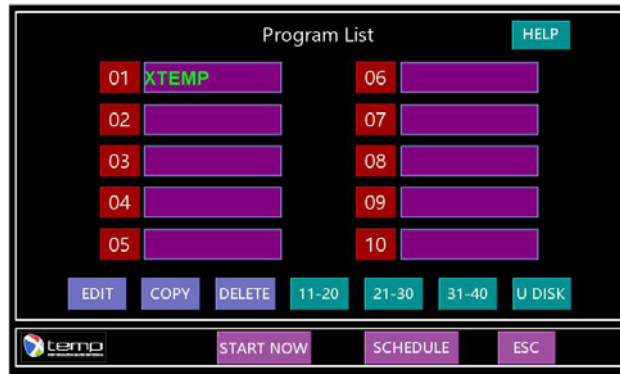


Fig 27

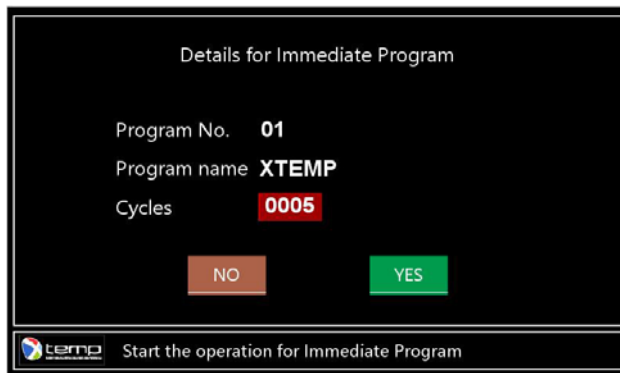


Fig 28

Tap Cycles for key pad pop up. Set the value for intended cycles and use [ENT] to accept, or [CLR] to clear error or [ESC] to exit. Tap [NO] to cancel initiation of the program, [YES] to start the program immediately. The screen of HOME will show status of Equipment in program operation... as shown in Fig 29:



Fig 29

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The equipment will terminate operation once program comes to the end of last cycle. Once it is expected to terminate the operation of the equipment, tap [STOP/SET] any time at the screen of **HOME**, which leads the screen of **Termination** as shown in Fig 12. Use [Yes] to terminate immediately.

3.12 Schedule a program operation

At screen of **Program list** as in Fig 27, select the program number to be executed, for example **01**, tap [SCHEDULE] to plan a future program operation:

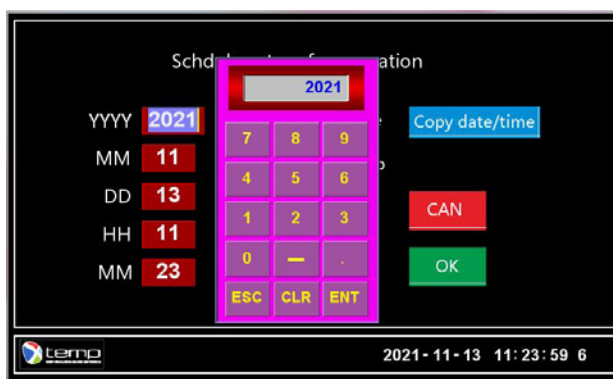


Fig 30

Follow procedures as in 3.9 and Fig 18 for schedule a constant operation, key in YYYY-MM-DD for date, and HH-MM for time to start the program operation. Set the values and use [ENT] to accept, or [CLR] to clear error or [ESC] to exit. Use [Copy date/time] for copying of the current date and time.

Use [CAN] to cancel and [OK] to continue to the next page as shown in Fig 31:

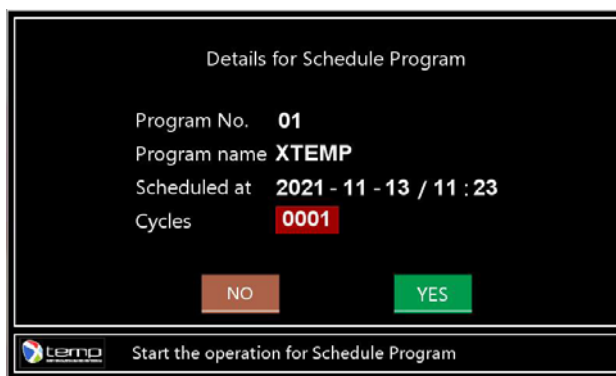


Fig 31

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Tap Cycles for keypad pop up. Set the value for intended cycles and use [ENT] to accept, or [CLR] to clear error or [ESC] to exit. Use [NO] to cancel a schedule plan and come back to HOME; Use [YES] to initiate a Schedule Program operation as shown in Fig 32. Once the schedule date and time arrives, the equipment will start program operation automatically.

3.13 Clear warning message

During normal operation of the equipment, the following event will trigger a warning message and lead to interruption of the equipment operation, with event status message showed as RED color. The warning message will not disappear even with the missing of the event cause until processed by the operator.



Fig 32

[RESET] for more than 2 sec can be used for restart of the equipment after clearance of the warning event. If any the root cause not removed, the warning message will pop up again in about 5 sec. Refer to Fig 33.

[MUTE] can be used to disable and enable the operation of a buzzer.

[STOP] can be used to terminate the equipment operation as for normal termination.

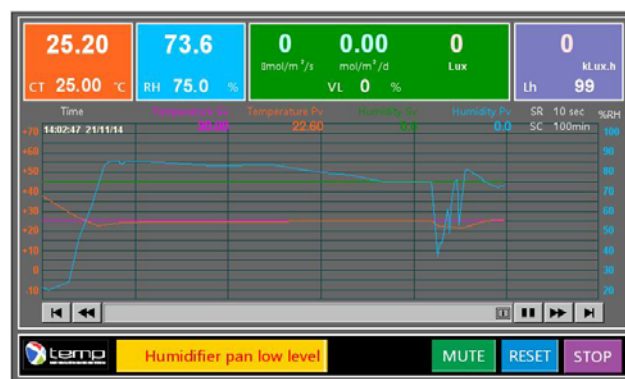


Fig 33

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Event Status Message

Category	Class	Event Message	Cause of Event	Warning Record
3	Emergency	Cabinet temperature exceeding the independent STB limiter	Cabinet Klixon triggered	Y
3	Emergency	Compressor discharge and/or suction pressures beyond the setting of the pressure switch	Dual pressure switch triggered	Y
3	Emergency	Water supply tank low level	No water in the supply tank	Y
3	Emergency	Humidifier pan low level	No water in the humidifier bath tank	Y

The history of the warning message is available by accessing to **Warning MSG** (refer to 3.14)

3.14 USER menu

Tap [USER] anywhere as appropriate to enter screen of **USER** as shown in Fig 34:



Fig 34

Tap area of the red frame successively as shown in Fig 34 to enter screen of **USER** as follows (Fig 32)

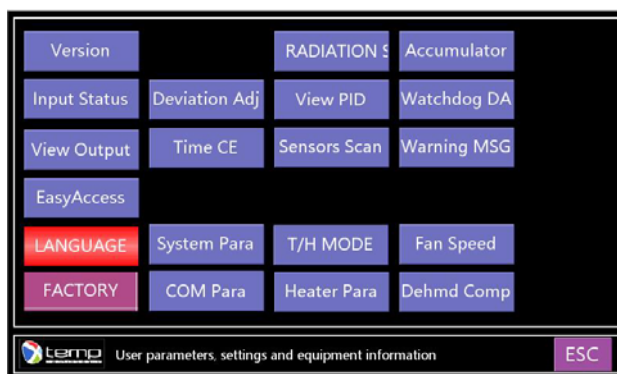


Fig 35

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Warning: No modification of parameters or settings without professional training and qualification by the manufacturer or authorized distributor.

USER screen is subject to change with the version of software update and without notice. The majority of the message and function are as follows:

[Version]: Software versions for PLC, HMI, modules of A/D and others. They are extremely important for technical support, maintenance and service.

[Accumulator]: Hour accumulator for equipment operation since commissioned.

[Input Status]: At situation of warning or abnormal, it is necessary to view if all the inputs are available to the controller, for example over-temperature switch, pressure switch, low-level cutout, door switch etc. **Input Status** may help service engineer to analysis cause of the fault and provide troubleshooting and solution.

[Deviation Adj]: Intended for deviation adjustment for display of temperature and humidity at screen of HOME as compared to certificate data from third party body. Standard procedures shall be followed for calibration, otherwise new errors may be introduced.

[View PID]: PID parameters affect the control of temperature and humidity significantly, whether overshooting during ramping and pulling down, or stability once stabilized. View the PID parameters for proper settings if overshooting or stability is beyond expectation. For PID adjustment, consult Xtemp or your local authorized distributor.

[Watchdog DA]: Once software locked against normal operation as a result of un-authorized use of the equipment, consult Xtemp for deactivation of the Watchdog. Under normal use condition, no activation of the Watchdog, so no necessary for deactivation of the Watchdog.

[Output Status]: At situation of warning or abnormal, it is necessary to view if all the outputs are available to the external devices, for example circulating fan, compressor, lamps etc. **Output Status** may help service engineer to analysis cause of the fault and provide troubleshooting and solution.

[Time CE]: To adjust the time error of the controller system, or to input a correct time once repaired.

[Sensors Scan]: At situation of temperature and humidity abnormal, it is expected to view if any of the sensor is in normal condition. **Sensors Scan** may help service engineer to analysis cause of the fault and provide troubleshooting and solution.

[Warning MSG]: For view of warning history, including warning message and time of its occurrence. **Warning MSG** may help service engineer to analysis cause of the fault and provide troubleshooting and solution.

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[EasyAccess]: EasyAccess is a value-added service provided by the manufacture, by use of internet and PC or mobile clients based on Penetration communication. For access of the function, contact Xtemp or your local engineer for information, activation and payment.

[Fan Speed]: Used to set the speed of the circulating fan or circulating pump. Optional for specific equipment only.

[Dehmd Comp]: Used to set the parameters of a compressor for dehumidification. Optional for specific equipment only.

[System Para]: Settings for system parameters including password for unlock of the **HOME** screen; password, IP address and gateway for remote control VNC, equipment code, taskbar, key tone, mouse, brightness and backlight delay etc, where VNC applies only to equipment incorporating Ethernet (Fig 36).

Where backlight is required all the time, input 0 for continuous backlight.



Fig 36

[Heater Para]: Used to set additional heating once **T/H MODE** set to stepper PID, refer to 3.15.

[T/H MODE]: Used to set PID mode for better temperature and humidity performance, refer to 3.15 for details.

[RADIATION SET]: Used to set the dimming rate of the lights from one level to another, and safe radiation level for the lamp as operator light or protection against optical hazard from door operation. Refer to 3.16 for details.

3.15 T/H MODE

At screen of **USER**, tap [T/H MODE] to enter screen of **T/H MODE** for stepper PID or heater PID (Fig 37). There are 2 modes for selection, MODE 0 or MODE 1,

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MODE 0, Hot-gas stepper valve (MV1) PID modulated, fixed heating rate, for moderate temperature control, improved temperature deviation and electric consumption. MODE 0 is default and preferred;

MODE 1, PID modulated heating, fixed hot-gas stepper valve (MV1) bypassing, for lower temperature and humidity control. Temperature deviation may be degraded and electric consumption will increase.

For MODE 0, setting of additional heating of 0~50 % is allowed. If heating up is difficult, increase the additional heating percentage. Higher valve may degrade cooling down rate. For best performance, no heating at temperature below 10 °C or when temperature beyond 2 °C of the setting.

For MODE 1, setting of hot-gas bypassing stepper of 0~30% is allowed. The operation of stepper MV1 is helpful against frost buildup, but may degrade lower temperature or lower humidity.

Tap the appropriate fields for change of the modes, percentage of the additional heating or stepper operation.

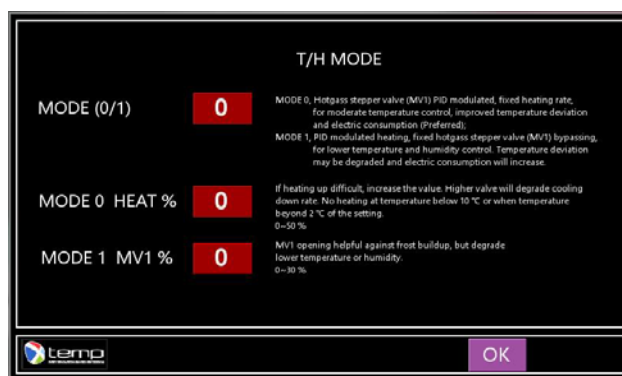


Fig 37

3.16 Radiation set

At screen of **USER**, tap [RADIATION SET] to enter screen of **RADIATION SET** for dimming rate and a safe radiation level (Fig 38).

Change the light from one level to another sometime cause problem of the tests and operation, for example comfort of the operator and test animal, behavior of plant growth. Appropriate setting of a dimming rate from one radiation level to another reduce the adverse effect of immediate light change and may improve the simulation of light change from day to night and vice versa. Rate of 1 means dimming rate of 1% in about 1.5~2.0 sec, while 99 means dimming rate of 1% in 420~450 sec. Try to calculate the exact dimming rate if the value is important to the tests.

3

Chapter 3 Controller Descriptions and Operation

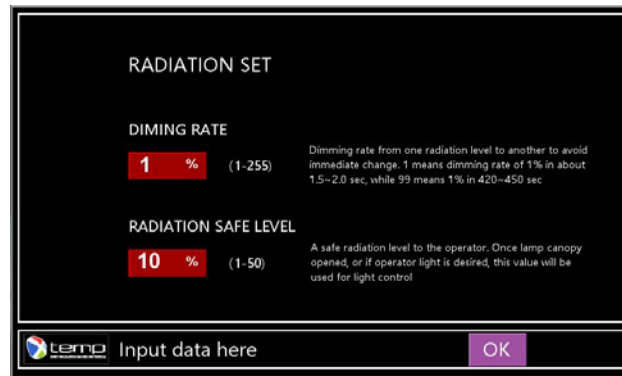


Fig 38

A safe radiation level to the operator can be set for operator light and protection against optical light hazard of door operation. Once lamp canopy opened, or if operator light is desired, this value will be used for light control.



Caution: Hazard of strong optical radiation!

Lamp canopies incorporated either at both sides, or within the cabinets generate strong visual radiation which could cause a hazard. Use special care when trying to get access to the cabinet interior:

- Use glass ware or equivalent PPE as appropriate;
- Check functionality of dimming capability of the lamp canopies once door opened, and confirm that the light intensity within safe limit;
- Access to the side lamp canopies only the well-trained personnel and with appropriate PPE against optical radiation, electric shock and burn hazard ;

Never disable the dimming sensor for safe light intensity.

3.17 Language

At screen of **USER**, tap [LANGUAGE] to enter setting screen for language as shown in Fig 39. Tap the **LANGUAGE** for keypad pop up. Set 0 for Chinese and 1 for English. Use [ENT] to accept, or [CLR] to clear error or [ESC] to exit. Tap [OK] to accept and return.

Chapter 3 Controller Descriptions and Operation

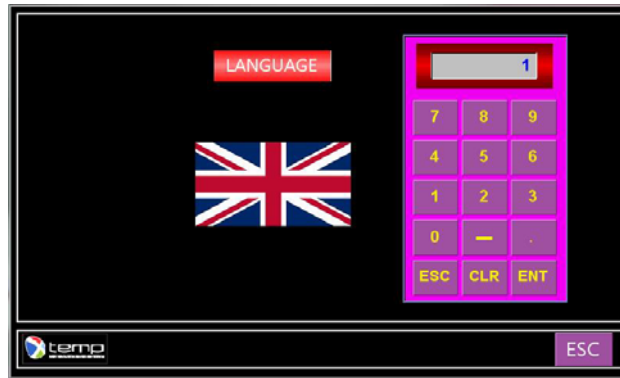


Fig 39

3.18 FACTORY

System parameters for equipment operation. Also accessible for technical support during maintenance and service.

User not accessible.

4

Chapter 4 Maintenance

Chapter 4 Maintenance

4.1 Regular maintenance

- 1) Clean the cabinet interior and exterior of the equipment periodically to keep the equipment clean, especially the interior bottom and humidifier bath of the equipment;
- 2) Check for air tightness of the door seal and the ventilator;
- 3) Check fixing screws periodically, and if any loose, fix it.



Remove the plug from power line before cleaning. Use soft dry tissue to clean the interior of the equipment and avoid any splashing or washing!

If any water or other conductive materials fall into the equipment containing electric and/or electronic parts and components, disconnect the power immediately. Power on only after water or conductive materials are completely evaporated or removed.



Regular check of the air tightness of the door seal is necessary for efficient and safe operation of the equipment. Intervals of 6 months for normal use, or the first time powering up after repairing or standstill for long period, are recommended.

4.2 Checking and replacing the fuse

With the mains plug connected and power switch in “on” position and if no HMI display, check the fuse first. If any doubt that checking and replacing fuse is necessary, use a fuse with the same size and capacity as rated and do as follows:

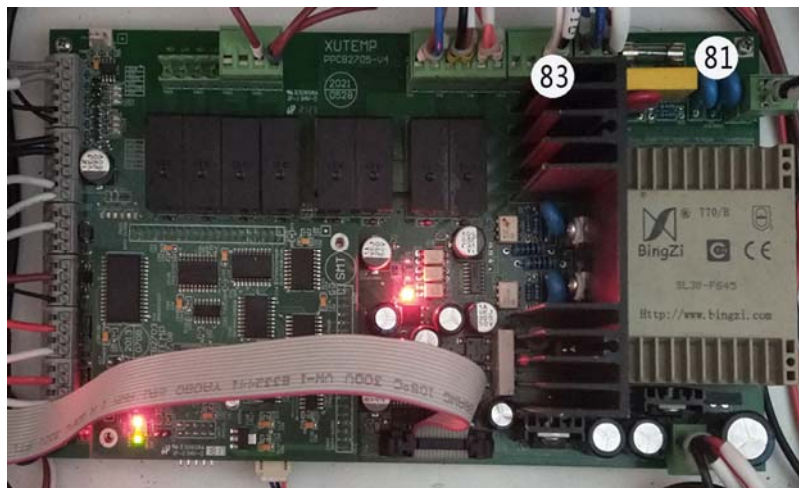
- 1) Make sure the mains plug has been removed;
- 2) Remove the top cover and find the fuse on the PCBA;
- 3) Check the fuse by inspection or measurement, and if not blown, replace and secure the fuse.



Do not disassemble or exchange assembly parts and electric circuits! Hazard of possible electric shock!

Except for replacing the fuse, there is no other part necessary for customer to disassemble or repair. If repairing is desired, contact with authorized engineer.

Chapter 4 Maintenance



81 Mains fuse 83 Humidifier output

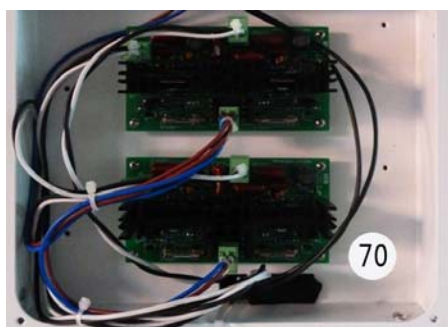
Fig 40 Checking and replacing the fuse



Always remove the mains plug from the power socket when performing checking or replacing the fuse, and never use any fuse different from the original one. Secure the fuse once checked or replaced. For servicing or maintenance, call authorized service engineer.

4.3 Inspection of power supply for piezoelectric elements

If no water mist generated with OUTPUT for HUMD exceeding 5% as detailed for Immediate Constant and as shown in Fig 14, and water level in normal condition (Fig 3) without low level warning, perform inspection of the power supply for the piezoelectric elements as follows:



70 Ultra-sonic generator for piezoelectric elements 75 Power transformer

Fig 41 Power transformer and power supply for piezoelectric elements

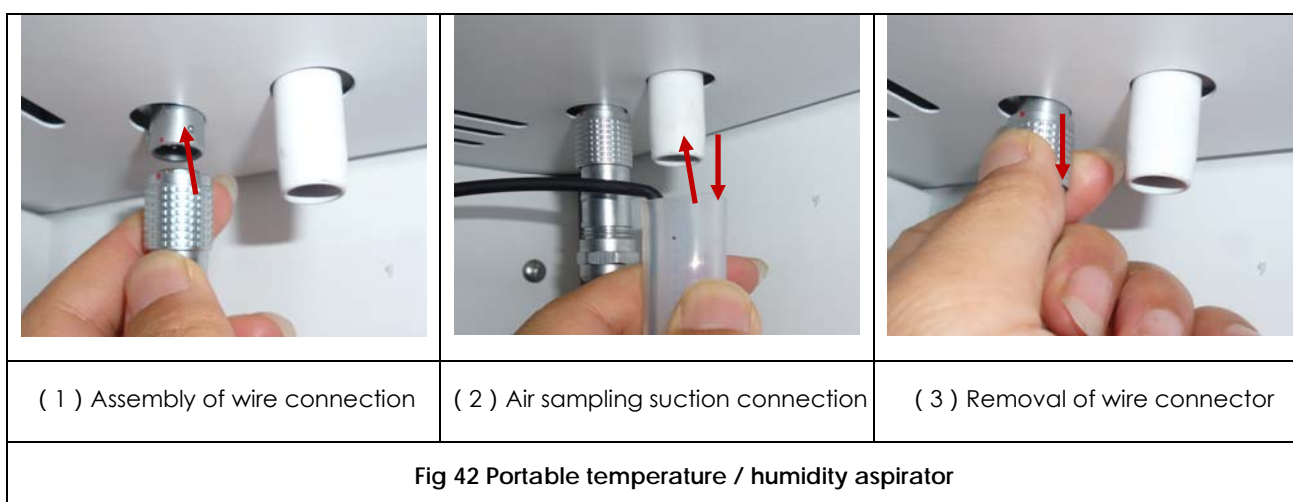
4

Chapter 4 Maintenance

- 1) Output of the PCBA for the humidifier is rated (Fig 40-83) as mains;
- 2) Output of the transformer for the humidifier is as rated (Fig 41-75), 36V~ ;
- 3) If there are more than one piezoelectric element (Fig 3-40), but only part of them generates no mist, keep inspecting the ultra-sonic generating module (Fig 2, Fig 41-70) and piezoelectric element (Fig 3-40).

4.4 Installation and replacement of the portable temperature / humidifier aspirator

In case installation and replacement of the portable temperature / humidifier aspirator is necessary, follow procedures as follows (Fig 42):



- 1) Insert the cable plug (146) to the socket (145) within the cabinet. Make sure to align the coupling mechanism of the connector;
- 2) Connect the air sampling tube (149) to the suction side of the circulating system (150). Make sure connection are reliable and air tight;
- 3) Use similar steps to remove the aspirator assembly from the socket and suction connection.

For best performance of temperature and humidity control, the air flow of the temperature / humidity aspirator is very important. In case a poor performance of the stability and uniformity or error display of the data, check the airflow of the aspirator as follows:

- 1) Initiate the air circulating of the equipment, set the temperature close to ambient without humidity control;
- 2) Use a lighter to check the air suction of the flame from the assembly (Fig 4-148). No suction or weak suction of the flame means no or weak air flow. Check cause and find a remedy for a solution. For further assistance, contact Xtemp representative.

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Chapter 4 Maintenance

4.5 Checking and cleaning of the condenser

The procedures for checking and cleaning of the condenser as follows:

- According to the environment conditions for equipment installation, the checking and cleaning of the condenser is recommended to be made at 3~6 months intervals.
- Start the circulating fan and compressor.
- Set the operating temperature at 20 °C, while keeping the compressor running and door opened (to the extent that no door alarm is triggered). This is meant to keep the compressor working at full capacity.
- Check intake and outlet of the air flow from top cover of the machine compartment and back side of the equipment to feel free air movement.
- Keep the compressor running continuously for at least 20 min. Feel the air flow and temperature at the back of the equipment where exhaust air outlets locate. Strong air movement and warm or hot temperature mean free heat removal from the condenser.
- Whether reduced air intake or heat discharge, it is evidence of blocked condenser or stalled axial fan(s).
- Stop the equipment and remove the mains plug from the power socket. Remove the top cover of the machine compartment.
- Use vacuum cleaner and followed by compressed dried air to clean the condenser. Make sure not to have any residual dust left in any electric, electronic or refrigerating parts and components.
- Replace the axial fan if any fault or damage and where necessary.
- Replace the top cover and fasten the screws as were removed.

4.6 Checking and charging of refrigerant

The procedures for checking and charging of the refrigerant as follows:

- Follow steps as for the checking and cleaning of condenser (4.5). Feel the air flow and temperature at the back of the equipment where exhaust air outlets locate. Strong air movement but mild or cold temperature mean possible leakage of the refrigerant.
- Stop the equipment and remove the mains plug from the power socket. Remove the top cover of the machine compartment.
- Use a compound pressure gauge or equivalent, with hosing for charging of refrigerant and connection to the compressor. Connect the hosing of low pressure to the suction side of the compressor, and check for pressure.

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Fig 43 Checking and charging of the refrigerant

- If suction pressure during deep cooling is lower than rated, this is indication of serious leakage refrigerating system, usually meaning a cracked joint or damaged connection or, blockage of the capillary tube or filter drier. Test the refrigerating system for leakage or blockage location by using of Nitrogen:
 - ❑ Connect the charging hosing to Nitrogen source of 99.99% purity to a pressure of 10 bar.
 - ❑ Keep the pressure for at least 2 h and record the pressure change during the period. Note the effect of ambient temperature on pressure fluctuation.
 - ❑ Spy the leakage source by using of soap water or equivalent. The leakage usually happens at joint of brazing, but sometimes seal of a schrader valve or refrigerating component.
 - ❑ Braze the joint where leakage occurred or replace the leakage part and component. Evacuate the system for at least 2 h. Use the same refrigerant, quantity and type, as indicated in the name plate.
- If pressure of refrigerant is no less than atmosphere, the higher the pressure, the less the extent of potential leakage. Flush the hosing and compound gauge by internal residual refrigerant. Charge the same refrigerant to a pressure resulting in rated cooling capacity.
- For locating of blockage of the system, the high and low pressure side have to be separated.

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Chapter 4 Maintenance



Use refrigerant only as identified on the nameplate of the equipment! Mixed or over charging of the refrigerant may degrade performance or result in over pressure of the refrigerating system!

Slow cooling down doesn't mean failure of the cooling system. There are reasons and causes that may reduce cooling down speed and minimum temperature, for example:

- Leakage of the door gasket;
- Reduced or blocked air movement within the equipment because of improper hoarding, heat dissipation from the specimen or the radiation;
- Frost buildup at lower temperatures;
- High ambient or poor air ventilating around the equipment;
- Failure of the controller leading to abnormal heating or hot-gas bypassing.

5

Chapter 5 Equipment Overview and Specifications

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5.1 Equipment overview

- Choose from models AR and PG for growth of Arabidopsis and plant, GE for germination and CC for simulation of general temperature, humidity and light conditions;
- Patented stepper valve hot gas bypassing and PID temperature and humidity control guarantee precise temperature and humidity regulation over the range for stability up to ± 0.2 °C and 3 %RH, as well as for accurate control of the cooling capacity which significantly improves the efficiency of the refrigeration system;
- Patented temperature and humidity aspirator, portable for precise temperature and humidity control in the working space of interest and sense, providing flexibility for measurement and control, maintenance and replacement;
- Fashion design of slim chamber equipped with vertical illuminated doors or horizontal lamp canopies, thermally ventilated or insulated, light isolated and protected, fully adjustable 0~100%, for flexible light programming, dimming, minimum influence from natural light and heating up effect;
- Integrated ultra-sonic atomizer, equipped with number of piezoelectric ceramic elements, for capacity up to 1kg/hr additive humidity;
- 7" high resolution true color TFT touch screen for data input of temperature, humidity, light intensity, alarm history and operating status, in text, graphic symbols and curves; Programmable temperature, humidity and light control for varieties of climatic conditions;
- Unique design of air circulation for uniform air movement, improved temperature and humidity distribution and draining of condensate, protecting seed and small animal from being blown. Available with either vertical or horizontal air movement for applications of plant and Arabidopsis growth, tissue culture, seed germination and climatic control;
- Ramping bottom interior with round corners for easy cleaning and draining of condensate and irrigated or spraying water;
- Multitude of optional devices to choose from: RS22/485 communication interface, Ethernet and PC/Mobile Clients for remote access, USB port, transducer for PPF/Lux/UVA sensors, cable hatch, power socket inside the incubator.

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Chapter 5 Equipment Overview and Specifications

5.2 Specifications

Models		UXP8401-PG280	UXP8401-PG480	UXP8401-PG800
Temperature range	°C (°F)	10 ~ +45 (light on), 5 ~ +40 (light off)		
Temperature stability	±°C (°F)	0.2 (0.36)		
Humidity range	%RH	50~75 (light on), 50~90 (light off), limited by 25 °C dew point		
Humidity stability	±%RH	3		
ACC temperature range	°C (°F)	45 (113)		
PPF*, max	μmol/m ² /s	1,000	1,200	1,300
Illumination intensity**	Lux	65,000	78,000	85,000
Effective capacity	L(cf)	280 (9.9)	480 (16.9)	800 (28.2)
Growth area (WD)	mm(in)	535×510 (21×20)	635×560 (25×22)	935×635 (36.8×25)
Growth height (H)	mm(in)	900 (35.5)	1,100 (43.3)	1,100 (43.3)
Overall dimension (WDH)	mm(in)	700×660×1600 (27.6×26.0×63.0)	800×750×1990 (31.5×29.5×78.3)	1080×825×2065 (42.5×32.5×81.3)
Compressor size	W	315	385	540
Heater wattage	W	450		
Shelves (standard/maximum)		1/2		
Interior material		SUS430, coated white		
Exterior materials		SPCC mild steel with powder coating		
Program		Temperature, humidity and light, 40 programs, 99 segments, 9999 cycles		
Refrigerant		HFC134a		
Door gasket		Silicone rubber		
Air movement		Vertical		
Illumination		Horizontal, 1 tier lamp canopy		
Type of lamp source		LED, WHITE 400-700 nm, 4200 K, RED, 660 nm, 1-100% dimming		
EMC for Europe		Class B according to EN 61326-1		
EMC for USA and Canada		Class A (for operation only on networks without connected domestic areas)		
Safety		Cabinet temperature Klixon, LLCO for humidifier bath tank Lamp canopy dimming to safe level, door open switch		
Options		Interfaces USB/Ethernet WEB, USB port, RS232/RS485 port PPF sensor, Lux sensor, UVA sensor		
Duty cycle		Continuous		
Power		115V ~, 60Hz		
Current draw	A	12	15	20

* average measurement with grid of 150 mm (3") by 150 mm (3"), and 150 mm (3") from the light source.

** calculated from PPF, use conversion factor of 65.

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Chapter 5 Equipment Overview and Specifications

Models		UXP8401-AR280	UXP8401-AR480	UXP8401-AR800
Temperature range	°C(°F)	10 ~ +45 (light on), 5 ~ +40 (light off)		
Temperature stability	±°C(°F)	0.2 (0.36)		
Humidity range	%RH	50~75 (light on), 50~90 (light off), limited by 25 °C dew point		
Humidity stability	±%RH	3		
ACC temperature range	°C(°F)	45 (113)		
PPF*, max	μmol/m ² /s	600	720	780
Illumination intensity**	Lux	39,000	47,000	50,000
Effective capacity	L(cf)	280 (9.9)	480 (16.9)	800 (28.2)
Growth area (WD)	mm(in)	535×510 (21×20)	635×560 (25×22)	935×635 (36.8×25)
Growth height (H)	mm(in)	380 (15)	510 (20)	510 (20)
Overall dimension (WDH)	mm(in)	700×660×1600 (27.6×26.0×63.0)	800×750×1990 (31.5×29.5×78.3)	1080×825×2065 (42.5×32.5×81.3)
Compressor size	W	315	385	540
Heater wattage	W	450		
Shelves (standard/maximum)		2/2		
Interior material		SUS430, coated white		
Exterior materials		SPCC mild steel with powder coating		
Program		Temperature, humidity and light, 40 programs, 99 segments , 9999 cycles		
Refrigerant		HFC134a		
Door gasket		Silicone rubber		
Air movement		Horizontal		
Illumination		Horizontal, 2 tiers lamp canopy		
Type of lamp source		LED, WHITE 400-700 nm, 4200 K, RED, 660 nm, 1-100% dimming		
EMC for Europe		Class B according to EN 61326-1		
EMC for USA and Canada		Class A (for operation only on networks without connected domestic areas)		
Safety		Cabinet temperature Klixon, LLCO for humidifier bath tank Lamp canopy dimming to safe level, door open switch		
Options		Interfaces USB/Ethernet WEB, USB port, RS232/RS485 port PPF sensor, Lux sensor, UVA sensor		
Duty cycle		Continuous		
Power		115V ~ , 60Hz		
Current draw	A	12	15	20

* average measurement with grid of 150 mm (3") by 150 mm (3"), and 150 mm (3") from the light source.

** calculated from PPF, use conversion factor of 65.

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Chapter 5 Equipment Overview and Specifications

Models		UXP8401-CC280	UXP8401-CC480	UXP8401-CC800
Temperature range	°C (°F)	10 ~ +45 (light on), 5 ~ +40 (light off)		
Temperature stability	±°C (°F)	0.2 (0.36)		
Humidity range	%RH	50~75 (light on), 50~90 (light off), limited by 25 °C dew point		
Humidity stability	±%RH	3		
ACC temperature range	°C (°F)	45 (113)		
PPF*, max	μmol/m ² /s	1,000	1,200	1,200
Illumination intensity**	Lux	65,000	78,000	78,000
Effective capacity	L(cf)	280 (9.9)	480 (16.9)	800 (28.2)
Interior dimension (WDH)	mm(in)	535×510×1000 (21×20×39.5)	635×560×1270 (25×22×50.0)	935×635×1270 (36.8×25×50)
Overall dimension (WDH)	mm(in)	700×660×1600 (27.6×26.0×63.0)	800×750×1990 (31.5×29.5×78.3)	1080×825×2065 (42.5×32.5×81.3)
Compressor size	W	315	385	540
Heater wattage	W	450		
Shelves (standard/maximum)		3/5	4/7	4/7
Interior material		SUS430, coated white		
Exterior materials		SPCC mild steel with powder coating		
Program		Temperature, humidity and light, 40 programs, 99 segments, 9999 cycles		
Refrigerant		HFC134a		
Door gasket		Silicone rubber		
Air movement		Vertical		
Illumination		Vertical, 2 side fixtures		
Type of lamp source		LED, WHITE 400-700 nm, 4200 K, RED, 660 nm, 1-100% dimming		
EMC for Europe		Class B according to EN 61326-1		
EMC for USA and Canada		Class A (for operation only on networks without connected domestic areas)		
Safety		Cabinet temperature Klixon, LLCO for humidifier bath tank Lamp canopy dimming to safe level, door open switch		
Options		Interfaces USB/Ethernet WEB, USB port, RS232/RS485 port PPF sensor, Lux sensor, UVA sensor		
Duty cycle		Continuous		
Voltage/Frequency		115V ~, 60Hz		
Packing size (WDH)	mm (in)		910×930×2160 (35.8×36.6×85.0)	
Net weight	Kg (lbs)		226 (498.2)	
Gross weight	Kg (lbs)		308 (679.0)	
Current draw	A	12	15	20

* average measurement with grid of 150 mm (3") by 150 mm (3"), and 150 mm (3") from the light source.

** calculated from PPF, use conversion factor of 65.

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Chapter 5 Equipment Overview and Specifications

Models		UXP8401-GE280	UXP8401-GE480	UXP8401-GE800
Temperature range	°C(°F)	10 ~ +45 (light on), 5 ~ +40 (light off)		
Temperature stability	±°C(°F)	0.2 (0.36)		
Humidity range	%RH	50~95 (light on), 50~98 (light off), limited by 25 °C dew point		
Humidity stability	±%RH	3		
ACC temperature range	°C(°F)	45 (113)		
PPF*, max	μmol/m ² /s	400	500	500
Illumination intensity**	Lux	26,000	32,000	33,000
Effective capacity	L(cf)	280 (9.9)	480 (16.9)	800 (28.2)
Interior dimension (WDH)	mm(in)	535×510×1000 (21×20×39.5)	635×560×1200 (25×22×47.2)	935×635×1200 (36.8×25×47.2)
Overall dimension (WDH)	mm(in)	700×660×1600 (27.6×26.0×63.0)	800×750×1990 (31.5×29.5×78.3)	1080×825×2065 (42.5×32.5×81.3)
Compressor size	W	250	315	385
Heater wattage	W	450		
Seed tray (standard/maximum)		4/10	5/15	5/15
Interior material		SUS430, coated white		
Exterior materials		SPCC mild steel with powder coating		
Program		Temperature, humidity and light, 40 programs, 99 segments , 9999 cycles		
Refrigerant		HFC134a		
Door gasket		Silicone rubber		
Air movement		Horizontal		
Illumination		Vertical, 2 side fixtures		
Type of lamp source		LED, WHITE 400-700 nm, 4200 K, RED, 660 nm, 1-100% dimming		
EMC for Europe		Class B according to EN 61326-1		
EMC for USA and Canada		Class A (for operation only on networks without connected domestic areas)		
Safety		Cabinet temperature Klixon, LLCO for humidifier bath tank Lamp canopy dimming to safe level, door open switch		
Options		Interfaces USB/Ethernet WEB, USB port, RS232/RS485 port PPF sensor, Lux sensor, UVA sensor		
Duty cycle		Continuous		
Power		115V ~ , 60Hz		
Current draw	A	12	15	20

* average measurement with grid of 150 mm (3") by 150 mm (3"), and 150 mm (3") from the light source.

** calculated from PPF, use conversion factor of 65.

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Chapter 5 Equipment Overview and Specifications



Specifications are subject to change without notice!

