Quality is more than a word

ESPEC Platinous Series
User Manual

EPL, EPU, EPX, EPZ Models

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Copyright Notice

Disclaimer

ESPEC North America, Inc. assumes no responsibility for accidents or equipment trouble that comes from the failure to observe handling instructions contained in this user manual. Do not perform any operation or handle the chamber in any way that is not described in this manual or that is specifically prohibited.

The contents are subject to change without prior notice.

Read this manual thoroughly and familiarize yourself with all safety precautions before using equipment.

Regulatory Compliance

Products with the CE label comply with the Directives and European Standards applicable at the time of certification. Specific Directives and Standards will be listed on provided Declaration of Conformity when applicable.

Contents

Chapter 1

ESPEC Platinous System Overview

This manual has been written for users of the Platinous Series Chambers and particularly for technicians. Read it thoroughly to obtain the maximum performance from the chamber.

1.1 About the Platinous Series

Various environmental conditions, including extreme temperatures or humidity, can cause damage when using or storing equipment, parts, and their respective materials.

Chambers of the Platinous Series are built for testing functionality, operation, durability, and other specifications under various environmental conditions. They are used to evaluate the effects that temperature and humidity can have on equipment and parts across the entire product life-cycle from development, production, shipping, and use; to when the equipment or part is discarded. With the Platinous Series, you can test the following:

- Heat resistance
- Cold resistance
- Maximum humidity resistance (Not possible with temperature only chambers)
- Minimum humidity resistance (Not possible with temperature only chambers)
- Storability
- Service life
- Serious deterioration or aging

1.2 Included Safety Features

To protect from the risk of overheating, there are three levels of protection:

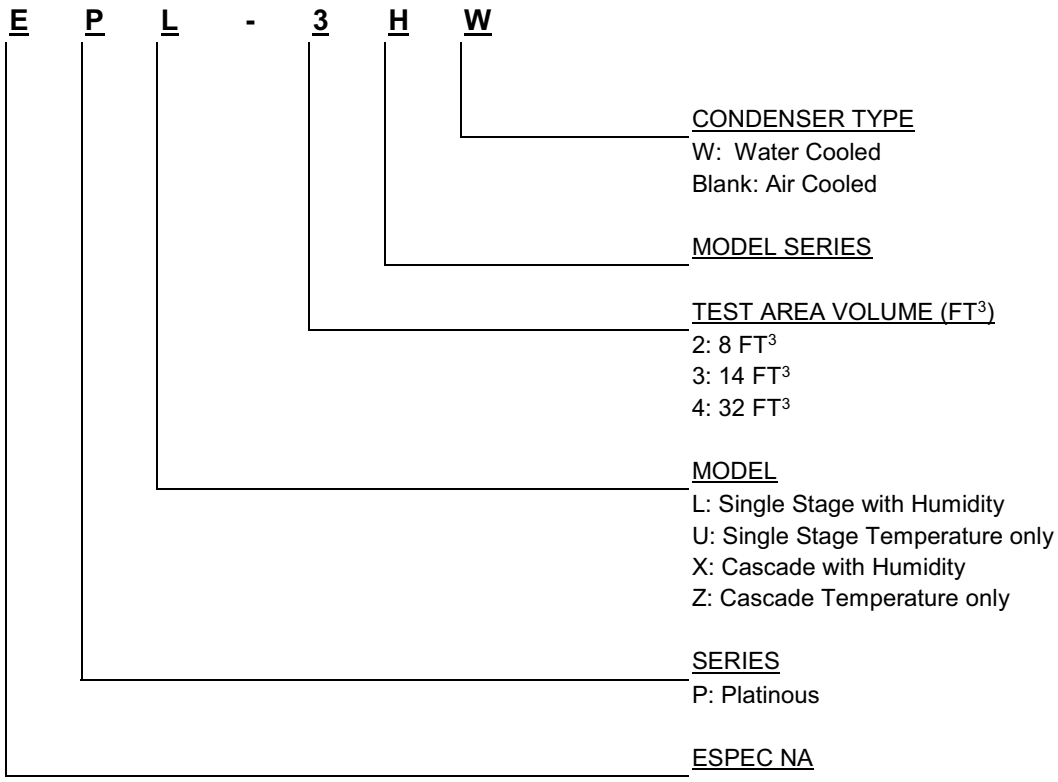
- Settable absolute temperature within the controller
- Settable independent Product Temp Protector
- Non-settable Thermal Limit

1.3 How to Read Chamber Model Number

Chambers of the Platinous Series are available in various configurations which differ according to temperature and humidity range, loading capacity, and the type of instrumentation. Check for your model number on the data plate on the rear of the chamber.

This manual has been written to cover a wide range of chamber models. You should only be concerned with sections that relate to your chamber.

1.3.1 Platinous Standard Chamber Description



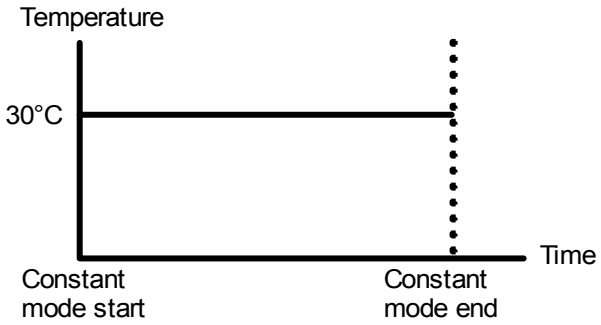
1.3.2 P-300 Instrumentation

The P-300 Instrumentation enables environmental testing under both constant conditions and programmed conditions, referred to as the “constant mode” and the “program mode” respectively.

Constant Mode

The constant mode maintains the user-set target temperature (& humidity) constant.

FIGURE 1.1. TEST CONDITIONS IN CONSTANT MODE

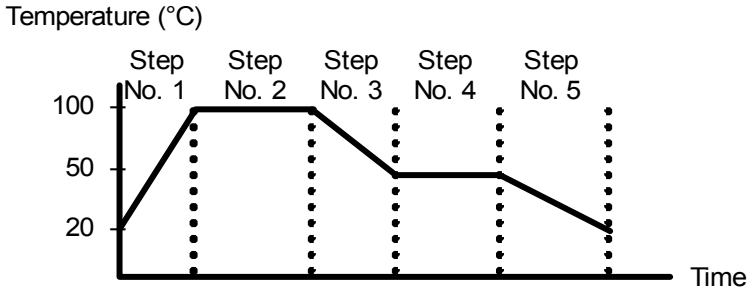


Program Mode

The program mode changes chamber temperature and humidity according to a user-set program.

This program is created before testing starts. It contains multiple steps. Each step contains temperature, humidity, and other settings as with the constant mode. Settings can be maintained throughout an entire step or changed at the constant rate.

FIGURE 1.2. TEST CONDITIONS IN PROGRAM MODE



1.4 Temperature & Humidity Control and Instrumentation

1.4.1 Temperature and Humidity Control

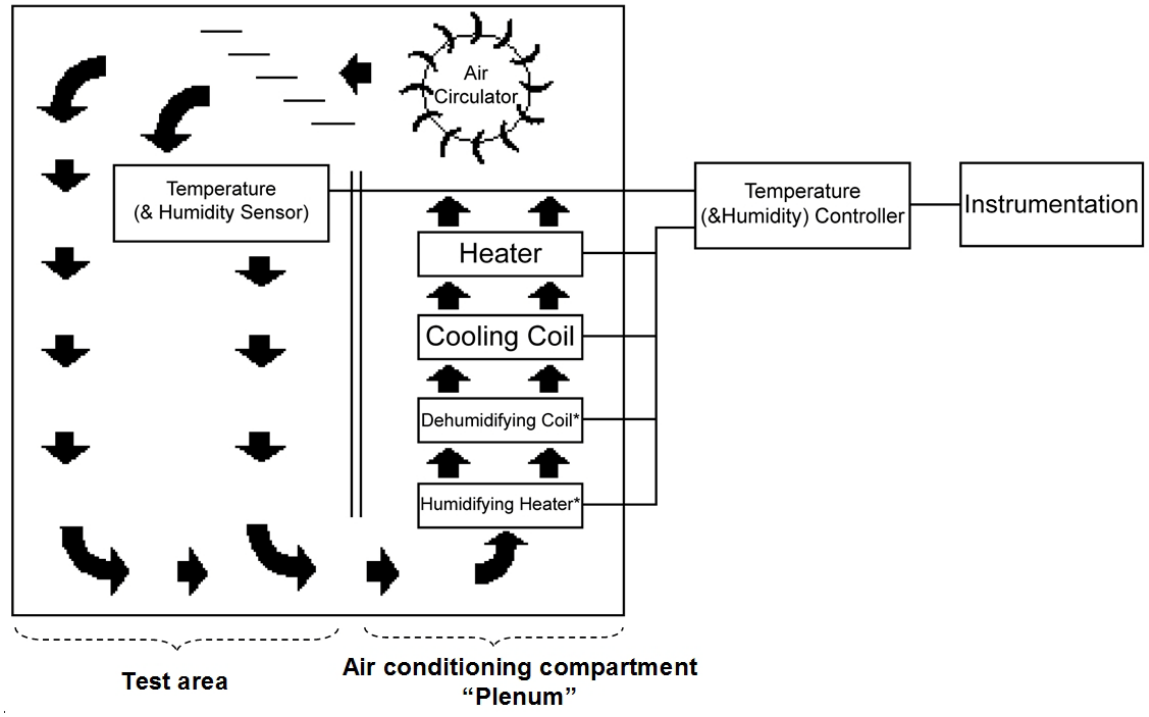
The Global-N Series employs a Balanced Temperature and Humidity Control (BTHC) system to control temperature and humidity*.

The BTHC system balances temperature and humidity inside the chamber to reproduce the desired conditions. This is done by continuously controlling the capacity of a cooler and dehumidifier* of high heat load, and a heater and humidifying heater* of low heat load, in real time.

Refrigerator capacity is also continuously controlled to offset the heat load from specimens. The central unit, which monitors and controls everything, is the temperature and humidity* controller. The instrumentation acts as the user interface.

*Not provided on temperature only chambers

FIGURE 1.3.PRINCIPLE OF BTHC SYSTEM



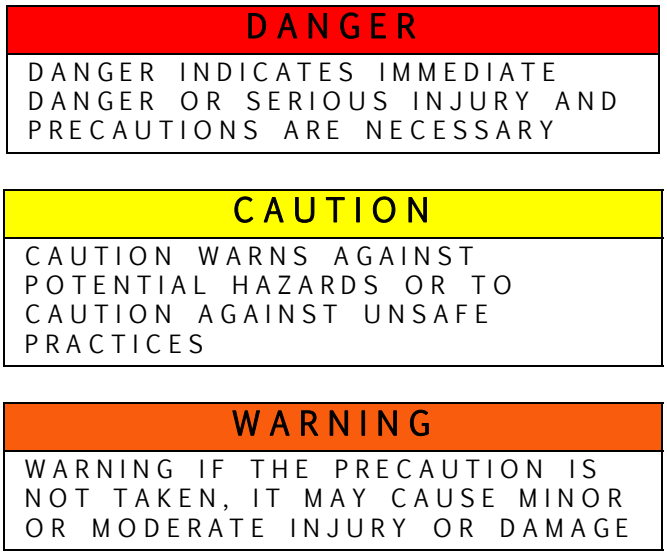
Chapter 2

Safety Precautions

This chapter explains safety precautions that should be observed to operate the equipment safely. Be sure to read carefully and follow instructions so as to prevent harm to yourself, anyone else, specimens, or the equipment.

Damage to any chamber equipment by prohibited substances is not covered by ESPEC warranty

2.1 Safety Symbols and Descriptions



Note: A note provides information for gaining full performance from the chamber or to prevent damage to equipment.

Procedure: A procedure explains how to operate on a step-by-step basis. Offers supplementary information.

2.2 Substances Not to Be Placed Inside Equipment

2.2.1 Explosive, Inflammable and Combustible Substances

DANGER

DO NOT INTRODUCE EXPLOSIVE, COMBUSTIBLE, OR INFLAMMABLE SUBSTANCES INTO THE EQUIPMENT. KEEP SUBSTANCES AWAY FROM THE EQUIPMENT AND IMMEDIATE AREA. WHEN EXPOSED TO EXCESSIVE HEAT SUBSTANCES MAY CAUSE FIRES AND/OR EXPLOSIONS.

EXPLOSIVE SUBSTANCES

- Nitro glycol, nitroglycerine, nitrocellulose and other explosive ester nitrates.
- Trinitro-benzine, trinitrotoluene, picric acid and other explosive nitro compounds
- Peracetic acid, methyl ethyl ketone peroxides, benzoyl peroxide and other organic peroxides.

INFLAMMABLE SUBSTANCES

- Combustible Substances:
  - Metal lithium, metal potassium, metal sodium, yellow phosphor, phosphor sulfide, red phosphor, celluloids, calcium carbonate (also called carbide), calcium phosphate, magnesium powder, aluminum powder, metal powders other than magnesium powder and aluminum powder, hydrosulfite.
- Oxides:
  - Potassium chlorate, sodium chlorate, ammonium chlorate and other chlorates.
  - Potassium perchlorate, sodium perchlorate, ammonium-perchlorate and other percholorates.
  - Potassium peroxide, sodium peroxide, barium peroxide and other inorganic peroxides.
  - Potassium nitrate, sodium nitrate, ammonium nitrate and other nitrates.
  - Sodium chlorite and other chlorites.
  - Calcium hypochlorite and other hypochlorites.
- Ignitable Substances:
  - Ethyl ether, gasoline, acetaldehyde, propylene oxide, carbon disulfide and other substances with an ignition point of -30°C (-22°F).
  - Normal hexane, ethylene oxide, acetone, benzene, methyl ethyl ketone and other substances with and ignition point above -30°C (-22°F) and below 0°C (32°F)
  - Methanol, ethanol, xylene, pentyl acetate amylacetate and other substances with an ignition point above 0°C and below 30°C (85°F).
  - Kerosene, light oil, turpentine oil, isopentyl alcohol (also called isoamyl alcohol), acetic acid and other substances with an ignition point above 30°C (85°F) and below 65°C (150°F).

- Combustible Gases
  - Hydrogen, acetylene, ethylene, methane, ethane, propane, butane and other combustible substances that are in a gaseous state at a temperature of 15°C (60°F) and at a pressure of 1 atmosphere.

2.2.2 Corrosive Substances

Humidifying water or specimens which generate substances that corrode stainless steel or silicone rubber can drastically shorten service-life of internal parts, including the refrigerator and packing.

Though apparently harmless at ambient temperature, these substances can readily corrode circuit boards and other parts when the equipment is run at high temperature and high humidity.

Even trace amounts of corrosives in the humidity water supply or released by the test items will become concentrated in the humidifying tray during extended periods of humidity operation. If corrosion is observed in the humidifying tray during extended high humidity testing, it should be drained and refilled daily to flush out the corrosive contaminants. This can be done by opening the wick arm drain valve for a least 30 seconds.

CORROSIVE SUBSTANCES (NOT LIMITED TO)

- Chlorine
- Chlorides
- Acids

2.3 Spark-Resistant Interior Precautions (Optional)

If chamber interior is spark-resistant (equipped with safety devices configured for specific substances) refer to chamber specification for minimum allowable auto-ignition temperature (AIT). Consult ESPEC for use with other substances.

2.4 Specimen Power Supply Control Terminals

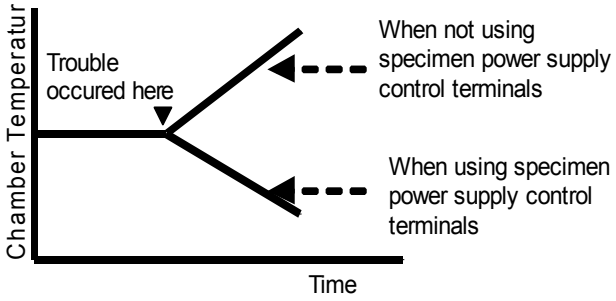
DANGER

GROUND THE EQUIPMENT WITHOUT FAIL. FOR DETAILS ON GROUNDING, SEE “SPECIMEN PROTECTION (SAFETY DEVICES)” ON PAGE 17

Use only the specimen power supply control terminals to apply voltage to specimens.

Specimens generate heat as they are charged. The specimen power supply control terminals are interlocked with the chamber control circuit, so power to specimens is turned OFF when the chamber is not running. Using other means to power specimens leaves the specimens charged in the event of chamber trouble. This can drive up temperature inside the chamber, which can damage specimens and in worse cases result in fire. See “How to Power Specimens (use only when required)”.

FIGURE 2.1. TEMPERATURE AND SPECIMEN POWER SUPPLY CONTROL TERMINALS



2.5 Specimen Protection (Safety Devices)

CAUTION

SET SAFETY DEVICES ACCORDING TO TEST CONDITIONS AND THE TYPE OF SPECIMENS. UNLESS PROPERLY SET, SPECIMENS COULD BE DAMAGED IF SOMETHING GOES WRONG DURING TESTING.

The chamber is controlled to a target constant temperature and humidity* by the controller. Nonetheless, temperature and humidity can get out of control for various reasons. In such cases, to protect specimens against thermal damage, the chamber has an independent overheat protector and various other safety devices built into the software of the controller.

* Humidity is not set with temperature only chambers.

Safety Device			Trip Point	Equipment Response	Remarks
Product Temp Protector		Over-heat	- Set approximately 20°C higher than target temperature. - Set below specimen's maximum allowed temperature.	- Alarm displayed - Buzzer sounded* - Heater shut OFF - Humidifier shut OFF (Temperature only chambers excluded) - Refrigerator shut OFF - Air circulator shut OFF - Specimen power supply control terminal interrupted	N/A
		Over-cool	- Set approximately 20°C lower than target temperature. - Set above specimen's minimum allowed temperature.		
Built into temperature & humidity controller	Temperature Alarms	Absolute High Limit	- Set approximately 15°C higher than target temperature - Set below specimen's maximum allowed temperature		
		Absolute Low Limit	- Set above following low limit temperatures - Set a minimum 5°C lower than target temperature - Set above specimen's minimum allowed temperature.		
		Upper Deviation Limit	- Set approximately 10°C higher than target temperature.	- Alarm displayed - Buzzer sounded* - Heater shut OFF	When temp & humidity returns within range limits, alarms are automatically cleared.
	Humidity Alarms (Not included on temperature only chambers)	Absolute High Limit	- Set approximately 10% RH higher than target humidity. - Set below specimen's maximum allowed humidity.	- Alarm displayed - Buzzer sounded* - Humidifier shut OFF	N/A
		Absolute Low Limit	- Set approximately 10% RH lower than target humidity. - Set above specimen's minimum allowed humidity.	- Alarm displayed - Buzzer sounded* - Refrigeration capacity lowered	

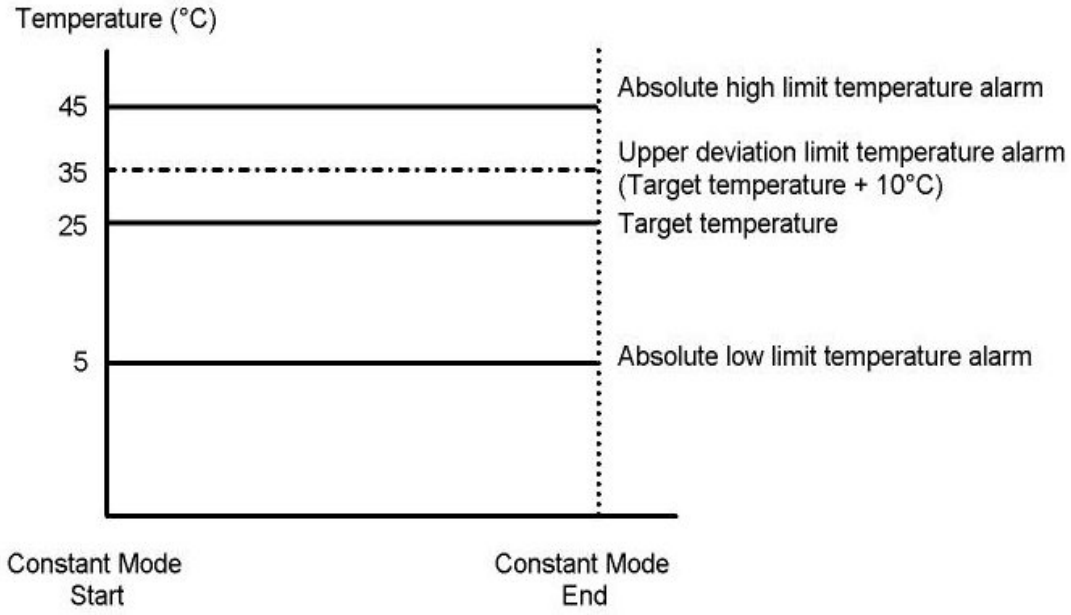
* Option to silence

Absolute high/low limit temperature (& humidity) alarms and upper deviation limit temperature alarm.

The absolute high/low limit alarms are completely independent of the target temperature and humidity. They do not change when target temperature or humidity are changed.

Conversely, the upper deviation limit alarm is relative to the target temperature. If the target temperature is changed, the deviation alarm temperature changes in proportion.

FIGURE 2.2.TEMPERATURE ALARM SETTINGS



2.5.1 Safety Device Setting Example

High Limit Temperature

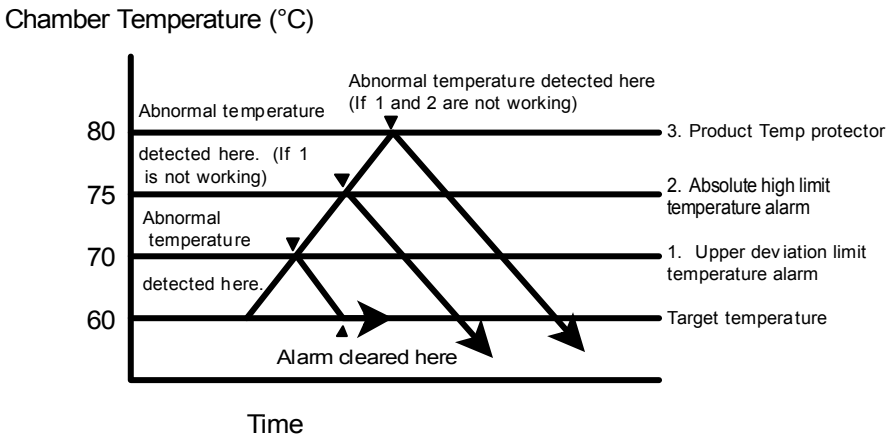
In the following example, the target temperature is 60°C and the maximum allowed temperature of the specimens is 80°C. Safety devices are set as follows:

TABLE 2.1. SETTING EXAMPLE FOR PRODUCT TEMP PROTECTOR AND HIGH LIMIT TEMPERATURE ALARMS

Product Temp Protector		+80°C	- Set 20°C higher than target temperature - Set to specimen's maximum allowed temperature
Temperature (&Humidity) Controller	**Absolute High Limit**	+75°C	- Set 15°C higher than target temperature - Set 5°C lower than specimen's maximum allowed temperature
	Upper Deviation Limit	+10°C	- Set 10°C higher than target temperature (will trip at 70°C)

With the settings in Figure 2.1 on page 16, the safety devices will trip in the succession shown in Figure 2.3 on page 19 as temperature inside the chamber rises beyond the target temperature. The first to trip will be the upper deviation limit alarm, followed by the absolute high limit alarm, and then the product temp protector. Due to the fact that the chamber is equipped with multiple safety devices, abnormal temperatures cannot escape detection even if one of the devices is not working properly.

FIGURE 2.3.TEMPERATURE ALARM TRIGGER CONDITIONS



2.6 Global Warming Potential of Refrigerants

Refrigeration circuit contains fluorinated greenhouse gases covered by the Kyoto Protocol. See Table for global warming potential of refrigerants used by ESPEC. See chamber serial tag for refrigerant and quantity used in this chamber.

TABLE 2.2. GLOBAL WARMING POTENTIAL OF REFRIGERANTS

Substance	GWP
R-23	12,000
R-134a	1,300
R-404a	3,800
R-449a	1,400
R-508b	12,000

Insulation material is made of foam blown with fluorinated greenhouse gases.

2.7 Disposing of the Chamber

CAUTION

CHAMBER DOOR IS NOT EQUIPPED WITH AN INTERNAL RELEASE. REMOVE DOOR BEFORE DISPOSAL.

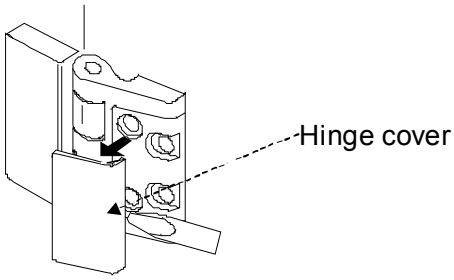
Tools Required:

- Slotted head screwdriver
- 7/16” socket box wrench to detach the door

Procedure:

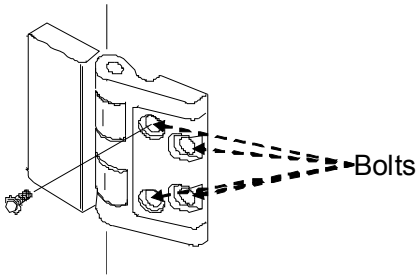
1. Pry off the hinge cover on the door side part of the hinge. Use the slotted head screwdriver.

FIGURE 2.4.PRYING OFF THE HINGE



2. Open the door slightly and prop it up with the hand winch. Then remove the bolts (4), which lock the hinge to the door. Use the box wrench.

FIGURE 2.5.HINGE BOLTS TO REMOVE



3. Detach the door

4. Remove refrigerant and dispose of properly per state standards

2.8 Other Precautions

DANGER

DO NOT USE OR LEAVE EQUIPMENT OUTDOORS. OUTDOOR ENVIRONMENTS ADVERSELY AFFECT PERFORMANCE AND FUNCTIONING.ELECTRICAL PART CONTACT WITH WATER CAN LEAD TO SHORT-CIRCUIT, FIRE, ELECTRICAL SHOCK, AND BREAKDOWN.

OPERATE IN A WELL VENTILATED AREA OR EXHAUST VENT PORT OUTSIDE OF BUILDING. CHAMBER USES LIQUID NITROGEN INJECTED DIRECTLY INTO WORKSPACE FOR COOLING. NITROGEN GAS WILL DISPLACE THE OXYGEN IN THE AIR AND CAN CREATE A HAZARDOUS CONDITION.

KEEP OUT OF CHAMBER! THERE IS A RISK OF BEING TRAPPED.

CAUTION

DO NOT INTRODUCE ELECTRICALLY CONDUCTIVE SPECIMENS WHICH MIGHT EASILY BE THROWN ABOUT BY AIR CURRENTS INSIDE THE CHAMBER. SPECIMENS OF THIS SORT CAN CAUSE LEAKS IN THE HEATER IF THEY INFILTRATE THE AIR CONDITIONER.

HOT AIR BLAST WHEN OPEN! USE CAUTION WHEN OPENING THE DOOR DURING AND SHORTLY AFTER OPERATION AT HIGH TEMPERATURE OR HIGH HUMIDITY. HOT (WET) AIR IS BLOWN FROM INSIDE THE CHAMBER WHEN OPENED.

WARNING

HOT INSIDE! DIRECT CONTACT MAY RESULT IN BURNS. WEAR HEAT RESISTANT GLOVES. DURING AND SHORTLY AFTER OPERATION ABOVE 55°C, THE CHAMBER IS HOT ON THE INSIDE (INCLUDING SPECIMENS, SHELVES, DOOR GASKET, AND TEST AREA WALLS).

Chapter 3

Before You Install Your ESPEC Chamber

This chapter gives an overview of the Platinous Series and temperature and humidity control.

3.1 Related Documents

- Controller Manual
- Web Controller Manual
- Web Controller Locater
- Options Manual
- Declaration of Conformity
- Features Details
- Parts List and Schematics
- Specifications
- Jabsco Water Pump Manual (EPL and EPX models only)
- Vaisala HMM100 User's Guide (EPL and EPX models only)

3.2 Accessories and Spare Parts

Confirm that the following accessories and spare parts have been included with your chamber:

See Section 5 in the chamber specifications document.

3.3 Preparing Installation Site

This equipment may require the following utilities:

- Electrical power
- Refrigeration cooling water
- Humidity water supply
- Drainage
- Compressed air
- Gaseous Nitrogen
- Liquid Nitrogen

3.4 Additional Product Information and Customer Support

Contact Information for Customer Support and/or Sales:

- Online Customer Support: www.espec.com/na/support
- Online Sales: www.espec.com/na/about/contact_us
- Customer Support: 616-896-6170
- Corporate and Sales: 616-896-6100

Download software, related documents and manuals:

- Manuals: www.espec.com/manuals and enter your serial number to download
- Related documents: www.espec.com/manuals and enter your serial number to download
- Software: www.espec.com/na/support/software to download

Please have the following information available when calling ESPEC Support and/or Sales:

- Chamber Model and Serial Number located on the equipment data tag
- Detailed information on the suspected failure and/or alarm detail
- Operating mode at time of failure, i.e., heating, cooling, temp, humidity
- If a specific part is needed, the ESPEC part number from your replacement parts list

Chapter 4

Names & Functions of Parts

This chapter identifies parts found on the chamber, instrumentation panel, electric parts compartment, and water circuit compartment by name and function. Return to this chapter any time that you are unsure where a part is located.

4.1 Chamber

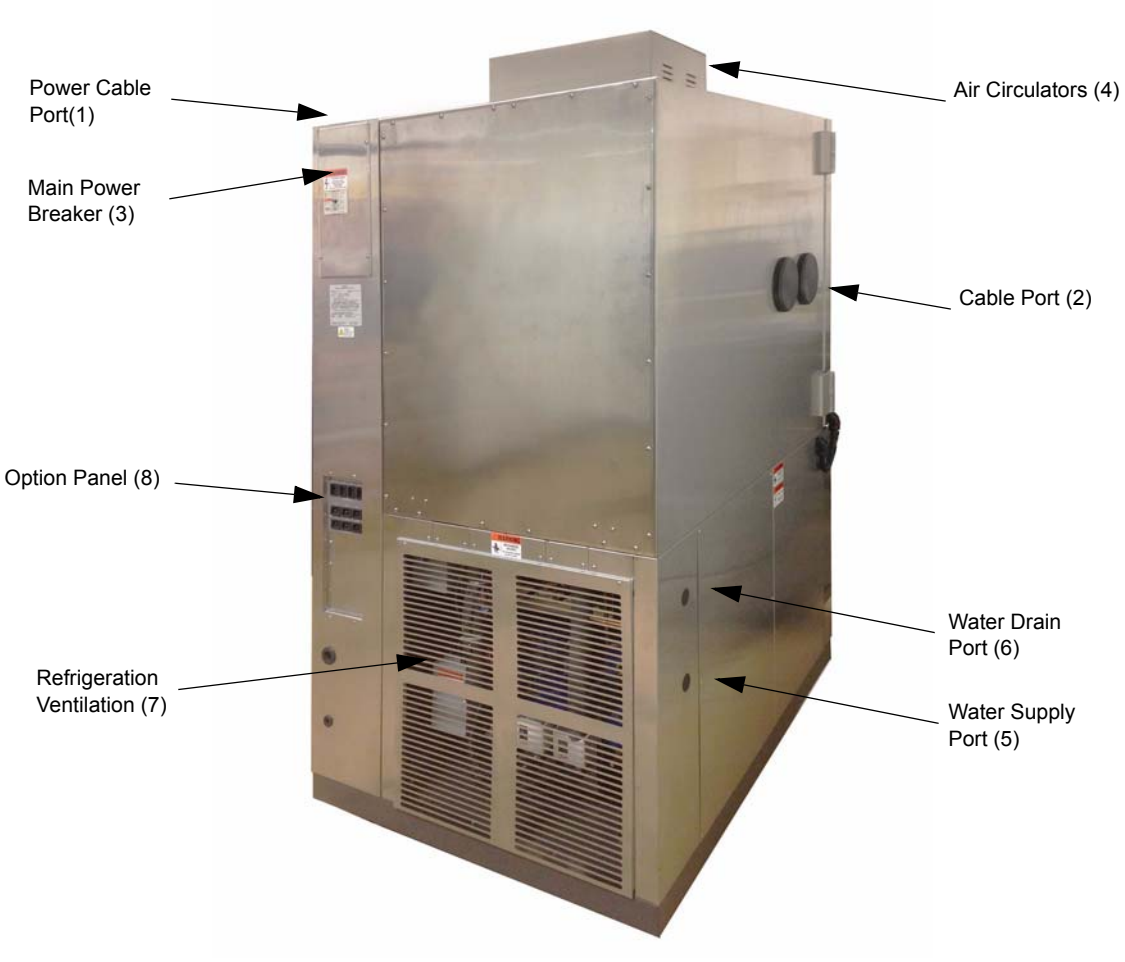
4.1.1 Front and Right

FIGURE 4.1. CHAMBER FRONT AND RIGHT

	Name	Function/Use
(1)	Instrumentation Panel	User-interface panel for controlling the temperature (& humidity) controller. It contains the product temp protector, USB port, chamber lamp switch and controls for options.
(2)	Electrical Compartment Door	Open to access the electric parts compartment
(3)	Water Circuit Compartment Door	Open to access the water circuit compartment
(4)	Door Handle	Use to open/close the chamber door
(5)	Humidity Drain Port	Connect a drain hose here
(6)	Humidity Water Port	Feed the humidity water supply into the water circuit through here
(7)	Condenser Grill	Gives access to air cooled condenser
(8)	Viewing Window	Allows you to view specimens inside the chamber during tests
(9)	LED Lamp Cover	Detach to change LEDs
(10)	Chamber Door	Open to access the test area
(11)	Compressed Air Port	For Dry Air Purge (Optional)

4.1.2 Left, Rear, and Top

FIGURE 4.2.LEFT, REAR AND TOP



	Name	Function/Use
(1)	Power Cable Port (Top Side)	Feed the power cable into main power breaker (3) through here
(2)	Cable Port	Feed cables (i.e. to charge specimens) into the test area through here
(3)	Main Power Breaker	Turns primary power supply to the chamber ON/OFF
(4)	Air Circulators	Air circulator motors
(5)	Water Supply Port	For refrigeration cooling water (optional)
(6)	Water Drain Port	For refrigeration cooling water (optional)
(7)	Refrigeration Ventilation	For air circulation (do not block)
(8)	Option Panel	For connection of specimen power, alarm, time signals, and optional communications

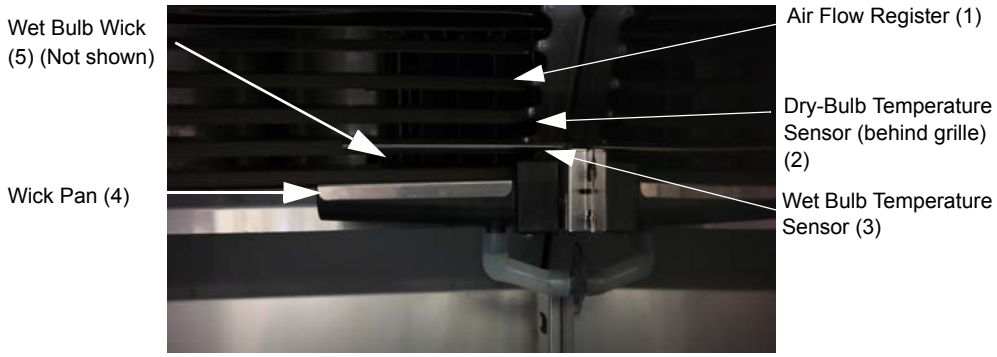
4.1.3 Test Area (1)

FIGURE 4.3.CHAMBER TEST AREA

	Name	Function/Use
(1)	Test Area	Area where specimens are located for temperature (& humidity) tests
(2)	Shelf Support Pilaster	Install shelf brackets here
(3)	Shelf Bracket	Supports the shelf. To change shelf height, reposition the brackets on the shelf support.
(4)	Shelf	Holds specimens during tests
(5)	Dew Tray	Collects and drains dew formed on the chamber door
(6)	Door Outer Gasket	Keeps outside air from penetrating the chamber
(7)	Door Inner Gasket	Keeps outside air from penetrating the chamber

4.1.4 Test Area (2)

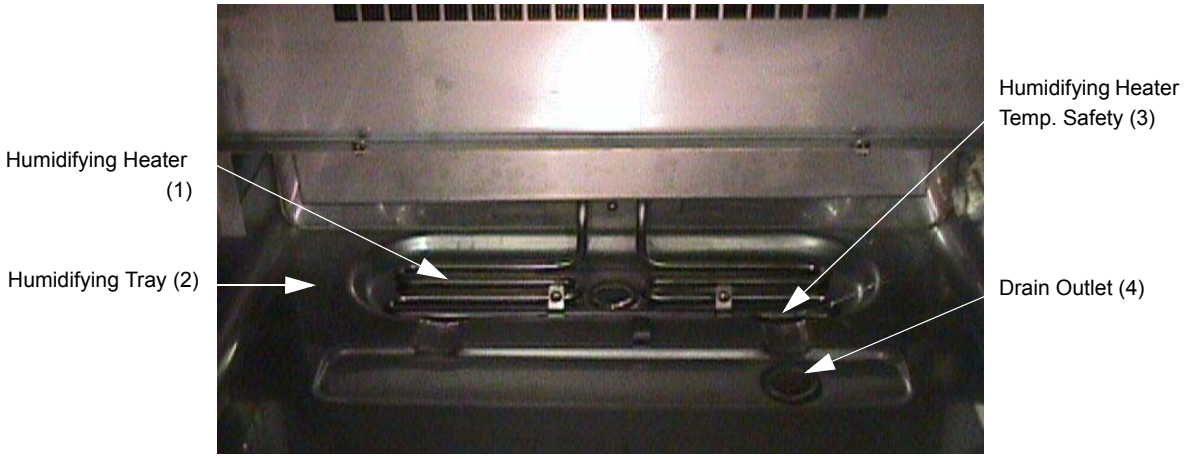
FIGURE 4.4.TEST AREA CEILING



	Name	Function/Use
(1)	Air Flow Register	Regulate internal airflow direction from here
(2)	Dry-Bulb Temperature Sensor (Not shown)	Detects dry-bulb (test area) temperature
(3)	Wet-Bulb Temperature Sensor*	Detects wet-bulb temperature (test area humidity)
(4)	Wick Pan*	Supplies water to the wet-bulb wick
(5)	Wet-Bulb Wick*	Used in detecting wet-bulb temperature (test area humidity)

*Not provided on temperature only chambers

FIGURE 4.5.UNDER TEST AREA FLOOR



	Name	Function/Use
(1)	Humidifying Heater*	Evaporates water in the humidifying tray
(2)	Humidifying Tray	Holds humidifying water
(3)	Humidifying Heater Temp. Safety*	Prevents the heater from overheating when humidifying water is low
(4)	Drain Outlet	Releases internal pressure buildup and drains overflow from the humidifying tray to the outside
(5)	Protective Grill (not shown)	Prevents direct contact with the humidifying heater

*Not provided on temperature only chambers

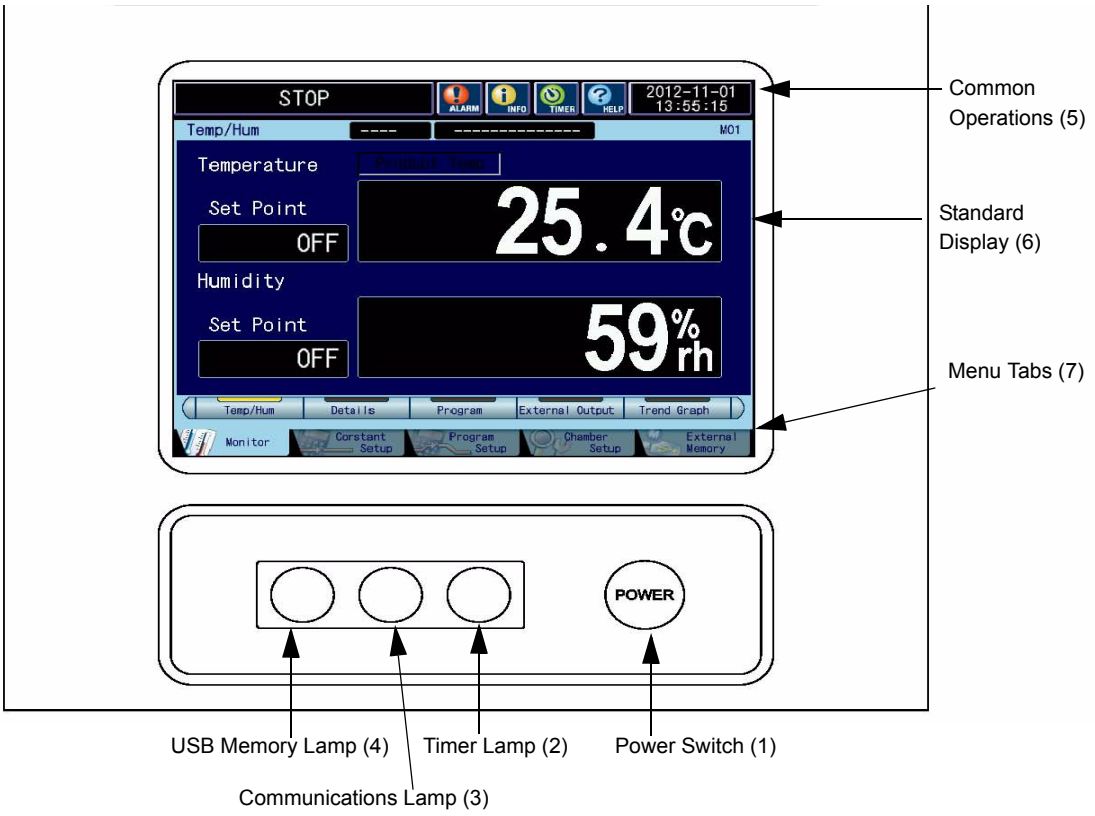
4.2 Instrumentation Panel

FIGURE 4.6.INSTRUMENTATION PANEL

	Name	Function/Use
(1)	Operating Panel	Controls the temperature (humidity) settings and start/stop operations of the temperature (humidity) controller. See **“Operating Panel” on page 32**”
(2)	Product Temp Protector	Stops the chamber to prevent damage to specimens. See **“Product Temp Protector” on page 55**.
(3)	Chamber Lamp Switch	Turns the chamber lamp on and off
(4)	Operating Panel Power Switch	Turns the power supply of the operation panel on and off
(5)	External Memory Terminal (USB)	Insert a USB memory device to transfer data between the chamber and a computer (or other chamber)

4.3 Operating Panel

FIGURE 4.7.OPERATING PANEL

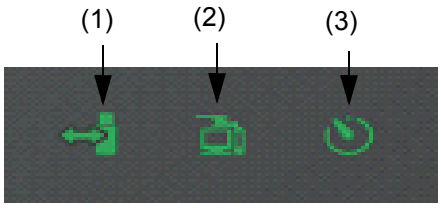


	Name	Function/Use
(1)	Power Switch	Turns power to the instrumentation ON/OFF
(2)	Timer Lamp	See description under External LED indicators
(3)	Communications Lamp	See description under External LED indicators
(4)	USB Memory Lamp	See description under External LED indicators
(5)	Common Operations	Displays and sets operations, alarms, status, external memory, and date
(6)	Standard Display	Displays and sets the main menu screens
(7)	Menu Tabs	Displays the menus by tabs

The display monitor works as a touch-screen. It is operated by gently pressing the screen elements. Operation is interactive. Whenever text or numbers need to be input, a ten-key pop-up window is automatically laid over the screen.

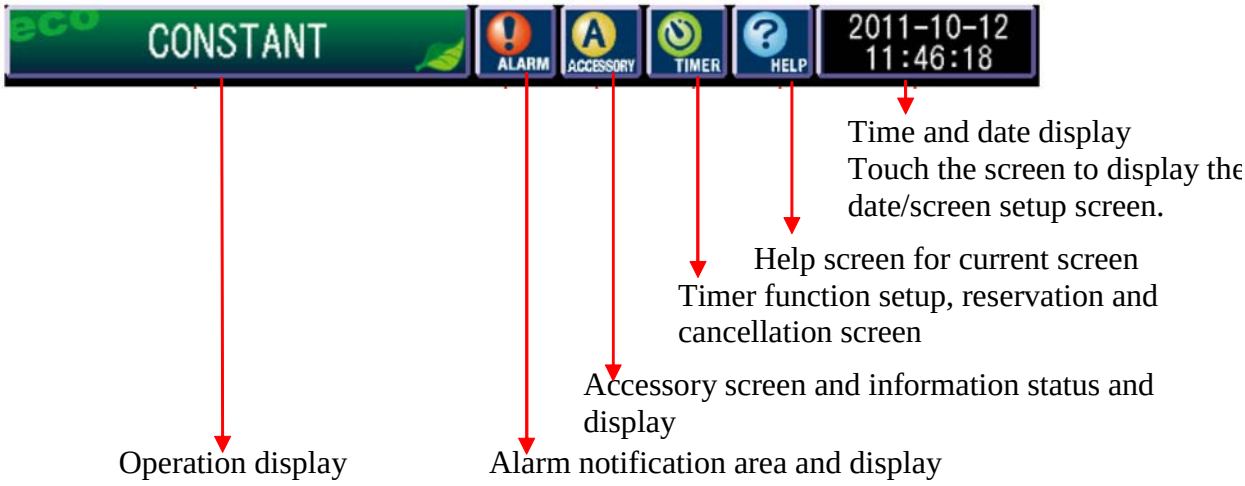
Note: Press on the touch-screen only with your fingers. Pressing with pointed or hard objects will damage the screen.

4.3.1 External LED Indicators

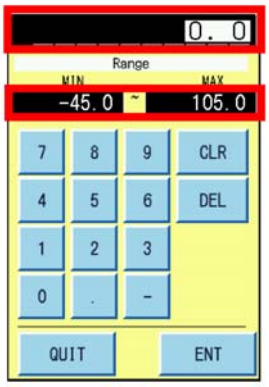


	LED Indicator Name	Display State	Meaning
(1)	USB Memory Lamp	On	Checking external memory
		Blinking (every second)	Preparing external memory (mount)
		Blinking (every second)	Accessing external memory
		Rapidly blinking (every 250 msec)	External memory error
		Off	External memory not connected
		Off	Unsupported USB device connected
(2)	Communication Lamp	Blinking	Communicating
		Off	Not communicating
(3)	Timer Lamp	Lit	Timer Set

4.3.2 Common Operations



4.3.3 Ten-Key Pop-Up Window



CLR: Clears all characters in the character string box.

DEL: Deletes the last character entered.

ENT: Finalizes the entered numerals and closes the ten-key window.

QUIT: Cancels the entered characters and closes the ten-key window.

Character string window: All entered characters are blinking.

Menu Tabs (7)

TABLE 4.1. TOUCHSCREEN ELEMENTS

	Processing Buttons
CLOSE	Stops processing in course and returns the display to the previous screen. If pressed before data changes are entered, a message confirming whether to suspend the operation or not is displayed.
YES	Executes the displayed operation. Carefully read the message displayed on the screen before pressing this button.
NO	Cancels the current operation. Processing is suspended and the display returns to the previous screen.
SAVE	Saves data updates. A message confirming whether to execute the operation or not is displayed on the screen.
	Selector Boxes
ITEM BOX	Selects the item given in the box. When selected, the box is highlighted.
•ON	Pressing the box selects and deselects the given item. When selected, the dot is yellow.
	Field Boxes
FIELD BOX	When pressed, a keypad is laid over the screen to enable text or numerical input.
	Keypad: Text Input
	Text can be input in Roman Alphabet or Japanese Kana.
CLEAR, DEL, QUIT, ENTER	These keys function in the same way as when inputting numerical values, though the names of the keys are slightly different.
SPACE	Inputs a space.
•CAPS	Switches between capital and lowercase letters. When the dot is yellow: CAPITALS When the dot is black: lowercase
	Switches between the Roman Alphabet and Japanese Kana modes. When dot is yellow: Japanese Kana When dot is black: Roman Alphabet

Chapter 5

Installation & Start-Up

This chapter explains how to install the chamber and prepare for tests. Be sure to read the sections on installation even if having the chamber installed by the place of purchase or ESPEC. Also refer to this chapter when relocating the chamber.

5.1 Installation Site Check

This section describes installation site and space requirements.

5.1.1 Installation Site

Install the chamber in a place which satisfies the following conditions:

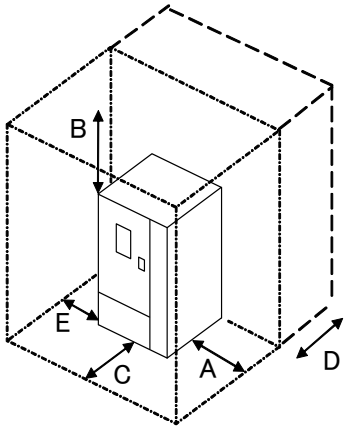
- On a flat, level floor which is strong enough to bear the weight of the equipment
- Where subject to only minimal mechanical vibrations
- Where not exposed to direct sunlight but which is well-ventilated
- Where ambient temperature is within the temperature range on the chamber specification. Ambient temperature must not have sharp fluctuations (<0.1°C/min or <3°C/30 mins).
- In a dust-free room
- Where not exceptionally wet or humid
- Away from flammables and explosives
- Where not exposed to combustible or corrosive gases
- Near power, water, and drainage utilities
- Not directly underneath or near fire alarms

Note: Chamber working temperature range is 5-35°C. Using the chamber outside of this range will lead to equipment problems. Performance is only guaranteed when in a room 10 to 25°C.

5.2 Installation Space

The chamber requires operational and maintenance space on the left and right sides. It must also be a safe distance from objects on the front side so that the door can be opened.

FIGURE 5.1.INSTALLATION SPACE



A: Min. 42” (106cm)*
B: Min. 6” (measured from top of motor cover)
C: See Table 5.1, “Required clearance from chamber front*,” on page 37
D: Min. 24” (61cm)
E: Min. 24” (61cm)

5.2.1 Front Clearance Requirements

Opening the door requires a minimum front clearance.

TABLE 5.1. REQUIRED CLEARANCE FROM CHAMBER FRONT*

Type	EPL, EPU, EPX, EPZ
2	28 in. (70cm)
3	32 in. (80cm)
4	48 in. (120cm)

5.2.2 Chamber Exterior Dimensions

See chamber specifications for exterior dimensions.

5.3 Chamber Casters

Casters allow chamber portability and use in multiple locations. Casters include feet to level the unit and fix it in place.

5.3.1 Operation

CAUTION

DO NOT MOVE THE CHAMBER WITH SPECIMENS INSIDE. SPECIMENS COULD OVERTURN OR FALL OFF SHELVES DURING TRANSPORT.

WARNING

USE CART/CHAMBER ONLY ON A FLAT/LEVEL FLOOR. AN UNLEVEL FLOOR COULD TRIGGER AN ALARM OR DESTABILIZE HUMIDITY CONTROL.

The chamber must be level side to side and front to back for proper humidity system operation.

Casters and adjuster feet are found under each of the four corners of the cart base. Adjuster foot height can be adjusted by loosening and tightening the nut. This will require a 1/2 inch or 13mm open end wrench.

FIGURE 5.2.HOW TO LOOSEN/TIGHTEN ADJUSTER FEET

Note: Always anchor the chamber in place with adjuster feet BEFORE use. Unless anchored, the chamber could move unexpectedly under external force.

5.3.2 Leveling Chamber

Procedure:

1. Lower the adjuster feet until the casters rise off the floor
2. Once installed, check that the chamber is level from side to side and front to back, using a level.

5.3.3 Moving Chamber

Procedure:

1. Raise the adjuster feet until the chamber is sitting on the caster wheels
2. Move the chamber

5.4 Before Installation

CAUTION

DO NOT MOVE THE CHAMBER WITH SPECIMENS INSIDE. SPECIMENS COULD OVERTURN OR FALL OFF SHELVES DURING TRANSPORT.

INSTALL THE CHAMBER ONLY ON A FLAT, LEVEL FLOOR. AN UNLEVELED FLOOR COULD TRIGGER AN ALARM OR DESTABILIZE HUMIDITY CONTROL. THE CHAMBER MUST BE LEVEL SIDE-TO-SIDE AND FRONT-TO-BACK FOR PROPER HUMIDITY SYSTEM OPERATION.

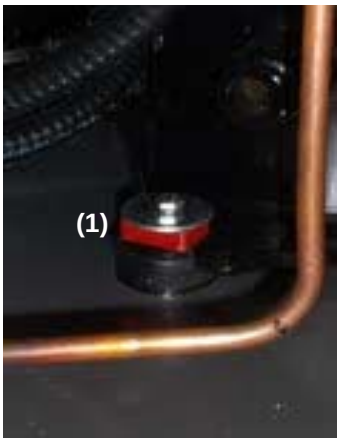
ALWAYS ANCHOR THE CHAMBER IN PLACE WITH THE ADJUSTER FEET BEFORE USE. UNLESS ANCHORED, THE CHAMBER COULD MOVE UNEXPECTEDLY UNDER EXTERNAL FORCE.

Procedure: Remove Compressor Shipping Protection

The compressors are provided with a shipping bracket to prevent the shifting of components during transport.

1. Open machine room rear panel
2. Remove red brackets under compressor foot:
    1. Loosen bolt by each bracket
    2. Remove bracket (1)
    3. Re-Tighten bolt. Compressor mounting has a metal sleeve to prevent over-tightening.

FIGURE 5.3.COMPRESSOR SHIPPING BRACKET



5.5 Power Supply Work

5.5.1 Primary Power Supply Requirements

The primary power supply must satisfy the requirements found on the power schematic in the Replacement Parts and Schematics Manual. Refer to applicable code requirements for feeder wire and fuse/breaker size.

DANGER

PRIMARY POWER WORK SHOULD ONLY BE DONE BY A QUALIFIED ELECTRICIAN

5.5.2 Primary Power Supply Connections

The chamber is connected to the primary power supply via the power cable. It is also grounded to prevent noise from infiltrating electronic circuits and to protect users against electric shock which can result from leakage current.

DANGER

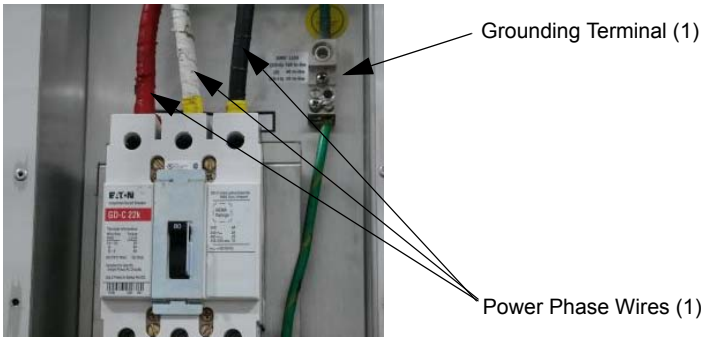
EXPLOSION! DO NOT GROUND THE EQUIPMENT ON GAS PIPES. GROUNDING OF THIS SORT COULD RESULT IN AN EXPLOSION.

GROUND THE EQUIPMENT PROPERLY. ELECTRICAL SHOCK! UNLESS THE EQUIPMENT IS GROUNDED, OVERCURRENT AND SHORT CIRCUIT PROTECTIVE DEVICES CANNOT OPERATE PROPERLY, POSSIBLY RESULTING IN ELECTRIC SHOCK. THIS WILL ALSO LEAVE THE EQUIPMENT UNPROTECTED AGAINST POWER SUPPLY NOISE.

Procedure: See Figure 5.4, "Primary Power Supply Connection,"

1. Open electrical box door
2. Enlarge power port to proper size for installed conduit or strain relief. Protect electrical components from any debris while enlarging hole.
3. Feed a power cable through the top power port
4. Connect phase wires to terminals on top of breaker
5. Connect the grounding wire of the power cable to the grounding terminal. Be sure the ground wire would be the last connection broken if stress was put on the primary power wires.

FIGURE 5.4. PRIMARY POWER SUPPLY CONNECTION



	Name
(1)	Grounding Terminal
(2)	Power Phase Wires

5.5.3 208/230VAC Transformer Supply Voltage Selection

Note: Applies only to 208/230 volt models

The control transformer can be wired for 208VAC or 230VAC supply power to the chamber. The default voltage the transformer is wired for is 208VAC unless specified for 230VAC when ordered. Refer to the following procedure to change the transformer wiring. Changing the wire connections should only be performed by qualified personnel.

Procedure: Change transformer wiring

1. Verify the chamber has been disconnected from the main power source and that the specimen power and time signal have been unplugged from the chamber
2. Open the instrument panel door and locate the main transformer
3. Reference the chambers electrical power print for the wire connections on the primary power side of the transformer
4. Loosen the appropriate screw terminal on the transformer and remove the wire. See Figure 5.5 below. Move the wire to the appropriate terminal on the transformer and tighten the screw to 20 inch pounds.

FIGURE 5.5.PRIMARY POWER WIRES TO TRANSFORMER

5.6 Cooling Water Connection (Water-Cooled chambers only)

This option uses a water-cooled condenser in the refrigeration system.

Equipment

- Condenser: Water-cooled type
- Condenser Fan: The condenser is not equipped with a fan
- Water Supply and Drain Ports: Refrigerator water supply and drain ports are located on the chamber's left side

Chamber Performance

Chamber performance is guaranteed for a water temperature of 25°C, no specimens and automatic refrigeration capacity control.

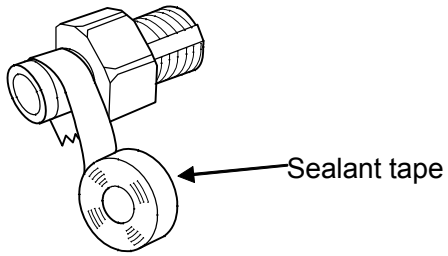
Water Supply and Drainage Work

Water-cooled chambers require water supply and drainage lines. First, check water supply rate and pressure included in your chamber specification.

Use water pipe for the supply and drainage lines

1. Rig piping between the supply source and the chamber. Use piping that fits the water supply and drain ports (1/2" FPT)
2. Wrap the male end threads of the nipple and pipes with sealant tape

FIGURE 5.6. WRAPPING THREADS WITH SEALANT TAPE



3. Attach the water pipes to the supply and drain ports on the chamber

5.7 Drainage

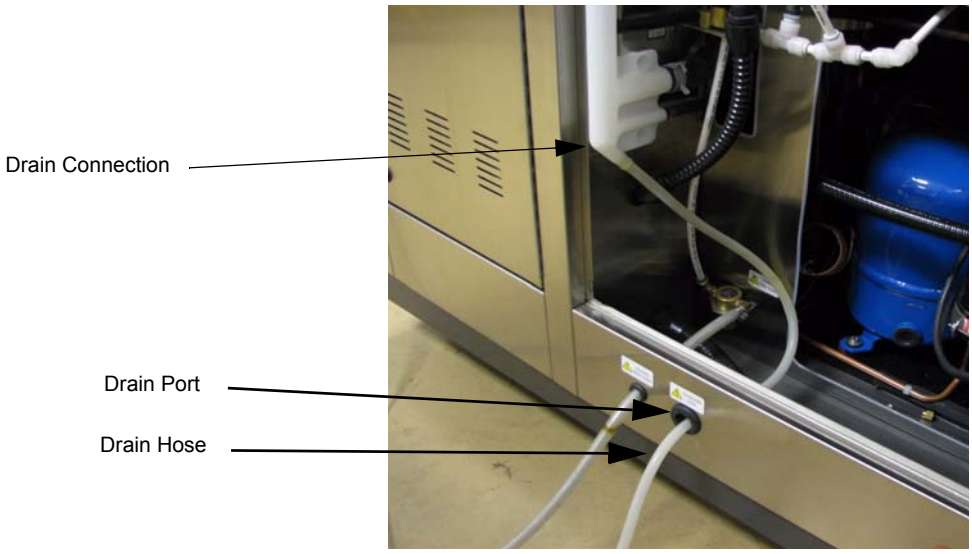
Drainage is needed to remove water from the humidifying tray and dew formed in the test area.

Procedure:

1. Turn the latches shown in the figure below and open the water circuit compartment door on the right side of the chamber.
2. Feed the drain hose to the outside through the drain port on the chamber right side. Gravity drainage is used, so keep the drain hose sloped downward and run it into a pit.
3. Shut the water circuit compartment door. Attach the door in the opposite order in which it was detached.

FIGURE 5.7.WATER CIRCUIT COMPARTMENT DOOR

FIGURE 5.8.HUMIDITY WATER DRAIN



Note: If a drainage pit is not located near enough to the chamber, run drainage into a container. The humidifying trays use about 1.2 L per drainage cycle for chamber types 2 and 3, and about 2.4 L for type 4 chambers. Whether running drainage into a pit or a container, keep the end of the drain hose open to the atmosphere. If submerged, water can backflow into the chamber.

5.8 Water Level Check (EPL, EPX models only)

For proper chamber operation, water level in the humidity tray must be checked.

5.8.1 Remove Protection Material

The humidifying tray water level regulator is contained inside the water circuit compartment, located on the right side of the chamber.

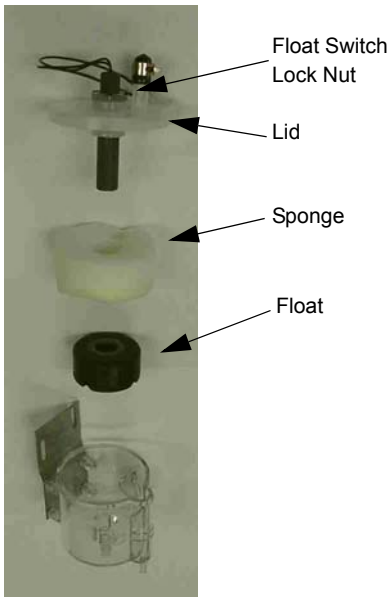
CAUTION

DO NOT RE-INSTALL FLOAT UPSIDE DOWN!

Procedure:

1. Open the lid of the water level regulator.
2. Take out the stopper sponges (protection material) found inside.
3. Note the position of the floats when the sponge is removed.
4. Return and close the lid to their original state.

FIGURE 5.9. WATER LEVEL REGULATOR



CAUTION

THE FLOAT SWITCH HOLDER LOCK NUT FITTED ON THE HUMIDIFYING TRAY WATER LEVEL REGULATOR IS FACTORY PRESET AND SHOULD NOT BE TURNED.

TO RE-ADJUST THE LEVEL REGULATOR, SEE "CHECK WATER LEVEL IN THE HUMIDIFYING TRAY WATER LEVEL REGULATOR" ON PAGE 48.

5.8.2 Water Supply Installation

Connection of the Water Supply Hose for the Humidifying Tray Water Circuit

Insert a 3/8” I.D. rubber hose, from a purified* water source, around the water supply hose nipple. The water supply should have a pressure between 20 ~ 50 psi to ensure proper operation of the humidifying circuit.

*The type of purifying system does not matter, but the purified water should be filtered (5 micron), have a conductivity of 0.2µS/cm to 10µS/cm, and a maximum of 2mg/L of free chlorine.

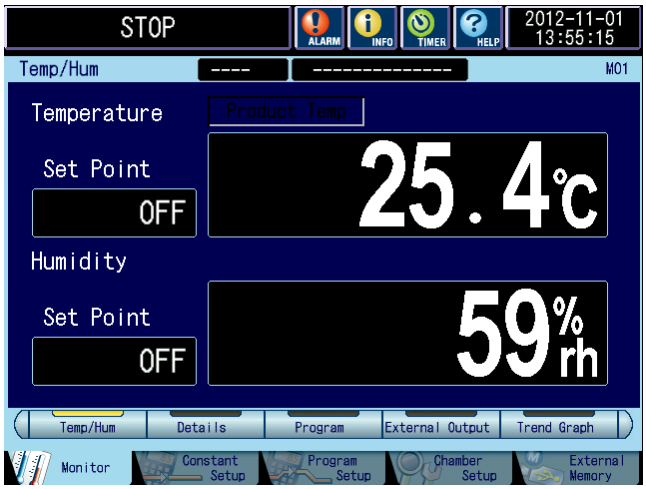
FIGURE 5.10. CONNECTING WATER SUPPLY HOSE

5.8.3 To Supply Water to the Humidifying Tray

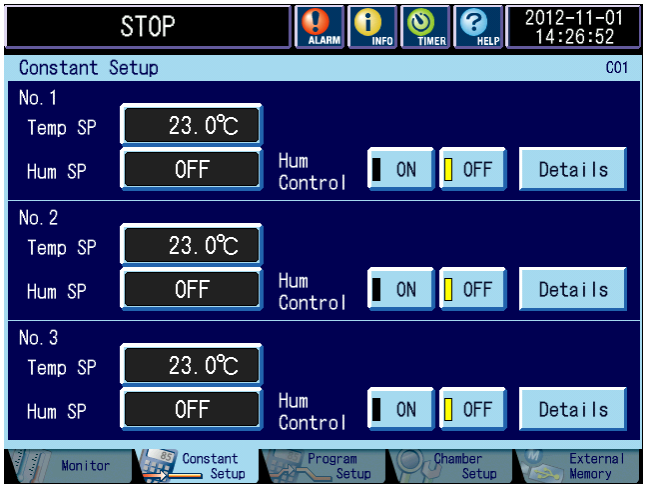
To supply water to the humidifying tray, it is necessary to run the chamber. Water is supplied automatically as long as humidity control is turned ON. The chamber is set to 23°C and humidity control of OFF when the chamber is shipped from the factory. For details on chamber setup, see the P-300 Controller Manual.

Procedure:

1. Remove lower air grille. Set the main power breaker in the ON position.
2. Press the POWER key on the operating panel. The display will come on and the monitor screen will appear shortly.



3. Go to the constant setup screen by pressing on the constant setup tab at the bottom of the screen.



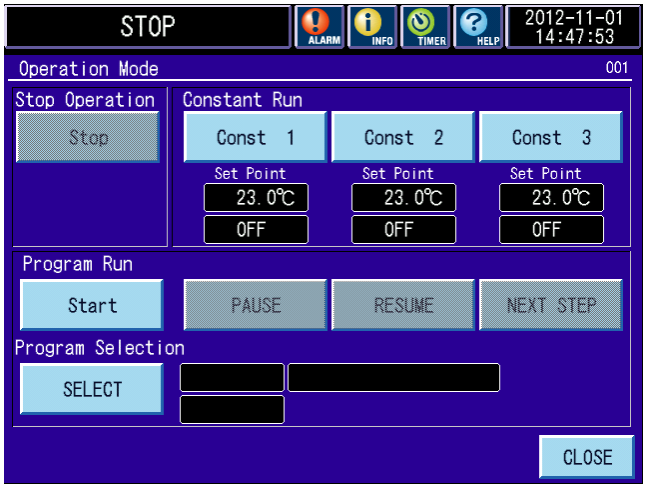
4. There are three available constant modes to choose from. For this procedure, use the No. 1 constant setup. If humidity control is on, proceed to step 6. If off, press the ON box next to Hum Control for constant setup No. 1 so that the rectangle turns yellow.

When rectangle is yellow: Humidity control is ON

When rectangle is black: Humidity control is OFF

5. Check humidity control is ON. A value between 0 and 100% RH will be displayed in the Hum SP field box.

6. Press the operation display box in the upper left hand corner of the screen to get the Operation Mode selection screen. Press the Const 1 box followed by the YES button on the confirmation message.



The chamber will start up and the humidifying tray will fill.

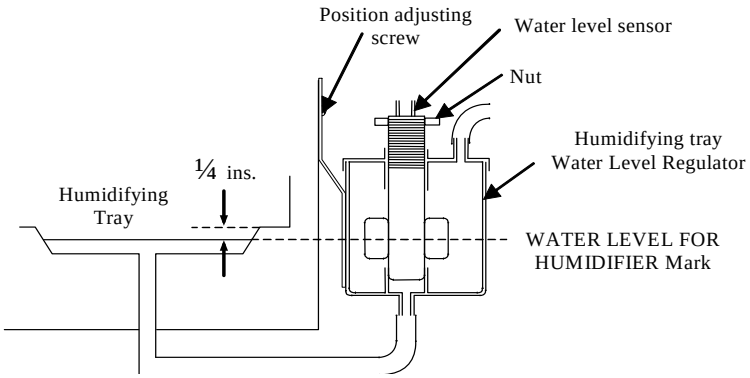
5.8.4 Check Water Level in the Humidifying Tray Water Level Regulator

Water level in the humidifying tray will depend on the water level in the humidifying tray water level regulator.

Procedure:

1. Open the water circuit compartment door.
2. Check that the water level in the humidifying tray water level regulator is at the water level for humidifier mark. If adjustment is required, see Step 2 in procedure below.
3. Close the water circuit compartment door

FIGURE 5.11.WATER LEVEL CHECK IN HUMIDIFYING TRAY



Procedure: If water level is low or high, regulate it as follows:

1. Loosen the position adjusting screw and raise/lower the water level regulator.
2. If water level cannot be regulated in step 1, loosen the nut and turn the water level sensor clockwise (seen from above) to lower water level, or counter-clockwise to raise it. Then, re-tighten the nut.
3. Close the water circuit compartment door and set the main power breaker to ON.
4. When water supply is complete, press the OPER./START key or the chamber operating status box to get the Operation Mode Selection screen again. Then press the STOP button under Stop Operation followed by the YES button on the confirmation message. The chamber will stop.
5. Press either the OPER./START key on the operating panel or the chamber operating status box on the screen to get the Operation Mode Selection Screen. Then press the START button under Constant Mode followed by the YES button on the confirmation message. The chamber will start up and the tray will fill.
6. Check water is the proper level. If water level is ok, the chamber is ready for use. If not, repeat steps 1-5.

Chapter 6

Operation

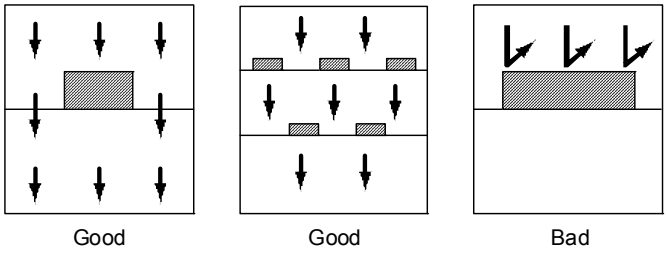
This chapter explains test preparations and preliminary checks, test startup and editing, and some of the handy features of the Platinous Series. Perform the work described in this chapter before every test.

6.1 Test Preparation

6.1.1 How to Arrange Specimens

Space specimens apart and away from walls so as not to block air circulation inside the test area. Temperature (& humidity) uniformity drops if air cannot flow freely, which will throw off test results.

FIGURE 6.1.HOW TO ARRANGE SPECIMENS

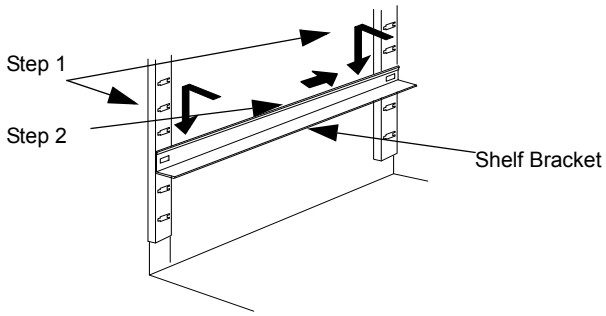


The shelves can be repositioned freely to suit the size and amount of specimens. Set them in a position that allows air to be unobstructed.

Procedure:

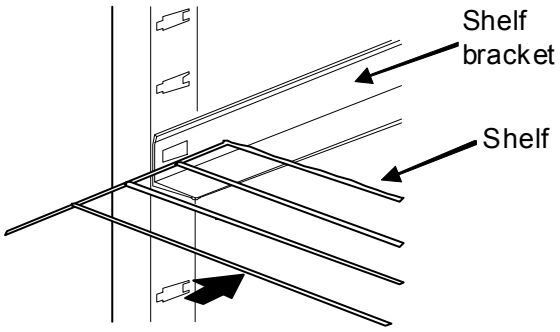
1. Attach the shelf brackets to the supports at a suitable height for specimens. Follow the steps below to attach the shelves.

FIGURE 6.2.HOW TO INSTALL SHELF BRACKETS



2. Set the shelf on the shelf brackets.

FIGURE 6.3.HOW TO INSTALL SHELVES



6.1.2 Refrigeration Cooling Check

Confirm the refrigeration cooling water system is operable and prepared for operation (all water supply valves are open.)

6.1.3 How to Power Specimens (use only when required)

Use the specimen power supply inlet to charge specimens. The rated electric capacity of the terminals is 125VAC, 2A.

DANGER

USE ONLY THE SPECIMEN POWER SUPPLY CONTROL TERMINALS TO APPLY VOLTAGE TO SPECIMENS.USING OTHER MEANS TO POWER SPECIMENS CAN DRIVE UP TEMPERATURE INSIDE THE CHAMBER IF THE CHAMBER IS TURNED OFF. THIS CAN DAMAGE SPECIMENS, AND IN WORSE CASES, RESULT IN FIRE.

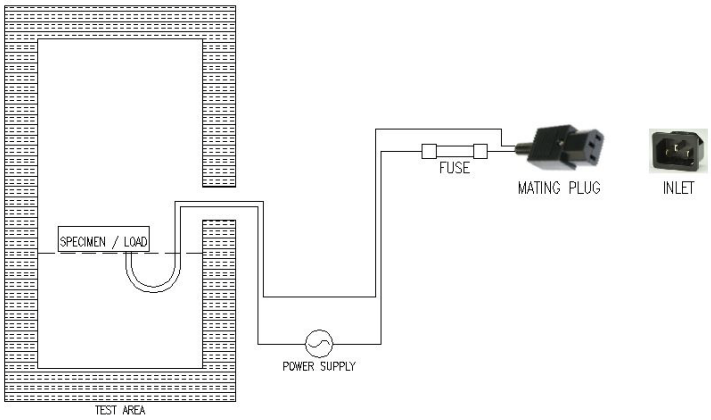
CAUTION

DROOP CABLES BELOW AND UP TO SPECIMENS AS SHOWN IN FIGURES. IF CABLES ARE TAUT, DEW CAN RUN DOWN THE CABLES AND DAMAGE SPECIMENS

To charge specimens with less than 2A of power

Be sure to fit the line with a suitable capacity fuse.

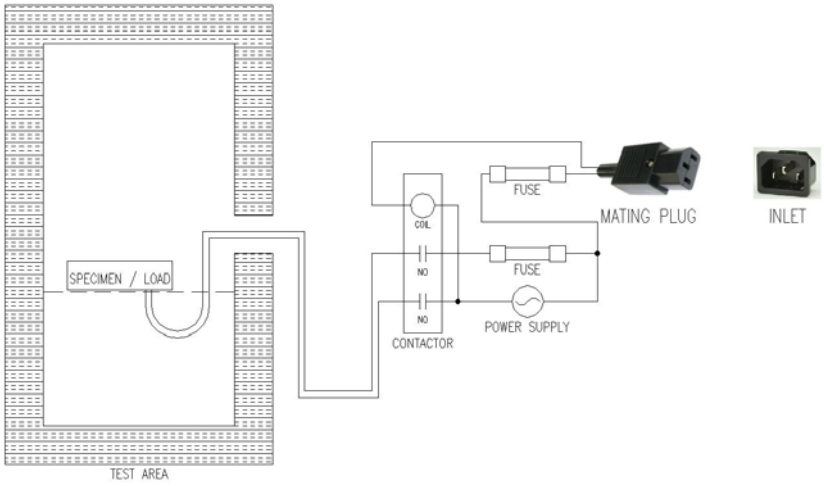
FIGURE 6.4.WIRING TO SPECIMENS LESS THAN 2A



To charge specimens with 2A or more power

Be sure to fit the line with a suitable capacity contactor and fuse.

FIGURE 6.5.WIRING TO SPECIMENS 2A OR MORE

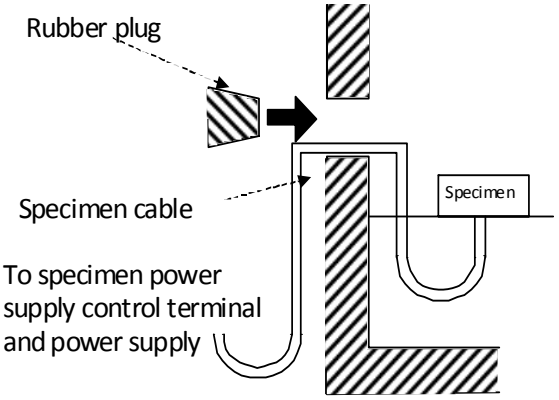


Procedure:

1. Remove the plug from the cable port.
2. Feed the cable from the specimens through the cable port and then cover the port with the included rubber plug.
3. Locate specimen power supply plug in the chamber accessory kit.
4. Connect wires to the specimen power supply plug.
5. Plug the specimen power supply plug back into the specimen power inlet connector.

Note: After feeding the specimen cable through the cable port, cover the port with the included silicone rubber plug. Without the plug, outside air will infiltrate the test area, which can keep temperature (& humidity) from reaching the target setting. Cut a notch the size of the cable in the plug and fit the cable in the notch.

FIGURE 6.6.HOW TO FEED SPECIMEN CABLES THROUGH THE CABLE PORT



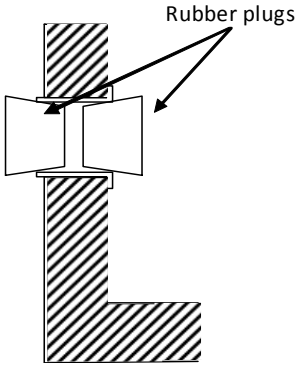
Use a specimen cable that can withstand test conditions. Refer to the following table for possible cable types.

TABLE 6.1. CABLE TYPE AND WITHSTAND TEMPERATURE

Cable Type	Withstand Temperature
Vinyl Cable	55°C
Styrene-butadiene cabtyre cable	70°C
Electron crosslinked heat-proof plastic cable	100°C
Glass-braid silicon shielded cable	200°C

When not using the cable port, fit a silicone rubber plug in it from the inside and outside.

FIGURE 6.7.WHEN NOT USING CABLE PORTS



6.1.4 Humidity Water Check (Humidity Chambers Only)

Confirm the water supply for the humidity system is operable and prepared for operation (all water supply valves are open).

6.1.5 Wet-Bulb Wick Check (Humidity Chambers Only)

The wet-bulb wick (included) must be installed to run humidity tests. If already in place, check whether it is wet or dry before starting. If dry, change it.

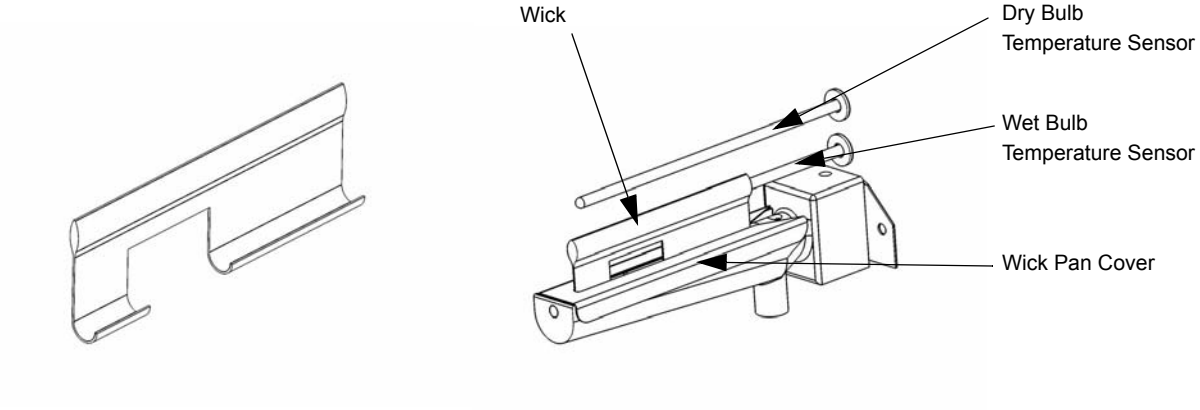
Note: Bacteria adhering to the wet-bulb wick can proliferate during tests and block water supply. Wash hands with soap and water before handling the wick.

Procedure:

1. Remove the wet-bulb wick from its package.
2. Remove wick pan cover.
3. Slide the wet-bulb wick over the wet-bulb temperature sensor. It is easier to slide the wick over the sensor by folding it in half.

Note: Make sure the tail end of the wet-bulb wick is aligned with the tip of the wet-bulb temperature sensor. Humidity control can be destabilized if the sensor is overly exposed or it the sensor is out of position.

4. Curve the ends of the wet-bulb wick so it sits smoothly on the bottom of the wick pan.



5. Lay the ends of the wet-bulb wick in the central trough of the wick pan
6. Reinstall wick pan cover

Note: Remove the wet-bulb wick for temperature-only tests, especially if running the chamber above ambient temperature. Should the wick dry out, it will be harder to supply it with water, which will throw off humidity measurements the next time a humidity test is run.

6.2 Specimen Safety Device Setup

6.2.1 Product Temp Protector

Set the appropriate temperature values (required for product protection) of the Product Temp Protector. This is accomplished by using the Product Temp Protector digital selector located on the front under the controller next to the option panel. Both an “Overtemp” and “Overcool” value are set using the digital selector.

CAUTION

ALWAYS SET THE PRODUCT TEMP PROTECTOR BEFORE BEGINNING TESTS. SET IT ACCORDING TO THE TYPE OF SPECIMENS AND TEST CONDITIONS.

Note: Unless properly set, the product temp protector will not trip in the event of chamber trouble, which could lead to specimen damage. For details on the product temp protector setting values, See “Specimen Protection (Safety Devices)” on page 17.

Do not press the Up and Down keys of the selector at the same time for five seconds or more.

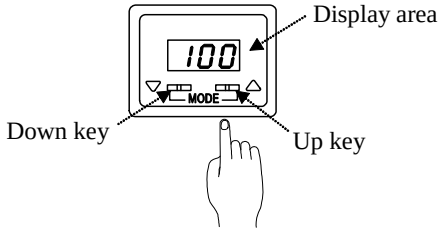
If the keys are pressed at the same time for five seconds or more, the equipment enters maintenance mode and the thermocouple range, temperature range, and warning mode settings of the selector are displayed. If these settings are changed, there are cases where the equipment malfunctions or does not operate even if the temperature set point is reached.

If an error occurs while settings are being changed, “Err” appears on the display and the program returns to the Set Point Display mode.

Procedure: Set the Product Temp Protector (Overheat and Overcool)

1. Under normal operation, the Product Temp Protector display toggles every three seconds between the overheat and overcool settings. To change settings, press the Up or Down key for 1/2 second. The current overheat (high limit) setting is displayed and “R&A” are displayed in the display area.
2. Specify the desired temperature. Each time that you press the Up or Down key, the temperature is increased (or reduced) by 1°C. If you press and hold the key for approximately two seconds or more, the ones digit is set to zero and the value is increased (or reduced) by 10°C.
3. Once the overheat (high limit) is set, do not press the Up or Down buttons for five seconds. The display will switch over to the overcool (low limit) setting and “M&A” are displayed in the display area.
4. Repeat step 2 to set the overcool (low limit) setting. Once the overcool (low limit) setpoint is entered, do not press the Up or Down buttons for five seconds. The “M&A” will disappear from the display and the overheat and overcool settings begin to toggle back and forth on the display every three seconds.

FIGURE 6.8.PRODUCT TEMP PROTECTOR DISPLAY/SELECTOR



6.2.2 Absolute High/Low Limit and Upper Deviation Limit Temperature (& Humidity) Alarms

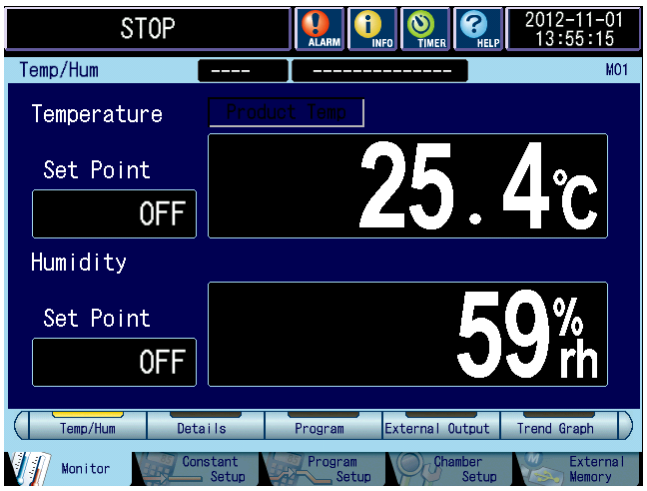
CAUTION

ALWAYS SET THE ABSOLUTE HIGH/LOW LIMIT TEMPERATURE ALARMS BEFORE BEGINNING TESTS. SET ALARMS ACCORDING TO THE TYPE OF SPECIMENS AND TEST CONDITIONS.

UNLESS PROPERLY SET, THE ABSOLUTE HIGH/LOW LIMIT TEMPERATURE ALARMS WILL NOT BE TRIGGERED IN THE EVENT OF CHAMBER TROUBLE, WHICH COULD LEAD TO SPECIMEN DAMAGE.

Procedure:

1. Set the main power breaker in the ON position.
2. Press the POWER key to activate control power. The display will come on and the main menu will appear shortly.

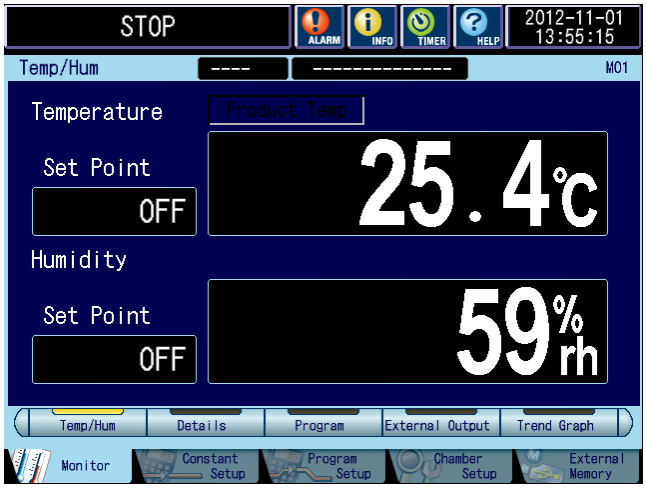


3. For constant mode setup, go to the constant setup screen by pressing on the constant setup tab at the bottom of the screen. For program mode setup, skip to step 7.

4. There are three available constant modes to choose from and each one can be individually configured. For this procedure, use the No. 1 constant setup. Press the Details box for constant mode No. 1.

5. Press the Others tab at the bottom of the screen to access the High/Low Limit Setup screen.

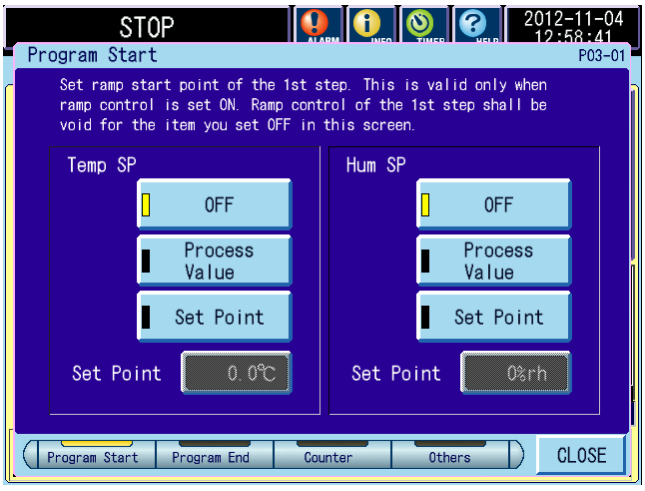
6. Set the temperature/humidity high/low limits. The absolute high/low limits will determine the allowed input range for only Constant Mode 1. Steps 4 through 6 would need to be performed for the other two Constant Modes (2&3).
7. To set the high/low limits for a specific program, press the Program Setup tab at the bottom of the Monitor screen.



8. For this example we will use program 1. Press the #1 box on the Program List screen. If there is no current program saved, a window will appear asking to start a New Program.

9. Press on the NEW PGM button and the Edit Program screen appears with an edit window that allows Step 1 of the program to be configured.

10. Close this box by pressing the Quit button in the Step edit box. Now press the DETAIL button at the bottom of the screen. The Program Start screen appears.

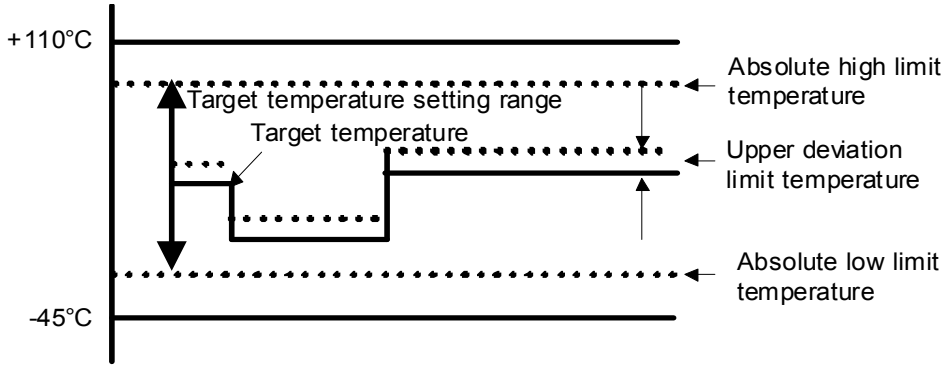


11. Press the Others button at the bottom of the screen to access the High/Low Limit Setup screen.

12. Set the temperature/humidity high/low limits. The absolute high/low limits will determine the allowed input range for only the program that is currently being edited. This will not affect any of the other programs or constant modes.

Note: The high/low limit values can not be set to a value greater than the default high/low limit values set at the factory.

FIGURE 6.9. ABSOLUTE HIGH/LOW LIMIT AND UPPER DEVIATION LIMIT TEMPERATURE



Absolute high/low temperature limits

These settings are designed to protect the chamber against thermal damage. Set them at least 10°C higher/lower than the target temperature. When tripped, an alarm is generated and the chamber stops running.

Upper deviation temperature limit

This setting is designed to protect specimens against heat damage. It also triggers a safety device inside the chamber, which causes the heater output to go to 0% output. When temperature returns within range, normal control is restored automatically.

Absolute high/low humidity limits

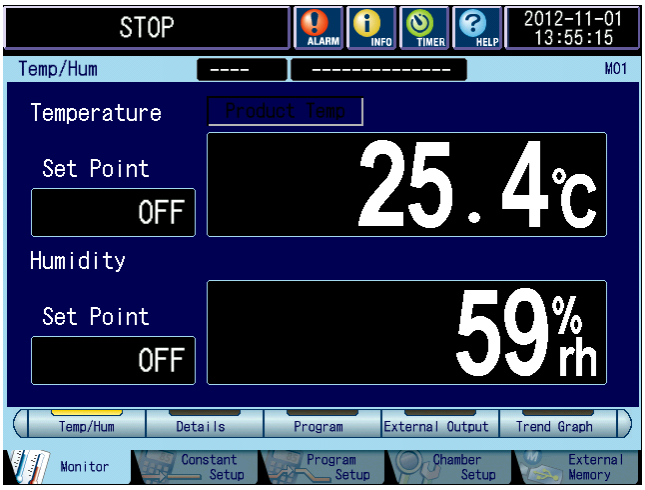
These settings are designed to protect specimens against humidity damage. when tripped, it triggers a safety device inside the chamber. Absolute high will cause the humidity heater to go to 0% output. When humidity returns within range, normal control is restored automatically.

6.3 Constant Temperature (& Humidity) Setup

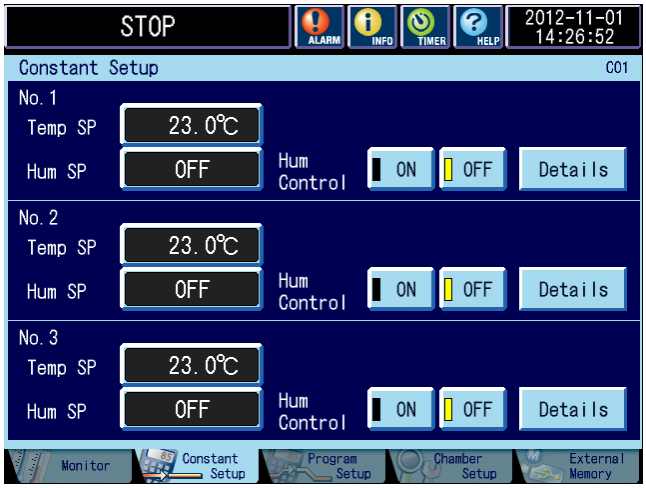
For constant mode operation, it is necessary to input the desired temperature and humidity.

Procedure:

1. Set the main power breaker in the ON position.
2. Press the POWER key to activate control power. The display will come on and the monitor screen will appear shortly.



3. For constant mode setup, go to the constant setup screen by pressing on the constant setup tab at the bottom of the screen.



4. There are three available constant modes to choose from and each one can be individually configured. For this procedure, use the No. 1 constant setup.
5. Input the target temperature (humidity). By pressing the field box next to Temp SP (Hum SP) a key-board entry window opens that allows the setpoint value to be entered. If humidity control is OFF, the humidity setpoint will not be displayed in the field box next to Hum SP.
6. Turn humidity control ON/OFF as needed. Press the ON box next to Hum Control to enable humidity mode. When humidity is enabled, the field box next to Hum SP will display the current humidity setting.

When rectangle is yellow: Humidity control is ON

When rectangle is black: Humidity control is OFF

7. When finished setting temperature (humidity), press the Monitor tab to return to the Monitor Screen.

6.4 Test Startup/End

6.4.1 Test Startup

Before starting tests, make the preparations and settings described in Sections “Test Preparation” on page 50 to “Constant Temperature (& Humidity) Setup” on page 61.

Note: Always wait at least 5 minutes after setting the main power switch in the OFF position before reactivating the primary power supply to the chamber. Frequent switching ON/OFF will greatly shorten refrigerator service-life.

Procedure:

1. Check control power is ON.
2. Get the Operation Mode Screen by pressing the chamber operation display box located in the top left corner of the screen.
3. Start operation in the constant mode by selecting one of the three constant modes; Cont 1, Const 2, or Const 3. When one of the three modes is selected, a window opens with a run confirmation message.

4. Press the YES box to start the chamber.

YES Button: Starts testing in the constant mode and returns to the original screen.
NO Button: Cancels the command and returns the display to the original screen. The chamber’s operating status does not change.

6.4.2 Preventing Dew on Test Specimens

Reference: When testing electronic components or similar specimens, it is necessary to keep dew from forming on specimens. Dew forms when specimen surface temperature is lower than the dew point of the air inside the chamber. To prevent dew formation, first warm specimens under temperature-only operations. Start temperature and humidity test only after specimen surface temperature is the same as the temperature inside the test area.

Dew formation can also be prevented by using the humidifier delay control option. See the table below for some typical dew points. For example, when temperature and humidity inside the chamber are 85°C and 85% RH respectively, the dew point of the air inside the chamber will be 80.9°C. Therefore, dew will form on specimens if their surface temperature is less than 80.9°C.

TABLE 6.2. DEW POINT

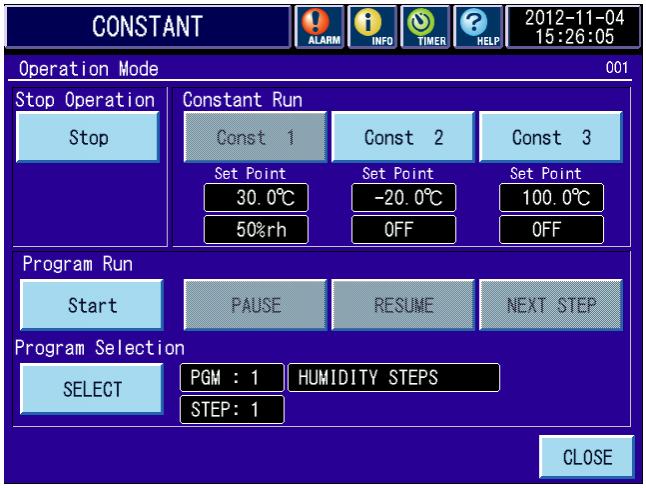
Dry-Bulb	Relative Humidity (% RH)	Dew Point (°C)
60	85	56.5
70	85	66.3
	90	67.7
85	85	80.9
	90	82.3

6.4.3 Test End

End tests by performing the following:

Procedure:

1. Go to the Operation Mode screen by pressing the chamber operation display box located in the top left corner of the screen.
2. Press the STOP button under Stop Operation.



3. Press the YES button on the confirmation message. The chamber will stop and will assume the standby state.
   YES button: Stops testing and returns the display to the original screen.
   NO button: Cancels the command and returns the display to the original screen. The chamber's operating status does not change.
4. Press the POWER key
5. If there are no plans to use the chamber for an extended period of time, set the main power breaker in the OFF position.

6.5 Useful Features

6.5.1 Auto/Manual Refrigeration Control

Refrigeration capacity is automatically controlled so as to reach and maintain the target temperature and humidity. For normal tests, set refrigeration capacity to automatic control.

CAUTION

WHEN REFRIGERATION CAPACITY IS SET TO 100%, THE REFRIGERATION RUNS AT MAXIMUM CAPACITY. IN SOME CASES IT WILL NOT BE POSSIBLE TO MAINTAIN THE TARGET TEMPERATURE.

CHECK THE CAPACITY SETTING BEFORE STARTING TESTS. SPECIMENS CAN BE DAMAGED IF TEMPERATURE CANNOT BE MAINTAINED.

Note: If trouble occurs during testing, set refrigeration capacity to manual control.

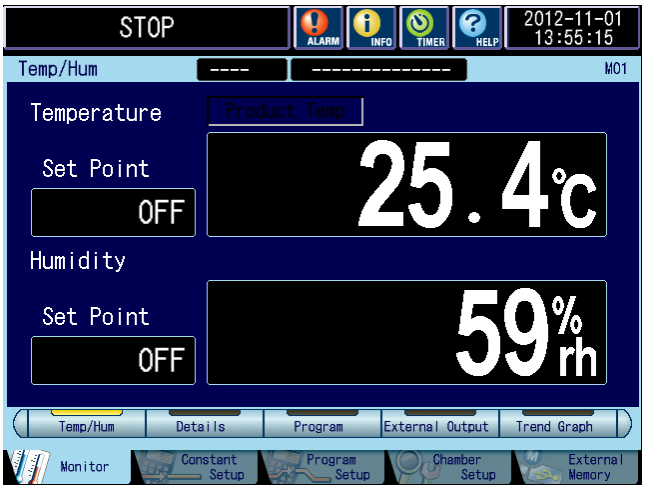
1. Useful if test samples create excess heat.
2. Useful if refrigeration needs to be turned off during operation.

Automatic Refrigeration Capacity Control

Procedure:

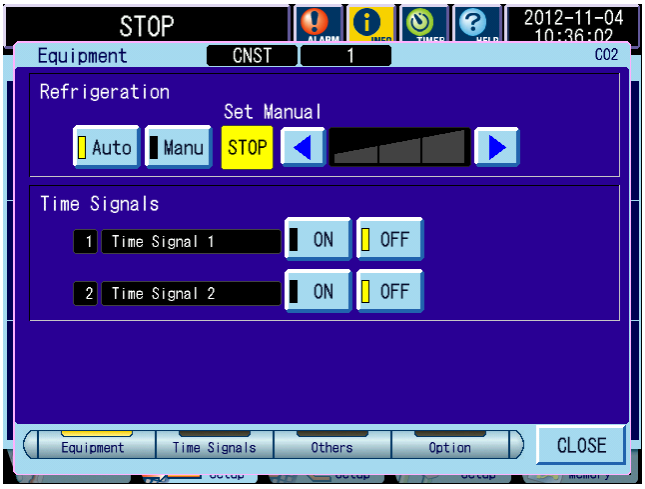
1. Set the main power switch in the ON position
2. Press the POWER key to activate control power
3. The following explains how to set refrigeration capacity in the constant mode. Press the CONSTANT SETUP tab at the bottom of the monitor screen.

Note: For an explanation on how to set refrigeration capacity in the program mode, see “Program Operation” in the P-300 Operation Manual reference.



4. For this example use Constant mode 1. Press the Details box for constant mode No. 1.

5. Set refrigeration capacity control. Select between auto and manual (Stop/20%/50%/100%) control.



6. When finished setting the refrigeration capacity control, press the CLOSE button to return to the Constant Setup screen.

Pre-Chill Setting (Refrigeration Control set to 20%)

Procedure: The refrigeration manual control can be used when transitioning from a set point above ambient to a low temperature. The pre-chill setting is accomplished by setting the manual refrigeration control to 20% output 3-5 minutes before the transition is to start. This will start the refrigeration system and pre-cool the cascade of the system to assure maximum capacity is available for transition. When the temperature transition is started the refrigeration should be returned to 'auto' control. This setting can be used in constant or program operation.

6.5.2 How to Use Time Signals

Time signals can be used to power specimens during specific program steps only, or to control external equipment, such as shutting off measuring instruments at the same time testing ends, or lighting up lamps when monitoring starts.

For an explanation on how to power specimens during programmed operation, “How to Power Specimens (use only when required)” on page 51.

CAUTION

ONLY USE TIME SIGNAL IF THE DRIVEN EQUIPMENT CAN BE RUN SAFELY IN THE EVENT OF CHAMBER TROUBLE AND SUBSEQUENT RE-SETTING.

6.5.3 External Alarm Terminal

Purpose - Use

This feature is used to notify an external point when the chamber has been stopped by a safety device tripping.

Specifications

- Number of outputs: 1
- Contact rating: 125V AC, 2A

Operation

A signal is output via a closed contact when the chamber has been stopped by a safety device tripping. The interface contact for the alarm signal closes when an alarm condition on the chamber occurs.

Usage

Connect the alarm circuit (i.e. alarm emitter, etc.) to the external alarm output on the Chamber Options Panel. The alarm circuit must be prepared by the user.

Chapter 7

Electrical Safety Devices

Safety devices equipped on Platinous Series Chambers serve the purpose of protection (safety) of the chamber, specimens, and personnel.

7.1 Safety Devices

If one of the following safety devices (with exceptions in the case of a “controller detected” alarm) is activated, an alarm will sound and be indicated on the HMI screen. The fault should be corrected before attempting to reset the chamber controller.

7.1.1 Chart of Safety Devices - EPL, EPU, EPX, EPZ

TABLE 7.1.

	SAFETY DEVICES	EPL EPX	EPU EPZ
1	Chamber Disconnect *	√	√
2	Transformer Primary Fuses *	√	√
3	Transformer Secondary Fuses *	√	√
4	Absolute high & low temperature limit	√	√
5	Upper deviation temperature limit	√	√
6	Absolute high & low humidity limit	√	
7	Circulation fan motor fuses/breaker *	√	√
8	Overload module for circulation fan motor	√	√
9	Heater Fuses *	√	√
10	Humidifying Heater Fuses *	√	
11	Overheat Protector for Humidifying Heater	√	
12	Motor Protector for Compressor	√	√
13	Compressor Discharge Temperature Limit	√	√
14	High/Low Pressure Switch for Refrigeration System	√	√
15	Thermal Limit	√	√
16	Sensor Burnout Protection	√	√
17	External Alarm & Controlled Specimen Power	√	√
18	Dry wick alarm	√	
19	Solid state humid sensor burnout/failure	Δ	
20	Product temp protector (overheat)	√	√
21	Product temp protector (overcool)	√	√
22	Emergency Stop Pushbutton *	Δ	Δ
	Δ = Optional		

*****No indication on HMI screen.

7.1.2 Function of Safety Devices

TABLE 7.2.

	DESCRIPTION	PURPOSE
1	Circuit breaker for Primary Source	Protection against Overload and Short Circuit
2	Transformer Primary Fuses	Control Circuit and Electrical Component Protection
3	Transformer Secondary Fuses	Control Circuit and Electrical Component Protection
4	Absolute high & low temperature limit (integrated with controller)	Specimen and chamber protection
5	Circulation fan motor fuses	Circulation motor circuit over-current and short circuit protection
6	Overload module for Circulator Motor	Circulator Fan Motor Protection
7	Heater Fuses	SSR and Heater Protection
8	Humidifying Heater Fuses	SSR and Humidifying Heater Protection
9	Overheat protector for humidifying heater	Humidifying heater protection Chamber and specimen protection
10	Branch Circuit Protection for Compressor	Compressor short circuit and over-current protection
11	High/Low Pressure Switch	Refrigeration System Protection
12	Thermal Limit Probe	Specimen and chamber protection
13	Sensor Burnout Protector (integrated with controller)	Temperature overheat protection (detection of disconnected sensor)
14	External Alarm Terminal and Controlled Specimen Power Terminal	Specimen and chamber protection
15	Solid State Humidity Sensor Burnout/Failure	Protection from loss of solid state humidity sensor inputs (loose wiring, loss of power, etc.)
16	Product temp protector (overheat)	Specimen and chamber protection
17	Product temp protector (overcool)	Specimen and chamber protection
18	Emergency Stop Pushbutton	Disables power to all control outputs for chamber, specimen, and personnel protection.

Chapter 8

Recommended Maintenance & User-Level Servicing

This chapter explains equipment checks and maintenance. To keep the chamber in good working condition, perform checks and maintenance periodically.

8.1 Check and Maintenance Lists

Check List

For an explanation on each check item, See “Checks” on page 73. If any of the following checks result in problems, contact the place of purchase or **ESPEC North America**.

TABLE 8.1. CHECK LIST

Check Item	When to Check
Main Power Breaker	Once Monthly
Product Temp Protector Trip Test	Before long test runs Before unmanned tests
Water Level Check for Humidifying Tray	Once every 3 months

Maintenance List

For an explanation on each maintenance item, See “Humidifier Cleaning” on page 75.

TABLE 8.2. MAINTENANCE LIST

Maintenance Item	When to Perform
Condenser Cleaning (Air cooled only)	Once Monthly
Humidifier Cleaning*	Once Monthly
Test Area Cleaning	Before Every Test
Electrical Compartment	Annually
Take-Down	Before Long Periods of Disuse
Compressor Service Valve Torque Check	Annually
Electrical Terminal Torque Check	Annually

*Not necessary with temperature-only chambers

8.2 Checks

8.2.1 Main Power Switch Trip Test

Once a month and before long test runs, cycle the main power breaker OFF and ON.

8.2.2 Product Temp Protector Trip Test

Before every test, test-trip the product temp protector both on an overtemp and overcool condition.

Procedure:

1. Check the main power switch is in the ON position.
2. Press the POWER key to activate control power. The display will come on and the monitor screen will appear shortly.
3. Press the chamber operation display box on the screen to get the Operation Mode selection screen.Then select one of the three Constant Run buttons followed by the YES button on the confirmation message. The chamber will start up.
4. Set the Product Temp Protector's over temp setting about 5°C lower than the chamber setpoint. If the Product Temp Protector is working properly, a buzzer will sound and the Alarm screen will appear on the display, and the chamber will stop running when the temperature inside the chamber reaches the Product Temp Protector over temp setting.
5. Reset the fault by turning power off at the instrument panel. Turn power back on at the instrument panel and set one of the three Constant Modes at least 10°C cooler than the previous test setpoint. Start the chamber by selecting the Constant Mode that was set at least 10°C cooler.
6. Set the Product Temp Protector overcool setting 5°C warmer than the chamber's setpoint. If the Product Temp Protector is working properly, a buzzer will sound, the Alarm screen will appear on the display, and the chamber will stop running when temperature inside the chamber reaches the Product Temp Protector overcool setting. If a buzzer does not sound for one or both of the above tests, something is wrong with the equipment. Contact the place of purchase or **ESPEC North America**.
7. To silence the buzzer, press the STOP BEEP button on the Alarm screen.

8.2.3 Wet Bulb Wick Check (EPL and EPX models only)

Running Temperature-Humidity Programs

The wet-bulb wick (included) must be installed to run humidity tests. If already in place, check whether it is wet or dry before starting. If dry, change it. When running a temperature-humidity program, always supply the wick with water, even during temperature-only parts of the program. Unless water is continually supplied, the wick might dry out, which will interrupt testing in progress when the situation is detected.

Temperature-Only Programs

Remove the wet-bulb wick for temperature-only tests, especially if running the chamber above ambient temperature. Should the wick dry out, it will be harder to supply it with water, which will throw off humidity measurements the next time a humidity test is run.

Note: Bacteria adhering to the wet-bulb wick can proliferate during tests and block water supply. Wash hands with soap and water before handling the wick.

Procedure:

1. Remove the wet-bulb wick from its bag
2. Gently fold the wick in half and slide over the sensor

Note: Make sure the tail end of the wet-bulb wick is aligned with the tip of the wet-bulb temperature sensor. Humidity control can be destabilized if the sensor is overly exposed or if the sensor is out of position.

3. Gently unfold and insert bottom portion of the wick in the central slot of the wick pan

8.3 Maintenance

CAUTION

SHARP EDGES! BE CAREFUL OF PROJECTIONS OR SHARP EDGES INSIDE THE CHAMBER. FOR YOUR SAFETY, ALWAYS WEAR GLOVES WHEN WORKING INSIDE THE CHAMBER.

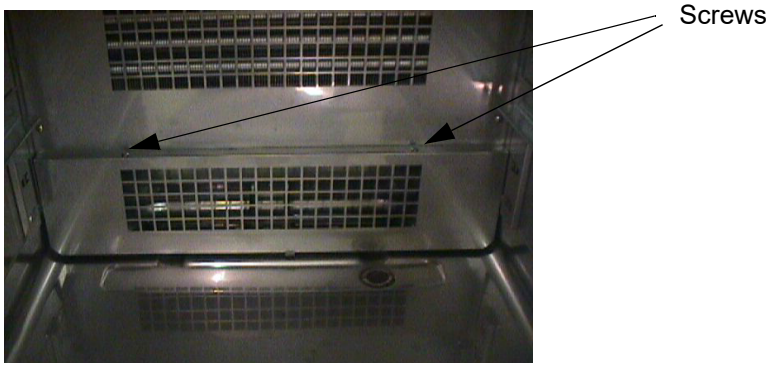
HOT ON THE INSIDE! DURING AND SHORTLY AFTER OPERATION, THE STEAM GENERATOR IS HOT AND HUMID ON THE INSIDE.

8.3.1 Humidifier Tray Cleaning

During operation, dirt and foreign matter stick to the humidifying tray and humidifying heater. To ensure long lasting use, clean the tray and heater of dirt once a month. A good way to inhibit dirt from accumulating is to drain the humidifying tray after every test.

Procedure:

1. Open the chamber door.
2. Loosen screws holding lower baffle and remove to expose humidifying tray area.



3. Clean the surfaces of the humidifying tray and humidifying heater with a brush or other means.
4. Reattach the lower baffle and close the chamber door.

8.3.2 Test Area Cleaning

Dirt and foreign matter inside the test area can throw test results off. Clean the test area before every test.

Procedure:

1. Open the chamber door
2. Wipe walls and parts clean with a soft cloth
3. Close the door

8.3.3 Electrical Compartment and Water Circuit Compartment Cleaning

Dust buildup inside the electric parts compartment and the water circuit compartment can cause problems. Clean inside both compartments once a month.

Procedure:

1. Check that the main power breaker is in the OFF position
2. Open the electric parts compartment and water circuit compartment doors
3. Clean dirt from both compartments with a vacuum or by other means
4. Close the compartment doors

8.3.4 Take-Down Before Long Periods of Inactivity

Before long periods of disuse, do the following. Failure to do so can affect testing and shorten equipment service-life.

1. Dry the test area (run the chamber).
2. Set the main power breaker in the OFF position and shut OFF primary power supply

8.3.5 Compressor Service Valve Torque

The torque applied to the compressor service valve must be checked annually to assure the expansion and contraction of the metal has not caused the service valve to loosen. If the valve loosens it will cause a leak in the refrigeration system, causing a reduction in performance.

Procedure: Verify the main power disconnect is off. Tighten the service valve with torque wrench. The torque is specified in the table below based on the thread size of the rotolock fitting.

Discus Compressor	Service Valves
½-13	54 ft. Lbs.
5/8-11	79 ft. Lbs.
All Other Compressors	**Service Valves**
5/16-18	225 ins. Lbs.
½-13	41 ft. Lbs.
5/8-11	79 ft. Lbs.
All Compressors	**Rotolock Couplings**
¾-16	30-40 ft. Lbs.
1-14	50-60 ft. lbs.
1-1/4-12	80-100 ft. Lbs.
1-1/2-12	100-120 ft. Lbs.
1-3/4-12	120-140 ft. Lbs.

8.3.6 Electrical Terminal Type Check

The terminals for the electrical components should be checked for tightness at least once per year. Thermal and vibration can cause the terminals to loosen over time. Loose terminals can cause a variety of electrical problems.

Procedure: Verify the main power disconnect is off and the power applied to the disconnect is off. Tighten terminals as required within the electrical box and the compressor junction box.

CAUTION

ALL WORK WITHIN THE ELECTRICAL BOX IS HAZARDOUS AND TO BE DONE ONLY BY A QUALIFIED ELECTRICIAN.

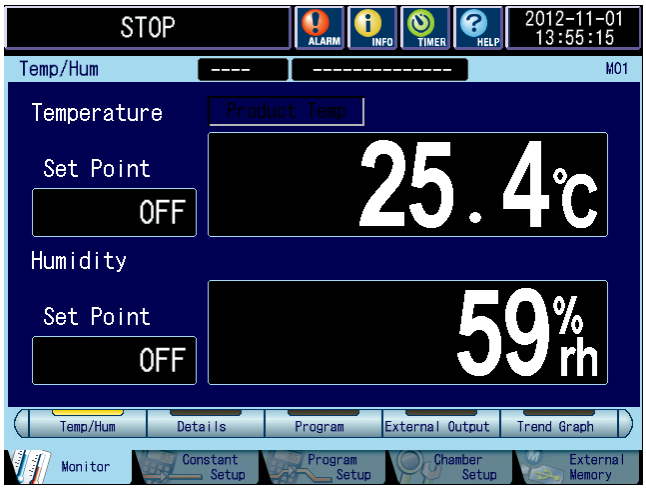
8.3.7 To Dry the Test Area

Turn the refrigeration and humidity control OFF, and run the chamber at a minimum 70°C for about 60 minutes. Then crack the chamber door slightly and run the chamber under the same conditions for about 15 minutes.

Procedure:

1. Check that the main power switch is in the ON position.
2. Change settings so that the operation is not interrupted or an alarm generated if the chamber is run with the door cracked slightly. Make the following settings:

Press the chamber setup tab at the bottom of the screen:



Press the configuration button.

Press the Operation Process button.

Under the Door Open Cond., set the Set Pause Action to OFF.

3. Set target temperature to a minimum 70°C and turn OFF humidity control utilizing one of the three Constant Run selections. (not necessary with temperature-only chambers).
4. Get the Operation Mode screen by pressing the chamber operation display box on the screen.
5. Press the Constant Run button for the constant mode that was configured in step 4. Run the chamber for about 60 minutes with the door closed, then for 15 minutes with the door slightly cracked.
6. Return settings made in step 3 to their original settings.

Power OFF:

Set the main power breaker in the OFF position, then shut OFF the primary power supply.

8.4 User-Level Servicing

8.4.1 Replacing Fuses

When a fuse blows, replace it with one of the included fuses.

Note: If a new fuse blows soon after being installed, contact the place of purchase or **ESPEC North America**.

Procedure:

1. Set the main power switch in the OFF position
2. Open the electric parts compartment door
3. Replace the blown fuse with a new one
4. Close the electric parts compartment door

8.4.2 Changing the Chamber Light (Door with Window Option Only)

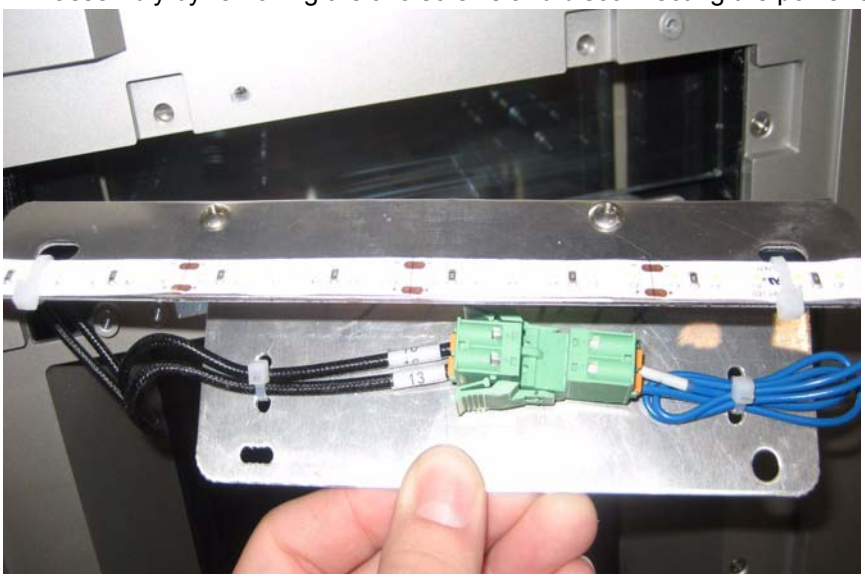
Change the chamber light after every 50,000 hours of service or whenever the light becomes too dim or stops working.

Procedure:

1. Set the main power switch to the OFF position.
2. Remove the light cover at the top of the window by removing the screw located on top of the window.

3. Set outside glass aside to prevent breaking.
4. Remove the light carrier assembly by removing the two screws.

5. Remove the LED assembly by removing the two screws and disconnecting the power connector.



8.4.3 Defrosting

Frost may form on the cooler in temperature operations below 40°C. Defrost the chamber in the following cases.

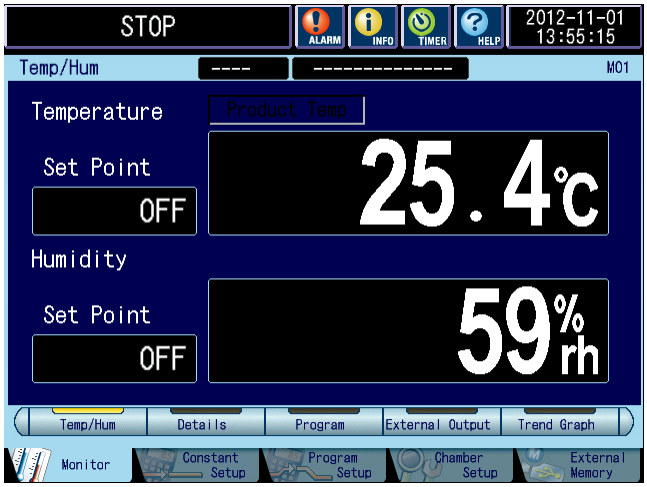
- If temperature inside the chamber is uncontrollable or rises slowly.
- If air blowing from the chamber is weak (when the door is opened.)
- If frost or ice form on test area wall.

Use this procedure to defrost packing as well.

Procedure:

1. Check the main power switch is in the ON position.
2. Turn refrigerator control OFF. For an explanation on how to set refrigerator control, See “Useful Features”.
3. Change settings so that the operation is not interrupted or an alarm generated if the chamber is run with the door cracked slightly. Make the following settings:

Press the Chamber Setup tab at the bottom of the screen.



Press the Configuration button.

Press the Operation Process button.

Under the Door Open Cond, set the Set Pause Action to OFF.

4. Set target temperature to a minimum 70°C and turn OFF humidity control utilizing one of the three Constant Run selections. (not necessary with temperature-only chambers).
5. Get the Operation Mode screen by pressing the chamber operation display box on the screen.
6. Press the Constant Run button for the constant mode that was configured in step 4. Run the chamber for about 60 minutes with the door closed, then for 15 minutes with the door slightly cracked.

Return settings made in step 3 to their original settings.

8.5 Consumable Parts and Replacement Interval

The below parts must be replaced periodically. Promptly replace them at the specified intervals if not sooner. Maintenance service is also provided by ESPEC North America. For spare parts and servicing, contact the place of purchase or **ESPEC**.

TABLE 8.3. CONSUMABLE PARTS AND REPLACEMENT INTERVAL

Part	Replacement Interval	Replacement Procedure
Wet-Bulb Wick	After temperature tests or every month	See “Wet-Bulb Wick Check (Humidity Chambers Only)” on page 54
Door Gasket (inner/outer)	3 years	Contact the place of purchase or ESPEC
Chamber Lamp	Every 50,000 hours or when dim	See “Changing the Chamber Light (Door with Window Option Only)” on page 81
Desiccant in Refrigeration Valve Compartment	Once yearly or whenever service is performed in refrigeration valve compartment.	See “Desiccant” on page 84

FIGURE 8.1.DESICCANT

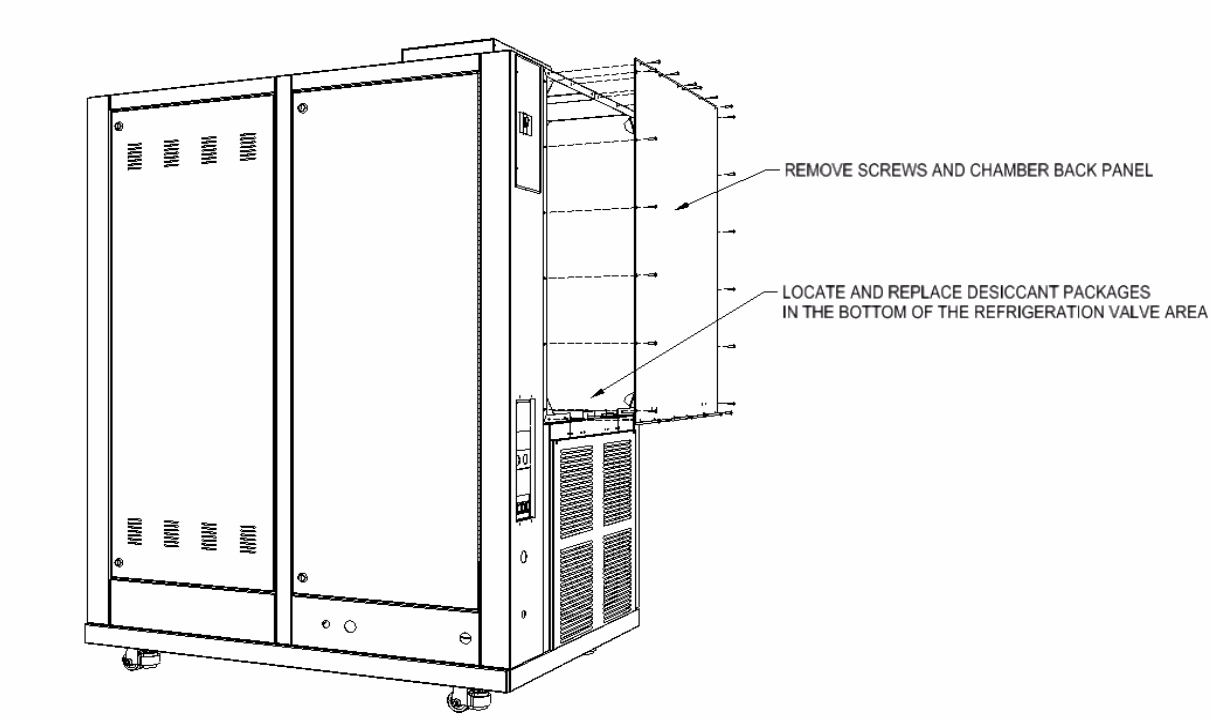


TABLE 8.4. DESICCANT PACKAGE QTY.

Chamber Type	Qty.
2	2
3	3
4	5

Chapter 9

Troubleshooting

This chapter explains equipment problems and how to remedy them. When a problem is detected by one of the self-check features, it is displayed on the instrumentation panel display and an alarm buzzer sounds. For problems not found with self-checks and help with operator errors, See **“Operator Error and Additional Troubleshooting” on page 96**”. This chapter also includes troubleshooting for options.

9.1 Troubleshooting Using Alarm Codes

DANGER

ELECTRIC SHOCK! BEFORE WORKING ON THE POWER CIRCUITS, UNPLUG CHAMBER OR POWER OFF MAIN. UNPLUG THE SPECIMEN POWER AND TIME SIGNAL CONNECTORS FROM THEIR SOCKETS. TAKE MEASURES TO PREVENT ACCIDENTAL CHARGING. WORKING WITH PRIMARY POWER SUPPLY ON RUNS THE RISK OF ELECTRIC SHOCK. UNPLUG POWER FROM THE CHAMBER BEFORE OPENING THE ELECTRICAL COMPARTMENT PANEL.

The Platinous Series is equipped with an alarm that sounds when problems occur as well as alarm messages which appear on the instrumentation panel display. Display alarm codes and their content are given in the alarm table on the following pages. Follow the steps as indicated.

For problems not found with self-checks, See “Operator Error and Additional Troubleshooting”.

If the issue is not resolved after taking the prescribed action, contact the place of purchase or **ESPEC North America**.

9.1.1 When an Alarm Occurs

The chamber will be in one of the states listed below when an alarm occurs. The alarm is cleared in a different way depending on what your needs are at that time. Procedures for clearing the alarm in each of these cases are given on the following pages.

- Running in the constant mode
- Running in the program mode

When running in the constant mode OR when running in the program mode

Procedure:

1. Press the STOP BEEP button on the Alarm screen to silence the buzzer.
2. If the chamber is running, press the chamber operation display box on the screen to get the Operation Mode Selection screen. Then press the STOP button under Stop Operation. Note the alarm name(s) before switching power OFF.
3. Press the POWER key to deactivate control power.
4. Set the main power breaker in the OFF position.
5. Remedy the trouble for the alarm displayed on the Alarm screen as explained in the alarm table.
6. Set the main power breaker in the ON position and then activate control power. The display will come on and the monitor screen will appear shortly.

9.1.2 Alarm Table

Alarm detected by the chamber is categorized as “Warning” and “Error”. After action is taken for an alarm categorized as a “Warning”, the [Clear] button on the help screen can be used to clear the alarm display. If an alarm occurs again even after taking action, contact a service representative.

Com: Indicates the network alarm number.

TABLE 9.1. ALARM TABLE

Alarm Name	Com	Category		Problem	Possible Cause	Action
		Warning	Alarm			
SYSTEM ERROR	31		○	Instrumentation system error (detected even when chamber is stopped)	• Internal system error	• Turn off the primary side power breaker and then restart operation • If error recurs, provide system error number to service personnel
DISPLAY UNIT FAULTY CONNECTION	–		○	Display is blank or screen contents are abnormal. Chamber operation stops.	• Internal circuitry error (communication error when turned on) • Communication error after primary side power breaker is turned off and then back on	• Turn off the primary side power breaker off and then back on
OVER HEATING	11		○	The temperature inside the chamber has risen above the Product Temp Protector setting (instrument panel). The chamber has been stopped.	• Either the specimens inside the chamber are generating heat • Or the Product Temp Protector is set too low.	• Turn control power OFF from the power button. Then remove the heat-generating specimens and/or correct the Product Temp Protector setting. Resume testing. If the same alarm occurs again, it is possible the camber over-temp device is being tripped.

TABLE 9.1. ALARM TABLE (CONTINUED)

Alarm Name	Com	Category		Problem	Possible Cause	Action
		Warning	Alarm			
HUMIDIFIER FAILURE/ BOIL DRY	21		○	The humidifier over-temp device opened because the operating temperature was too high.	• Low humidity tray water level • Lack of water supply • Mineral build up in the humidity tray	• Set the main power switch in the OFF position and check/ adjust water level. Check water supply. Clean humidity tray. Reactivate the system from the main power switch followed by the Power button on the instrument panel. Resume testing. If the same alarm occurs again, call for service.
HUMIDIFIER NORMAL WATER SUPPLY			○	The humidifier water supply sensor did not detect normal water flow during humidity operation.	• The strainer on the humidifying water supply circuit is clogged or the circuit is leaking • Water pressure is too low	• Check the humidity water supply water circuit and correct as necessary. Then resume testing. If the same alarm occurs again, call for service.
REFRIG-1 PRESSURE: HI PRESS	8		○	The refrigerator high pressure increased, stopping operation of the chamber. If backup operation is turned on and multiple refrigerators are equipped, only operation of the applicable refrigerator is stopped and chamber operation continues.	• Condenser error • Refrigerant gas leak	• Turn off the primary side power breaker • Clean the condenser filters and fins • Defrost the evaporator (water-cooled specifications option) • Clean the strainer • Check the cooling water temperature and flow rate

TABLE 9.1. ALARM TABLE (CONTINUED)

Alarm Name	Com	Category		Problem	Possible Cause	Action
		Warning	Alarm			
DRY WICK	0	○		The wet-bulb temperature for measuring relative humidity has exceeded the given level during humidity control operation. Humidity control operation continues, but humidity control accuracy may be affected and a humidity alarm may occur.	• Dry wet-bulb wick (gauze)	• After operation is complete, replace the wet-bulb wick (gauze) • Auto recovery will be performed
ABS HIGH LIMIT: TEMP	2		○	Chamber operation is stopped because the test area temperature is greater than the upper limit absolute value of the temperature alarm	• Heat generated by sample • Low upper limit alarm value setting	• [Power] switch off • Remove the source of heat from inside the test area • Specify a proper upper limit absolute setting value • Auto recovery will be performed when a setting lower than the temperature in the test area is specified
ABS LOW LIMIT: TEMP	3		○	Chamber operation is stopped because the test area temperature is less than the lower limit absolute value of the temperature alarm.	• Over capacity of cooling within the test area • Cooling source effect • High lower limit alarm value setting	• [Power] switch off (when using manual selection) change the cooling capacity • Remove the cooling source from inside the test area. • Specify a proper lower limit absolute setting value.

TABLE 9.1. ALARM TABLE (CONTINUED)

Alarm Name	Com	Category		Problem	Possible Cause	Action
		Warning	Alarm			
UPPER DEV LIMIT: TEMP	1	○		The test area temperature has exceeded the upper limit deviation of the temperature alarm, stopping the heater and humidifier until a reset is performed.	• Heat generated by sample • Low deviation alarm value setting	• Remove the source of heat from inside the test area • Set the alarm value for deviation from the setting temperature 10? higher • Auto recovery will be performed when a setting lower than the temperature in the test area is specified
ABS HIGH LIMIT: HUM	22	○		The test area humidity has exceeded the upper limit value of the humidity alarm, stopping the humidifier until a reset is performed.	• Momentary relative humidity rise • Low upper limit absolute value • Dry wick	• Configure a proper upper limit absolute value • Replace the wick • Auto recovery will be performed when test area internal temperature drops below the alarm value
ABS LOW LIMIT: HUM	23	○		The test area humidity is below the lower limit absolute value of the humidity alarm, stopping the heater and refrigerator control until a reset is performed.	• Momentary drop in relative humidity • Lower limit alarm value setting is too high	• Check the lower limit alarm value setting • Auto recovery will be performed when test area internal humidity rises above the alarm value
HUMIDIFIER DRAINAGE FAILURE	26		○	An attempt was made to drain the water from the humidifier, but the water level does not decrease, stopping operation of the chamber. If the backup operation is set to [On], humidity control operation stops and temperature control operation continues.	• Faulty drain solenoid • Humidifier level sensor fault	• Turn off the primary side power breaker • Check the heater supply water drain system and then restart operation

TABLE 9.1. ALARM TABLE (CONTINUED)

Alarm Name	Com	Category		Problem	Possible Cause	Action
		Warning	Alarm			
HUMIDIFIER LEAD OFF WATER SUPPLY	26		○	After humidity control operation started, the humidifier could not be filled with water in the set time during initial water supply, stopping operation of the chamber. If the backup operation is set to [On], humidity control operation stops and temperature control operation continues.	• Heater supply water system error • Drop in supply water pressure	• Turn off the primary side power breaker • Check the heater supply water drain system and then restart operation
AIR CIRCULATOR FAILURE	7		○	The area surrounding the air circulator motor became abnormally hot, activating the temperature switch built in to the air circulator and stopping operation of the chamber.	• Overload operation of air circulator motor	• Stop operation for awhile and allow the air circulator motor to cool down
OVERCOOLING	10		○	The test area temperature is below the setting of the Product Temp Protector (installed in the instrumentation panel), stopping operation of the chamber.	• Over capacity of cooling • Cooling source effect • Overcool protector setting is high	• [Power] switch off (when using manual selection) change the cooing capacity • Reduce the cooling sources of the test area • Properly configure the Product Temp Protector
DOOR OPEN (PAUSE)	9	○		The chamber door was detected to be open during operation. Pause operation is set to [On], so operation is paused.	• Open chamber door • Improperly closed door	• Re-consider the door alarm wait time • Close the chamber door properly
DOOR OPEN (RUNNING)	9	○		Open chamber door detected during operation. Pause operation is set to [Off], so operation continues with the door ajar. Operations may not be performed properly, and other alarms may occur.	• Open chamber door • Improperly closed door	• Re-consider the door alarm wait time • Close the chamber door properly

TABLE 9.1. ALARM TABLE (CONTINUED)

Alarm Name	Com	Category		Problem	Possible Cause	Action
		Warning	Alarm			
REFRIG-2 PRESSURE:HI PRESS	8		○	The refrigerator high pressure increased, stopping operation of the chamber. If backup operation is turned on and multiple refrigerators are equipped, only operation of the applicable refrigerator is stopped and chamber operation continues.	• Condenser error • Refrigerant gas leak	• Turn off the primary side power breaker • Clean the condenser filter and fins • Defrost the evaporator (water-cooled specifications option) • Clean the strainer • Check the cooling water temperature and flow rate
SENSOR BURN-OUT: PRODUCT TEMP SENSOR	0		○	A disconnection of the specimen temperature sensor input was detected, stopping operation of the chamber	• Faulty specimen temperature sensor connection • Loose temperaturecontrol unit terminal (TC3) • Sensor disconnection	• Check the connection of the specimen temperature sensor
SENSOR BURN-OUT: PRODUCT TEMP SENSOR	0	○		A disconnection of the specimen temperature sensor input was detected.	• Faulty specimen temperature sensor connection • Loose temperature control unit terminal (TC3) • Sensor disconnection	• Check the connection of the specimen temperature sensor
SENSOR BURN-OUT: EXT ANALOG BOARD (TC1)	0		○	A disconnection of the expansion analog board sensor input was detected, stopping operation of the chamber.	• Loose expansion analog circuit board terminal • Sensor disconnection	• [Power] switch off, then resume operation
SENSOR BURN-OUT: PRODUCT TEMP CONTROLER (RTD)	0		○	Chamber is stopped because of detection of disconnection of the sensor input on the temperature control unit.	• Loose temperature control unit terminal • Sensor disconnection	• [Power] switch off, then resume operation

TABLE 9.1. ALARM TABLE (CONTINUED)

Alarm Name	Com	Category		Problem	Possible Cause	Action
		Warning	Alarm			
SENSOR BURN-OUT: TEMP CONTROLLER (TC1)	0		○	Chamber is stopped because of disconnection of control temperature sensor input on the temperature control unit.	• Loose temperature control unit terminal • Temperature detect terminal disconnection	• [Power] switch off, then resume operation
SENSOR BURN-OUT: TEMP CONTROLLER (TC2)	0		○	Chamber operation is stopped because of disconnection of humidity control sensor input on the temperature control unit. If the backup operation is set to [On], humidity control operation stops and temperature control operation continues.	• Loose temperature control unit terminal • Humidity detect terminal disconnection	• [Power] switch off, then resume operation
SENSOR BURN-OUT: TEMP CONTROLLER (TC5 to TC9)	0		○	Chamber is stopped because of disconnection of refrigerator sensor input on the temperature control unit. If backup operation is turned on and multiple refrigerators are equipped, only operation of the applicable refrigerator is stopped and chamber operation continues.	• Loose temperature control unit terminal • Sensor disconnection	• [Power] switch off, then resume operation
SENSOR BURN-OUT: TEMP CONTROLLER (TC10 to TC12)	0		○	Chamber is stopped because of disconnection of refrigerator sensor input on the temperature control unit. If backup operation is turned on and multiple refrigerators are equipped, only operation of the applicable refrigerator is stopped and chamber operation continues.	• Loose temperature control unit terminal • Sensor disconnection	• [Power] switch off, then resume operation

TABLE 9.1. ALARM TABLE (CONTINUED)

Alarm Name	Com	Category		Problem	Possible Cause	Action
		Warning	Alarm			
OUT-OF-RANGE: TEMP CONTROLLER SENSOR (TC5 to TC9)	8		○	Chamber is stopped because of refrigerator sensor input on the temperature control unit measured a temperature outside the prescribed level. If backup operation is turned on and multiple refrigerators are equipped, only operation of the applicable refrigerator is stopped and chamber operation continues.	• Frost formed on the evaporator • Compressor error • Refrigerant gas leak	• [Power] switch off, then resume operation
OUT-OF-RANGE: TEMP CONTROLLER SENSOR (TC10)	8		○	Chamber is stopped because of refrigerator sensor input on the temperature control unit measured a temperature outside the prescribed level. If backup operation is turned on and multiple refrigerators are equipped, only operation of the applicable refrigerator is stopped and chamber operation continues.	• Frost formed on the evaporator • Compressor error • Refrigerant gas leak	• [Power] switch off, then resume operation
OUT-OF-RANGE: TEMP CONTROLLER SENSOR (TC12)	8		○	Chamber is stopped because of refrigerator sensor input on the temperature control unit measured a temperature outside the prescribed level. If backup operation is turned on and multiple refrigerators are equipped, only operation of the applicable refrigerator is stopped and chamber operation continues.	• Frost formed on the evaporator • Compressor error • Refrigerant gas leak	• [Power] switch off, then resume operation

TABLE 9.1. ALARM TABLE (CONTINUED)

Alarm Name	Com	Category		Problem	Possible Cause	Action
		Warning	Alarm			
SENSOR BURN-OUT: TEMP CONTROLLER (DC)	0		○	Chamber is stopped because of detection of disconnection of the sensor input on the temperature control unit. If the backup operation is set to [On], humidity control operation stops and temperature control operation continues.	• Loose temperature control unit terminal • Sensor disconnection	• [Power] switch off, then resume operation
EXTERNAL DEVICE (1): ERROR	19		○	Chamber operation is stopped because an error was detected in the external device connected to the chamber.	• See the provided "External Devices: User's Manual"	• See the • "External Devices: User's Manual"

9.2 Operator Error and Additional Troubleshooting

DANGER

ELECTRIC SHOCK! BEFORE WORKING ON THE POWER CIRCUITS, UNPLUG CHAMBER OR POWER OFF MAIN. UNPLUG THE SPECIMEN POWER AND TIME SIGNAL CONNECTORS FROM THEIR SOCKETS. TAKE MEASURES TO PREVENT ACCIDENTAL CHARGING. WORKING WITH PRIMARY POWER SUPPLY ON RUNS THE RISK OF ELECTRIC SHOCK. UNPLUG POWER FROM THE CHAMBER BEFORE OPENING THE ELECTRICAL COMPARTMENT PANEL.

This section explains problems not found with chamber self-checks and cases of operator error. If the issue is not resolved after taking the prescribed action, contact the place of purchase or **ESPEC North America**.

TABLE 9.2. OPERATOR ERROR AND ADDITIONAL TROUBLESHOOTING

Trouble	Cause	Remedial Action
The instrumentation panel does not light up after pressing the POWER key.	Primary power supply is OFF.	Activate the primary power supply.
	The main power switch is in the OFF position.	Set the main power switch to the ON position.
	There is a reverse or open phase in the primary power supply connection.	Reconnect the primary power supply correctly. See **"Power Supply Work" on page 40**
	Fuse F13 is blown.	Replace fuse F13. See **"Replacing Fuses" on page 80**. If the new fuse blows, call for service.
This display goes out all of a sudden or the displayed information is strange.	System trouble or internal board trouble.	Switch the main power switch OFF and ON. If the same trouble reoccurs, call for service.
The door is hard to close.	Something is caught in the door.	Remove the obstruction.
	Frost has formed and hardened on the door packing.	Defrost the chamber. See **"Defrosting" on page 82**.
	Internal pressure is high because the chamber is hot and highly humid on the inside.	There is nothing wrong with the equipment. Proceed as planned.
The door is hard to open.	Internal pressure is lower than room pressure.	There is nothing wrong with the equipment. Proceed as planned.
	Frost has formed and hardened on the door packing.	Defrost the chamber. See**"Defrosting" on page 82**
During operation below zero, icicles 5cm or longer form on the internal drain outlet, or the test area is covered in frost.	Outside air has infiltrated through the cable port.	Cover the cable port with the rubber plug.
	Door packing is not properly sealing the door and frame, or packing has deteriorated.	Call for service.
Strange noises are heard.	Frost has formed on the air circulator blades.	See **"Defrosting" on page 82**.

TABLE 9.2. OPERATOR ERROR AND ADDITIONAL TROUBLESHOOTING (CONTINUED)

Trouble	Cause	Remedial Action
Strange odors are detected.	Lingering odors inside the chamber.	Clean the test area. See **"Maintenance" on page 75**
	Specimens are generating odors.	There is nothing wrong with the equipment. Proceed as planned.
The chamber is vibrating.	The chamber is not level.	Correct adjuster foot height. See **"Installation Site Check" on page 36**
The viewing window is clouded or frosted over.	Humidity rose sharply.	There is nothing wrong with the equipment. Proceed as planned.
	The fuse in the frost prevention heater blew.	Replace fuse F14. See **"Replacing Fuses" on page 80**. If the new fuse blows, call for service.
The chamber is wet on the outside.	The room is highly humid.	There is nothing wrong with the equipment. Proceed as planned.
Frost has formed around the door hinges, door and viewing window (EPX,EPZ)	The room is highly humid.	There is nothing wrong with the equipment. Proceed as planned.
	The fuse in the frost prevention heater blew.	Replace fuse F14. See **"Replacing Fuses" on page 80**. If the new fuse blows, call for service.
Temperature (& Humidity) is unstable.	The door is open.	Close the door.
	The rubber plug fell off the cable.	Fit the plug into the port.
	Ambient temperature changes more than 5°C/hr.	Stabilize ambient temperature and resume testing.
	High heat load equipment is being turned ON/OFF.	Reduce the heat load.
	The water supply filter is clogged.	Clean the filter. See **"Maintenance" on page 75**.
Temperature gradually rises higher than the target temperature.	Specimens are generating heat.	Reduce the amount of heat generated by specimens.
	Frost has formed on the cooler.	Defrost the chamber. See **"Defrosting" on page 82**.
Temperature rises or lowers too slowly.	The door is open.	Close the door.
	Specimens are generating heat.	Reduce the amount of heat generated by specimens.
	Ambient temperature is too low or too high.	Raise or lower the ambient temperature.
Temperature stops rising or begins to drop during heat-up.	Frost has formed on the dehumidifier-cooler.	There is nothing wrong with the equipment. Proceed as planned. Or, defrost the chamber. See **"Defrosting" on page 82**
Poor Temperature uniformity.	Air flow inside the chamber is poor.	Improve air flow.
	Specimens are generating heat.	Reduce the amount of heat generated by specimens.
	Frost has formed on the cooler.	See **"Defrosting" on page 82**.

TABLE 9.2. OPERATOR ERROR AND ADDITIONAL TROUBLESHOOTING (CONTINUED)

Trouble	Cause	Remedial Action
The chamber lamp does not light up.	Fuse F13 has blown.	Replace fuse F13. See **"Replacing Fuses" on page 80**. If the new fuse blows, call for service.
	LED lamp need to be replaced	See **"Changing the Chamber Light (Door with Window Option Only)" on page 81**.
	The starter is blown.	Call for Service

7.

Chapter 10

Warranty & Procedure

Warranty

WARRANTY CALL EFD 0895 01/29/15

This warranty policy is applicable to all chamber models.

ACCEPTANCE LIMITED TO FOLLOWING TERMS: A party seeking to purchase ESPEC NORTH AMERICA, INC. products (the "Buyer") is strictly limited to the following terms. These terms supersede all prior agreements and understandings between the parties, and these terms shall not be varied or waived without the express written authorization of ESPEC NORTH AMERICA, INC. ("ESPEC").

TECHNICAL INFORMATION/SPECIFICATIONS: All commercial and technical details and information furnished by ESPEC relating to its products, including without limitation, drawings, weights and dimensions, and all performance specifications quoted by ESPEC, are approximations only unless specifically provided to the contrary.

PRICES: The prices for goods to be sold do not include sales, use, excise or any other taxes, charges or expenses related to the sale, delivery, use or consumption of the goods to be sold. The Buyer agrees to directly pay when due all such taxes, charges or expenses to the extent possible and to promptly reimburse ESPEC for all such taxes, charges or expenses which ESPEC pays.

The prices for the goods to be sold are based on details, information and specifications provided by the Buyer, including without limitation, the delivery date and place for the goods, engineering standards and installation site conditions. All such details, information and specifications are assumed to be proper, correct and complete. Any addition to or impropriety, incorrectness, incompleteness or change in any such details, information and specifications may result in a change in the purchase price for the goods sold, which change ESPEC may unilaterally make and Buyer shall pay.

Except as otherwise specifically provided, the purchase price shall be paid by the Buyer in U.S. dollars.

PAYMENT TERMS: Full payment for the goods shall be due within 30 days after ESPEC delivers the goods alongside the carrier at ESPEC's plant.

ESPEC may impose a late charge for each payment under a Contract of Sale not made when due in an amount not to exceed 5% and may charge interest on any late payment from the due date at the highest rate permitted by law.

Buyer shall repay ESPEC all attorney's fees ESPEC incurs collecting late payments or unpaid accounts.

LIMITED WARRANTY: A limited warranty is given by ESPEC to the original buyer of new ESPEC equipment. Subject to the conditions and limitations below, ESPEC warrants that the equipment manufactured by ESPEC is free from defects in material and workmanship which would render the equipment unfit for normal and recommended use.

This limited warranty is effective only for the 360 days after the date of shipment.. During this period, ESPEC will provide repaired or replacement parts without charge. This warranty covers all components, labor, installation and associated expenses for the replacement parts, subject to the exceptions below.

This limited warranty does not cover:

Parts, labor and installation for the following components: light bulbs, port plugs, fuses, deionizer cartridges, wiper blades, plug-in relays, wick socks, water filters, plug-in timers, fasteners, recorder pens, chart paper, nor water level, flow regulated or height level adjustments.

Defects or damages arising as the result of shipment by common carriers or private transportation unless ESPEC contractually assumes the risk of damage to the equipment during shipment.

Defects, damages or malfunctions caused by parties other than ESPEC, including but not limited to defects, damages or malfunctions arising as the result of improper utilities, mishandling, modification, abuse, misuse, neglect, intentional damage, improper repair, loss of refrigerant or improper maintenance, start-up or installation of the equipment.

Defects or damages arising as the result of accident, flood, fire, earthquake or other act of God.

This is the EXCLUSIVE remedy as between you and the Company with respect to the equipment provided to you, and ESPEC SHALL NOT BE LIABLE FOR LOSS OR DAMAGE TO PROPERTY INCLUDING LOSS OR DAMAGE CAUSED BY FIRE OR EXPLOSION OR FOR ANY ASSOCIATED INCIDENTAL OR CONSEQUENTIAL LOSS OR EXPENSE, due directly or indirectly to the use of the equipment.

Except as described above, ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, including the implied warranty of MERCHANTABILITY are disclaimed and excluded.

This limited warranty is only valid in the contiguous states of the United States of America and a 150 mile radius from the following Canadian cities; Vancouver, Toronto, Windsor and Ottawa.

INDEMNIFICATION: Buyer shall defend, indemnify and hold seller harmless from and against all claims, liabilities, losses, damages, settlement expenses, and/or attorney's fees, for injury or death of any person and/or the damage or loss of any property allegedly or actually resulting from or arising out of the use or failure of the equipment unless such losses are solely and completely the result of ESPEC's negligence. Without limiting the foregoing in any respect, Buyer's indemnification duty shall arise out of any misuse of the equipment or any other negligent or wrongful act or omission of the Buyer or its employees, agents, and/or subcontractors, or any person or entity who purchases or gains access to the equipment through the Buyer whether or not ESPEC or any other person or entity is jointly negligent in the design, manufacture, instruction, training, provision of warnings, selection, delivery, repair, maintenance, possession, use, operation or return of the equipment.

DELIVERY/RISK OR LOSS: The risk of loss with respect to the goods to be sold will pass to the Buyer at ESPEC's plant upon the delivery of the goods alongside the designated carrier; and all shipping costs, losses, liabilities and damages and all insurance and delivery obligations with respect to the goods once delivered by ESPEC alongside the carrier at ESPEC's plant, are the Buyer's risk and responsibility, although ESPEC will give reasonable assistance to the Buyer in tendering claims to the carrier.

GOVERNING LAW: Any offer made by ESPEC or any contract entered into by ESPEC and the Buyer shall be construed and interpreted only according to the laws of the State of Michigan, U.S.A., including without limitation, the Uniform Commercial Code as in effect in the State of Michigan, U.S.A. In that regard, Buyer and Seller specifically agree and acknowledge that the provisions of the United Nations Convention on Contracts for the International Sale of Goods shall not apply to the rights and obligations of the parties under the Contract.

VENUE: The Buyer hereby agrees that any suit or claim relating to the sale or operation of ESPEC's products shall be filed in the Michigan Circuit Court for Kent County or in the Federal Court for the Western District of Michigan.

Std/360/360 EFD 0897 08/21/15 Rev. 1.03

ESPEC Warranty Procedure

All warranty service and parts calls must be directed to ESPEC Customer Support Department @ 877-463-7732 or 616-896-6100 between 8:00 am and 5:00 pm Eastern Time, or email to support@espec.com

Unauthorized service during the warranty period may void warranty.

Certain types of service during the warranty period will require a purchase order prior to service.

Before you call, check the following items:

1. Follow the steps in the Troubleshooting and Maintenance Chapters of this manual
2. Confirm that all utilities are connected to the chamber and functioning properly
3. Locate the ship date on the chamber data tag
4. Confirm the chamber is within the warranty period by reading the Warranty in this manual

When placing the call, be sure to have the following information available:

1. Chamber Model and Serial Number that is located on the side of the chamber
2. Detailed information on the suspected failure and/or alarm detail
3. Operating mode at time of failure, i.e., heating, cooling, temp., humidity
4. Detail of program being run at the time of failure and a copy of recorder chart or test data, if available

To order a replacement part, please provide the following:

1. The complete ESPEC part number from your replacement parts list.
2. Model and serial number of the chamber for which the replacement part is being requested.
3. The specific complaint regarding the failed part.

The Customer Support Department will authorize the return of the failed material and issue an RMA (Return Material Authorization) number.

1. Put the RMA number on the packing list along with the name and phone number of a contact person.
2. All parts being returned may be shipped freight collect via:
   0 – 70 lbs. – UPS surface
   71 lbs. and over – Contact ESPEC for routing instructions
   Any other means of shipment will result in an additional charge to the customer.

Any failed part, replaced under terms of the warranty, and not returned to ESPEC when an RMA is issued, will be invoiced at the current price.

All parts are shipped FOB Hudsonville,MI 49426

Chapter 11

Appendix

11.1 Glossary

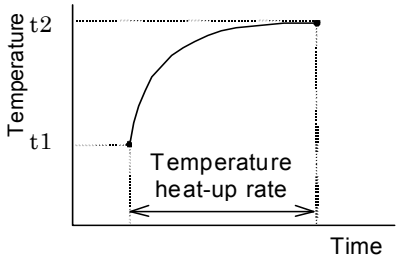
Air-Cooled Specifications	The condenser in the refrigeration circuit is cooled by air.
Boil-Dry Protector	A device which prevents the humidifying heater from overheating when humidifying water is low or empty.
Constant Control	A control method which keeps temperature and humidity inside the chamber constant.
Dewing	A phenomenon whereby moisture in the air forms a dew. Dew forms on an object if its temperature is below the dew point determined by air temperature and humidity. For example, the dew point for an air temperature of 85°C and a humidity of 85%RH is 81°C.
Dry-Bulb Temperature	The air temperature measured by a dry-bulb temperature sensor.
Effective Area	The area inside the test area up to 1/6 the distance from walls in all directions.
External Alarm Terminal	A terminal which outputs a signal when the chamber is stopped by trouble. The terminal is designed to set off a buzzer or bell in the area around the chamber or to send an alarm signal to a remote point.
Heat Load	The heat generated by specimens inside the chamber. The name comes from the fact that this heat acts as a load on the chamber.
Humidifying Water	Water used to humidify the test area. Water is kept in the humidifying tray. The humidifying heater evaporates it to humidify the test area.
Humidity Fluctuation	The variation between the mean maximum humidity around the geometric center of the chamber. Not the same as the difference from the true humidity.
Humidity Range	The range of humidity that can be reproduced inside the chamber.
Humidity Uniformity	The difference in humidity between the geometric center of the chamber and any arbitrary point in the effective area.
Lowest Attainable Temperature	The lowest temperature that can be reproduced inside the chamber.
Maximum Current	The maximum amount of electric current supplied to the chamber through the power cable when the chamber is running within the temperature and temperature-humidity control range. With a 3-phase power supply, the maximum current is that which flows through any one of the wires. Maximum current is measured in amperes (A).
Product Temp Protector	A device for preventing temperature inside the chamber from rising abnormally high because of chamber trouble or heat generated by specimens, or abnormally low because of chamber trouble with the refrigeration circuit.
Specimens Power Supply Control Terminal	A terminal to charge specimens, which is interlocked with the chamber power circuit so that power to specimens is shut OFF in the event of chamber trouble.

Temperature Fluctuation

The variation between the mean maximum temperature and mean minimum temperature around the geometric center of the chamber. Not the same as the difference from the true temperature.

Temperature Heat-up Rate

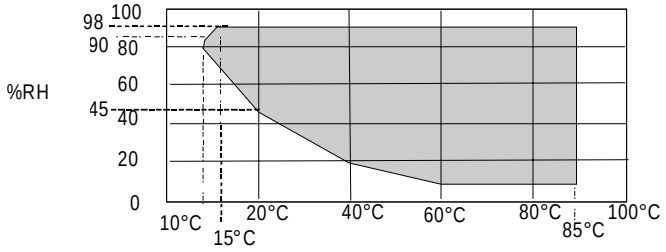
FIGURE 11.1. TEMPERATURE HEAT UP RATE



Temperature-Humidity Control Range

The range in which temperature and humidity can be reproduced inside the chamber. It is normally expressed as a graph with temperature as the x-axis and humidity as the y-axis.

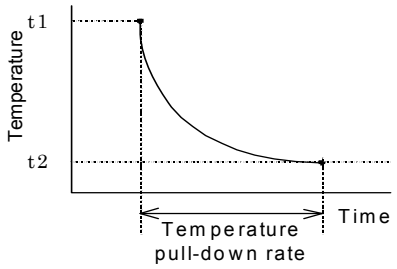
FIGURE 11.2. TEMPERATURE-HUMIDITY CONTROL RANGE



Temperature Pull-down Rate

The time required for the temperature to change from a defined temperature t1 to a defined lower temperature t2. This is simply the time required for the drop in temperature and does not include the time it takes for the temperature to stabilize.

FIGURE 11.3. TEMPERATURE PULL-DOWN RATE



Temperature Range

The range of temperatures that can be reproduced inside the chamber.

Temperature Uniformity

The difference in temperature between the geometric center of the chamber and any arbitrary point in the effective area.

Test Chamber

A contained ambient constructed so as to obtain a desired temperature and humidity.

Water-cooled Specification (Water Cooled Condenser)	The condenser in the refrigeration circuit is cooled by water. Usually, a cooling tower or similar unit is used to supply water and cool heat generated by the condenser. The water-cooled specification is an option with Platinous Series Chambers.
Wet-Bulb Temperature	The temperature measured by a temperature sensor on which a wet cloth has been draped. Is is used to measure humidity. Relative humidity is calculated from this temperature and the air temperature measured by a dry-bulb sensor.
Wet-Bulb Wick	The cloth draped over a wet-bulb temperature sensor. It absorbs water and keeps the sensor wet. Though gauze is used in meteorological applications, a woven cloth is used inside an environmental chamber because of its strong resistance to heat and cold.

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