Installation Operation Maintenance Manual MicroClimate® Series

MCB-1.2

MC-3

56291 REV AE
4/2020

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Note: CSZ is continuously upgrading the components used in its equipment. Consequently, the physical appearance of certain components may vary from that shown.

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INTRODUCTION

This manual has been tailored to match the specific features and options provided on your Temperature Chamber at the time of original manufacture. The last section of the manual is the specific information section. This area was developed in an attempt to better define items on CSZ chambers that are “SPECIFIC” to a customer. Please refer to this section for warranty, controller PID parameters, and calibration/verification test data sheets.

Cincinnati Sub-Zero Temperature Chamber:

MODEL NO. _____

SERIAL NO. _____

DO NOT USE THIS MANUAL IN AN ATTEMPT TO OPERATE OR MAINTAIN ANY OTHER MODEL OR SERIAL NUMBER.

PLEASE READ THIS ENTIRE MANUAL BEFORE OPERATING THIS UNIT.

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	GENERAL DANGER, CONSULT MANUAL
	ELECTRICAL SHOCK
	EXPLOSION, ARC FLASH HAZARD
	LOW TEMPERATURE
	HOT SURFACE
	KEEP HANDS CLEAR; PINCH HAZARD
	CONSULT OPERATORS MANUAL BEFORE OPERATING
	WEAR EYE PROTECTION
	TURN OFF AND LOCK OUT SYSTEM POWER BEFORE SERVICING
	WEAR PROTECTIVE GLOVES
	FORKLIFT RIGHT, DESIGNATES CHAMBER LIFTING POINTS
	FORKLIFT LEFT, DESIGNATES CHAMBER LIFTING POINTS
	DO NOT OPERATE WITH PACEMAKER
	PROTECTIVE CONDUCTOR TERMINAL

CHAMBER LABELS AND MEANINGS

Some graphical safety labels may be replaced with textual based safety labels. Read the entire manual for other safety information that is applicable to our chamber.

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MCB(H)-1.2

MC(H)-3

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INTRODUCTION

WARNING

Warnings contained in this manual are identified by this symbol. Warnings identify any conditions or practices that, if not strictly observed, could result in personal injury or possible loss of life.

CAUTION

Cautions in this manual are identified by this symbol. Cautions identify any condition or practice that, if not strictly observed, could result in damage to, or destruction of, the system equipment. Please read all precautions before operating your unit.

NOTE

Notes contained in this manual are identified by this symbol. Notes identify items of importance to proper operation and maintenance.

For CE Marked Chambers Only

This instrument has been designed and tested in accordance with IEC Publication 61010-1:2010. Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use and has been supplied in a safe condition. The instruction documentation contains information and warnings which must be followed by the user to ensure safe operation and to maintain the instrument in a safe condition.

GENERAL SAFETY PRECAUTIONS

The following are general safety precautions that are not related to any specific procedures and therefore do not appear elsewhere in this manual. These are recommended precautions that must be understood and applied during many phases of operation and maintenance of the equipment.

IMPORTANT: All OSHA and other applicable local and national codes, regulations, and guidelines regarding lockout/tagout procedures must be followed. This includes a lockable disconnect switch.

KEEP AWAY FROM LIVE CIRCUITS

Operating personnel should at all times observe all safety precautions. Do not replace components or make adjustments inside the equipment with the high voltage supply turned on. Under certain conditions, dangerous potentials may still exist when the power switch is in the off position due to charges retained by capacitors. To avoid injury, always remove power and discharge and ground a circuit before touching it.

NOTE: Keep unit away from flammable substances.

DO NOT SERVICE OR ADJUST ALONE

No one should reach into an enclosure to service or adjust equipment except in the presence of someone who is capable of rendering aid.

RESUSCITATION

Personnel working with or near high voltages should be familiar with modern methods of resuscitation. Such information may be obtained from the Local Red Cross Agency.

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GENERAL SAFETY PRECAUTIONS

WARNING — **DO NOT** replace components or make adjustments inside the equipment with the main power supply turned on. Under certain conditions, dangerous potentials may still exist when the power switch is in the off position due to charges retained by capacitors. To avoid injury, always remove power and ground a circuit before touching it.

WARNING — Paint thinners, cleaning solutions and other chemicals or solvents should never be stored in the vicinity of the unit. High operating temperatures and live electrical circuits could ignite fumes and cause an explosion.

WARNING — **DO NOT** touch refrigeration piping during chamber operation. The refrigeration piping can become very hot or extremely cold, and cause severe burns.

WARNING — High voltage remains present during an alarm. This unit must be locked out at the main power source prior to servicing. The enclosure cover should also remain installed at all times.

WARNING — Lock-out main power prior to servicing. High voltage remains present on main electrical panel with covers removed.

WARNING — The chamber door must remain closed during operation. If the door is required to be open, wear safety goggles to prevent the high velocity airflow from blowing particles or objects into your eyes.

WARNING — This chamber operates at extreme temperatures. Avoid any personal contact with objects and surfaces that may be hot or cold to prevent severe burns or frostbite.

WARNING — The refrigeration unit is a pressurized system and hazards exist which could result in personal injury. Removal and installation of the hermetic compressor be performed by experienced personnel only. Failure to follow these instructions may result in serious personal injury.

WARNING — Gaseous nitrogen/C02 vent connection must be ducted to the outdoors to prevent displacement of oxygen around the unit.

WARNING — **DO NOT** place items in the chamber that could burn or explode at high temperatures. This chamber uses open wire heating elements which generate surface temperatures over 1000ºF/538°C. This is **NOT** an explosion-proof chamber.

CAUTION — PRODUCT PROTECTION. Chambers are equipped with high heat limits or safety devices. These safety devices are installed to protect the chamber from exceeding design limits. These safety devices remove power ONLY from the chamber heaters and **DO NOT** remove power from your product. Provisions must be made to de-energize the product on test and the chamber in the event of an over-temperature protection.

WARNING — All OSHA and other applicable local and national codes, regulations, and guidelines regarding lockout/tagout procedures must be followed while servicing this unit. This may include a lockable disconnect switch to remove power from the equipment while servicing.

WARNING — **DO NOT** reach into an enclosure to service or adjust equipment except in the presence of someone who is capable of rendering aid.

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GENERAL SAFETY PRECAUTIONS

WARNING Window frame may become hot during operation.

CAUTION **DO NOT** put corrosive substances into the chamber examples of corrosive substances include, but are not limited to, Chlorine, Chlorides and Acids.

WARNING **DO NOT** place items in the chamber which can emit corrosive vapors or substances.

WARNING There are **NO** provisions for venting fumes.

CAUTION To prevent damage to your test samples and the chamber's compressors, DO NOT exceed the live load rating of the chamber. (See the General Description Section of this manual for the Live Load rating for your unit.)

CAUTION Running Temperature/Humidity points outside of the standard range can cause damage to the refrigeration compressor(s).

WARNING High Voltage remains present when the chamber standby/on switch (if equipped) is in the standby position. The standby position does not remove power from the main electric panel.

WARNING Do not place any objects on top of the chamber. Don't climb on top of chamber.

WARNING All loads must be removed from chamber prior to transport and/or maintenance and servicing. Do not attempt to move the chamber with the chamber door open.

WARNING **Only qualified maintenance personnel** should be permitted to perform any maintenance and installation procedures.

WARNING To prevent hazards to operators and other personal, read the installation manual in its entirety. If there are any questions regarding the information in the manual, please contact Cincinnati Sub-Zero.

WARNING Do NOT position chamber so that it is difficult to operate disconnect device.

WARNING If the equipment is use in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

WARNING **DO NOT** remove lid without referencing Installation section for proper procedure.

WARNING The safety of any system incorporating the equipment is the responsibility of the assembler of the system.

ELECTROSTATIC DISCHARGE SENSITIVE DEVICES

This manual contains maintenance procedures for parts and assemblies sensitive to damage by electrostatic discharge (ESD). Parts or assemblies are identified as ESD sensitive by the symbol to the left.

The following are general precautions that should be observed when handling ESD sensitive devices or assemblies:

1. Handling ESD sensitive devices at approved field force protective work stations.
2. Keep work area free of static generators, such as plastic cups, foam cushions, and rayon or polyester apparel.
3. Avoid static-producing activities, such as wiping feet and removing or putting on smocks while in the work area.
4. Use ESD protective equipment, such as grounded work benches, grounded tools and test equipment, conductive flooring, air ionizers, personnel ground straps with 1 megohm minimum resistance, and protective apparel whenever possible.
5. Store and transport ESD sensitive devices in protective bags, tote boxes, or trays. Use original packaging whenever possible.
6. Remove power and signals before removing or installing ESD sensitive devices or assemblies.
7. Handle ESD sensitive circuit card assemblies by their shunt bars or edges. Do not touch parts, terminals, or circuitry. Do not use canned coolant for fault isolation.

⚠ WARNING

DO NOT touch refrigeration lines while the unit is in operation. Lines can become extremely hot or very cold and can cause severe burns.

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WARNING

DO NOT CONNECT THIS UNIT TO A GFI CIRCUIT BREAKER.

SAFETY FEATURES

Cincinnati Sub-Zero incorporates many safety features in the design of its equipment. These safety features provide protection for the equipment, as well as for operating and maintenance personnel.

ELECTRICAL CIRCUIT PROTECTION

1. The MCB-1.2 model (115VAC,60 Hz) requires a dedicated 20 amps circuit. The MCB 1.2 model (230VAC,50 Hz) requires a dedicated 16 amps circuit. The building/facility circuit breaker will provide short circuit protection between mains conductor and protective earth. See the electrical schematic for information on the other models.

2. Compressors have internal thermal overload protection which will shut down the compressor in the event of a thermal overload.

REFRIGERATION SYSTEM PROTECTION

1. The refrigeration systems utilize refrigerants which are non-flammable and non-explosive.

OVER-TEMPERATURE PROTECTION

High temperature limit controllers, thermal cut-outs, and thermostats are installed to protect the chamber from exceeding design limits. The safety devices remove power only from the chamber heaters when an over-temperature condition exists in the chamber. They DO NOT remove power from the product being tested.

1. High temperature limit controller (9-Inst) (MCB(H) Models) (MC(H)-3 models) Chamber over-temperature protection only. It is preset to open at the temperature indicated on the electrical schematic (typically 200°C-240°C). Once the temperature in the chamber drops below the Hi limit setting, cycle power to the chamber to reset the limit controller.

2. Product High/Low Limit (Optional)
   The chamber may be equipped with a Product High/Low Limit Alarm that incorporates an independent type “T” thermocouple to monitor part temperature. The high/low limit alarm shuts down the chamber and sounds an audible alarm if the preset temperature limits are exceeded. The alarm can be used by the customer to shut down the product under test (SEE ELECTRICAL SCHEMATIC for proper connection). The limit alarm is both high and low, can be set for latching or non-latching, and has an adjustable hysteresis band.

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NOTE

Condensation on exterior surfaces is normal when operating at cold temperatures for an extended period of time.

SYSTEM DESCRIPTION

MC-Series Temperature chambers are pre-engineered chambers designed to provide an environment with specific temperature (humidity) conditions. The standard MC-model is composed of three basic sections: 1. Control section, 2. Chamber section, 3. Refrigeration/ Heating section. Optional equipment includes, but is not limited to: 4. Pen Recorders, 5. High/Low Limit.

The MCB-1.2 and MC-3 (230V and 400V) chambers have a standard temperature range of -94ºF to +375ºF (-70ºC to +190ºC). The MC-3 (115V) has a standard temperature range of -85°F to +375°F (-65°C to +190°C). The chambers are designed to operate in a commercial environment, i.e. temperature of +75°F +/- 10°F (+23°C +/- 6°C), maximum dew point of 55°F (12.8°C), and an altitude of 7,000 ft. (2133.6M). Refer to the specifications at the end of this section for additional information. The single stage model has a temperature range of -22ºF to +375ºF (-30ºC to +190ºC).

CONTROLLER

The standard controller on MC Series chambers is EZT-430S. Operating instructions for the EZT-430S are found in the EZT-430S User's Manual on the digital media that accompanied this chamber. The Watlow F4 controller is an option. The EZT-570S is an option on the MC-3 only. The User Manuals for both the standard and optional controllers are found on the digital media that accompanied the chamber.

CHAMBER

Chamber Interior

MCB-1.2 (115V and 230V)

The chamber interior consists of the workspace and the top component area, separated by a stainless steel plenum. A probe bracket is attached to the upper right corner of the grill on the plenum cover. The bracket contains the probes for the controller and recorder (if required). The top area behind the plenum contains the refrigeration evaporator, heater, and evaporator fan. Refer to Figures 1, 2, and 3.

MC-3 (115V, 230V and 400V)

The chamber interior consists of the workspace and the back plenum area separated by a stainless steel panel. A probe bracket is attached to the upper left corner of the grill on the plenum cover. The bracket contains the probes for the controller and recorder (if required). The back plenum contains the refrigeration evaporator, heater, and evaporator fan. Refer to Figures 4, 5, and 6.

Chamber Exterior

Fiberglass insulation is used with a high temperature binder for temperatures up to 500ºF (260ºC). The cabinet is constructed with minimal mechanical contact between the liner and the exterior to reduce conductive heat losses and minimize condensation on the exterior cabinet.

An optional multiple-pane window assembly in the door of the chamber allows viewing of the chamber interior during operation. The window is constructed of tempered glass panes to assure frost-free viewing during low temperature chamber operation. Under certain ambient conditions, it may be normal to see some condensation around the outer window frame area during low temperature operation.

REFRIGERATION/HEATING COMPONENTS

A. Refrigeration

MC-Series chambers have a cascade mechanical refrigeration system. The cascade system for a MCB-1.2 and the MC-3 (230V and 400V) have an ultimate low temperature of -94ºF (-70ºC) and the MC-3 (115V) has an ultimate low temperature of -85°F (-65°C). The MCB single stage has a temperature range of -22°F (-30ºC) to +375°F (+190ºC). There are some options that will affect ultimate low temperature. The cascade system uses refrigerant R-404A in System #1 and R-508B in System #2. The refrigeration system is air cooled. The ambient around the unit should not exceed 80ºF (26.7ºC) for proper operation. Ultimate low temperatures will vary with ambient conditions.

All refrigeration components are selected to ensure safe, reliable, and balanced operation. The components may be purchased from the CSZ Service Department or a local refrigeration wholesaler.

B. Heater

Open-coil nichrome heating elements are standard on all systems. The heaters are mounted in porcelain insulators attached to stainless steel frames. The heaters are located in the plenum area and do not radiate directly into the test space.

HUMIDITY (OPTIONAL)

The MCBH-1.2 and the MCH-3 Series chambers provide the same temperature ranges for heating and cooling as the MCB-1.2 and the MC-3 Series, but add the ability to control humidity within the range of 10% to 95% relative humidity as limited by a +185°F (+85°C) dry bulb temperature and a +45°F (+7°C) dewpoint. The MCBH-1.2 and the MCH-3 both use a steam generator.

****In some instances and at certain setpoints, the PID parameters in the controller can be changed to achieve better control in humidity mode. Please see Chapter 4 and the controller manual for instructions on how to edit PID's.*

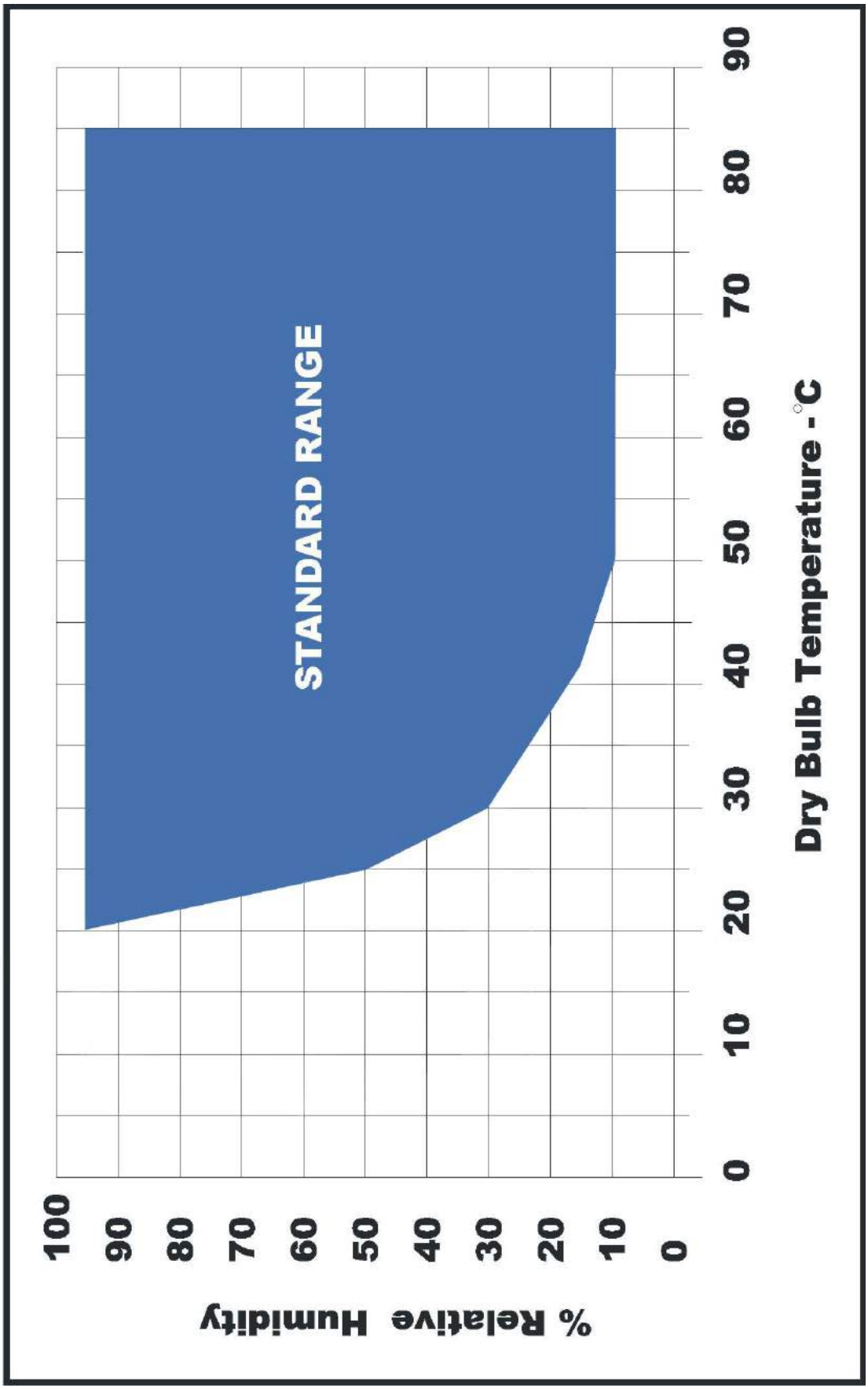

Figure 1. Humidity Performance Chart

MCB-1.2

Figure 2. MCB-1.2 Plenum Area

Figure 3. MCB-1.2 Air Temperature Sensor Location

Note: CSZ is continuously upgrading the components used in its equipment. Consequently, the physical appearance of certain components may vary from that shown.

MCBH-1.2

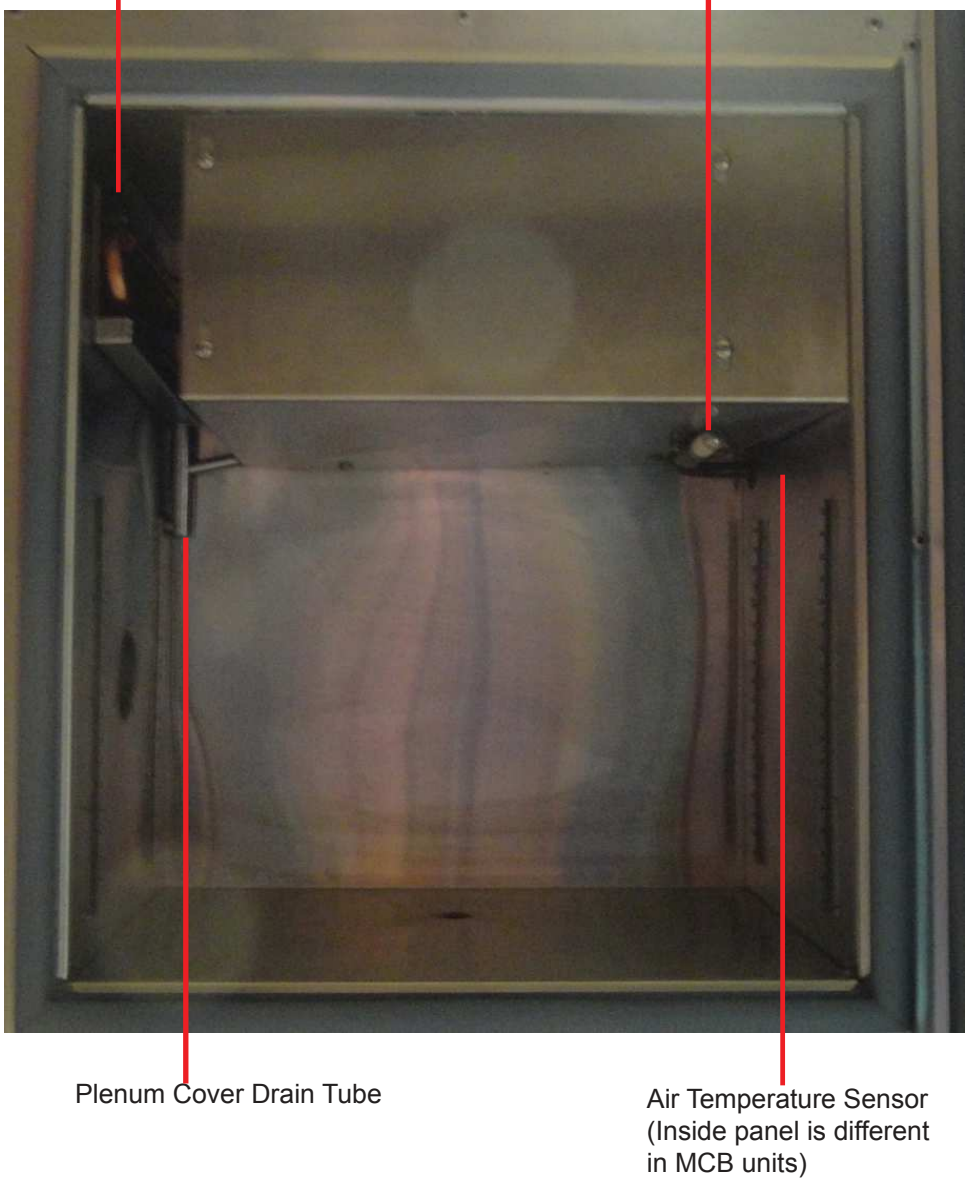

Figure 4. MCBH-1.2 Air Temperature Sensor Location

Note: CSZ is continuously upgrading the components used in its equipment. Consequently, the physical appearance of certain components may vary from that shown.

Figure 5. Plenum Area

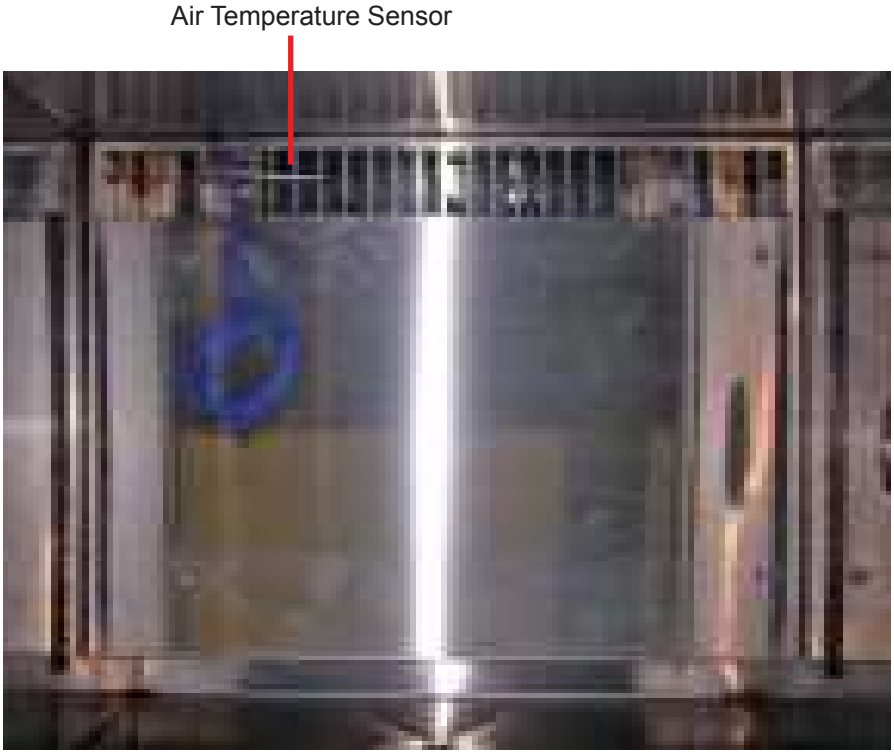

Figure 6. Air Temperature Sensor Location

Note: CSZ is continuously upgrading the components used in its equipment. Consequently, the physical appearance of certain components may vary from that shown.

MCH-3

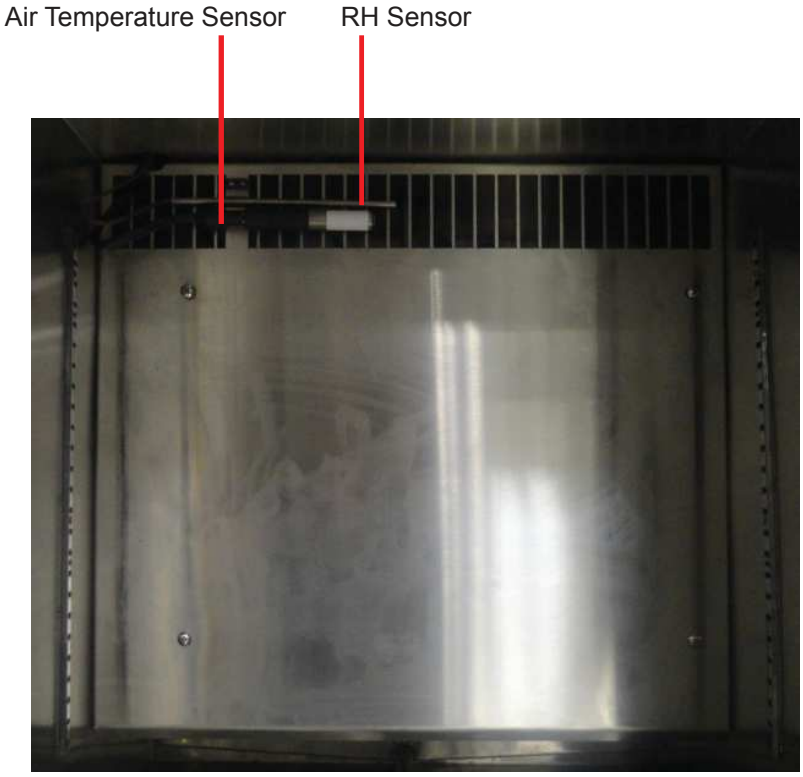

Figure 7. Air Temperature Sensor Location MCH-3

NOTE

The redundant high/ low limit has a LED display which displays a “SAFE” condition when temperature has returned to safe conditions. Press the “RESET” button to reset the limit.

PEN RECORDERS (OPTIONAL)

The Circular Chart Recorder (not illustrated) features fully programmable inputs ranging and linearization with stepper motor pen and chart drive speed. Refer to the chart recorder manual on the digital media that shipped with your unit.

HIGH/LOW LIMIT CONTROL (OPTIONAL)

The High/Low Limit Control is designed with set-points for high and low temperatures. These can be precisely set at temperatures to permit safe operation. Power to the product being tested and a circuit interrupting power to the chamber must be wired through the output relay of the device. The Limit Control will shut down the chamber operation and product operation if the safe operating temperature limit of the product, either hot or cold, has been exceeded.

Note: CSZ is continuously upgrading the components used in its equipment. Consequently, the physical appearance of certain components may vary from that shown.

IEEE-488 SYSTEM (OPTIONAL)

The IEEE-488 bus is also known as the “General Purpose Interface Bus” (or GPIB). The purpose of the IEEE-488 bus is to transfer information between two or more devices. A device may either be an instrument or a computer. Devices may ‘Talk’ (send), ‘Listen’ (receive), or be idle on the bus. Only one device can be ‘addressed’ (allowed) to Talk on the bus at a time, while one or more devices may Listen.

One device on the bus must be the System Controller. The Controller determines which device will talk and which devices will listen. The Controller is usually a computer containing a IEEE-488 interface card and application programs. The IEEE-488 specification allows the System Controller to pass its duties to another device, making it the ‘Active Controller’.

There are two types of messages sent over the IEEE-488 bus: interface messages and device dependent messages. Interface messages manage the IEEE-488 bus, using commands to clear the interface, address devices to talk or listen, and so forth. Device dependent messages transfer commands specific to the device controller.

The IEEE-488 bus interface is externally mounted on top of the unit using the “hook and loop” (Velcro®) strips provided, or on a bench beside the unit. A 25 pin male serial cable has also been provided to connect the interface to the communications port on the front of the unit.

LN2/CO2 BOOST COOLING SYSTEM (OPTIONAL)

In addition to the main refrigeration system, the chamber is equipped with an optional connection port for supplying boost cooling from an external source of cryogenic liquefied gas (either carbon dioxide or liquid nitrogen). The boost cooling gas is vented directly into the chamber by a controller under the conditions of sustained cooling demand.

WARNING

Gaseous Nitrogen/C02 vent must be ducted out doors. To prevent displacement of oxygen around the unit. Asphyxia can occur if this is not installed properly.

Specifics

The LN2 cylinder should be connected with a well insulated line that is at least 3/8”/9.5mm inside diameter. The line length should be 5FT/152cm or less. The LN2 tank should have a maximum supply pressure of 25 PSIG/172 kPa.

Mechanical cooling with LN2 boost: over the temperature range of the chamber, the refrigeration system operates normally. When the LN2 switch is turn “on”, the LN2 cooling valve will open when there has been a call for cooling from the controller for more than 10 seconds. This will boost the cooling effect and reduce the temperature in the chamber faster.

WARNING

Wear appropriate PPE when handling LN2 connection.

HUMIDITY PANEL COMPONENTS (OPTIONAL)
(Steam Generator System)

CAUTION

Failure to maintain cartridge may result in chloride corrosion of stainless steel interior surfaces.

The water supply system for humidity is provided on the humidity panel assembly located on the left side of the unit. The door will need to be opened to access these parts. The following is a description and function of the major components (see
Figures 2 and 3)

1. Water Valve and Rack Assembly

    a. The valve is used to temporarily turn off the water supply in order to change the demineralizer filter without interrupting chamber operation.

    b. The rack holds the demineralizer filter.

2. Water Supplier Solenoid

    a. This is a normally closed solenoid valve and is energized (opened) only when the chamber is in the humidity mode.

3. Demineralizer Filter

    a. The filter removes most common impurities from tap or soft water.

    b. The outer casing of the filter is transparent and the crystals are visible. A new cartridge (once the water has been circulated through it) will be violet or dark blue. A spent cartridge will turn brown, orange, yellow or white. The cartridge should be changed before it completely changes color. A reference mark is provided on the filter to indicate when it should be changed. Spare cartridges are available through the CSZ Service Department. Refer to the Humidity Maintenance Section for instructions on how to change the filter.

4. Control Solenoid

    a. This is a normally closed solenoid valve which is energized (opened) to supply water to the steam generator.

WARNING

Do not open the door to the humidity panel assembly while the main power is supplied to the chamber. Disconnect power to the entire chamber before opening the door to the humidity panel assembly.

6. Steam Generator System

    a. The steam generator provides humidity in the form of steam. The steam generator has a multi-level float switch which controls the water level. The heater boils the water to generate steam. The steam is injected into the chamber.

    b. A high temperature safety thermostat is mounted on the boiler wall to remove heater power if an over-temperature situation is reached. To reset, the over temperature situation must no longer be present. Remove power from the chamber before resetting the high temperature safety thermostat.

HUMIDITY CHAMBER COMPONENTS (OPTIONAL)

The chamber area contains the remaining components necessary to generate and maintain humidity levels within the work space. The following is a description of these components (see Figures 4 and 5).

A. Solid State Humidity Sensor

DO NOT RELOCATE. It has been located at the factory for maximum performance.

This unit utilizes a solid state relative humidity sensor which takes the place of the traditional wet bulb and dry bulb sensors. The solid state sensor is a highly accurate quick responding direct RH measuring device. It feeds an electronic signal to the controller that in turn controls and displays direct relative humidity.

B. Humidity Wet Coil

This coil is cooled by the R-404A (System 1) system and functions as a dehumidification coil. Dehumidification of the chamber air is accomplished by condensing water from the chamber air onto the refrigerated surface.

C. Wet Coil Pan

The wet coil pan is used to collect moisture from the wet coil and dispense it through the chamber drain.

D. Recirculating Water

The Recirculating Water Reservoir Option is a fully integrated accessory that requires only minor installation. Just fill the reservoir with water to the fill line, connect a drain line to the plastic ball valve located at the bottom rear of the unit and the system is ready to operate.

Typical System Operation:

- A water pump (located under the reservoir) turns on when the humidity function is turned on and pumps water from the reservoir to the boiler
- The water vapor condenses into a liquid and runs down the chamber drain, back to the reservoir
- This cycle is repeated over and over
- The float switch (located on top of the reservoir) turns the pump off when the water level in the reservoir is too low and needs to be replenished, preventing damage to the pump

Maintenance:

- Drain and clean the reservoir every 2 months or sooner as required by usage and water conditions

MCB 1.2

Figure 8. MCB 1.2 Recirculating Water

NOTE

For Microclimate MCB 1.2 Models the Recirculating Water Reservoir is mounted separately from the unit, either on the floor or on a wall close to the chamber. In addition to the steps above, the plastic water supply line on top of the reservoir must be connected to the water inlet on the Humidity System, which is located on the left side of the chamber. Plug the Power Cord for the recirculating water into a 115VAC, 60 Hz, 20 A outlet that is separate from the chamber's outlet. If the chamber is rated for the recirculating water into a 230VAC, 50Hz, 16A outlet that is separate

MC3

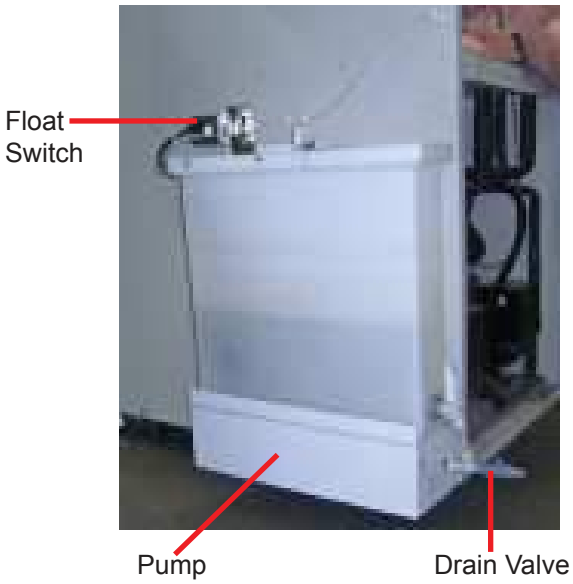

Figure 9. MC3 Recirculating Water

Note: CSZ is continuously upgrading the components used in its equipment. Consequently, the physical appearance of certain components may vary from that shown.

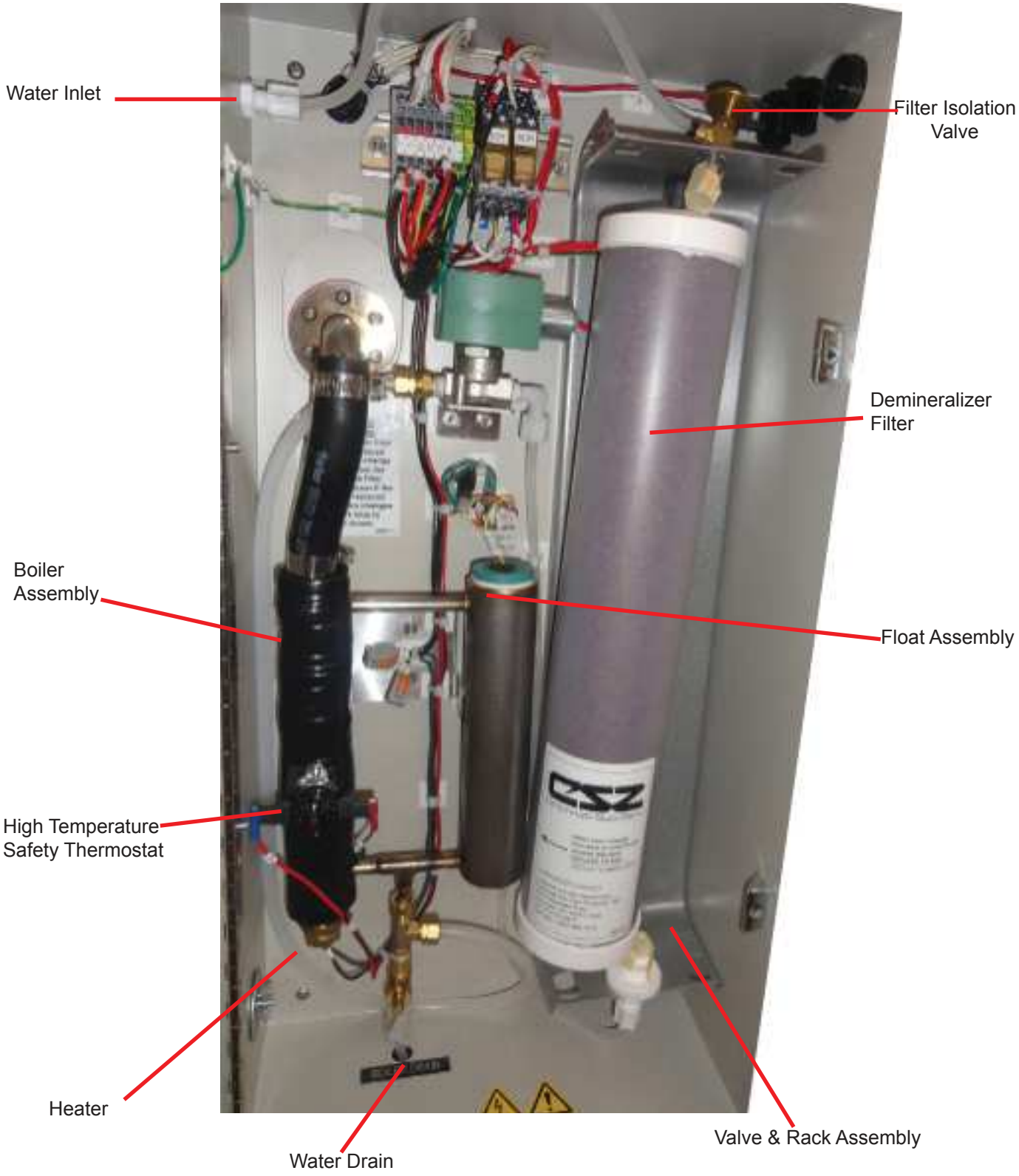

Figure 10. Steam Generator System

Note: CSZ is continuously upgrading the components used in its equipment. Consequently, the physical appearance of certain components may vary from that shown.

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MICROCLIMATE SPECIFICATIONS

Model MCB-1.2-.33-.33-H/AC

MCB	-	MicroClimate Benchtop
1.2	-	1.2 cubic feet of work space (excluding sensors)
.33-.33	-	.33 HP HFC-404A, .33 HP R-508B Cascade Refrigeration System
H/AC	-	Hermetic Compressors, Air Cooled Condenser

Temperature Range:	-70°C (-94°F) to +190°C (+375°F)
Control Stability:	±0.5°C from -50°C to +190°C, ±1°C below -50°C, at steady state conditions after stabilization.
Temperature Performance: (Non-humidity operation)	Temperature pulldown from +24°C (+75°F) to: -40°C (-40°F) in 20 minutes -54°C (-65°F) in 25 minutes -68°C (-90°F) in 40 minutes Temperature heat-up from: +24°C (+75°F) to + 94°C (+200°F) in 10 minutes +24°C (+75°F) to +190°C (+375°F) in 35 minutes -34°C (-30°F) to + 24°C (+ 75°F) in 10 minutes -68°C (-90°F) to + 24°C (+ 75°F) in 15 minutes (Based on +24°C/+75°F ambient, 115 V service, and use of included accessories. Some accessories may affect performance.)
Live Load Capacity:	175 watts at -40°C (-40°F) 100 watts at -54°C (-65°F)
Interior Dimensions:	16” wide x 11” deep x 12” high (40.64 cm wide x 28 cm deep x 30 cm high)
Exterior Dimensions:	36.75” wide x 24.5” deep x 28” high (93 cm wide x 62 cm deep x 71 cm high) (Addition of certain accessories may increase dimensions)
Shipping Weight:	Approximately 285 pounds/129 kilograms
Heat Rejection:	Approximately 1,300 watts (4,500 BTU/hr) maximum during cooling operation.
Utility Requirements:	115 volts (±5%), Single Phase, 60 Hertz, with dedicated 20 amp service required 230 volts (±5%), Single Phase, 50 Hertz, with dedicated 16 amp service required **Warning: Do not plug unit into a GFI Circuit Breaker.**
Included Accessories:	- 2” Access Port centered in left hand side - Shelf Supports - Refrigeration Service Taps - 115 Volt, 20 amp plug with 10 foot power cord, 60 Hertz models - 230 Volt, 16 amp plug with 3 meter power cord, 50 Hertz models
Included Instruments:	- EZT-430S Controller

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Model MCBH-1.2-.33-.33-H/AC

MCBH	-	MicroClimate Benchtop Humidity
1.2	-	1.2 cubic feet of work space (excluding sensors)
.33-.33	-	.33 HP HFC-404A, .33 HP R-508B Cascade Refrigeration System
H/AC	-	Hermetic Compressors, Air Cooled Condenser

Temperature Range:	-70°C (-94°F) to +190°C (+375°F)
Humidity Range:	10% to 98% RH
Control Stability:	±0.5°C from -50°C to +190°C, ±1°C below -50°C, at steady state conditions after stabilization.
Temperature Performance: (Non-humidity operation)	Temperature pulldown from +24°C (+75°F) to: -40°C (-40°F) in 20 minutes -54°C (-65°F) in 25 minutes -68°C (-90°F) in 40 minutes Temperature heat-up from: +24°C (+75°F) to + 94°C (+200°F) in 10 minutes +24°C (+75°F) to +190°C (+375°F) in 35 minutes -34°C (-30°F) to + 24°C (+ 75°F) in 10 minutes -68°C (-90°F) to + 24°C (+ 75°F) in 15 minutes (Based on +24°C/+75°F ambient, 115 V service, and use of included accessories. Some accessories may affect performance.)
Live Load Capacity:	175 watts at -40°C (-40°F) 100 watts at -54°C (-65°F)
Interior Dimensions:	16” wide x 11” deep x 12” high (40.64 cm wide x 28 cm deep x 30 cm high)
Exterior Dimensions:	42.75” wide x 24.5” deep x 28” high (109 cm wide x 62 cm deep x 71 cm high) (Addition of certain accessories may increase dimensions)
Shipping Weight:	Approximately 300 pounds/136 kilograms
Heat Rejection:	Approximately 1,300 watts (4,500 BTU/hr) maximum during cooling operation.
Utility Requirements:	115 volts (±5%), Single Phase, 60 Hertz, with dedicated 20 amp service required 230 volts (±5%), Single Phase, 50 Hertz, with dedicated 16 amp service required **Warning: Do not plug unit into a GFI Circuit Breaker.**
Included Accessories:	- 2” Access Port centered in left hand side - Shelf Supports - Refrigeration Service Taps - 115 Volt, 20 amp plug with 10 foot power cord 60 Hertz models - 230 Volt 16 amp plug with 3 meter power cord 50 Hertz models
Included Instruments:	- EZT-430S Controller

Cincinnati Sub-Zero

Model MCB-1.2-.33-H/AC

MCB	-	MicroClimate Benchtop
1.2	-	1.2 cubic feet of work space (excluding sensors)
.33	-	.33 HP HFC-404A Single Stage Refrigeration System
H/AC	-	Hermetic Compressors, Air Cooled Condenser

Temperature Range:	-30°C (-22°F) to +190°C (+375°F)
Control Stability:	±0.5°C from -50°C to +190°C, ±1°C below -50°C, at steady state conditions after stabilization.
Temperature Performance: (Non-humidity operation)	Temperature pulldown from +24°C (+75°F) to: 0°C (-40°F) in 3 minutes -18°C (-65°F) in 9 minutes -25°C (-90°F) in 14 minutes Temperature heat-up from: +24°C (+75°F) to + 94°C (+200°F) in 10 minutes +24°C (+75°F) to +190°C (+375°F) in 35 minutes -25°C (-30°F) to + 24°C (+ 75°F) in 8 minutes (Based on +24°C/+75°F ambient, 115 V service, and use of included accessories. Some accessories may affect performance.)
Live Load Capacity:	150 watts at -18°C (0°F) 200 watts at 0°C (32°F)
Interior Dimensions:	16” wide x 11” deep x 12” high (40.64cm wide x 28cm deep x 30cm high)
Exterior Dimensions:	36.75” wide x 30.5” deep x 28” high (93cm wide x 77cm deep x 71cm high) (Addition of certain accessories may increase dimensions)
Shipping Weight:	Approximately 325 pounds/147 kilograms
Heat Rejection:	Approximately 1,610 watts (5,500 BTU/hr) maximum during cooling operation.
Utility Requirements:	115 volts (±5%), Single Phase, 60 Hertz, with dedicated 20 amp service 230 volts (±5%), Single Phase, 50 Hertz, with dedicated 16 amp service **Warning: Do not plug unit into a GFI Circuit Breaker.**
Included Accessories:	- 2” Access Port centered in left hand side - Shelf Supports - Refrigeration Service Taps - 115 Volt, 20 amp plug with 10 foot power cord 60 Hertz model - 230 Volt, 16 amp plug with 3 foot power cord 50 Hertz model
Included Instruments:	- EZT-430S Controller

Cincinnati Sub-Zero

Model MCBH-1.2-.33-H/AC

MCB	-	MicroClimate Benchtop with humidity
1.2	-	1.2 cubic feet of work space (excluding sensors)
.33	-	.33 HP HFC-404A Single Stage Refrigeration System
H/AC	-	Hermetic Compressors, Air Cooled Condenser

Temperature Range:	-30°C (-22°F) to +190°C (+375°F)
Humidity Range:	10% to 95% RH
Control Stability:	±0.5°C from -50°C to +190°C, ±1°C below -50°C, at steady state conditions after stabilization.
Temperature Performance: (Non-humidity operation)	Temperature pulldown from +24°C (+75°F) to: 0°C (-40°F) in 3 minutes -18°C (-65°F) in 9 minutes -25°C (-90°F) in 14 minutes Temperature heat-up from: +24°C (+75°F) to + 94°C (+200°F) in 10 minutes +24°C (+75°F) to +190°C (+375°F) in 35 minutes -25°C (-30°F) to + 24°C (+ 75°F) in 8 minutes (Based on +24°C/+75°F ambient, 115 V service, and use of included accessories. Some accessories may affect performance.)
Live Load Capacity:	150 watts at -18°C (0°F) 200 watts at 0°C (32°F)
Interior Dimensions:	16” wide x 11” deep x 12” high (40.64cm wide x 28cm deep x 30cm high)
Exterior Dimensions:	36.75” wide x 30.5” deep x 28” high (93cm wide x 77cm deep x 71cm high) (Addition of certain accessories may increase dimensions)
Shipping Weight:	Approximately 325 pounds/147 kilograms
Heat Rejection:	Approximately 1.610 watts (5,500 BTU/hr) maximum during cooling operation.
Utility Requirements:	115 volts (±5%), Single Phase, 60 Hertz, with dedicated 20 amp service 230 volts (±5%), Single Phase, 50 Hertz, with dedicated 16 amp service **Warning: Do not plug unit into a GFI Circuit Breaker.**
Included Accessories:	2” Access Port centered in left hand side - Shelf Supports - Refrigeration Service Taps - 115 Volt, 20 amp plug with 10 foot power cord 60 Hertz model - 230 Volt, 16 amp plug with 3 foot power cord 50 Hertz model
Included Instruments:	- EZT-430S Controller

Cincinnati Sub-Zero

Model MC-3-.33-.33-H/AC

MC	-	MicroClimate
3	-	3 cubic feet of work space (excluding sensors)
.33-.33	-	.33 HP HFC-404A, .33 HP R-508B Cascade Refrigeration System
H/AC	-	Hermetic Compressors, Air Cooled Condenser

Temperature Range:	-65°C (-85°F) to +190°C (+375°F)
Control Stability:	±0.5°C from -50°C to +190°C, ±1°C below -50°C, at steady state conditions after stabilization.
Temperature Performance: (Non-humidity operation)	Temperature pulldown from +24°C (+75°F) to: -40°C (-40°F) in 50 minutes -54°C (-65°F) in 75 minutes -65°C (-85°F) in 150 minutes Temperature heat-up from: +24°C (+75°F) to + 94°C (+200°F) in 25 minutes +24°C (+75°F) to +190°C (+375°F) in 100 minutes -34°C (-30°F) to + 24°C (+ 75°F) in 20 minutes -68°C (-90°F) to + 24°C (+ 75°F) in 25 minutes (Based on +24°C/+75°F ambient, 115 V/60 Hz service, and use of included accessories. Some accessories may affect performance.)
Live Load Capacity:	175 watts at -40°C (-40°F) 100 watts at -54°C (-65°F)
Interior Dimensions:	17” wide x 17” deep x 18” high (43.2 cm wide x 43.2 cm deep x 45.7 cm high)
Exterior Dimensions:	25.0” wide x 38.75” deep x 64.75” high (63.5 cm wide x 98.43 cm deep x 164.5 cm high) (Addition of certain accessories may increase dimensions)
Shipping Weight:	Approximately 500 pounds/226 kilograms
Heat Rejection:	Approximately 1,300 watts (4,500 BTU/hr) maximum during cooling operation.
Utility Requirements:	115 volts (±5%), Single Phase, 50/60 Hertz, with dedicated 20 amp service 230 volts (±5%), Single Phase, 50 Hertz, with dedicated 16 amp service **Warning: Do not plug unit into a GFI Circuit Breaker.**
Included Accessories:	- 3” Access Port centered in left hand side - Shelf Supports - Refrigeration Service Taps - 115 Volt, 20 amp plug with 10 foot power cord - 230 Volt, 16 amp plug with 3 foot power cord
Included Instruments:	- EZT-430S Controller

Cincinnati Sub-Zero

Model MCH-3-.33-.33-H/AC

MCH	-	MicroClimate Humidity
3	-	3 cubic feet of work space (excluding sensors)
.33-.33	-	.33 HP HFC-404A, .33 HP R-508B Cascade Refrigeration System
H/AC	-	Hermetic Compressors, Air Cooled Condenser

Temperature Range:	-65°C (-85°F) to +190°C (+375°F)
Humidity Range:	10% to 95% RH
Control Stability:	±0.5°C from -50°C to +190°C, ±1°C below -50°C, at steady state conditions after stabilization.
Temperature Performance: (Non-humidity operation)	Temperature pulldown from +24°C (+75°F) to: -40°C (-40°F) in 35 minutes -54°C (-65°F) in 65 minutes -65°C (-85°F) in 110 minutes Temperature heat-up from: +24°C (+75°F) to + 94°C (+200°F) in 25 minutes +24°C (+75°F) to +190°C (+375°F) in 100 minutes -34°C (-30°F) to + 24°C (+ 75°F) in 20 minutes -65°C (-90°F) to + 24°C (+ 75°F) in 25 minutes (Based on +24°C/+75°F ambient, 115 V service, and use of included accessories. Some accessories may affect performance.)
Live Load Capacity:	175 watts at -40°C (-40°F) 100 watts at -54°C (-65°F)
Interior Dimensions:	17” wide x 17” deep x 18” high (43.2 cm wide x 43.2 cm deep x 45.7 cm high)
Exterior Dimensions:	31” wide x 38.75” deep x 64.75” high (78.7 cm wide x 98.43 cm deep x 164.5 cm high) (Addition of certain accessories may increase dimensions)
Shipping Weight:	Approximately 500 pounds/226 kilograms
Heat Rejection:	Approximately 1,300 watts (4,500 BTU/hr) maximum during cooling operation.
Utility Requirements:	115 volts (±5%), Single Phase, 50/60 Hertz, with dedicated 20 amp service 230 volts (±5%), Single Phase, 50 Hertz, with dedicated 16 amp service **Warning: Do not plug unit into a GFI Circuit Breaker.**
Included Accessories:	- 3” Access Port centered in right hand side - Shelf Supports - Refrigeration Service Taps - 115 Volt, 20 amp plug with 10 foot power cord - 230 Volt, 16 amp plug with 3 foot power cord
Included Instruments:	- EZT-430S Controller

Cincinnati Sub-Zero

Model MC-3-.50-.50-H/AC (230V)

MC	-	MicroClimate
3	-	3 cubic feet of work space (excluding sensors)
.50-.50	-	.50 HP HFC-404A, .50 HP R-508B Cascade Refrigeration System
H/AC	-	Hermetic Compressors, Air Cooled Condenser

Temperature Range:	-70°C (-94°F) to +190°C (+375°F)
Control Stability:	±0.5°C from -50°C to +190°C, ±1°C below -50°C, at steady state conditions after stabilization.
Temperature Performance: (Non-humidity operation)	Temperature pulldown from +24°C (+75°F) to: -40°C (-40°F) in 22 minutes -54°C (-65°F) in 32 minutes -68°C (-90°F) in 48 minutes Temperature heat-up from: +24°C (+75°F) to + 94°C (+200°F) in 6 minutes +24°C (+75°F) to +190°C (+375°F) in 18 minutes -34°C (-30°F) to + 24°C (+ 75°F) in 7 minutes -68°C (-90°F) to + 24°C (+ 75°F) in 8 minutes (Based on +24°C/+75°F ambient, 115 V service, and use of included accessories. Some accessories may affect performance.)
Live Load Capacity:	350 watts at -40°C (-40°F) 250 watts at -54°C (-65°F)
Interior Dimensions:	17” wide x 17” deep x 18” high (43.2 cm wide x 43.2 cm deep x 45.7 cm high)
Exterior Dimensions:	25.0” wide x 38.75” deep x 64.75” high (63.5 cm wide x 98.43 cm deep x 164.5 cm high) (Addition of certain accessories may increase dimensions)
Shipping Weight:	Approximately 500 pounds/226 kilograms
Heat Rejection:	Approximately 2,050 watts (7,000 BTU/hr) maximum during cooling operation.
Utility Requirements:	230 volts (±5%), Single Phase, 50/60 Hertz, with dedicated 30 amp service required **Warning: Do not plug unit into a GFI Circuit Breaker.**
Included Accessories:	- 3” Access Port centered in left hand side - Shelf Supports - Refrigeration Service Taps - 230 Volt, 30 amp plug with 10 foot power cord
Included Instruments:	- EZT-430S Controller

*** Performance Specifications are based on the 230V unit
If the chamber is a 208V the times may be slightly longer.

Cincinnati Sub-Zero

Model MCH-3-.50-.50-H/AC

MCH	-	MicroClimate Humidity
3	-	3 cubic feet of work space (excluding sensors)
.50-.50	-	.50 HP HFC-404A, .50 HP R-508B Cascade Refrigeration System
H/AC	-	Hermetic Compressors, Air Cooled Condenser

Temperature Range: -70°C (-94°F) to +190°C (+375°F)

Humidity Range: 10% to 95% RH

Control Stability: ±0.5°C from -50°C to +190°C, ±1°C below -50°C, at steady state conditions after stabilization.

Temperature Performance:
(Non-humidity operation)

Temperature pulldown from +24°C (+75°F) to:
-40°C (-40°F) in 22 minutes
-54°C (-65°F) in 32 minutes
-68°C (-90°F) in 48 minutes

Temperature heat-up from:
+24°C (+75°F) to + 94°C (+200°F) in 6 minutes
+24°C (+75°F) to +190°C (+375°F) in 18 minutes
-34°C (-30°F) to + 24°C (+ 75°F) in 7 minutes
-65°C (-90°F) to + 24°C (+ 75°F) in 8 minutes
(Based on +24°C/+75°F ambient, 230 V service, and use of included accessories. Some accessories may affect performance.)

Live Load Capacity:
350 watts at -40°C (-40°F)
250 watts at -54°C (-65°F)

Interior Dimensions:
17” wide x 17” deep x 18” high
(43.2 cm wide x 43.2 cm deep x 45.7 cm high)

Exterior Dimensions:
31” wide x 38.75” deep x 64.75” high
(78.7 cm wide x 98.43 cm deep x 164.5 cm high)
(Addition of certain accessories may increase dimensions)

Shipping Weight: Approximately 500 pounds/226 kilograms

Heat Rejection: Approximately 2,050 watts (7,000 BTU/hr) maximum during cooling operation.

Utility Requirements:
230 volts (±5%), Single Phase, 50/60 Hertz, with dedicated 30 amp service required
Warning: Do not plug unit into a GFI Circuit Breaker.

Included Accessories:
- 3” Access Port centered in right hand side
- Shelf Supports
- Refrigeration Service Taps
- 230 Volt, 30 amp plug with 10 foot power cord

Included Instruments: - EZT-430S Controller

*** Performance Specifications are based on the 230V unit
If the chamber is a 208V the times may be slightly longer.

Cincinnati Sub-Zero

Model MC-3-1-1-H/AC

MC - MicroClimate Upright Temperature
3 - 3 Cubic Ft. (85 L)
1-1 - 1HP HFC-404A, 1HP R-508B Cascade Refrigeration System
H/AC - Hermetic Compressor, Integral Air Cooled Condenser

Temperature Range:	-70°C to +190°C (-94°F to +375°F)
Control:	±0.5°C (±1°F) at steady state condition after stabilization
Temperature Performance:	Temperature pull-down from: +24°C (+75°F) to -40°C (-40°F) in 12 minutes +24°C (+75°F) to -54°C (-65°F) in 16 minutes +24°C (+75°F) to -68°C (-90°F) in 24 minutes +85°C (185°F) to -40°C (-40°F) in 24 minutes Temperature heat-up from: +24°C (+75°F) to +93°C (+200°F) in 2.5 minutes +24°C (+75°F) to +190°C (+375°F) in 10 minutes -34°C (-30°F) to +24°C (+75°F) in 3.5 minutes -68°C (-90°F) to +24°C (+75°F) In 4 minutes
Live Load Capacity:	800 watts at -40°C (-40°F) 500 watts at -54°C (-65°F) 200 watts at -68°C (-90°F)
Interior Dimensions:	17"W x 17"D x 18"H (43.2cm x 43.2cm x 45.7 cm)
Exterior Dimensions:	27.5"W x 38.75"D x 65.5"H (70cm x 98.43cm x 166 cm)
Ship Weight:	Approximately 700 pounds/318 kilograms
Heat Rejection:	Approximately 4,103 watts (14,000 BTU/hr) maximum during cooling operation.
Utility Requirements:	208/230 Volt, 1 Phase, 60 Hertz 40 amp minimum service (220/ 230 Volt, 1 Phase, 50 Hertz) 35 amp minimum service
Included Accessories:	- 3” Access Port centered in left hand side - Shelf Supports - Refrigeration Service Taps
Included Instruments:	- EZT-430S Controller

*** Performance Specifications are based on the 230V unit
If the chamber is a 208V the times may be slightly longer.

Cincinnati Sub-Zero

Model MCH-3-1-1-H/AC

MC - MicroClimate with Humidity
3 - 3 Cubic Ft. (85 L)
1-1 - 1HP HFC-404A, 1HP R-508B Cascade Refrigeration System
H/AC - Hermetic Compressor, Integral Air Cooled Condenser

Temperature Range:	-70°C to +190°C (-94°F to +375°F)
Humidity Range:	10% to 95% RH
Control:	±0.5°C, ±4% RH at steady state conditions after stabilization
Temperature Performance:	Temperature pull-down from: +24°C (+75°F) to -40°C (-40°F) in 12 minutes +24°C (+75°F) to -54°C (-65°F) in 16 minutes +24°C (+75°F) to -68°C (-90°F) in 24 minutes +85°C (185°F) to -40°C (-40°F) in 24 minutes Temperature heat-up from: +24°C (+75°F) to +93°C (+200°F) in 2.5 minutes +24°C (+75°F) to +190°C (+375°F) in 10 minutes -34°C (-30°F) to +24°C (+75°F) in 3.5 minutes -68°C (-90°F) to +24°C (+75°F) In 4 minutes
Live Load Capacity:	800 watts at -40°C (-40°F) 500 watts at -54°C (-65°F) 200 watts at -68°C (-90°F)
Interior Dimensions:	17"W x 17"D x 18"H (43.2cm x 43.2cm x 45.7 cm)
Exterior Dimensions:	27.5"W x 38.75"D x 65.5"H (70cm x 98.43cm x 166 cm)
Ship Weight:	Approximately 700 pounds/318 kilograms
Heat Rejection:	Approximately 4,103 watts (14,000 BTU/hr) maximum during cooling operation.
Utility Requirements:	208/230 Volt, 1 Phase, 60 Hertz 40 amp minimum service (220/ 230 Volt, 1 Phase, 50 Hertz) 35 amp minimum service
Included Accessories:	- 3” Access Port centered in left hand side - Shelf Supports - Refrigeration Service Taps
Included Instruments:	- EZT-430S Controller

*** Performance Specifications are based on the 230V unit
If the chamber is a 208V the times may be slightly longer.

Cincinnati Sub-Zero

Model MCH-3-1.5-1.5-H/AC

MC - MicroClimate with Humidity
3 - 3 Cubic Ft. (85 L)
1-1 - 1HP HFC-404A, 1HP R-508B Cascade Refrigeration System
H/AC - Hermetic Compressor, Integral Air Cooled Condenser

Temperature Range:	-70°C to +190°C (-94°F to +375°F)
Humidity Range:	10% to 95% RH
Control:	±0.5°C, ±4% RH at steady state conditions after stabilization
Temperature Performance:	Temperature pull-down from: +24°C (+75°F) to -40°C (-40°F) in 10 minutes +24°C (+75°F) to -54°C (-65°F) in 12 minutes +24°C (+75°F) to -68°C (-90°F) in 20 minutes +85°C (185°F) to -40°C (-40°F) in 20 minutes Temperature heat-up from: +24°C (+75°F) to +93°C (+200°F) in 2.5 minutes +24°C (+75°F) to +190°C (+375°F) in 10 minutes -34°C (-30°F) to +24°C (+75°F) in 3.5 minutes -68°C (-90°F) to +24°C (+75°F) In 4 minutes
Live Load Capacity:	800 watts at -40°C (-40°F) 500 watts at -54°C (-65°F) 200 watts at -68°C (-90°F)
Interior Dimensions:	17"W x 17"D x 18"H (43.2cm x 43.2cm x 45.7 cm)
Exterior Dimensions:	27.5"W x 38.75"D x 65.5"H (70cm x 98.43cm x 166 cm)
Ship Weight:	Approximately 700 pounds/318 kilograms
Heat Rejection:	Approximately 4,688 watts (16,000 BTU/hr) maximum during cooling operation.
Utility Requirements:	400Y/277 VAC, 3 Phase, 50 Hertz 25 amp minimum service
Included Accessories:	- 3” Access Port centered in left hand side - Shelf Supports - Refrigeration Service Taps
Included Instruments:	- EZT-430S Controller

Cincinnati Sub-Zero

SEQUENCE OF OPERATIONS

REFRIGERATION SYSTEM

Model #: MCB(H)-1.2-.33-.33-H/AC and MCB(H)-3-.33-.33-H/AC

System 1 Description (Refrigerant R-404A) - Refer to drawing: MCB-RF00 and MC3(H)-RF00

The compressor (item 1) will pump compressed R-404A vapor through the discharge line. The discharge refrigerant vapor enters the air-cooled condenser.

The air-cooled condenser (item 5) cools the high pressure R-404A vapor and condenses it into a high-pressure liquid. The condenser fan motor will be energized anytime System 1 is running.

High-pressure liquid refrigerant exits the condenser. The liquid flows through a filter-drier, sight glass, and into the T.E.V. (item 11) where it changes to a low-pressure two-phase refrigerant. The two phase refrigerant is cold due to the flashing of refrigerant. It enters the cascade condenser (item 13) where the heat from system 2 boils the rest of the R-404A into a vapor. The cascade condenser serves as the evaporator for system 1.

Superheated R-404A vapor exits the cascade condenser and moves through the system 1 suction line. to the compressor.

System 2 Description (Refrigerant R-508B)

The compressor (item 41) will pump compressed R-508B vapor through the discharge line. The discharge refrigerant vapor passes through the discharge desuperheating loop on the front of the condenser (item 44). This cools the vapor before entering the cascade condenser.

The cascade condenser (item 13) cools the high pressure R-508B vapor and condenses it into a high-pressure liquid.

High-pressure liquid refrigerant exits the cascade condenser. The liquid flows through a filter-drier and enters a tee. The tee will divert some of the liquid refrigerant to be used in the bypass circuit (see last paragraph of this section). The rest of the refrigerant passes through the solenoid valve (item 49) then to the T.E.V. (item 50) where it changes to a low-pressure two-phase refrigerant. The two phase refrigerant is cold due to the flashing of refrigerant. It enters the evaporator where the refrigerant is distributed through the evaporator coil. The evaporator (item 52) serves to boil the rest of the R-508B into a vapor. This boiling action cools the chamber.

Superheated R-508B vapor exits the evaporator and moves through the system 2 suction line. A crank case pressure regulator, (CPR) Item 28 (MC3 only) limits the suction pressure so the compressor does not over load. A service port is located near the compressor.

The bypass circuit is composed of: The liquid injection solenoid valve (Item 60) and a capillary tube (Item 61). The liquid injection valve will be energized when no cooling is required in the chamber. The vapor tank (item 55) is connected to a capillary tube (item 61a) then to the suction line.

Control System

REFRIGERATION (Refer to drawing: MCB-RF00 or MC3(H)-RF00 & MC3-EW00)

Mode: Normal cooling (Below 17°C)

When there is call for cooling the R-404A compressor turns on, 1-SOL is energized. After the stagger start timer expires, approximately 1 minute, the R-508B compressor turns on.

When there is a call for cooling refrigerant (R-508B) flows through the solenoid (2-SOL) and the T.E.V. into the evaporator and cools the chamber. When the chamber is near the set point the controller begins to cycle 2-SOL on and off. When 2-SOL is turned off, 5-SOL is energized allowing refrigerant to by-pass back to the suction line.

Mode: Normal cooling (Above 17°C)

When there is a call for cooling the R-404A compressor turns on, 1-SOL and H1-SOL are energized. When the chamber is at or near set-point H1-SOL begins to cycle. When H1-SOL is off, 4-SOL is energized allowing refrigerant hot gas to by-pass back to the suction line.

Mode: Humidity

In humidity mode, the unit operates as a single stage R-404A refrigeration system.

When Dehumidification is called for, Solenoid H-11 SOL is energized. The refrigerant passes through a solenoid valve (item H27) and a Wet Coil capillary tube (item H23). Two phase refrigerant exits the Capillary tube and enters the wet coil (item H25). The wet coil is cold enough to attract water from the chamber air, but not cold enough to freeze the water on the coil. The temperature of the coil is regulated by a pressure regulating E.P.R. valve (item H26). The E.P.R. valve is set at 68 psig/4.7 barG which corresponds to a 29°F/-16°C wet coil temp. The warm chamber air keeps the moisture from freezing on the coil. After the E.P.R. valve, there is a check valve (item H28) which keeps refrigerant from migrating to the wet coil when humidity mode is inactive. After the refrigerant passes through the check valve, it enters the suction line and returns to the compressor

When humidity is called for, Solenoid H-11 SOL is de-energized.

For Dry Bulb Temperature cooling in humidity mode, solenoid H1-SOL and 1-SOL are energized. This allows refrigerant to flow through the R-404A Capillary tube into the evaporator, which cools the chamber. When HI-SOL is off, 4-SOL is energized allowing refrigerant hot gas to by-pass back to the suction line.

For Dry Bulb Temperature heating, solenoid H1 SOL is de-energized, 4-SOL and 1-SOL are energized, acting a by-pass for the refrigeration circuit. The heaters are activated to warm the chamber.

REFRIGERATION SYSTEM

Model #: MCB(H)-1.2-.33-H/AC (115V and 230V)

Single Stage System (Refrigerant R-404A) - Refer to drawing: MCB-RF03

The compressor (item 1) will pump compressed R-404A vapor through the discharge line. The discharge refrigerant vapor enters the air-cooled condenser.

The air-cooled condenser (item 5) cools the high pressure R-404A vapor and condenses it into a high-pressure liquid. The condenser fan motor will be energized anytime System 1 is running.

High-pressure liquid refrigerant exits the condenser. The liquid flows through a receiver filter-drier, sight glass, a tee for the wet coil, and into the main cooling solenoid valve (item 10) and then the T.E.V. (item 11) where it changes to a low-pressure two-phase refrigerant. The two phase refrigerant is cold due to the flashing of refrigerant. It enters the evaporator (item 13) where it cools the chamber and boils the rest of the R-404A into a vapor.

Superheated R-404A vapor exits the evaporator and moves through the system 1 suction line. A service port is located near the compressor.

Control System

REFRIGERATION (Refer to drawing: MCB-RF03 & MCB(H)-EW02)

Mode: Normal cooling

When there is call for cooling the R-404A compressor turns on, 1-SOL is energized.

When there is a call for cooling refrigerant (R-404A) flows through the solenoid (1-SOL) and the T.E.V. into the evaporator and cools the chamber. When the chamber is near the set point the controller begins to cycle 1-SOL on and off. When 1-SOL is turned off, 4-SOL is energized allowing refrigerant to by-pass back to the suction line.

Mode: Humidity

When Dehumidification is called for, Solenoid H-11 SOL is energized. The refrigerant passes through a solenoid valve (item H27) and a Wet Coil capillary tube (item H23). Two phase refrigerant exits the Capillary tube and enters the wet coil (item H25). The wet coil is cold enough to attract water from the chamber air, but not cold enough to freeze the water on the coil. The temperature of the coil is regulated by a pressure regulating E.P.R. valve (item H26). The E.P.R. valve is set at 68 psig (4.7 barG) which corresponds to a 29°F (-16°C) wet coil temp. The warm chamber air keeps the moisture from freezing on the coil. The refrigerant enters the suction line and returns to the compressor

When humidity is called for, Solenoid H-11 SOL is de-energized.

For Dry Bulb Temperature cooling in humidity mode, 1-SOL is energized. This allows refrigerant to flow through the R-404A T.E.V. into the evaporator, which cools the chamber. When 1-SOL is off, 4-SOL is energized allowing refrigerant hot gas to by-pass back to the suction line.

For Dry Bulb Temperature heating, solenoid 1-SOL is de-energized and 4-SOL is energized, acting a by-pass for the refrigeration circuit. The heaters are activated to warm the chamber.

CASCADE UNIT - SYSTEM 1 (R-404A) DESCRIPTION

Refer to Refrigeration Diagram in Drawing Section
NOTE: Pressure settings are approximate.

The compressor (item 1) will pump compressed R-404A vapor through the discharge line where the high pressure gauge displays the pressure of the refrigerant. The high pressure switch (item 95 or item 100) senses the discharge refrigerant pressure and will open a contact in the event that discharge pressure exceeds 350 psig. This contact opening will serve to shut down the unit and will automatically reset when the pressure drops to 250 psig (17.2 barG). The discharge refrigerant vapor enters the condenser.

The condenser (item 5) cools the high pressure R-404A vapor and condenses it into a high pressure liquid. If the condenser is air-cooled, the condenser fan motor will be energized anytime System 1 is running. If the unit is water-cooled, the discharge pressure regulator (item 7) will maintain the discharge pressure at approximately 210 psig (14.5 barG).

High pressure liquid refrigerant exits the condenser and the liquid flows through a receiver (water-cooled units and 1 - 1.5 units only), filter-drier, sight glass, and into the T.E.V. (item 11) where it changes to a low pressure two-phase refrigerant. The two phase refrigerant is cold due to the flashing of refrigerant. It enters the cascade condenser (item 13) where the heat from system 2 boils the rest of the R-404A into a vapor. The cascade condenser serves as the evaporator for system 1. If humidity is called for, some of the R-404A refrigerant is diverted to the humidity loop prior to entering the T.E.V. See humidity loop section below for description. Superheated R-404A vapor exits the cascade condenser and moves through the system 1 suction line. A service valve is located near the compressor.

Humidity Loop (Optional Equipment)
When Humidity is called for, the unit runs as a single-stage unit and not a cascade. High-pressure liquid refrigerant from the condenser, is diverted into two separate paths.

The first path is to the liquid-line solenoid (item H49) that feeds liquid refrigerant to the capillary tube (item H50). The pressure of the refrigerant drops through this capillary tube due to friction and the acceleration of the refrigerant. The refrigerant exits the capillary tube a two-phase mixture as some of the refrigerant has now flashed into vapor. The refrigerant enters the evaporator coil (item 52) and leaves a superheated vapor to the suction line.

The second path is to the humidity coil solenoid (item H27) that feed liquid refrigerant to the humidity coil capillary tube (item H23). Two-phase refrigerant exits the capillary tube and enters the wet coil (item H25). The wet coil is cold enough to attract moisture from the chamber air, but not allowed to get cold enough to freeze the moisture on the coil. The temperature of the coil is regulated by a pressure regulating E.P.R. valve (item H26) and is intended to be a flooded coil by design. The E.P.R. valve is set at 68 PSIG (4.7 barG), which corresponds to a 29˚F/-16°C wet coil temperature. The warm chamber air keeps the moisture from freezing on the coil. After the E.P.R. valve there is a check valve (item H28) that keeps refrigerant from migrating to the wet coil when the humidity mode is inactive. The refrigerant leaves the check valve and enters the suction line, where it remixes with rest of the refrigerant from the first path.

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CASCADE UNIT - SYSTEM 2 (R-508B) DESCRIPTION

The compressor (item 41) will pump compressed R-508B vapor through the discharge line where the high pressure gauge senses the pressure of the refrigerant. The high pressure switch (item 95) senses the discharge refrigerant pressure and will open a contact in the event that discharge pressure exceeds 350 psig This contact opening will serve to shut down the unit and will automatically reset when the pressure drops to 250 psig (17.2 barG).

The discharge refrigerant vapor passes through the oil separator; the oil separator (item 45) removes the oil in the refrigerant vapor. It collects the oil and drains it back to the compressor crankcase. This prevents oil logging in the evaporator. This discharge vapor then passes through the desuperheating loops. If the unit is air-cooled, the desuperheater (item 45), is part of the air-cooled condenser (item 5). If the unit is water-cooled, the
desuperheater is a separate component. The discharge refrigerant vapor then enters the cascade condenser.

The cascade condenser (item 13) cools the high pressure R-508B vapor and condenses it into a high pressure liquid.

High pressure liquid refrigerant exits the cascade condenser. The liquid flows through a filter-drier and enters a tee. The tee will divert some of the liquid refrigerant to be used in the bypass circuit (see last paragraph of this section). The rest of the refrigerant passes through the liquid line solenoid valve (item 49) and into the T.E.V. (item 50) where it changes into a low pressure two-phase refrigerant. The two phase refrigerant is cold due to the flashing of refrigerant. It enters the distributor (item 51) where the refrigerant is evenly distributed to the evaporator circuits. The evaporator (item 52) serves to boil the rest of the R-508B into a vapor. This boiling action cools the chamber. System 2 is not in operation during humidity mode.

Superheated R-508B/R-23 vapor exits the evaporator and moves through the system 2 suction line. A service valve is located near the compressor.

The bypass circuit is composed of two lines in parallel. The Hot Gas Bypass Line, and the Liquid Injection Line. The hot gas bypass line consists of a solenoid valve (item 62) and Hot Gas Bypass Regulator (item 63). The liquid injection line consists of a Liquid Injection T.E.V. (item 61). The hot gas bypass solenoid (item 62) will open and close opposite of the liquid line solenoid (item 49). It will allow hot discharge refrigerant vapor to flow directly to the suction line. This is done as a means to control cooling capacity or to “unload” the system. The liquid injection T.E.V. will sense the temperature of the suction line. It will open automatically to feed liquid refrigerant into the suction line. This will provide cooling for the hot gas that is being fed into the suction line. The cooling effect keeps the compressor from overheating.

On cascade systems using scroll compressors, there is also a discharge temperature control valve (item 78). This DTC valve receives liquid refrigerant from the liquid line and injects it into the scroll compressor. This prevents the compressor from overheating and results in no loss of capacity or mass flow.

CASCADE CONTROL SYSTEM

Refer to Refrigeration Diagram in Drawing Section

Mode: Normal cooling/heating

When there is call for cooling the R-508B liquid line solenoid (2-SOL) energizes, and the R-404A compressor turns on. Thirty seconds later the R-508B compressor turns on. High pressure switches (1 & 4 PS) will turn off the compressors if a high discharge pressure is reached on either system. Contact Cincinnati Sub-Zero's service department if this occurs. The high pressure switches automatically reset.

When there is a call for cooling 2-SOL is energized. When the chamber is near the set point the controller begins to cycle 2-SOL on and off. If the controller does not call for cooling for ninety seconds the refrigeration system will turn off.

For heating, solenoid (2-SOL) is de-energized and the heaters are activated.

Mode: Humidity (Optional Equipment)

In humidity mode the unit runs as a single stage system. The R-404A compressor turns on. A high pressure switch (1-PS) will turn the compressor off if a high discharge pressure is reached. Contact Cincinnati Sub-Zero's service department if this occurs.

When cooling is called for, solenoid H-1 SOL is energized allowing refrigerant to flow to the evaporator coil. When the chamber is near the dry bulb temperature set point, the controller begins to cycle H-1 SOL on and off. When Dehumidification is called for, solenoid H-11 SOL is energized allowing refrigerant to flow to the wet coil. When humidity is called for, solenoid H-11 SOL is de-energized.

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START-UP INSTRUCTION SUMMARY

The standard controller installed on MC-Series units is the CSZ EZT-430S. Optional controllers, including the Watlow F-4 and the CSZ EZT-570S are also available. Specifications for the controller may be found in the individual controller's manuals, located on the digital media included in this binder.

WARNING

Do not connect unit to a GFI Circuit Breaker.

The controller on both the MCB(H) and MC(H)-3 units, is on whenever the chamber is supplied with power.

1. Load your test sample into the chamber.
2. Enter the Single Setpoint Operation Temperature/humidity (optional).
3. Turn **ON** the conditioning and/or humidity (optional) system.

SUMMARY FOR STEP-BY-STEP SET-POINT OPERATION - EZT-430S CONTROLLER

These instructions will enable the operator to use the EZT-430S Controller in a single set-point operation. The User's Manual for the EZT-43S Controller (found on the digital media that accompanied your unit) should be reviewed for more detailed operation.

NOTE

Any changes to the CSZ configurations programmed in the temperature controller or safety limit without prior authorization by CSZ could void warranty. Related issues and costs associated from the changing of these configuration settings could be deemed customers responsibility. Call factory prior to changing these configurations.

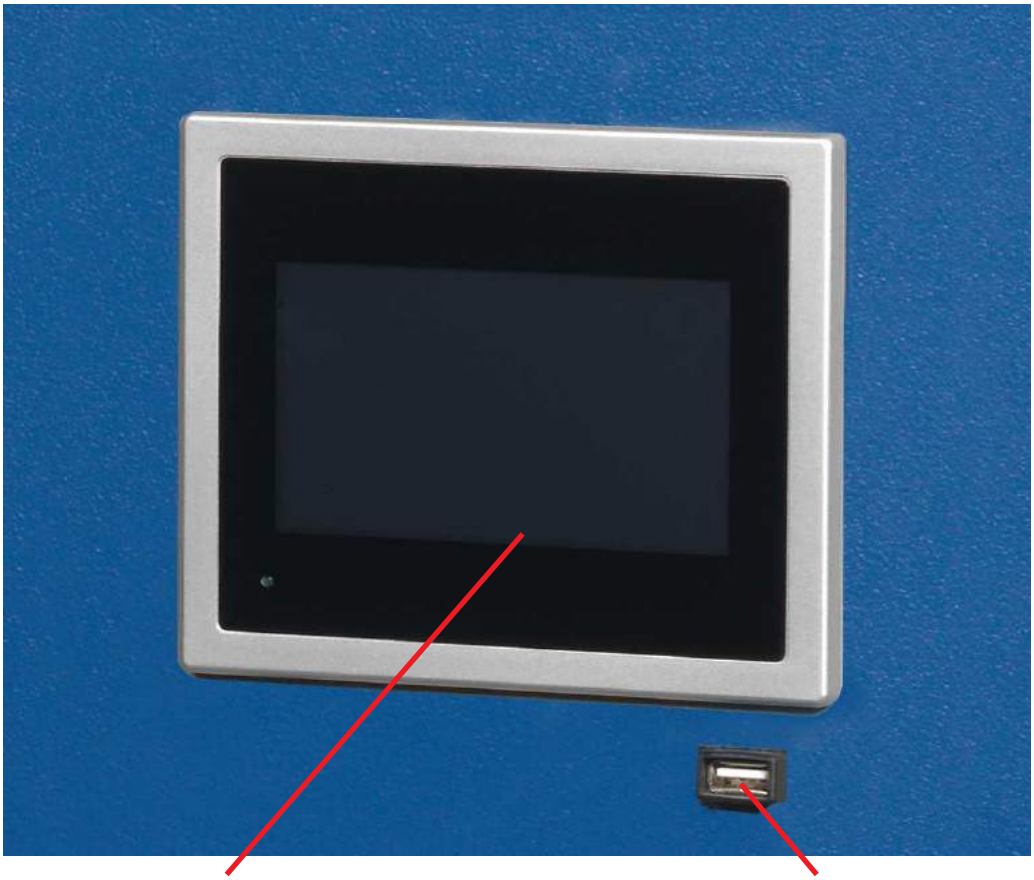


Figure 1. CSZ EZT-430S Controller Section

Note: CSZ is continuously upgrading the components used in its equipment. Consequently, the physical appearance of certain components may vary from that shown.

SINGLE SETPOINT OPERATION - TEMPERATURE/HUMIDITY

1. Press the numeric setpoint for temperature or humidity, the setpoint adjust key pad will be shown on the screen. Enter the desired setpoint.

2. Turn on the conditioning/humidity system by pressing the Manual Operation button then, turning ON/ OFF the corresponding “event” switch (see manual event control).

EVENT CONTROL

Events are the “switches” used to turn the digital outputs of the EZT-430S loop controls on and off. These events can be manually turned on and off as well as programmed into automatic ramp/soak programs so that they can be turned on and off at set time intervals.

AUTOMATIC RAMP/SOAK PROGRAM OPERATION

The following section covers the basics on how to create a new automatic ramp/soak program, running a previously saved program and stopping a currently running program. For further instruction on automatic ramp/soak programs, reference the Automatic Ramp/Soak Program Operation section in the provided EZT-430S User Manual.

Sample profiles have been provided from CSZ preloaded on the EZT-430S controller in order to provide an example of a completed profile.

Creating a New Automatic Ramp/Soak Program (Icon Based Navigation)
To create a new automatic ramp/soak program from the home screen, press the Program Operation button, then select the Edit icon.

Once at the Program Entry screen, use the following instructions for programming an automatic ramp/soak program:

1. Enter the number of steps for the program you want to create.

   Note: *The number of steps can be changed at any time while programming a profile in order to shorten or lengthen the profile as required. Profiles can be from 2 to 64 steps in length.*

2. Designate the desired ramp and soak time intervals by selecting the drop-down and selecting either hh.mm for hours and minutes or mm.ss for minutes and seconds.

3. To scroll between each step, select the right arrow to go to the next step or select the left arrow to go to the previous step.

4. Select the Event button(s) to enable the specific events for the designated step.

5. Repeat the instructions 2 – 4 for all steps to be programmed.

When the program has been completed, the program must be saved prior to being run on the controller. To save the newly created program, select the File icon, and select Save As. Select the field next to File Name and enter the name for the program by using the keyboard that is displayed. When the name has been successfully entered, select Done to close the keyboard then select Save to save the program.

With the profile saved, the display will change to the Program Entry screen with the currently saved program displayed.

Running a Saved Automatic Ramp/Soak Program (Icon Based Navigation)
To run a previously saved profile from the home screen, select the Program Operation button, then the Select icon.

With the file window open, select the program to be run, then press the Done button.

After selecting the desired profile, the selected file name will be displayed on the Program Operation window and the Home screen display.
Press the Run button to load/run the displayed program. The display will change the Program Start screen. The start step can be adjusted up and down by pressing the right/left arrow buttons or by pressing the step number field and directly entering the desired start step via the numeric keypad. The default start program step is 1. Once the desired start step number is entered, press the “Start” button. The program will then be transferred to the loop control(s) and started once the transfer is complete.

Note: *If a program is already loaded, the user can start the program without entering a start step. This offers a quick start/stop of programs for repetitive test operations. In this case, the program will always start from step 1.*

Hold/Resume Ramp/Soak Program Operation (Icon Based Navigation)

At any time during the operation of a program, it can be manually placed into hold. This stops the program timer; however, the EZT-430S continues operation under the current step settings at the time the program was put into hold. To pause a program, select “Hold” from the Program menu. To resume the program from the point in which it was paused, select “Start” from the Program menu.

NOTE: *The program will automatically be placed in hold if holdback is enabled for the step and the process value of the selected loop deviates from set point by more than the holdback band. When the program is in holdback, it cannot be resumed by pressing the Run button. The program will automatically resume once the process value of the selected “hold loop(s)” is within the holdback band from set point.*

To Stop a Running Automatic Ramp/Soak Program (Icon Based Navigation)

To stop a currently running program press the Program Operation button. Once in the Program Operation, press the Stop button. Select Yes in the Halt Automatic Program pop-up.

NOTE

If other devices are used to measure humidity or temperature within the chamber, such as a chart recorder (optional), the temperature readings between the chamber controller and the chart recorder will vary slightly due to the tolerances between the two devices and their individual sensing elements.

CHAMBER PERFORMANCE

The performance of your chamber is significantly effected by the characteristics of your test sample. Factors include size, material, shape, weight and power dissipation if energized. The test sample should be placed in the chamber in a manner that allows proper ventilation. Air flow enters in the top left of the plenum and exits the top right.

HIGH/ LOW LIMIT CONTROL (OPTIONAL)

If the chamber is operated with a live load (heat dissipating product), protection should be provided. Provisions must be made to remove power from the product being tested and from the chamber in the event the chamber temperature exceeds safe limits for the product being tested. When testing a dead load (non-heat dissipating product), protection need only remove power from the chamber.

The High/Low Limit Control shuts down the chamber and product under test operation if the preset temperature limits are exceeded. Should the temperature go beyond these limits, an audible alarm sounds and the chamber shuts down. The Limit Control is a high and low limit control. It accepts an input from a single Type "T" thermocouple to sense process temperature. An LED display provides process temperature or limit set point information. Discrete LEDs tell the operator the status of the unit. High and low limit set points are user selectable at the front of the panel. The output device is a six amp mechanical relay. The High/Low Limit Control incorporates auto power reset. In a non-limit condition, auto power reset will automatically energize the output relay and silence the audible alarm when power is applied. If a limit condition exists, the output relay will latch in a de-energized state and the audible alarm will sound. The output relay can be re-energized and the audible alarm silenced by the front panel "Reset" switch being depressed one time only when the limit condition no longer exists. The "Reset" should be depressed a second time to reset the alarm. The limit has three alarms that must be set up the same to energize all alarm contacts at the same conditions. Alarm 1 shuts down the chamber. Alarm 2 sounds the audible alarm. Alarm 3 is used to de-energize the test product.

NOTE

The following start-up instructions are written for the Watlow F4 Controller. For optional controller, please refer to Specific Instructions in the controller manual.

SUMMARY FOR STEP-BY-STEP SET-POINT OPERATION - F4 CONTROLLER (Optional)

These instructions will enable the operator to use the Watlow F4 Programmer/Controller in a single set-point operation. The User's Manual for the Watlow F4 Programmer/Controller (found on the digital media that accompanied your unit) should be reviewed for more detailed operation.

Single Set-Point Operation - Temperature

1. For 115V units, plug the chamber into the proper electrical receptacle.

   On MCBH units this will supply power to the Watlow F4 Controller, Product Hi/Low Limit (optional) and chamber light (optional). The Watlow F4 controller will turn on immediately and perform a 5-10 second self test. Wait for completion of self test. For MCH-3 units, turn on the main power switch on the front of the chamber to supply power to the controller.

2. On MCBH units the system is turned ON/OFF through digital output #1. To turn the conditioning system ON/OFF:

   Use the ▲ ▼ up and down arrow keys to navigate through the lower display and place the arrow cursor on the digital out field.

   a. Use the ► right arrow key to enter the digital out field.
   b. Use the ► right arrow key to Event output 1.
   b. Use the ▲ ▼ up and down arrow keys to select ON/OFF.
   b. Use the ► right arrow key to set the system ON/OFF.
   c. Use the ◄ left arrow keys to exit the digital outfield and return to the main page.

3. Use the arrow keys (up & down) to change the temperature set-point as follows:

   Use the ▲ ▼ up and down arrow keys to navigate through the lower display and place the arrow cursor on setpoint 1.

   a. Use the ► right arrow key to enter the setpoint field.
   b. Use the ▲ ▼ up and down arrow keys to change the setpoint.
   c. Use the ► ◄ right or left arrow keys to exit the setpoint field.

4. To turn on the humidity system, follow steps 2 and 3 above to turn on digital output 2 for humidity and adjust setpoint 2 for humidity.

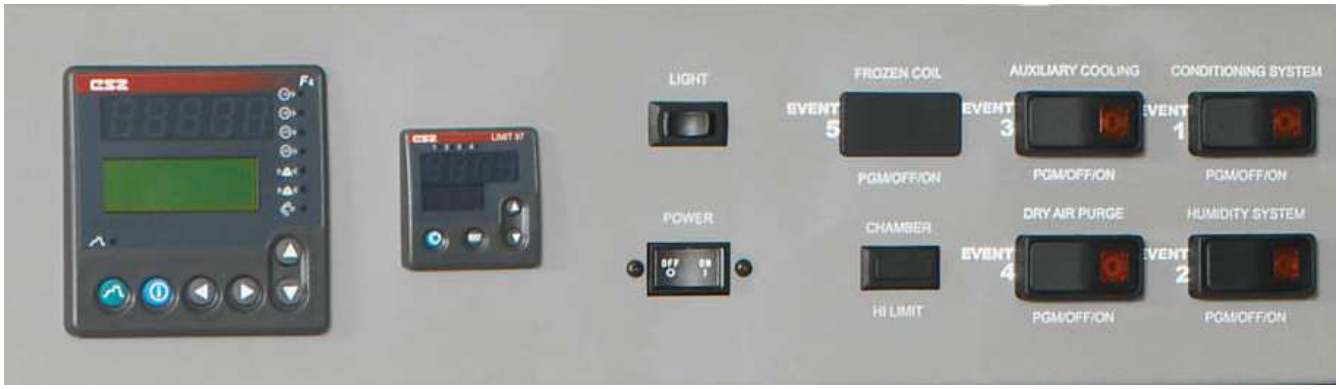


Figure 2. Watlow F4 Controller Section

NOTE

For MCH-3 units, you can manually turn on the conditioning system using the switch on the front of the chamber. If desired, the switch can be placed in program mode. This allows the digital output of the F4 to control the conditioning system.

CAUTION

When running a programmed profile the end step must HOLD the final temperature. If other end step option are chosen the unit will Pull-Down chamber temperature to maximum low temperature. MC-3 = -68°C

NOTE

The following start-up instructions are written for the F4 Controller. For optional controllers, please refer to Specific Instructions in the controller's manual.

Note: CSZ is continuously upgrading the components used in its equipment. Consequently, the physical appearance of certain components may vary from that shown.

SINGLE SET-POINT OPERATION - HUMIDITY

NOTE

Humidity performance will be affected if live loads are placed in the chamber when trying to achieve certain humidity levels.

NOTE

When running at high humidity levels for an extended period of time, the tip of the humidity sensor can become saturated, resulting in erroneous readings. To correct this condition, it is recommended that the tip be dried out by turning the humidity system off and raising the temperature to 250ºF/121°C for 10 minutes. The sensor accuracy will be restored by evaporating the water out of the porous cover over the sensing element.

1. The Humidity system is turned ON/OFF through digital output #2. To turn ON/OFF the humidity system:

   Use the ▲ ▼ up and down arrow keys to navigate through the lower display and place the arrow cursor on the digital out field.

   a. Use the ► right arrow key to enter the digital out field.
   b. Use the ► right arrow key to Event output 2.
   b. Use the ▲ ▼ up and down arrow keys to select ON/OFF.
   b. Use the ► right arrow key to set the system ON/OFF.
   c. Use the ◄ left arrow keys to exit the digital outfield and return to the main page.

2. Use the arrow keys (up & down) to change the humidity set-point as follows:

   Use the ▲ ▼ up and down arrow keys to navigate through the lower display and place the arrow cursor on setpoint 2.

   a. Use the ► right arrow key to enter the setpoint field.
   b. Use the ▲ ▼ up and down arrow keys to change the setpoint.
   c. Use the ► ◄ right or left arrow keys to exit the setpoint field.

3. When returning to temperature only operation, turn the humidity system off. Failure to do this will result in the unit not reaching low temperatures.

4. Verify that the demineralizer cartridge is fresh. The color of the cartridge should be dark.

CHAMBER PERFORMANCE

The performance of your chamber is significantly effected by the characteristics of your test sample. Factors include size, material, shape, weight and power dissipation if energized. The test sample should be placed in the chamber in a manner that allows proper ventilation. Air flow enters in the top left of the plenum and exits the top right.

START-UP INSTRUCTION SUMMARY (EZT-570S CONTROLLER)

The control section, illustrated in Figure 1, is composed of a CSZ EZT-570S Controller. Specifications for the Controller are in the EZT-570S User's manuals found on the digital media that accompanied your unit.

NOTE

The following start-up instructions are written for the CSZ EZT-570S Controller. For optional controllers, please refer to Specific Instructions in the controller's manual.

NOTE

Humidity performance will be affected if live loads are placed in the chamber when trying to achieve certain humidity levels.

Figure 3. CSZ EZT-570S Controller Section

NOTE

When running at high humidity levels for an extended period of time, the tip of the humidity sensor can become saturated, resulting in erroneous readings. To correct this condition, it is recommended that the tip be dried out by turning the humidity system off and raising the temperature to 250ºF/121°C high temp (max Walk-In temp is only 185ºF/85°C) for 10 minutes. The sensor accuracy will be restored by evaporating the water out of the porous cover over the sensing element.

NOTE

Any changes to the CSZ configurations programmed in the temperature controller or safety limit without prior authorization by CSZ could void warranty. Related issues and costs associated from the changing of these configuration settings could be deemed customers responsibility. Call factory prior to changing these configurations.

Note: CSZ is continuously upgrading the components used in its equipment. Consequently, the physical appearance of certain components may vary from that shown.

PUMPDOWN

Chambers with large horsepower refrigeration systems have an automatic mode of operation called “pumpdown”. The refrigeration system is in this mode whenever it is not running to cool or dehumidify the chamber. In pumpdown mode, the system 1 compressor will automatically turn on and off at preset pressures in order to force refrigerant into the high side of the system. This serves as a means to protect the compressor on start-up.

If pumpdown was not used, refrigerant could migrate throughout the system and accumulate, typically in the coldest location like the compressor crankcase. On start-up, this refrigerant could then enter the compressor as a liquid and cause permanent damage to the compressor. In addition, a crankcase heater is installed on the compressor in order to heat the oil in the crankcase of the compressor. This helps boil out any refrigerant, so that it can be pumped into the high side of the system.

If the chamber is equipped with the pumpdown mode of operation, the “Pumpdown” button will be provided on the Alarm Monitor screen. This provides a manual way to reset pumpdown mode. Pumpdown will be automatically disabled if main power is off for more than 30 minutes. This is due to the fact that without main power, the crankcase heater will be off and can not warm the compressor. Depending on the temperature of the compressor, this could allow refrigerant to accumulate in the compressor causing a potentially damaging start-up.

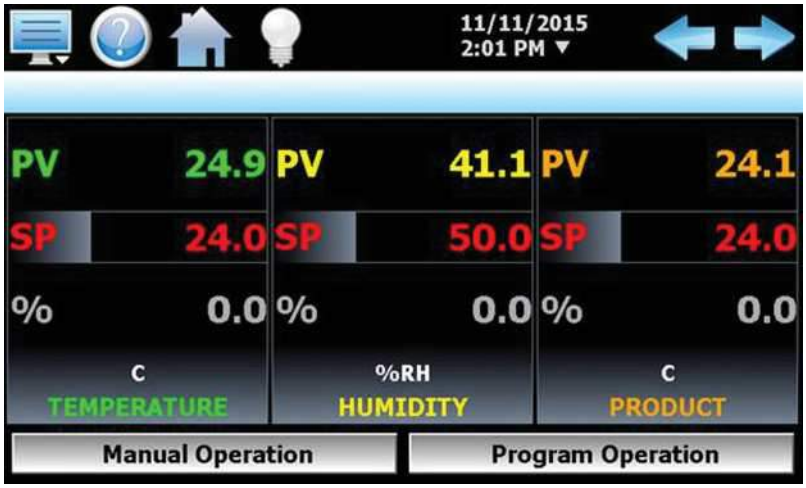
NOTE

Prior to starting the four (4) hour pumpdown cycle, please confirm that the scroll compressors are operating in the proper rotation.

The “Pumpdown Disabled” alarm will notify the operator of this condition.
The chamber will not operate when pumpdown is disabled. Pumpdown will automatically reset after the main power has been on for a period of 4 hours or it can be reset at any time by pressing the “Pumpdown” button.

If your chamber is equipped with pumpdown, main power should remain on at all times. If power is removed for extended periods of non use, DO NOT reset pumpdown after power is applied to the unit. Only silence the alarm. Allow for the 4 hour warm-up period prior to use or damage to the compressor may result.

SINGLE SET POINT OPERATION



To adjust the setpoint:

1. Select one of the loop views from the main View menu.

2. Input the setpoint temperature.

   Press the numeric display for the setpoint (SP) for temperature. The setpoint adjust keypad will be shown on the screen. Enter the desired setpoint value and press the “Enter” button.

3. Turn the Chamber event on to start the chamber, see manual event control.

MANUAL EVENT CONTROL (TURNING THE CHAMBER ON/OFF)

Events are the “switches” used to turn the chamber, its related functions, and optional systems on and off. These events can be manually turned on and off as well as programmed into profiles so that they can be turned on and off at set time intervals.

To turn the chamber and optional events on/off:

1. Select “Manual Operation” from the main View menu.

2. To turn the events on or off, touch the slide switch.

PROFILE OPERATION

To create and run programs on the EZT-570S, see Chapter 4 of the EZT-570S User Manual

Sample profiles have been provided by CSZ preloaded on the EZT-570S controller in order to provide an example of a completed profile.

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PREPARATION FOR USE

1. Inspect all equipment for damage that may have occurred during shipment. **Contact Cincinnati Sub-Zero immediately if any shipping damage is noticed.**
2. Ensure that all packing materials have been removed from all parts.
3. Read this manual in its entirety.
4. Select a suitable location for chamber.
   a. A minimum clearance of 12” (30.5 cm) must be maintained for proper ventilation around chamber.
   b. The chamber must be installed in an environment of 75ºF ±5ºF (+23ºC ±3ºC) with a maximum relative humidity of 95%, max altitude of 5000 ft (1524 meters) for proper operation.
   c. The chamber and its compressors must be level to ensure proper lubrication.
   d. The MCB-1.2 gives off approximately 7,000 BTU/HR of heat to the room. The MC-3 gives off approximately 9,000 BTU/HR (1/2 HP) AND 12,000 BTU/HR (1 HP) of heat to the room.
   There must be a means of removing this heat to keep the chamber environment within specification.

WARNING

Only **qualified maintenance personnel** should be permitted to perform any maintenance or installation procedures.

WARNING

Do not locate system in an area near flammable or toxic material. Failure to follow these instructions may result in serious personal injury.

LIFTING INSTRUCTIONS

MC3(H)

Unit lifting points are designated with fork lift labels. DO NOT attempt to lift this chamber manually.

MCB

The MircoClimate Benchtop Chamber weighs approximately 400 lbs (181 kg). It is recommended that a portable electric hoist or similar device be used to lift the unit into position so it can be installed on a sturdy table, workbench, or similar structure.

Lifting the unit into position by hand is not recommended with less than three (3) people.

NOTE

In moving or relocating the chamber, never tip the unit more than 45 degrees without instructions from Cincinnati Sub-Zero.

MAIN POWER CONNECTION

1. Connect to the power source per electrical schematic.

The main power and supply wiring must be connected per the NEC, CEC or any other applicable local and national codes or regulations.

For permanent connected and multi-phase equipment, a switch or circuit breaker must be included in the installation. It must be suitably located and easily reached and must be marked as the disconnecting device for the equipment.

A main power disconnect must be provided with a time delay fused switch or circuit breaker with ampere rating of that specified in (Table 1) for the particular unit being connected. The switch or circuit breaker must remove power from all ungrounded conductors, and shall not interrupt the protective earth conductor

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WARNING

Do not connect unit to a GFI Circuit Breaker.

MODEL NUMBER	POWER REQUIREMENTS
MCB-1.2-.33-H/AC	115V (±5%), 1 Phase, 60 Hz, 20 amps
MCBH-1.2-.33-H/AC	115V (±5%), 1 Phase, 60 Hz, 20 amps
MCB-1.2-.33-.33-H/AC	115V (±5%), 1 Phase, 60 Hz, 20 amps
MCBH-1.2-.33-.33-H/AC	115V (±5%), 1 Phase, 60 Hz, 20 amps
MCBH-1.2-.33-.33-H/AC	230V (±5%), 1 Phase 50 Hz, 16 amps
MC-3-.33-.33-H/AC	115V (±5%), 1 Phase, 60 Hz, 20 amps
MCH-3-.33-.33-H/AC	115V (±5%), 1 Phase, 60 Hz, 20 amps
MC3-.50-.50-H/AC	208/230V (-0%, ±5%), 1 Phase, 60 Hz, 30 amps
MC3-.50-.50-H/AC	220/240V (±5%), 1 Phase, 50 Hz, 30 amps
MC3H-.50-.50-H/AC	208/230V (-0%, ±5%), 1 Phase, 60 Hz, 30 amps
MC3H-.50-.50-H/AC	220/240V (±5%), 1 Phase, 50 Hz, 30 amps
MC(H)-3-1-1	208/230V (-0%, ±5%). 1 Phase, 60 Hz, 40 amps
MC(H)-3-1-1	220/240V (-0%, ±5%), 1 Phase, 50 Hz, 35 amps
MC(H)-3-1.5-1.5-H/AC	400Y/277V (±5%), 3 Phase, 50 Hz, 25 amps

Table 1. Power Requirements

SINGLE PHASE CORD CONNECTED EQUIPMENT

These units are cord connected only 60 Hz chambers that are rated for 20 amp outlets are supplied with a 3 conductor power cord with a 20A, 115V that are rated for 16 A outlets plug. The units should be connected to a dedicated 20A circuit. CE marked 50 Hz chambers are supplied with a 3 conductor cord with a 16A, 230V IEC60309 type plug, and should only be connected to a 16A circuit. Chambers that are not supplied with a cord and plug must have a properly rated cord and plug installed prior to energized the chamber.

THREE PHASE POWER CONNECTIONS

All incoming wires must be sized accordingly to the chambers specific electrical schematic or equivalent metric size must be used following all local and national codes for sizing incoming power wires.

L1 is connected to the IL1 distribution block on TB-1
L2 is connected to the IL2 distribution block on TB-1.
L3 is connected to the IL3 distribution block on TB-1.
Protective Earth conductor *must* be connected to the protective conductor terminal.

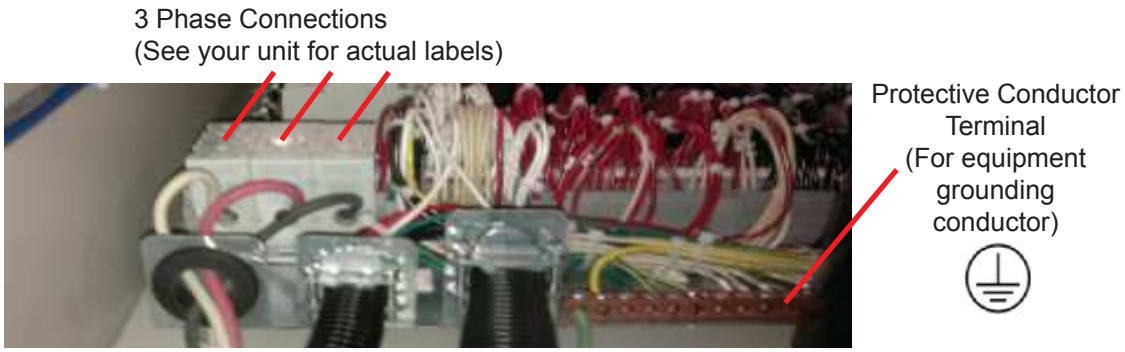

Figure 1. Power Distribution Block

Note: CSZ is continuously upgrading the components used in its equipment. Consequently, the physical appearance of certain components may vary from that shown.

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WARNING

Only **qualified maintenance personnel** should be permitted to perform any maintenance or installation procedures.

REMOVING TOP COVER OF CHAMBER (CE MARKED MC3(H) CHAMBERS ONLY)

High voltage remains present on the main electrical panel with the lid removed. Lock-out main power prior to installation or servicing following all applicable local and national codes and regulations.

Remove all of the screws fastening the lid to the top of the chamber. With the screws removed, the lid is only connected to the top of the chamber by a green/yellow protective bonding conductor. Use caution when lifting the lid so that the lid does not slide uncontrolled. The protective bonding conductor should never support the entire weight of the lid.

WARNING

Use caution when lifting the lid so that the lid does not slide uncontrolled

Lift the middle section of the left side of the lid (relative to the front of the chamber). Ensure that a proper grip is maintained so that the lid does not slide in any direction uncontrolled. Remove the nut that secures the protective bonding conductor located on the underside of the lid to the chamber using a nut driver. The lid can now be safely removed from the chamber. Prior to re-installing the lid, secure the green-yellow protective bonding conductor back the same grounding lug on the underside of the lid using a nut driver.

Figure 2. Top Cover Removal

WARNING

Maximum water inlet pressure is 172kPa for a boiler (This is not applicable for use with recirculating water option). Exceeding this pressure may cause catastrophic failure of the filter housing.

HUMIDITY SYSTEM (IF EQUIPPED)

Connect tap or deionized water to the humidity package on the left side of the unit. (If your chamber has recirculating water please see the humidity section in Chapter 2 of this manual for more detailed instruction)

Note: CSZ is continuously upgrading the components used in its equipment. Consequently, the physical appearance of certain components may vary from that shown.

MCB-1.2

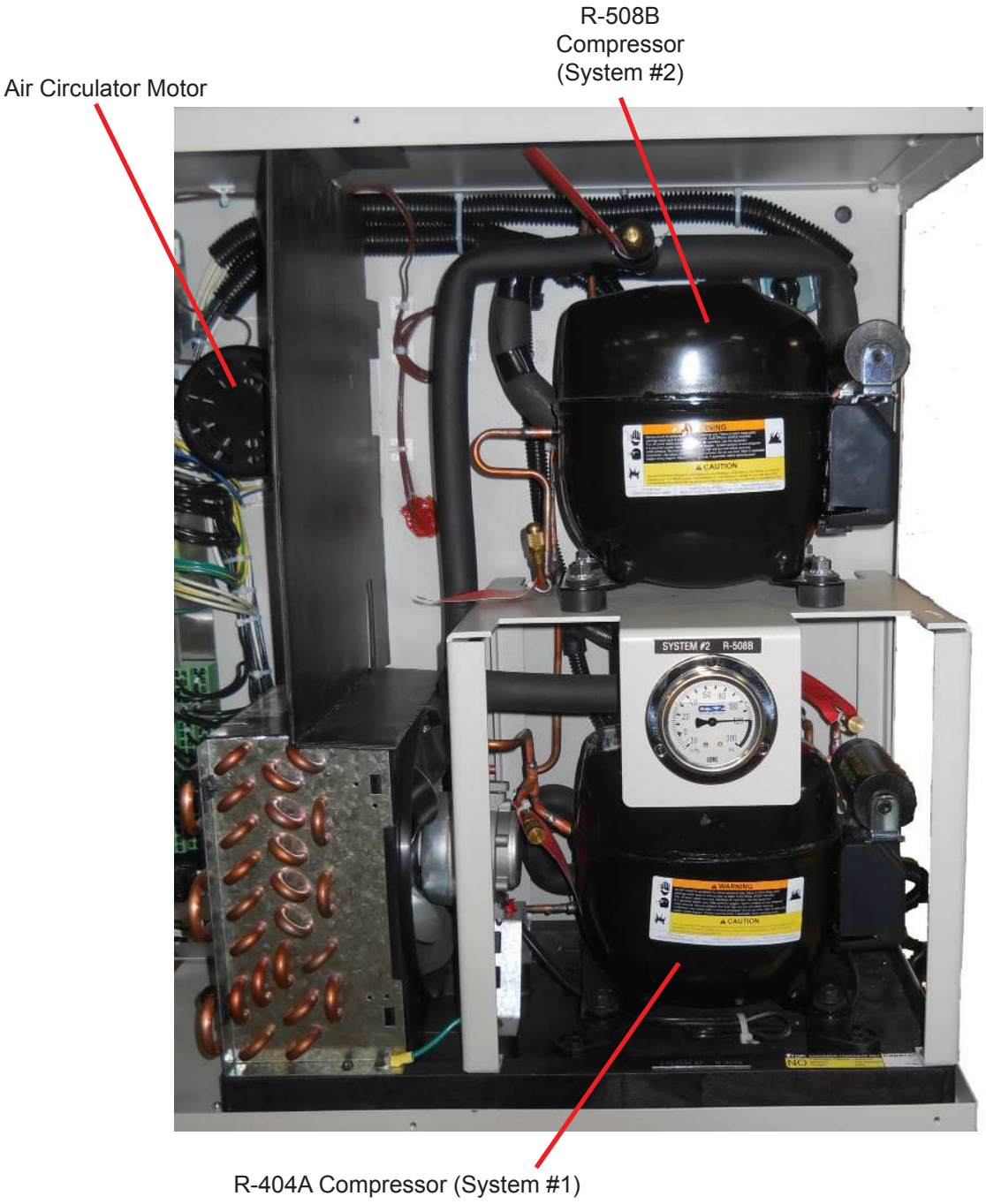


Figure 3. Refrigeration Power Pack MCB 1.2 (Cascade)

Note: CSZ is continuously upgrading the components used in its equipment. Consequently, the physical appearance of certain components may vary from that shown.

MCB-1.2

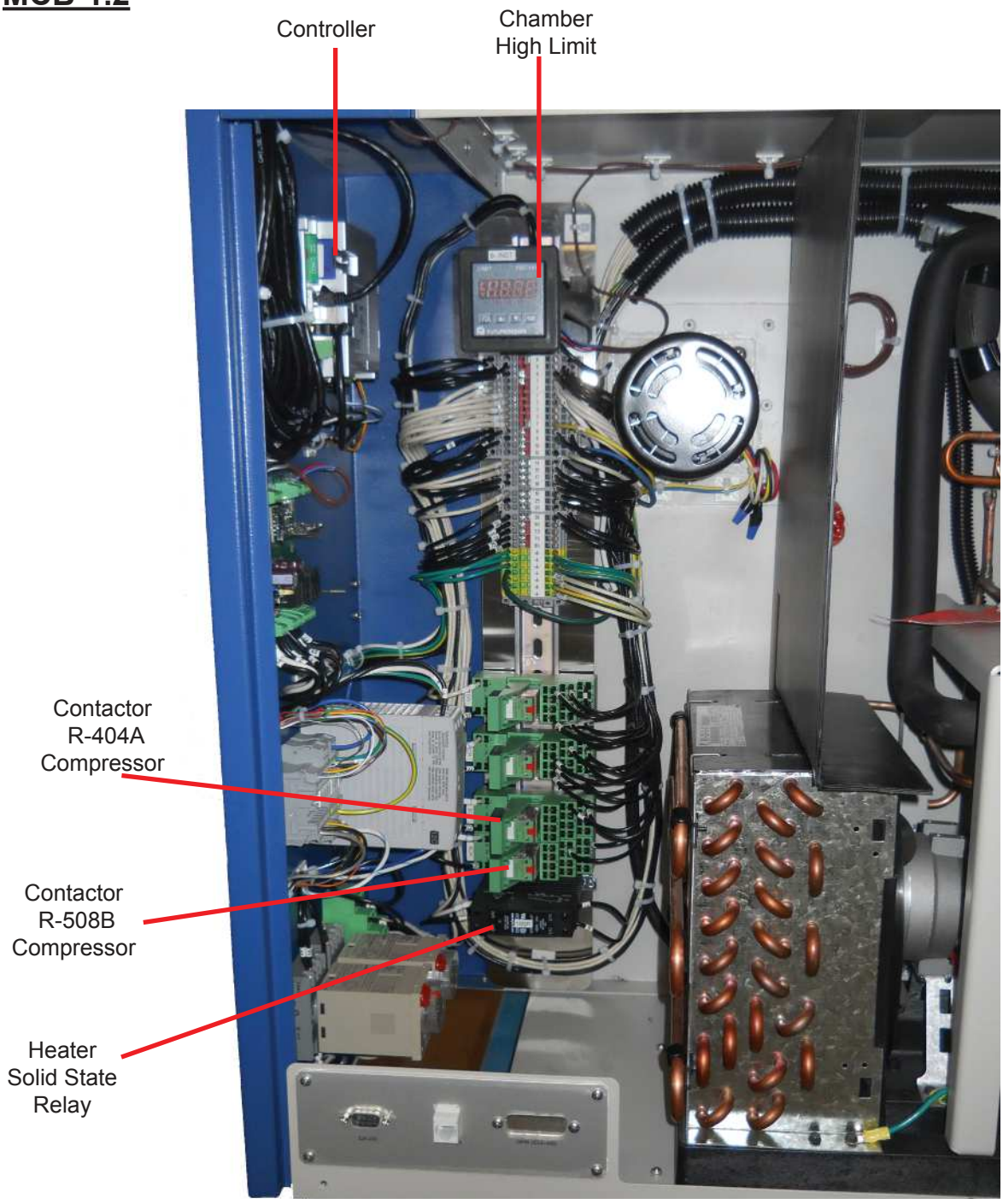


Figure 4. Main Power Wiring, MCB

Note: CSZ is continuously upgrading the components used in its equipment. Consequently, the physical appearance of certain components may vary from that shown.

MCBH-1.2

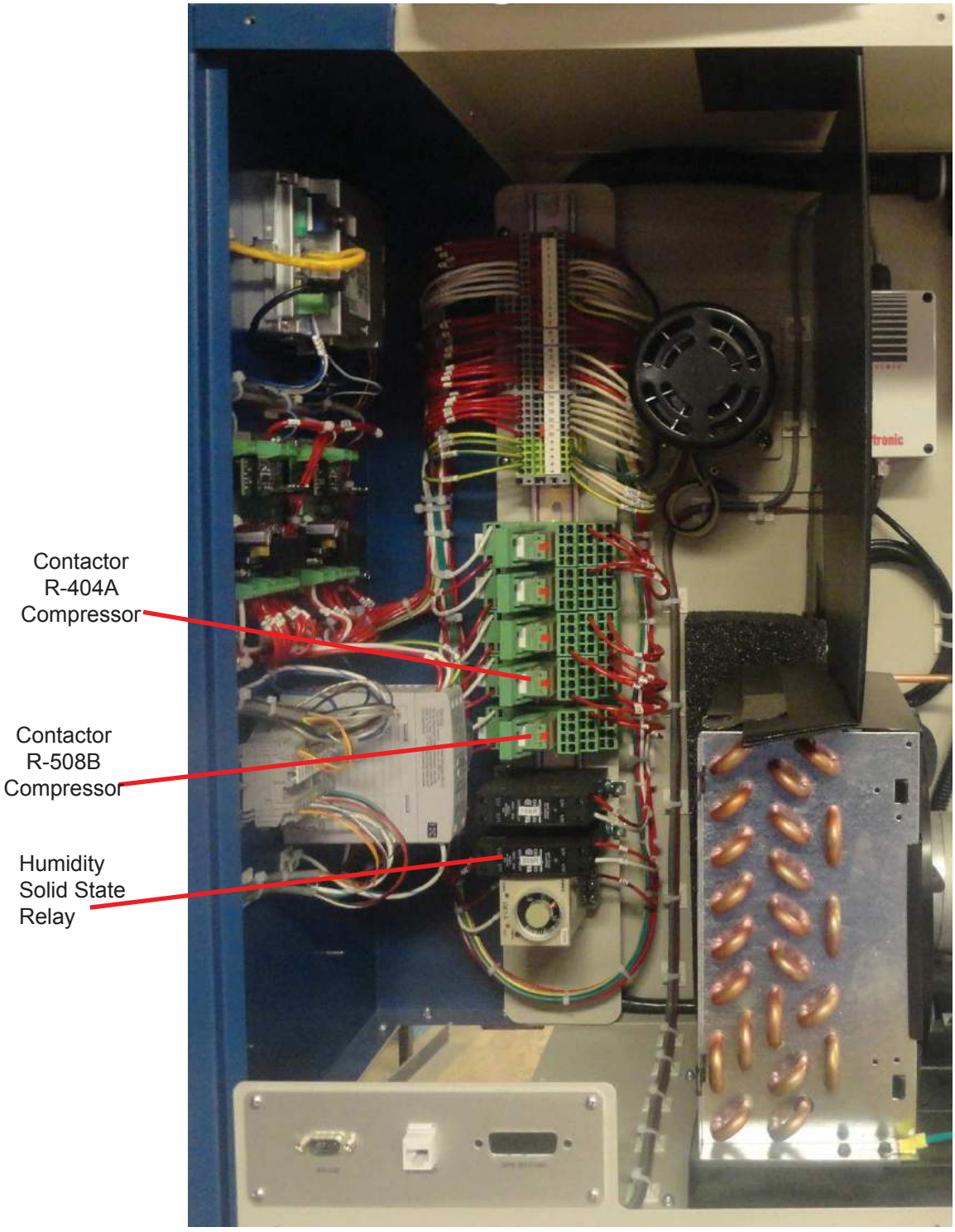


Figure 5. Main Power Wiring, MCBH

Note: CSZ is continuously upgrading the components used in its equipment. Consequently, the physical appearance of certain components may vary from that shown.

MC-3

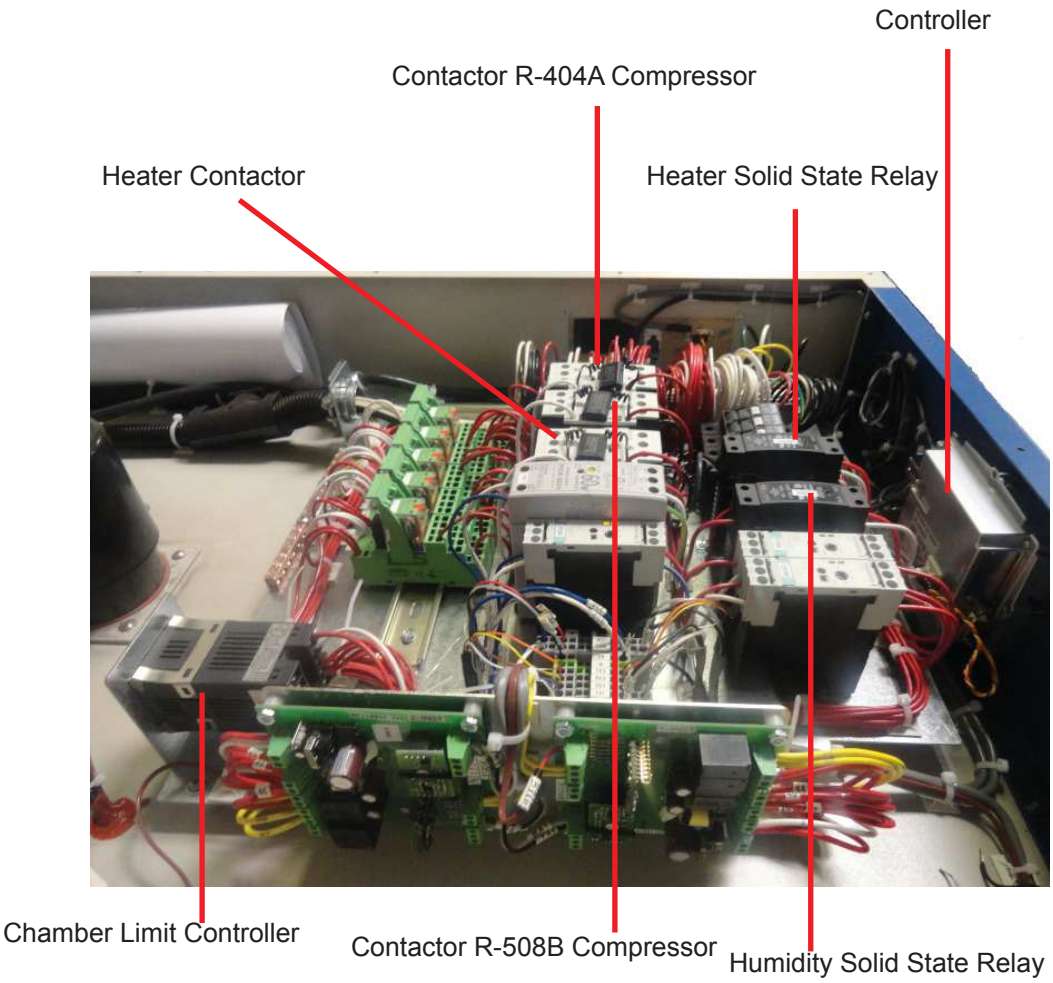
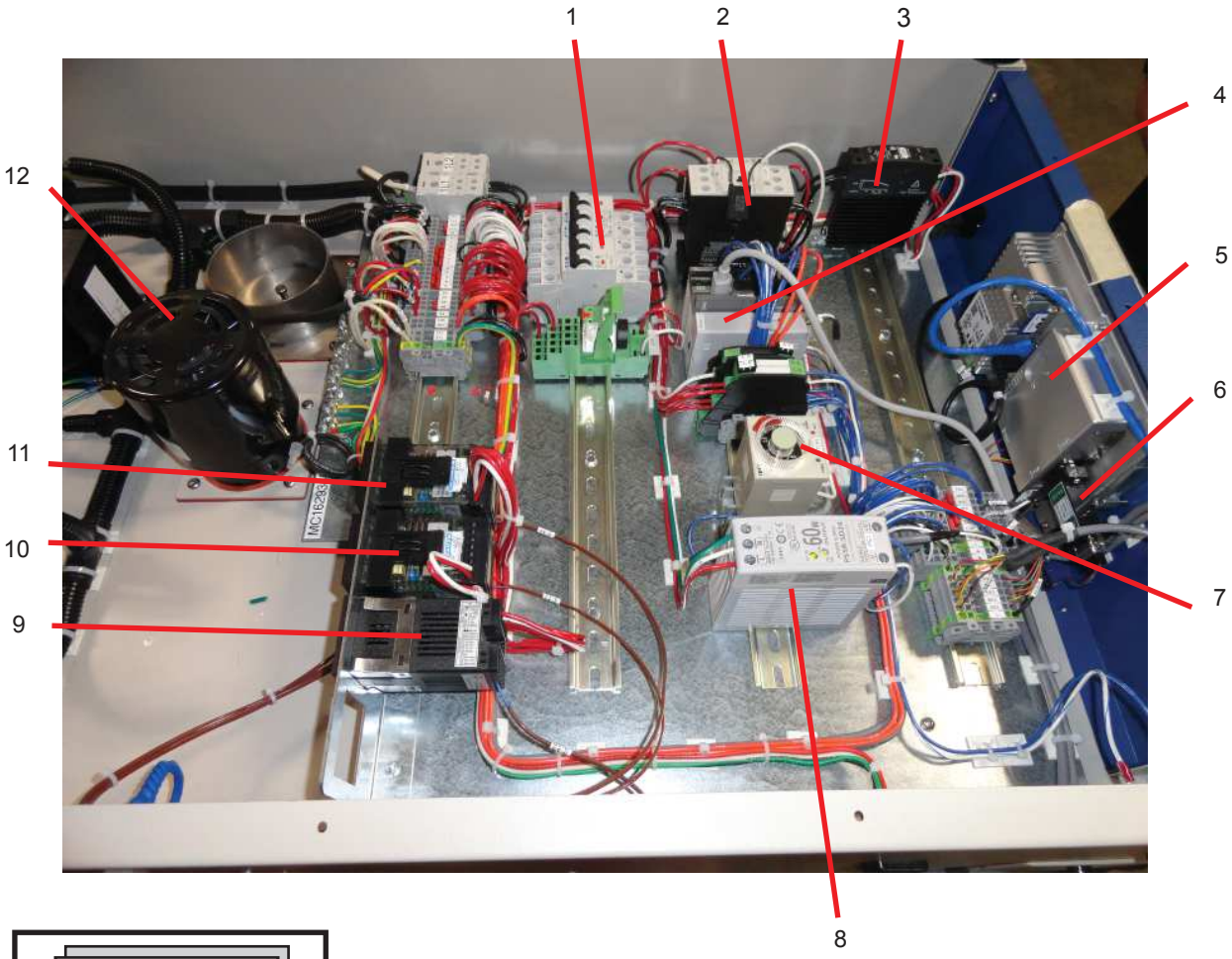


Figure 6. EZT 430S Main Power Wiring, MC-3

Note: CSZ is continuously upgrading the components used in its equipment. Consequently, the physical appearance of certain components may vary from that shown.

MC-3



NOTE

The number and placement of panel components will vary based on options purchased.

Figure 7. Main Power Wiring, MC-3 with EZT-570S Controller, No Humidity

1	Circuit Breakers	7	EZT Start-up Delay Timer
2	Contactor	8	24v Power Supply
3	Solid State Relay	9	Chamber Limit Controller
4	EZT-570S Control Module	10	Product Temperature Controller
5	EZT-570S Touchscreen Unit	11	Air Temperature Controller
6	RS-232 Isolator	12	Air Circulation Motor

Note: CSZ is continuously upgrading the components used in its equipment. Consequently, the physical appearance of certain components may vary from that shown.

MC-3

Figure 8. Refrigeration Power Pack MC-3

Note: CSZ is continuously upgrading the components used in its equipment. Consequently, the physical appearance of certain components may vary from that shown.

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WARNING

Only **qualified maintenance personnel** should be permitted to perform any maintenance procedures.

NOTE

If any of the following scheduled inspections require maintenance, contact a qualified service technician or Cincinnati Sub-Zero's Service department.

INSPECTION SCHEDULE

In the day-to-day operation of this equipment, you will become aware of certain levels of noise, vibration, temperature, and pressure. If you encounter any significant changes in these levels, investigate them immediately.

A inspection program should be developed for this equipment. To assist in your development of this program, Cincinnati Sub-Zero has prepared a list of routine inspections. While this list is not all inclusive, it will serve as a good base on which to build your own custom program. The establishment of such a program will add significantly to the life of the equipment and will reduce unscheduled down time on the equipment.

PREVENTIVE MAINTENANCE SCHEDULE

INSPECT	DAILY	MONTHLY	YEARLY
1. Interior & Exterior Cleaning	X		
2. R-404A Charge (If Applicable)		X	
3. R-508B Stand-By Pressure (If Applicable)		X	
4. Humidity Demineralizer Filter (Optional Equipment)		X	
5. Air Cooled Condenser (If Applicable)		X	
6. Electrical Panel		X	
7. Tubing Abrasion		X	
8. Humidity Sensor (Optional Equipment)		X	
9. Reservoir (Optional Equipment)		X	
10. Chamber Controller Calibration/Verification			X

WARNING

Please reference the Installation section for the proper procedures for removal and re-installing of the lid while conducting the preventive maintenance schedule.

DAILY

1. Interior and Exterior Cleaning

a. Wipe or vacuum out all debris.

b. Clean interior surfaces with a damp cloth, mild detergent, or stainless-steel cleaner. Avoid cleaners that are abrasive or leave a residue. DO NOT use steel wool.

c. Clean the chamber exterior and door gaskets with a damp cloth or a mild detergent. If a detergent is used, test a small area to make sure it does not damage the finish.

MONTHLY

2. R-404A Charge (If Applicable)

Check the sightglass for bubbles every 7 to 14 days. If bubbles are present, the unit is low on refrigerant. Call a qualified service technician to add refrigerant.

3. **System 2 (R-508B) Stand-By Pressure (If Applicable)**
   Check the pressure in the controller prior to starting the conditioning system. A discharge pressure reading lower than the standby pressure on the data plate could indicate a leak in the system. DO NOT START. To check the stand-by pressure, power off the unit. Let the unit stand for 24 hours (this will allow for full equalization). Check pressure reading on the gauges.

4. **Humidity Demineralizer Filter (Optional Equipment)**
   The demineralizer filter should be replaced when the color change reaches 3" from the bottom of the filter. Damage will occur if the filter is not replaced when the color changes from dark blue to orange brown.

5. **Air-Cooled Condenser (If Applicable)**
   Should be cleaned monthly with a vacuum. This period may be extended if operating conditions warrant. A dirty, clogged condenser can lead to excessive head pressure in the R-404A/R-410A system and can result in a loss of system efficiency and premature failure.

6. **Electrical Panel**
   Check for components and wires which may vibrate loose during operation. Check for signs of contactor or relay arcing. Check to see that power and ground connections remain secure.

7. **Tubing Abrasion**
   Check for evidence of friction wear on all refrigeration lines. Particular care should be taken in inspecting capillary tubes to pressure gauges/transducers. Check lines any time the system is shut down.

8. **Humidity Sensor (Optional Equipment)**
   Clean tip of sensor with alcohol. Dry sensor in chamber at 250.0°F/121.1°C for 10 minutes after cleaning.

9. **Reservoir (Optional Equipment)**
   The reservoir should be cleaned monthly to eliminate debris or film. Open up the drain valve, flush with clean water and wipe down the inside of the tank using a clean rag. Refill water to designated level.

YEARLY

10. **Chamber Controller Calibration/Verification**
    Calibrate/Verify the chamber controller settings if all instruments in your facility are periodically calibrated to one device (metrology), or if a measurement system component fails. The calibration/verification procedure is located in the Controller Manual which accompanied your unit.

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GENERAL VISUAL INSPECTION

Chassis
Deformation, dents, punctures, badly worn surfaces, damaged connectors, damaged fastener devices, or damaged handles. Inspect for corrosion and damage to finish.

Connectors
Broken or deformed shells or clamps, and other irregularities. Inspect for cracked or broken insulation and for contacts that are broken, deformed, or out of alignment. Inspect for corroded or damaged plating on contacts and for loose, poorly soldered, or corroded terminal connections.

Indicators
Cracked or missing lenses

Metal Parts
Physical damage to mounting plates, chassis, brackets, nuts, bolts, screws, washers, handles, fasteners, and hardware.

Plastic Parts
Signs of cracked or charred insulation, and loose or missing mounting hardware on plastic parts such as terminal boards, mounting blocks, and insulating members. Inspect for other abnormalities that might indicate future breakdown.

Wiring
Physical damage and charring on open and laced wiring of chassis, terminal boards, and parts of equipment, by checking insulation. Inspect wires for breakage and for improper dress.

TEST EQUIPMENT REQUIRED FOR MAINTENANCE

Table 1 is a list of the test equipment required to test and maintain the chamber.
Equivalent equipment may be used.

NOMENCLATURE	USE
Precision millivolt source	Millivolt source for use in calibrating analog inputs
Type "T" reference table	Reference table used for calibrating temperature inputs
Digital voltmeter	Measures voltage
Ammeter	Measures current
Two sets of manifold refrigeration gauges with charging hoses	Monitoring refrigeration system pressures and connecting purge/charge equipment to refrigeration system
One tank of HFC-404A (If Applicable)	Charging refrigeration system
One tank of R-508B (If Applicable)	Charging refrigeration system
Leak detector	Detecting leaks in refrigeration system
Ohmmeter	Continuity and resistance tests
Digital Clamp-on Ammeter	Reads current draw of electrical components including heaters, compressors, etc

Table 1. Required Test Equipment

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GENERAL TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE	CORRECTIVE ACTION
Compressor will not run	Conditioning system OFF	Turn ON conditioning system
	No electrical power	Check facility circuit breaker
	Wrong voltage applied to unit	Check voltage and correct
	Compressor internal overload tripped	Will automatically reset when cooled
	High/Low Limit tripped Control alarm energized	Correct cause of limit condition, repair and reset
	Motor failure	Check winding resistance and lead to ground resistance
	Motor shorted	Replace compressor
Unit short cycles continuously	Gain setting too high	Decrease gain setting
	Proportional band setting to low	Increase proportional band setting
	Compressor low on refrigerant	Check refrigerant and charge if necessary
Compressor difficult to start	Wrong voltage applied to unit	Connect correct voltage
	Defective run/start capacitor(s)	Replace capacitor(s)
	Defective start relay	Replace start relay
	Refrigeration overcharge	Recover and recharge
High load amps	Low voltage	Check supply circuit
	Electrical malfunctions	Check for proper wiring and correct compressor capacitor
		Check for grounds and measure winding resistance
	Defective start relay	Check and replace
Low Amps	Low refrigerant	Check for leaks; charge system
Insufficient cooling effect	Refrigerant shortage	Repair leak and recharge
	Frosted coil	Defrost and dry coil
	Low air circulation	Check fan blade and shaft. Blade may have come off
	Exceeding rated live load capacity (See data sheets)	Reduce live load
	Cooling coils obstructed	Remove obstruction or defrost
	Clogged capillary tube	Replace cap tube
	Liquid Injection Solenoid valve bad, (stuck open)	Replace valve
	Dirty condenser	Clean condenser
	R-404A compressor frosting	Possible leak in R-508B. Check ambient pressures
R-508B Head Pressure too high	Refrigerant overcharge	Recover excess refrigerant
	Exceeding rated live load capacity (See data sheets)	Reduce live load
	Air in system	Recover, evacuate and recharge.
	R-404A system short of gas	Repair leak and recharge

Table 2. General Troubleshooting Procedures

GENERAL TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE	CORRECTIVE ACTION
R-508B Head Pressure too low	Refrigerant shortage	Repair leak and recharge
R-404A Head Pressure too high	Condensing air too warm	Maximum condenser inlet air = 80°F
	Restricted air cooled condenser	Clean condenser
	Air in system	Recover, evacuate and recharge
R-404A Head Pressure too low	Condensing air too cold	Location may need to be changed
	Low refrigerant charge	Repair leak & recharge
Noisy unit	Insufficient compressor oil	Consult Cincinnati Sub Zero
	Fan	Check blades
	Tubing rattle	Bend tubes away from contact
	Compressor mounting	Tighten

Table 2. General Troubleshooting Procedures, Continued

Cincinnati Sub-Zero

HUMIDITY TROUBLESHOOTING (Optional Equipment)

PROBLEM	PROBABLE CAUSE	CORRECTIVE ACTION
Humidity not reaching desired level	Steam Generator not functioning	Replace, No water in Steam Generator
		Heater Failed
	Water is not connected to unit	Check Float switch, water supply
		Fill Soleniod valve
		Connect water
	Water fill solenoid not energized	Check coil - replace if burned
		Check solenoid circuit - repair circuit
	Chamber fan not functioning	Check fan circuit
		Check fan blade for tightness on shaft
	Humidity event not turned on in the F4 controller	Turn Event ON
	Solid state sensor defective	Replace
	Demineralizer cartridge clogged internally	Replace cartridge
	Dirty humidity sensor	Clean tip with alcohol. Dry chamber at 250.0°F/121.1°C for 10 minutes after cleaning

Table 3. Humidity Troubleshooting Procedures

Cincinnati Sub-Zero

SATURATED TEMPERATURE/PRESSURE CHART		
TEMP.	GAUGE PRESSURE (P.S.I.G.)	
ºF	R-404A	R-508B
-130	28.0*	3.8*
-125	27.5*	0.4
-120	27.0*	2.9
-115	26.1*	5.9
-110	25.5*	9.2
-105	24.6*	12.8
-100	23.5*	16.8
-95	22.3*	21.4
-90	20.9*	26.3
-85	19.2*	31.8
-80	17.5*	37.8
-75	15.2*	44.3
-70	12.8*	51.5
-65	10.1*	59.3
-60	7.0*	67.7
-55	3.6*	76.9
-50	0.2	86.8
-45	2.2	97.5
-40	4.5	109.0
-35	7.0	121.3
-30	9.8	134.6
-25	12.9	148.8
-20	16.2	164.0
-15	19.9	180.2
-10	23.8	197.5
-5	28.1	215.8
0	32.8	235.3
5	37.8	256.0
10	43.3	277.9
15	49.1	301.2
20	55.4	325.7
25	62.2	351.6
30	69.4	378.9
35	77.2	407.7
40	85.5	438.0
45	94.3	469.9
50	113.7	503.5
55	115.7	538.7
60	124.3	Critical
65	135.6	Pressure
70	147.5	
75	160.1	
80	173.5	
85	187.6	
90	202.4	
95	218.1	
100	234.6	
105	252.0	
110	270.3	
115	289.5	
120	309.6	
125	330.8	
130	352.9	
135	376.1	
140	400.5	

*Inches of mercury below one atmosphere

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SATURATED TEMPERATURE/PRESSURE CHART		
TEMP. ºC	GAUGE PRESSURE (bar(g))	
	HFCR-404A	HFC/PFC R-508B
-90,0	-	3,9*
-87,2	-	0,0
-84,4	-	0,2
-81,7	-	0,4
-78,9	-	0,6
-76,1	-	0,9
-73,3	-	1,1
-70,6	-	1,5
-67,8	-	1,8
-65,0	-	2,2
-62,2	16,9*	2,6
-59,4	14,8*	3,0
-56,7	12,3*	3,5
-53,9	9,5*	4,1
-51,1	6,4*	4,6
-48,3	2,9*	5,3
-45,6	0,0	6,0
-42,8	0,2	6,7
-40,0	0,3	7,5
-37,2	0,5	8,4
-34,4	0,7	9,3
-31,7	0,9	10,3
-28,9	1,2	11,3
-26,1	1,4	12,5
-23,3	1,7	13,7
-20,6	2,0	14,9
-17,8	2,3	16,3
-15,0	2,7	17,8
-12,2	3,1	19,3
-9,4	3,5	20,9
-6,7	3,9	22,7
-3,9	4,4	24,5
-1,1	4,9	26,5
1,7	5,4	28,5
4,4	6,0	30,7
7,2	6,6	33,1
10,0	7,3	35,6
12,8	8,0	36,7
15,6	8,7	Critical
18,3	9,5	Pressure
21,1	10,3	
23,9	11,2	
26,7	12,1	
29,4	13,1	
32,2	14,1	
35,0	15,2	
37,8	16,3	
40,6	17,5	
43,3	18,8	
46,1	20,1	
48,9	21,5	
51,7	23,0	
54,4	24,5	
57,2	26,1	
60,0	27,8	

*Inches of mercury below one atmosphere

CAUTION

The demineralizer filter should be replaced when the color change reaches 3" (7.62cm) from the bottom of the cartridge. Damage will occur if the cartridge is not replaced when the color changes from dark blue to orange-brown.

CAUTION

Make sure that the rubber gaskets at each end are properly oriented before tightening the locking ring.

HUMIDITY SYSTEM MAINTENANCE (Optional Equipment)

1. The outer casing of the demineralizer filter is transparent and the crystals are visible. A new cartridge is violet or dark blue once water has been circulated through it. A spent cartridge will turn brown, orange, yellow or white. The cartridge should be changed before it completely changes color. Spare cartridges are available through the Cincinnati Sub-Zero Products' Service Department.

CHANGING THE CARTRIDGE (Optional Equipment)

1. To change the demineralizer filter cartridge, close the valve, and loosen the large, white-locking ring on the bottom of the cartridge and rack. This will reduce the pressure on the cartridge. Push the cartridge straight up and pull the lower part of the cartridge out.
   Reverse the operation when replacing the cartridge. SEE CAUTION.

2. Check the compression fittings on the humidity panel periodically for tightness.

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NOTE

On units with a recirculating water option, drain and clean reservoir every two months or sooner as required by usage and water conditions.

CLEANING THE HUMIDITY SENSOR (Optional Equipment)

Please refer to the Vaisala manufacturer's manual for maintenance and calibration information regarding the humidity sensor and its components.

Be aware that there is an allowable tolerance for humidity readings:

1. < 90% + or - 2% and > 90% + or - 3% for the sensors within the chambers.

2. Handheld accuracy is typically + or - 2% for quality instruments.

The recommended interval for calibration at least once a year. It is also recommended to calibrate the sensor if it is not operating within its stated accuracy limits.

⚠ **CAUTION**

The filter on the end of the humidity sensor must be in place for the sensor to operate properly. Operating the sensor without the filter will damage the instrument.

WATER QUALITY

Purified water is recommended for use with our humidity systems. Water should be provided within 0.05 to 2M (.25 to 10ppm) DI, and <2mg/L of free chlorine Distilled water or Reverse Osmosis (RO), water outside of these limits may cause *either corrosion or scaling*. Tap water may be used with our optional *Demineralizer Filtration System. A *Recirculation Humidity Water Supply System is also available. Inlet water pressure should not exceed 25 psi (172kPa) for use with a boiler. A *Water Pressure Regulator must be used.

NOTE

When using a separate hand-held humidity sensor for checking humidity readings in the chamber, the probe must be given at least 1 hour to stabilize within the chamber after insertion. Also be aware that the error of the chamber probe and error of the handheld must be taken into consideration when comparing readings. If the chamber probe has an accuracy of + or - 3% and the hand-held has an accuracy of + or - 2%, the reading can be off by as much as 5% and still be accurate.

Why does my chamber heat or cool slower than the published specifications?

Performance is significantly effected by the characteristics of your test sample. Factors include size, weight, material, shape, and power dissipation if energized. The test sample should be placed in the chamber in a manner that allows for air circulation. You should not place the test sample directly on the chamber floor. It should be placed on the shelf. Multiple test samples should be distributed throughout the chamber to ensure even airflow and minimize temperature gradients. If necessary, additional shelves should be used to evenly distribute the load.

Why is there water/ice/snow in the chamber?

Any time the ambient air is subjected to temperatures below the dewpoint, moisture will condense out of the air. The effect is ice or frost during low temperature operation. When the chamber is heated above 0°C, the ice or frost will turn into water. To avoid moisture condensation, make sure the port plugs are inserted at all times. Also, avoid opening the chamber door while the chamber is operating at temperatures below room ambient. When a low temperature test is completed, warm the chamber to at least room ambient before opening the chamber door and before removing your test sample.

I haven't used the chamber for a while. Is there anything I should do to prepare it for operation?

Perform ALL the steps in the Preventive Maintenance Schedule before placing the chamber back into service. This will ensure that nothing has been damaged and that a leak has not developed.

Can the person who services our air conditioning also service the chamber?

Probably not. Most air conditioning mechanics are not familiar with low-temperature cascade refrigeration systems. While this chamber is relatively easy to maintain and repair, most air conditioning mechanics do not have the necessary refrigerants and may not be familiar with the microprocessor-based controls. This chamber should only be serviced by a qualified mechanic that is familiar with low-temperature cascade refrigeration systems. Call Cincinnati Sub-Zero to recommend one in your area, or to check if the one you would like to use is qualified.

Can/Should I put a filter in front of the condenser air inlet?

No, Cincinnati Sub-Zero does not recommend this. Please follow the maintenance procedures and clean the condenser fins periodically.

I need to send the chamber to Europe/Asia. Will it work with their power?

Europe and Asia generally have 50 Hz power. Standard voltages in Europe are typically 220V to 240V, while parts of Asia may be 200V. MCB(H) operation at 220V to 240V/ 50 Hz requires bucking transformers to lower the voltage for the unit to 100V. These transformers are available from Cincinnati Sub-Zero for a reasonable

cost and can be installed in the field.
Dedicated 230V 50Hz models are available for MC(H)-3 units. Note that the cooling performance will be slightly reduced at 50 Hz. Please call Cincinnati Sub-Zero for details on re-configuring for 50 Hz. operation.

How often should I charge the refrigeration system?

This chamber uses a closed-loop refrigeration system. Just like your refrigerator at home, it does not need periodic charging. If the charge is low, this means that there is a leak. Leaks should be repaired before recharging.

What kind of Freon does the chamber use?

The word Freon® is a DuPont registered trade name for their CFC-based refrigerants and is incorrectly used as a generic term for refrigerants. Cincinnati Sub-Zero chambers do not use CFC-based refrigerants. The high-stage system uses R-404A, which is also known as DuPont Suva® HP62. The low-stage system uses R-508B, which is also known as DuPont Suva® 95.

My static pressure is lower than the data plate specification. Is this an indication of a leak in my refrigeration system?

This does not always mean that there is a leak. Ozone friendly refrigerants use POE oil which has the ability to absorb refrigerant to the point of actually causing a lower pressure reading. A decrease in the chambers performance along with lower pressure readings is a possible indicator of a leak. (Please contact Cincinnati Sub-Zero if this occurs).

What is the hissing and clicking sound when my unit is at or approaching set point?

This is normal. The sounds are caused by the solenoid valves alternating between cooling and bypass.

What is the average air flow rating inside the chamber?

The average air flow is 60-80 feet per minute in an empty chamber. The airflow velocity over your test specimen depends on several factors, including test specimen size, geometry location within the chamber.

Sometimes I see bubbles in the 404 sight glass. Does this mean my chamber has a leak in it or is undercharged?

This does not necessarily mean that the unit is undercharged or has a leak. Under certain conditions it is possible to see bubbles in the sight glass. Contact Cincinnati Sub-Zero if you have any questions.

Why do I smell something when I operate the chamber for the first time at high temperatures?

Cincinnati Sub-Zero chambers are cleaned and polished before leaving the factory. Stainless steel polish can give off an odor while at elevated temperatures. This is a temporary condition and is non toxic.

HOW TO CONTACT CSZ

Cincinnati Sub-Zero Products
12011 Mosteller Road
Cincinnati, OH 45241

Telephone (Main)	1-513-326-5252
Toll Free (North America)	1-877-233-9871
Service & Parts	1-513-719-3300
Fax	1-513-326-5258
Internet	http://www.cszproducts.com

HOW TO OBTAIN REPLACEMENT PARTS / PARTS ORDERING PROCEDURE

If a part fails and must be returned to Cincinnati Sub-Zero Products for repair or replacement under the terms of the warranty, follow the procedure below.

1. Contact our **Service Department at (513) 719-3300** from 7:30 AM to 5:30 PM (Eastern Time Zone).

For overnight shipments, the Service Department must be contacted ***BEFORE*** 2:00 PM (Eastern Time Zone).

You may submit your request online at: http://www.cszindustrial.com/Contact/Service-Request.aspx

2. To order the replacement part, please provide the following information:
   a. A purchase order number or credit card number.
   b. The complete Cincinnati Sub-Zero Part number.
   c. The model number and serial number of the chamber for requiring the replacement part.
   d. The specific complaint regarding the failed part.

NOTE: CSZ provides a list of parts for all chambers in a Bill of Materials which is included in the manual. The recommended spare parts for your chamber have an asterisk (*) on the left hand margin.

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

4. Any part replaced under terms of the warranty is invoiced at the current price. Upon receipt of the defective material Cincinnati Sub-Zero Products will issue a credit for the amount billed less any prepaid freight charges.

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ELECTRICAL SCHEMATIC SYMBOLS

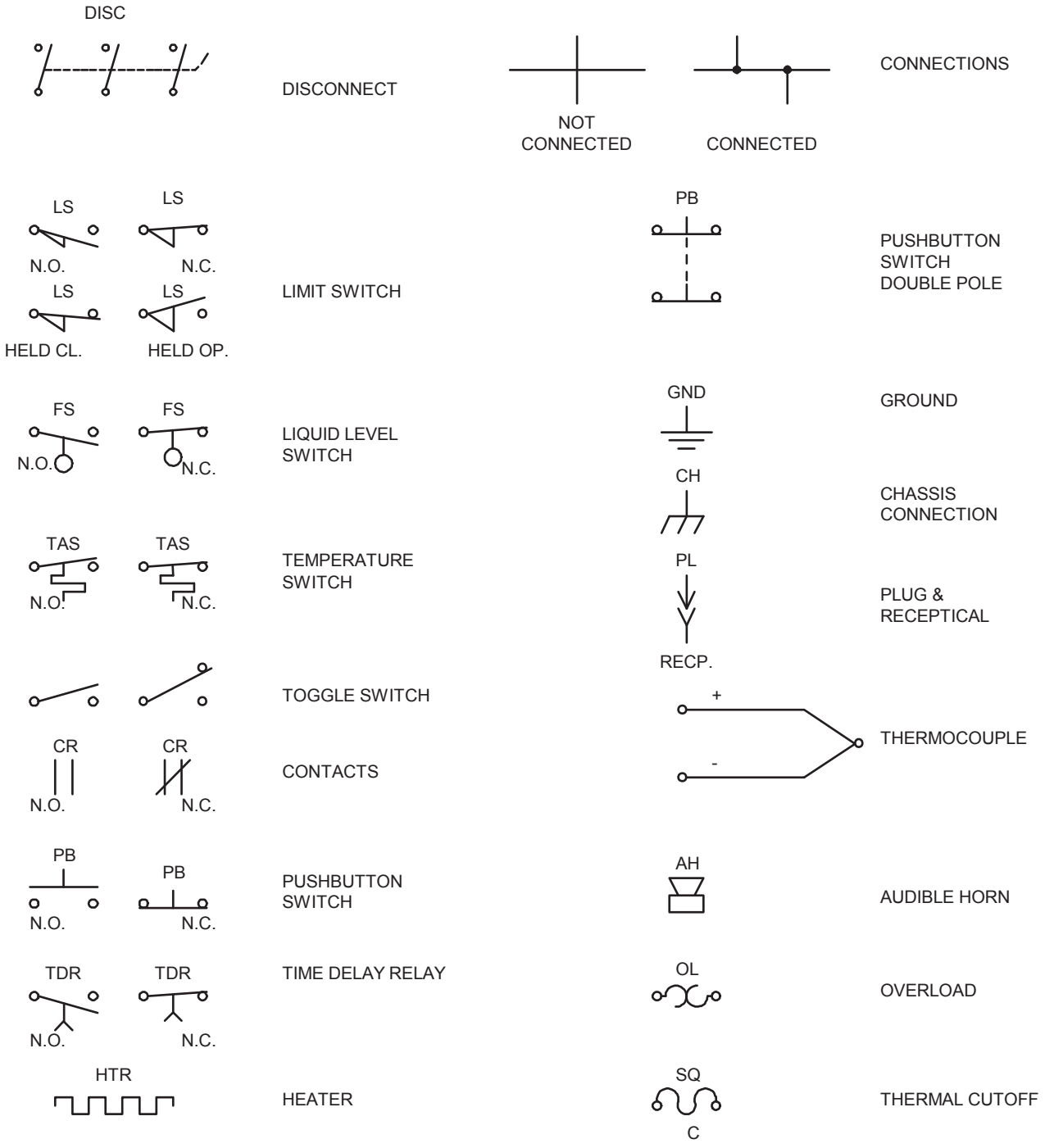

Figure 1. Symbols used on Electrical Schematics

ELECTRICAL SCHEMATIC SYMBOLS

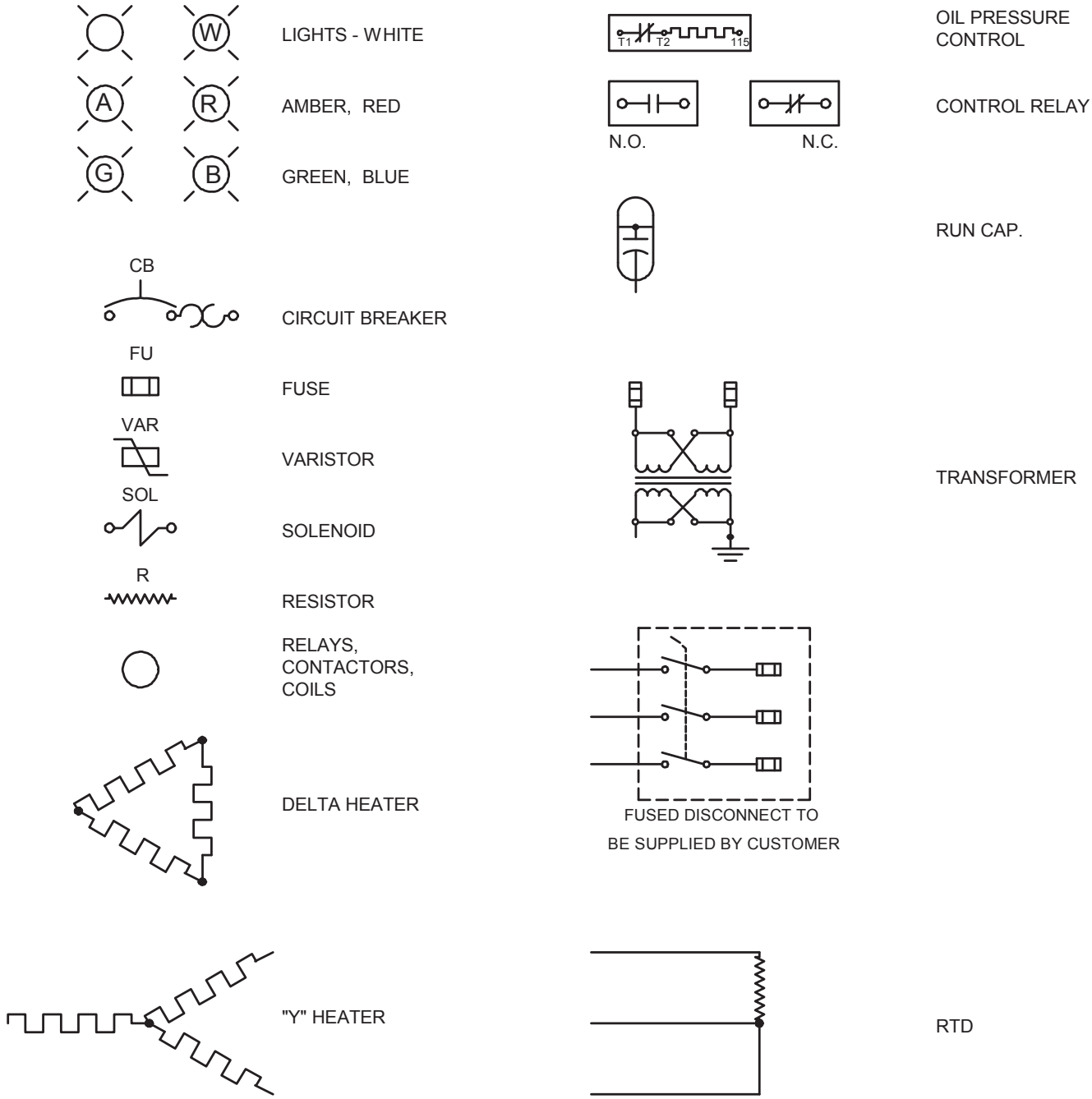

Figure 2. Symbols used on Electrical Schematics (Continued)

REFRIGERATION SCHEMATIC SYMBOLS

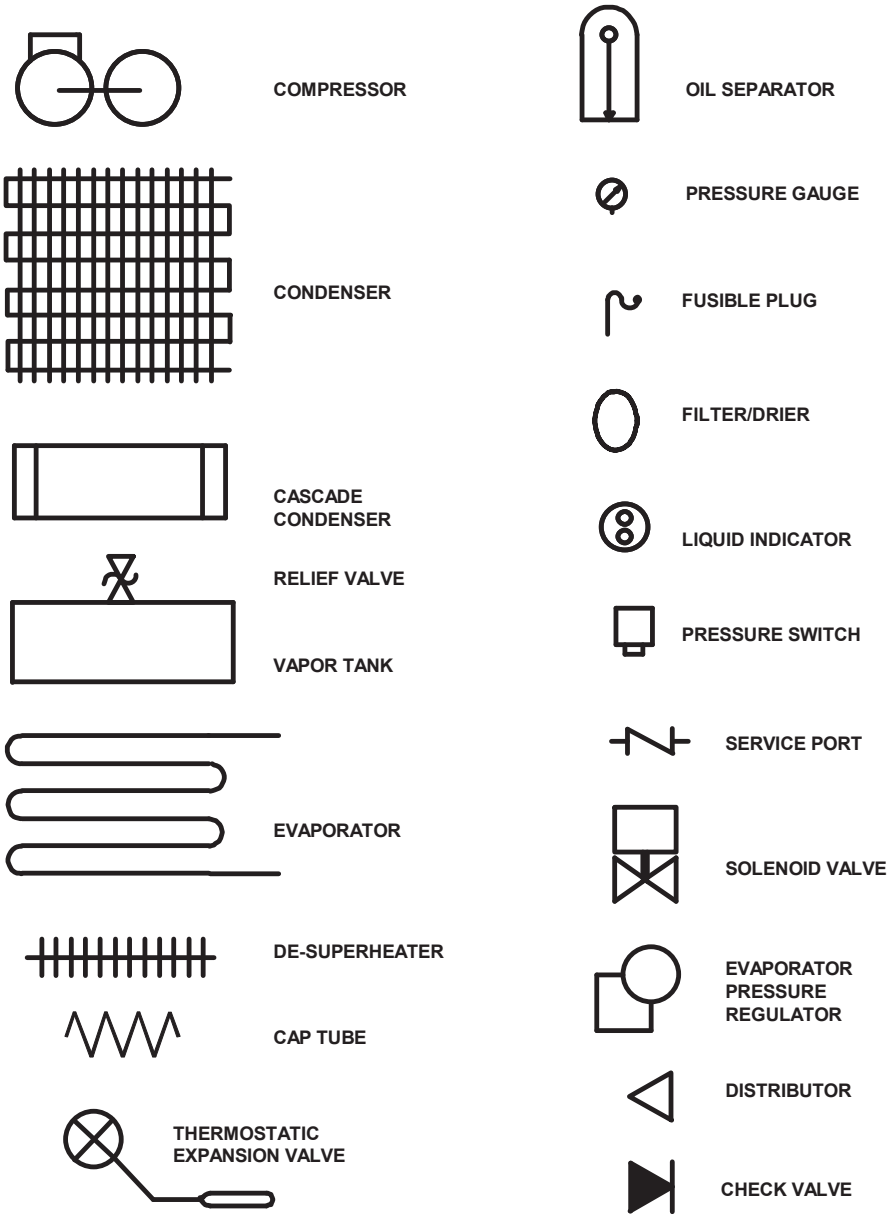

Figure 3. Symbols used on Refrigeration Diagrams

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