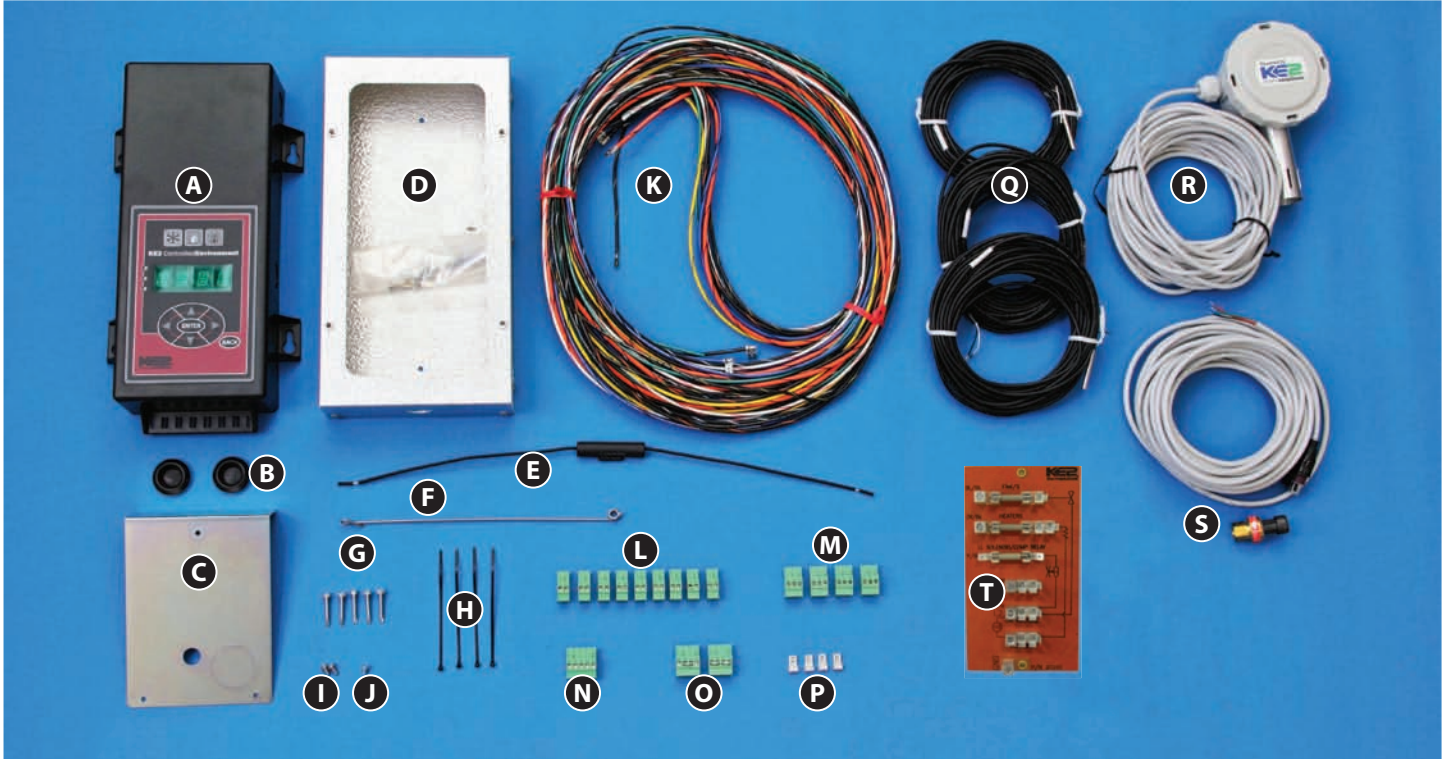




KE2 Controlled Environment

Quick Start Guide

This reference should remain on site with the installed KE2 Controlled Environment.



Parts List: The following is included in KE2 Controlled Environment kit:

- Kit #20893 with 120/208-240 VAC controller - 25' wire harness
- Kit #20897 with 120/208-240 VAC controller - 40' wire harness

- | | |
|--|--|
| <ul style="list-style-type: none"> A (1) KE2 Controlled Environment B (2) 1/2" plastic knockout plugs C (1) high voltage safety shield D (1) mounting box and hardware E (1) aux relay in-line fuse F (1) air sensor mount G (5) self-tapping screws H (4) wire ties (rated for low temp) I (2) course thread screws J (1) fine thread machine screw with lock washer K (1) wire harness L (9) 2-position screw down terminals (for sensors and digital input, analog output) M (4) 3-position screw down terminals (for power in, transducer & 3A relays) | <ul style="list-style-type: none"> N (1) 5-position screw down terminal (for EEV) O (1) 120 Voltage jumper & (1) 208-240V Voltage jumper (208-240V already on back of KE2 Controlled Environment) P (4) 90 degree quick disconnects Q (3) 40' temperature sensors R (1) 40' humidity sensor S (1) pressure transducer and 40' cable T (1) KE2 Terminal board with fuses ● (1) warranty card (not shown) |
|--|--|

Optional Accessory (Not included in kit):

For increased functionality, an External Digital Switch Relay is available. This can be used for heaters, humidification or de-humidification, if standard relays are used for other functions.

- **External Digital Switch Relay** (pn 21032) - only used when Digital Switch Relay is required

Supplies List

The KE2 Controlled Environment is supplied with all of the accessories required for the controller to work, however, standard truck stock items will also be required to install the controller. To simplify the installation, a list of items has been provided.

- **Conduit to go between the controller and the evaporator**
- **(2) Conduit connectors** (straight or elbow as required)
- **(8) Spade Connectors matched to the gauge of high voltage wires**
- **Additional wire ties**
- **18 gauge twisted shielded pair** (if extending sensor wires)
- **Foam insulation if running wires outside the space.**
- **Silicone** (for sealing any box penetrations)



KE2 Controlled Environment Quick Start Guide

Arriving at the Jobsite

When arriving at any jobsite, it is good practice to verify the correct operation of the system. Even systems running for a considerable amount of time without requiring a service call may not be running properly.

Inspect the coil to see the current frost pattern. If the unit has not recently performed a defrost, look for the heaviest area of frost. This will be used to locate the coil sensor.

Installers should account for a full system diagnostic in the installation estimate for the controller.

Although it may seem unnecessary, identifying system issues before the controller is installed will save time overall. It will also allow the controller to provide the highest energy savings.

Verify the system is running correctly. Taking several measurements will help determine the current health of the system. Using the diagram below, fill in the necessary information.

Two of the most critical indicators of system health are the superheat and subcooling.

Superheat - Superheat is the most overlooked inefficiency in existing systems. Typically the superheat on a TEV is set when there is not product in the controlled space, if it is set at all.

When applying the controller to an existing system, it should include an electronic expansion valve, the superheat should be between 6-8

degrees for low temperature, and 8-10 degrees for medium temperature applications.

Subcooling - There should be a solid column of liquid at the inlet of the valve. This can be verified by looking at the sight glass, however, the proper method requires measuring the subcooling of the liquid entering the valve.

Verify Temperature Difference

A typical Temperature Difference (TD) between the coil temperature and the air temperature is between 5 and 15°F. An insufficient TD, between the coil and air temperature, indicates a system issue that needs to be addressed before installing the KE2 Controlled Environment.

Understanding Frost

The air exiting side of the evaporator is often the coldest spot on the coil due to the load effecting the temperature. As air travels through the fins of the evaporator, the Relative Humidity will reach 100%. Moisture will begin to drop out of the air and deposit on the coil surfaces to form frost. Although frost typically has a negative connotation when discussed in refrigeration, initial frost formation has a positive effect. Some may even say "frost is our friend." It is not uncommon to see a small amount of frost on the coils that have KE2 Controlled Environment controllers installed. The KE2 Controlled Environment is continually measuring, monitoring, and managing the frost to assist in maximum energy efficiency. When the efficiency of the coil is reduced due to excessive frost, the KE2 Controlled Environment will initiate a defrost.

Trouble Shooting Diagram

Refrigerant _____

Suction Pressure _____ PSI

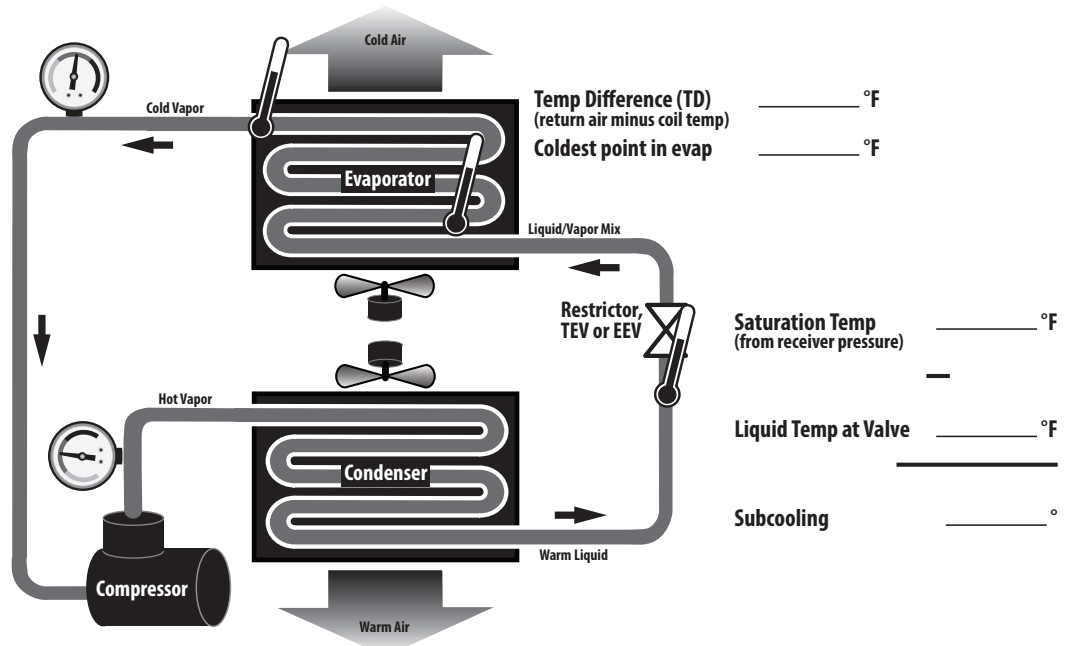
Suction Temp (evaporator outlet) _____ °F

Saturation Temp (calculated from Suct. Pressure) _____ °F

Superheat _____ °

Discharge Pressure _____ PSI

AMPS _____



Temp Difference (TD) (return air minus coil temp) _____ °F

Coldest point in evap _____ °F


Saturation Temp (from receiver pressure) _____ °F

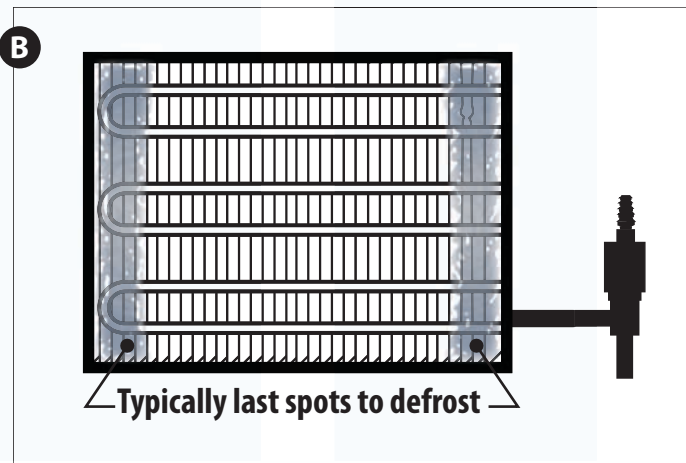
Liquid Temp at Valve _____ °F

Subcooling _____ °



IMPORTANT Preliminary Steps Determine the coil sensor location

- A** To determine the most appropriate sensor location, when arriving on site, put the system into defrost.
 - B** The location where frost is last to disappear is where the coil sensor should be placed. Monitor both the air entering side, as well as the air exiting side, of the evaporator coil. Don't be surprised if the last place for frost to disappear is on the air exiting side. It is usually near the right or left end of the coil.
-  It is important to verify all heating elements are working properly.

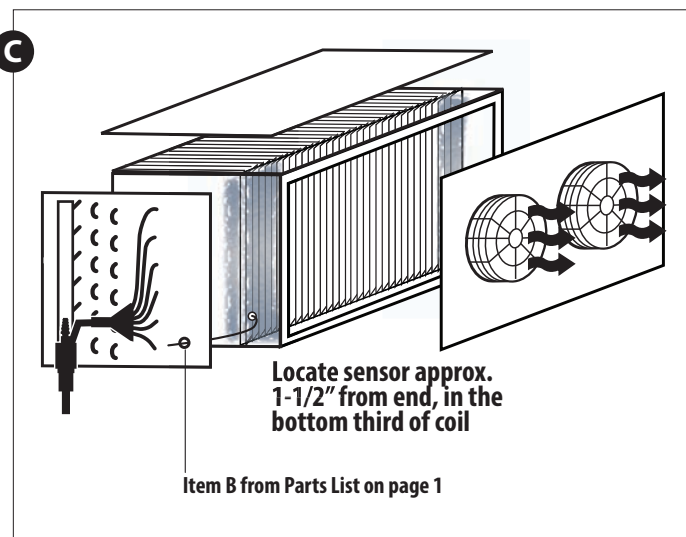


- C** **Steps to Ensure Proper Coil Sensor Location**
More often than not on coils, the location of the sensor is a short distance from the end, approximately 1 to 1-1/2" away from the right and left edges of the active coil surface. The ice tends to grow from these edges towards the center. Therefore, the sensor location is best situated approximately 1 to 1-1/2" from the outer edges and typically near the bottom 1/3rd portion of the evaporator. The sensor needs to be as far away from the defrost heat sources as possible.

This is most easily located by viewing the current frost pattern. The last place frost disappears during the defrost cycle is the correct sensor location.

Note: Insert plug (Item B from parts list) into coil housing when mounting sensor wire to prevent damage to the sensor from sharp edges. Two plugs are provided. One plug should be inserted into the inner housing to access the coil, and the other into the outer housing to exit the coil. Installer must puncture plug to insert sensor.

As with any wiring installation, it is appropriate to leave a service loop. Enough wire should be left to move the sensor to the opposite end of the evaporator.



- D** **Make note of the locations you have determined for placement of the coil sensors.**

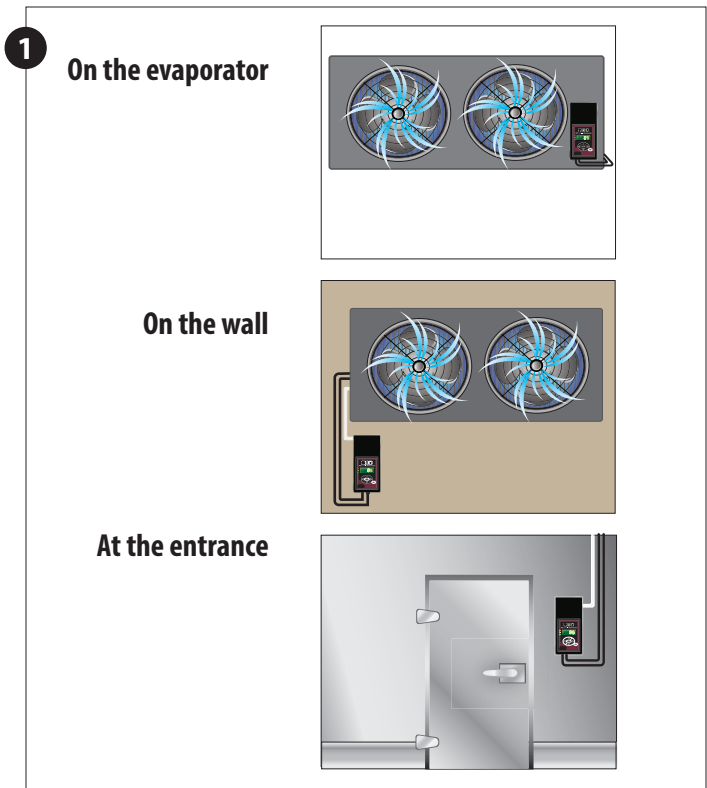


KE2 Controlled Environment Quick Start Guide

1 Determining Location

■ The controller is designed to be as versatile as possible. The location should be discussed with the end users to determine if they have a preference. It is designed so it can be installed inside or outside the controlled space.

■ The controller can also be located at the condenser, but should not be installed outdoors without an enclosure to protect it from sunlight and moisture (must be within operating range -40°F to 140°F)



2 Cut a length of conduit to go from the controller to the evaporator

■ Measure the distance between the controller and evaporator to account for the extra length necessary to properly route conduit.

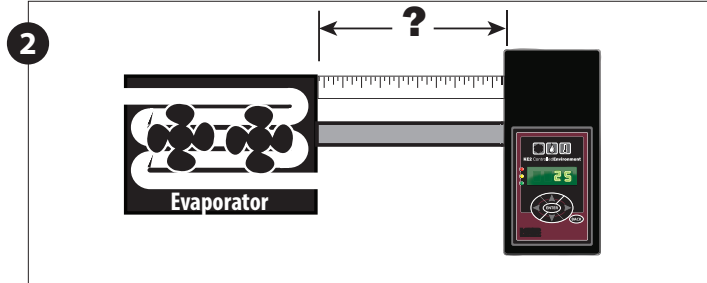
The wire whip has the following wires that go to the controller:

- Controller power (3 wires)
- Fan control (2 wires)
- Defrost (heater) control (2 wires)
- Liquid line solenoid (2 wires)

If the Aux Relay is used, the installer will need to supply an additional pair of wires to the controller

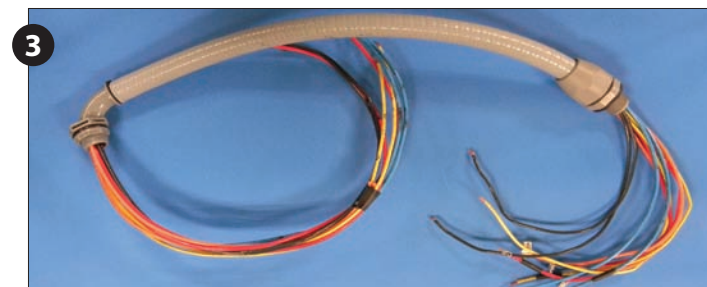
- Aux relay (2 wires)

Note: Install in accordance with local wiring codes. KE2 Therm does not accept responsibility for incorrect or unsafe wiring.



3 Cut wires to length

- Once wire locations are determined, cut the wires to length.
- The wire should be long enough to account for the necessary connections in the controller and evaporator.
- Using the wire harness with different colored wires, (blue - fan, orange - heaters, yellow - solenoid) will simplify the installation and troubleshooting.



4 Determine the current draw of the unit.

■ Using the nameplate to determine the Amp rating of the unit. This information should be used to select the proper sized wire. It should also be used to verify the unit does not exceed the relay rating on the KE2 Controlled Environment controller.

MODEL NO.	SERIAL NO.			
	QTY	HP	VOLTS	PH HZ
1	1/20	208-230	1 60	
MOTOR CIRCUIT	AMPS EA	MIN CKT AMPS	MAX OVRVRT PROT	
	1.0	15	20	
HEATER CIRCUIT	VOLTS	PH	AMPS	
	230	1	4.6	
REFRIG & OIL	REFRIG TYPE	REFRIG WGT	OIL TYPE	

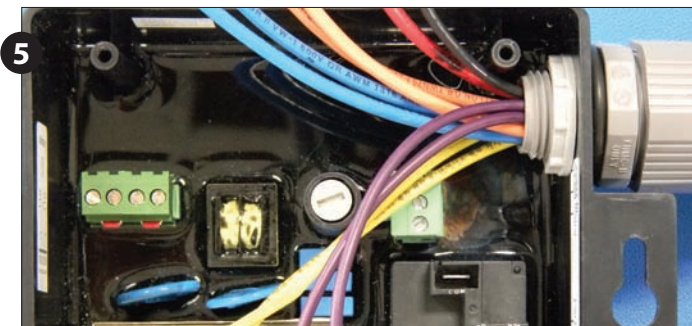


KE2 Controlled Environment

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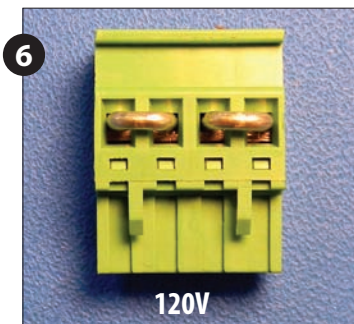
Preparing conduit

- 5** ■ Feed the wires through the conduit.
- The conduit connectors can be added at this time. Determine if a straight or 90 degree connector is most appropriate for the installation, and attach to the conduit.
 - Securely connect one end of the conduit to the controller.



Wiring the controller

- 6** ■ Locate the second Voltage Jumper in the accessory kit.
- It is a 4 position plug with 2 jumpers already installed.
 - Use the plug with 1 jumper for 208-240V power or the jumper with 2 jumpers for 120V power.
 - **Power is not connected to Voltage selector, it is a selector only.**
 - Power for the controller is connected to the **Power In** location using a 3 position connector.



! The controller display will illuminate when 120V is applied with 208-240V selected, however it will not function properly.

Controller Power

- 7** ■ The wires used to provide power to the controller are pre-stripped. Simply pull off the insulation.
- Locate a 3 position terminal in the accessories kit.
 - Fasten to the 3 position pluggable connector*.
 - Plug into the board as indicated in Wiring Schematic.



*All terminal screws should be tightened to 5 ft-lbs.

Fan Relay

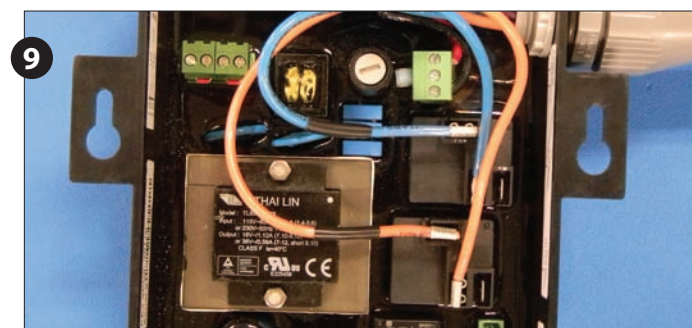
- 8** ■ The blue wires are used for fan control.
- They are blue with a black stripe, and the black with a blue stripe.
 - Plug the black with a blue stripe to the COM terminal.
 - Plug the blue with a black stripe to the NO position of the Fan Relay.



! Confirm combined fan motor load is not over 10 amps.

Defrost (Heater) Relay

- 9** ■ The orange wires are used for the heater control.
- Locate the orange with black stripe, and the black with orange stripe.
 - Plug the black with orange stripe to the COM terminal.
 - Plug the orange with black stripe to the NO position of the Defrost Relay.



! Confirm combined heater load is not over 20 amps.

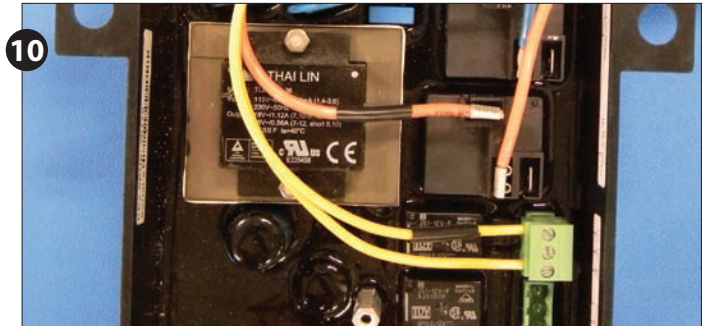


KE2 Controlled Environment Quick Start Guide

Liquid line solenoid (LLS) /Compressor Relay

- 10** ■ The yellow wires are used for Liquid Line Solenoid control.
- Locate a 3-position connector from the accessories kit.
 - Fasten the black with yellow stripe to the fused lead.
 - Fasten yellow w. black stripe from the LLS to NO terminal position.
 - Plug into the location as indicated in Wiring Schematic.

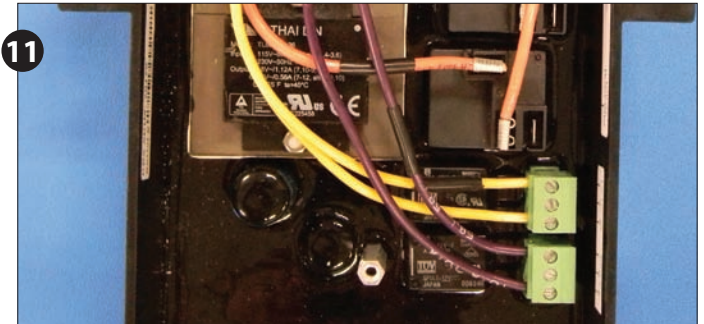
Max relay rating is 3A.



Auxiliary Relay

- 11** ■ If using the Auxiliary Relay an additional pair of wires will need to be supplied to the controller by the installer.
- the Aux relay pluggable connector is supplied with an in-line fuse to protect the controllers circuitry.
 - Strip approx. 1/4" wire insulation on end of the 2 wires for the alarm
 - Locate a 3-position connector from the accessories kit.
 - Fasten one wire to the screw terminal, and the other to the end of the in-line fuse using an appropriately sized wire nut.
 - Plug into the location as indicated in Wiring Schematic.

Max relay rating is 3A.



Note: Before installing safety cover, plug in remaining connectors to store for future use.

Install Safety cover

- 12** ■ Once high voltage wiring is done, install metal cover on controller.
- Locate the cover and 3 small screws from the accessories kit.
 - Position the cover over the 3 mounting posts.
 - Using 2 course threaded screws attach controller to plastic posts.
 - Use the fine threaded machine screw with lock washer to fasten the controller to the metal post.

Set the controller in a safe place.



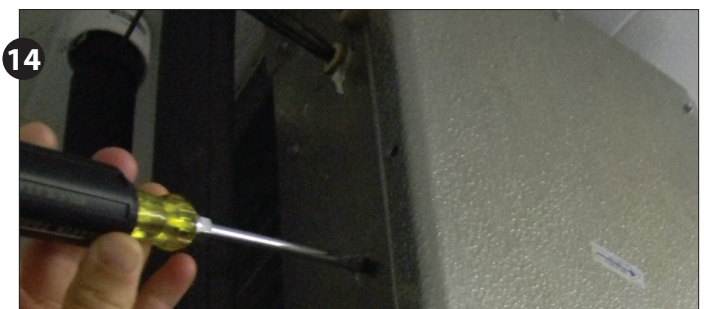
Preparing the Evaporator

- 13** ■ The evaporator wiring will require access to the high voltage terminal block on the coil.
- Turn off power to the system.
 - Verify power is no longer present using a multimeter.



Evaporator wiring

- 14** ■ Now that the conduit is prepared, it can be connected to the evaporator.
- Locate the proper sized knockout and carefully remove knockout.
 - Connect conduit to the evaporator





KE2 Controlled Environment Quick Start Guide

Study the existing wiring.

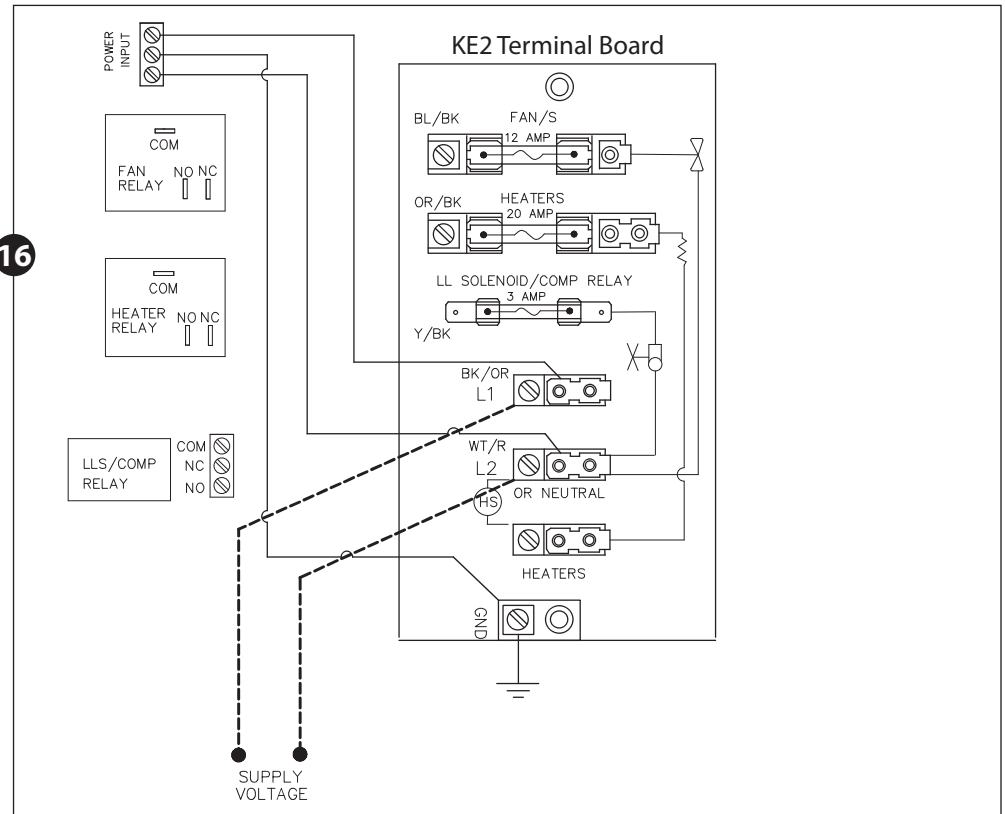
- 15** ■ Determine the location of the following: incoming power, fan leads, heater leads, defrost termination leads, and fan delay leads.

Evaporator wiring – Controller

- 16** ■ Strip the end of the wires used to power the controller.

- Attach to the line power to provide continuous power to the controller.
- Attach ground wire.

Note: Ground is required for the internal safeties to operate properly.



Evaporator wiring – Fans

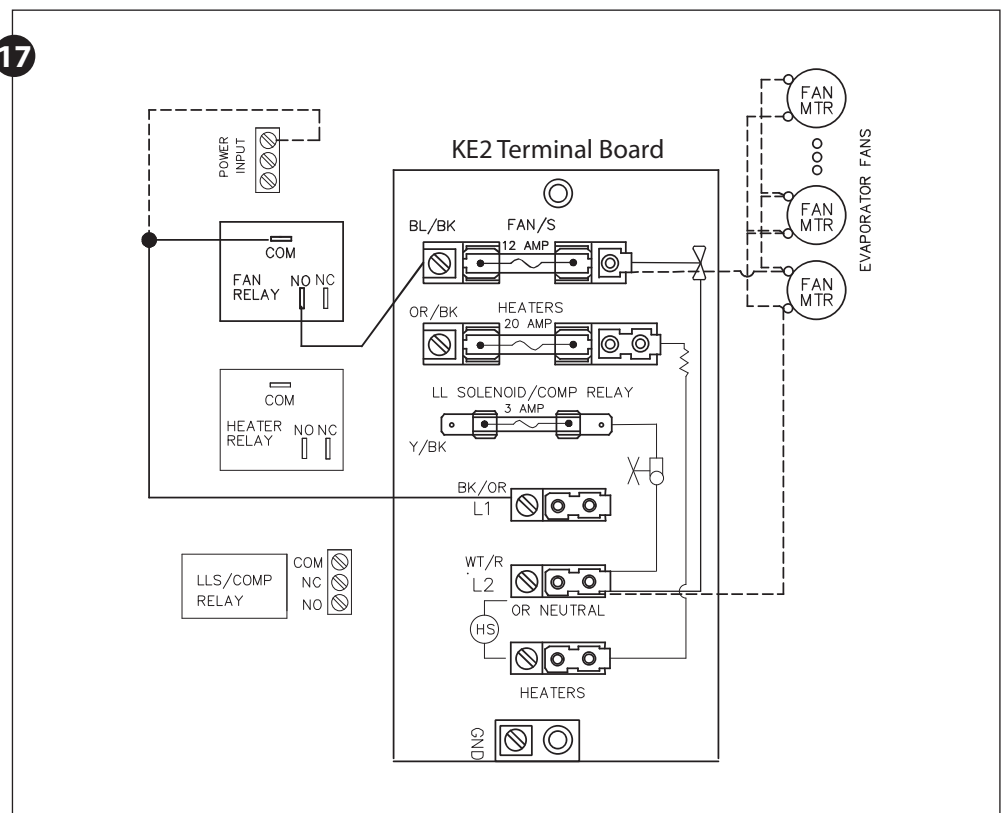
- 17** ■ Strip the ends of the wires (connected to the KE2 Evap) used to control the evaporator fans.

- The fan wires can be attached to the terminal block using either screw down terminals or spade connectors.

- Attach one of wires to the L1/Line. This wire will be connected to COM of fan relay on the controller.

- Attach the wire connected to the NO terminal on the Fan Relay to one of the fan leads.

- Connect L2/Neutral to remaining fan lead.





KE2 Controlled Environment Quick Start Guide

Evaporator wiring – Heater

18 ■ Strip the ends of the wires being used for heater control.

■ The heater wires can be attached to the terminal block using either screw down terminals or spade connectors.

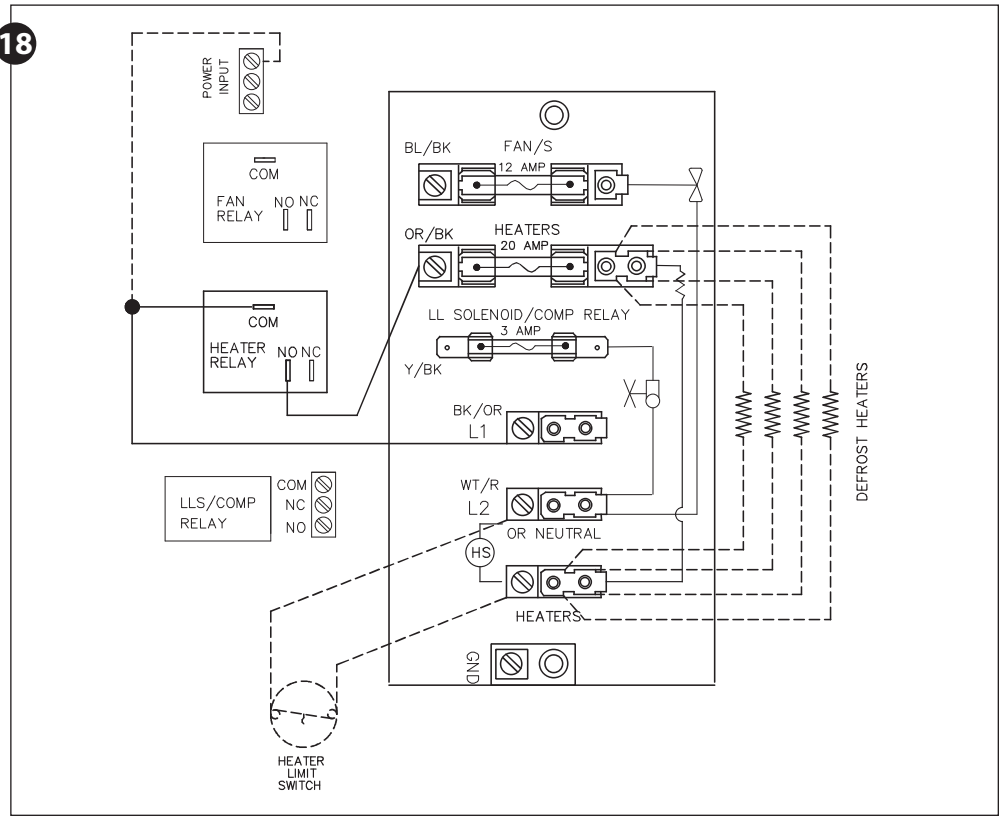
19 Remove defrost termination (Klixon®) from circuitry

■ Attach one of wires to the L1/Line. This wire will be connected to COM of defrost relay on the controller.

■ Attach the wire connected to the NO terminal on the Defrost Relay to one of the defrost leads.

■ Connect L2/Neutral to the remaining defrost lead.

! The defrost safety should not be removed from the circuit. Its purpose is to prevent the heaters from over heating and causing damage.

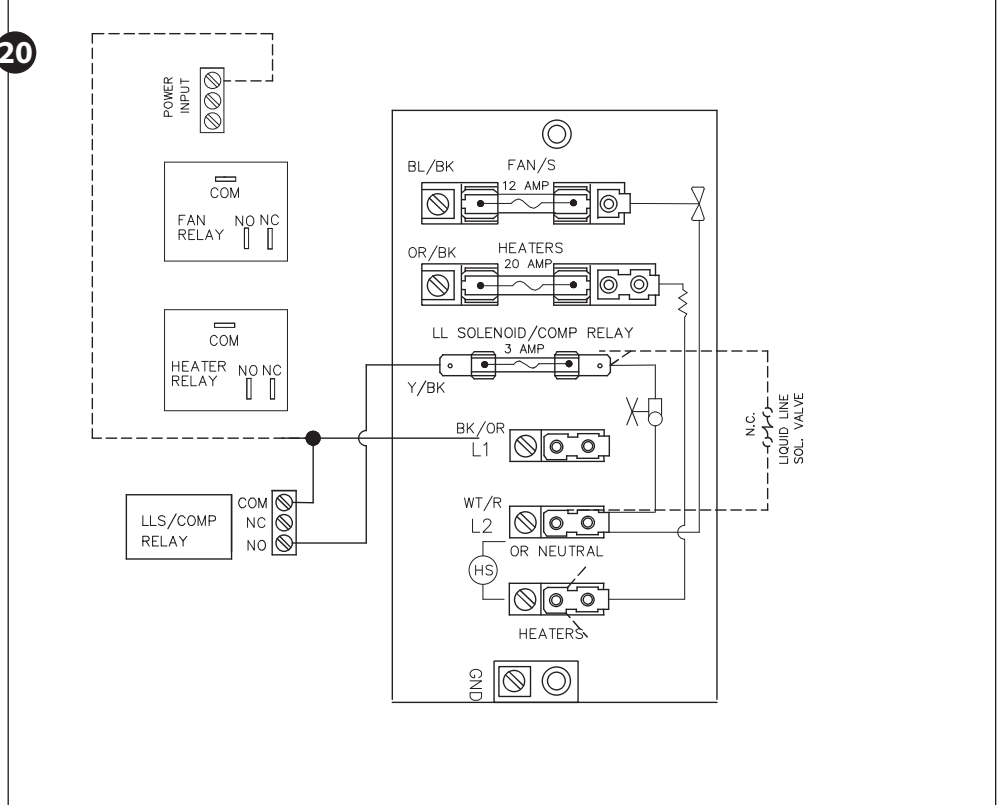


20 Evaporator wiring – Liquid Line Solenoid/Compressor

■ Strip the ends selected to control the liquid line solenoid.

■ Attach the wire from the NO terminal on the L.L. Solenoid/Compressor relay to one of the solenoid leads. Attach the wire from the COM on the L.L. Solenoid/Compressor relay to the L1/Line Voltage.

■ Connect L2/Neutral to the remaining L.L. Solenoid/Compressor lead.

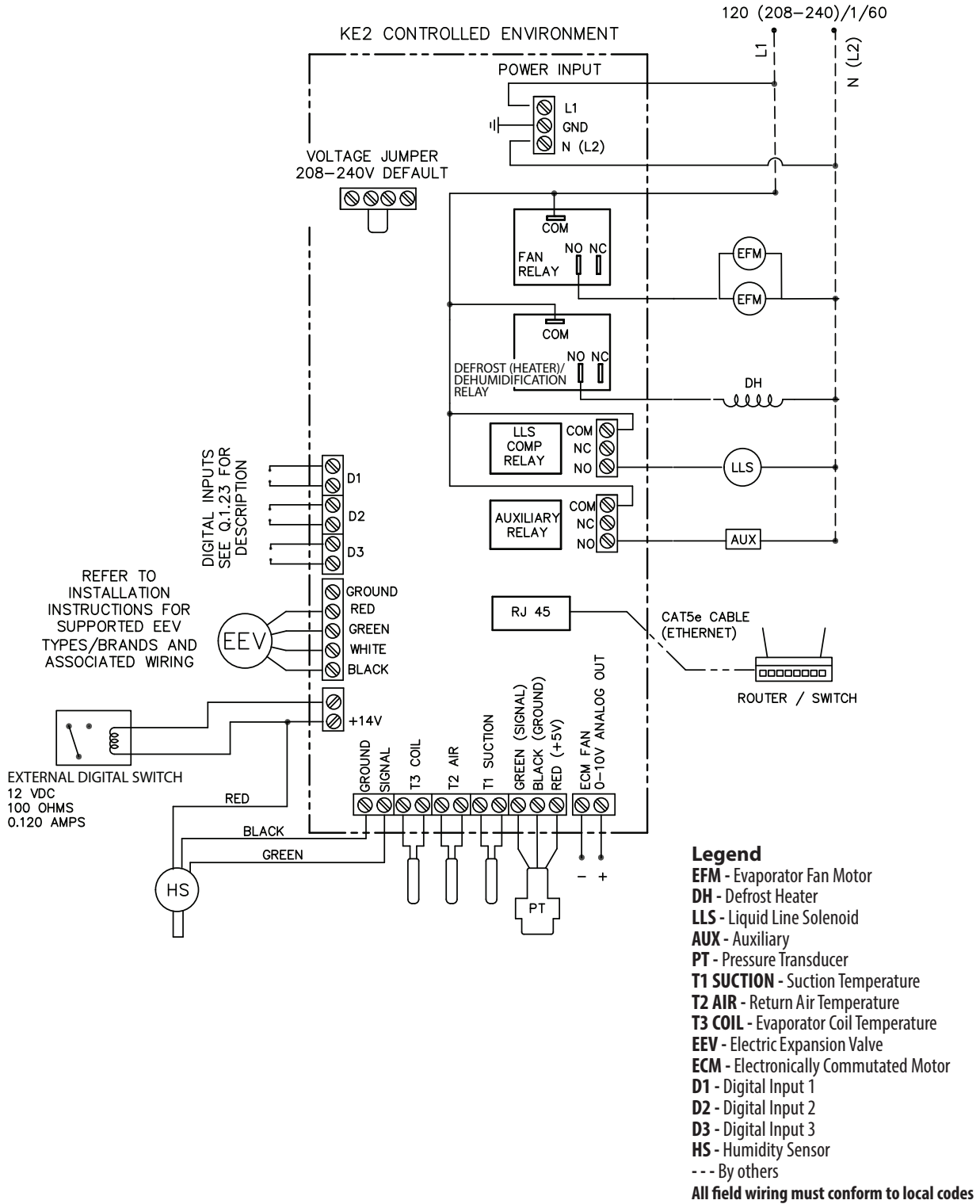




KE2 Controlled Environment

Quick Start Guide

Wiring Schematic - Controller New Installation





KE2 Controlled Environment Quick Start Guide

Wiring Schematic - Controller with KE2 Contactor Box

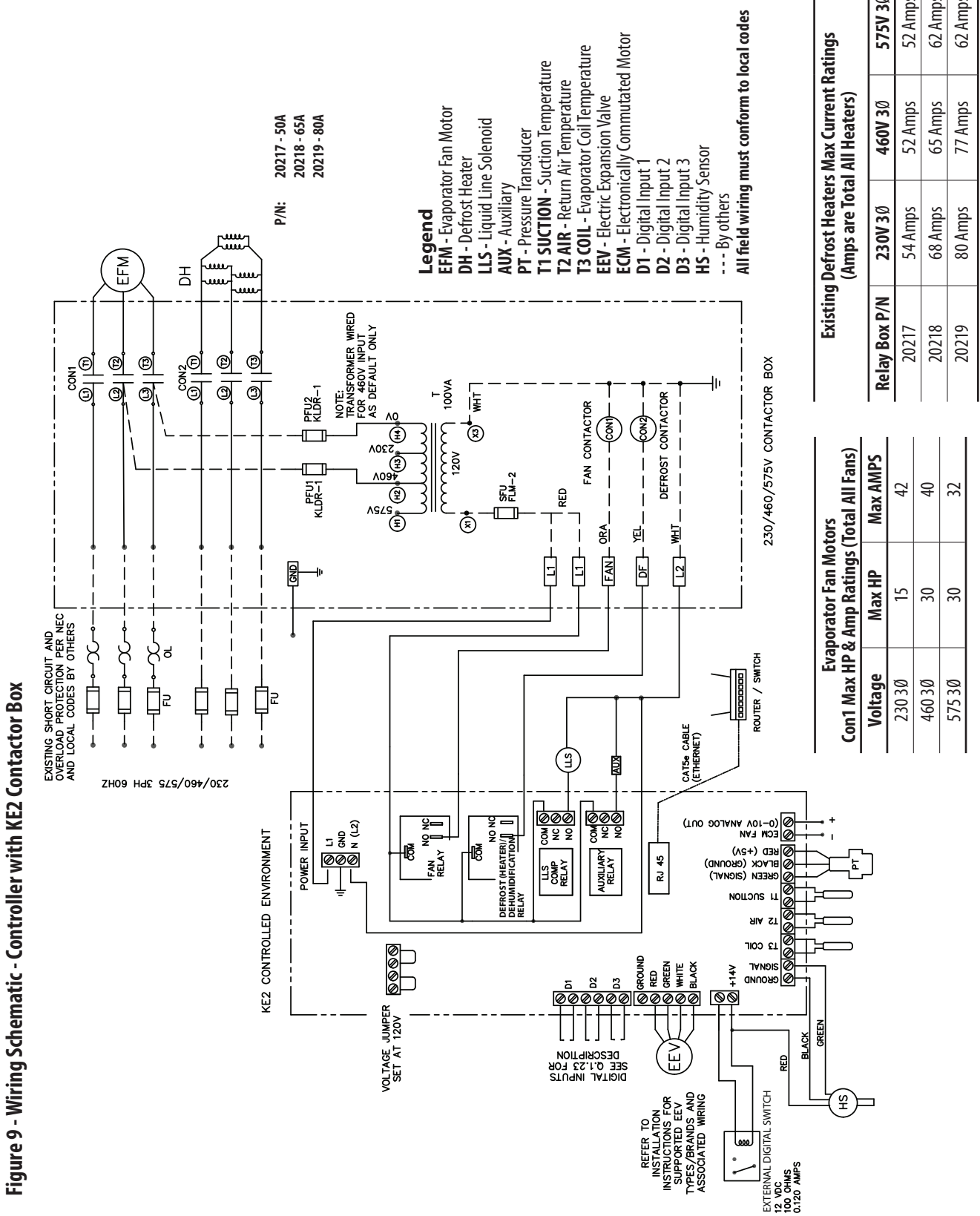


Figure 9 - Wiring Schematic - Controller with KE2 Contactor Box



KE2 Controlled Environment Quick Start Guide

Evaporator wiring – Auxiliary

- 21** ■ The auxiliary relay is optional and wiring will vary depending on the auxiliary relay method selected.
- Depending on auxiliary relay location, an additional conduit may be required.
 - Strip the ends selected to control the auxiliary component.
 - Break the hot leg of the auxiliary component.
 - Attach the wire from the NO terminal on the auxiliary relay to one of the auxiliary component leads. Attach the wire from the COM on the auxiliary component relay to the L1/Line Voltage.
 - Connect L2/Neutral to the remaining auxiliary component lead.
 - Route and secure the conduit to the location the controller is to be installed.
 - Wiring must follow local wiring codes.

Installing the HSV

- 22** ■ For the KE2 Controlled Environment to reach its full potential, an Electric Expansion Valve (EEV) is required. KE2 Therm's Hybrid Stepper Valve (HSV) is the optimal choice to be paired with the controller, although other manufacturers' valves can be used.

Acting as an adjustable Automatic Expansion valve, the valve controls the pressure, instead of superheat, allowing the controller to use the coil's TD to maximize or minimize dehumidification, and bring the humidity to the proper level.

Installing an EEV on an existing system requires the system to be pumped down, the existing valve to be removed, and then the EEV to be sweat back into the system. **Install the electronic expansion valve per the manufacturer's instructions included with the valve.**

Installing the sensors

- 23** ■ Although not required, sensors should be labeled with their function. This will eliminate confusion when connecting the sensors to the controller.

Air Sensor Bracket

- 24** ■ Install the Air Temperature Sensor using the Stainless Steel self-piercing screw and bracket from the accessory kit.
- The end with the single loop is designed to be mounted with the screw included.
 - The end with multiple loops is designed to hold the sensor.
 - Locate the best place to install the sensor.
 - The sensor should be located between 6 and 12 inches away from the face of the evaporator. This distance prevents the sensor from sensing heat from the heating elements during the defrost cycle, but close enough to accurately sense the return air temperature.
 - The sensor bracket may be bent as necessary to locate the sensor in the proper position.



WARNING!

Do not allow the metal portion of the air sensor to touch anything other than air. It should not touch the bracket, nylon cable tie, or any other solid surface.





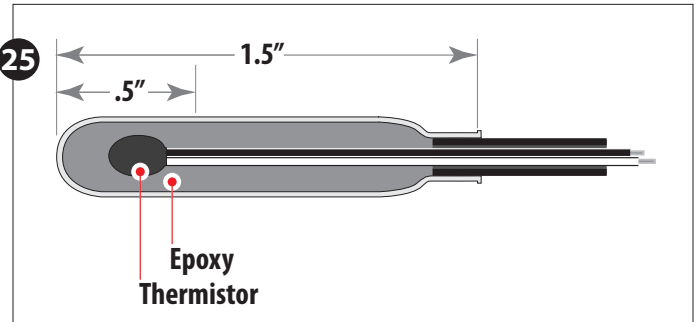
Coil Sensor

■ The coil sensor location is of the utmost importance for the proper operation of the controller. It is essential that the sensor is in the coldest location on the coil at the end of the defrost cycle, to ensure a complete defrost. See preliminary steps A-D on page 3 to determine the coldest location on the coil.

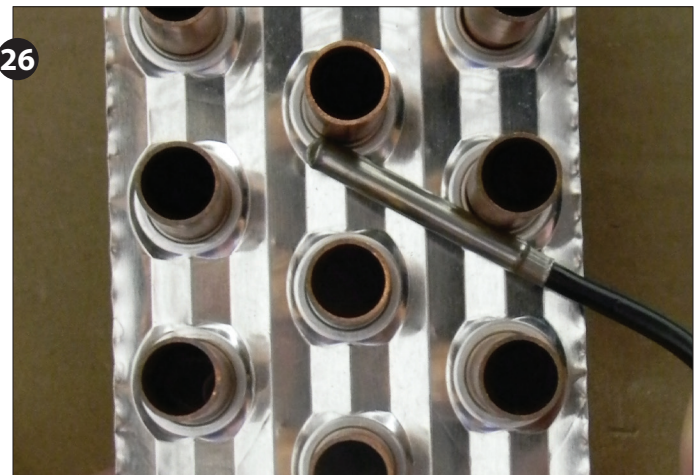
Once you have determined the proper sensor location as described in preliminary steps A-D on page 3, the sensor can be installed.

Installing the Sensor Properly

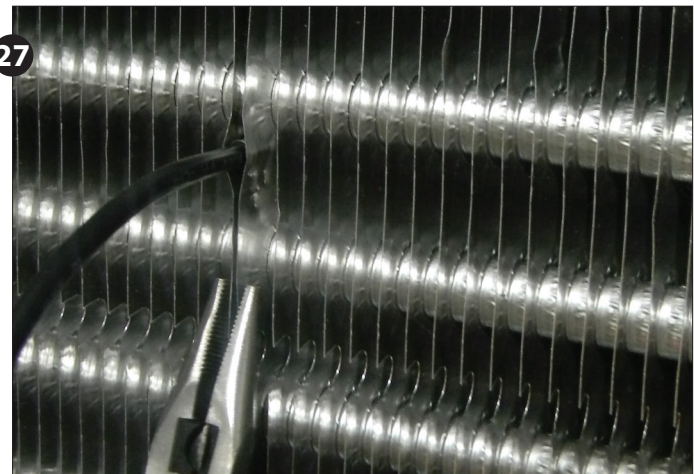
25 It is important to note, the most active portion of the sensor is the first 1/2" of the 1-1/2" long stainless steel probe.



26 As a result, it is important to touch two circuit tubes. When inserting the sensor into the coil, the tip should touch one of the circuit tubes. This location provides an appropriate location for the sensor.



27 Insert the probe into the fins approximately 1/16" deeper than the stainless shielding of the probe. Pinch the two fins gently together to secure the sensor in place. This provides the thermal ballast to ensure a complete defrost every time.



Pressure Transducer

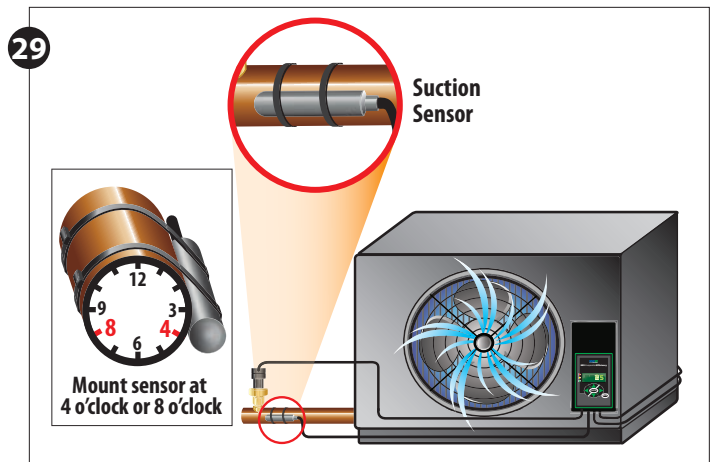
28 The pressure transducer should be installed at the outlet of the evaporator. It requires a 1/4 inch Schrader port for installation. Many evaporator models have a preexisting service port on their suction headers. If a service port is not available, one should be added to the system when the system is pumped down to add the Electric Expansion Valve.



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Suction Sensor

- 29** ■ Suction sensor location will affect the controller's superheat. Ensure proper system operation by locating the sensor at the 4 o'clock or 8 o'clock position. This ensures accurate superheat, avoiding potential problems. Specific areas to be avoided are the top and bottom of the tube. Locating the sensor on the top of the suction line introduces the potential for the denser liquid refrigerant, which travels along the bottom of the tube, to get past. The bottom of the suction line may be coated with the system's oil, creating an insulating barrier between the refrigerant and the sensor.

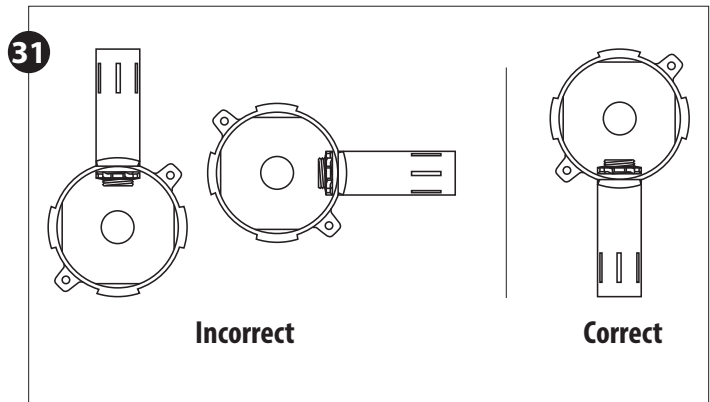


Installing the Humidity Sensor

- 30** ■ The humidity sensor should be located in an area representative of the controlled space. When selecting the sensor location, some areas should be avoided. Large openings to the space have the potential to allow large amounts of humidity to enter the space and provide a false high humidity reading. Conversely, locating the sensor away from all openings or an area with poor air movement may provide a false low humidity reading.

- 31** ■ When installing the sensor, the orientation of the sensor is important. **The sensor must be placed with the metal cylinder in the downward direction.** Orientating the sensor with the cylinder in either a horizontal or upside down position will result in inaccurate readings.

The humidity sensor comes preconfigured and prewired with a 40 foot lead from KE2 Therm. Installers should not open the water-tight housing and make adjustments without consulting KE2 Therm Technical Support. If the sensor must be located more than 40 feet from the controller, its cable may be extended to 100 feet using twisted, shielded pair. When extending beyond 100 feet, contact KE2 Therm.



Extending sensor wires

- After the sensors are mounted, they are routed back to the controller. If the wires must be extended, use **18 gauge twisted shielded pair**. Maximum length for 18 gauge: 100ft.
- When running the wires back to the controller care must be taken to avoid interference being introduced into the sensor wires. Interference can be introduced when sensor wires are located near high voltage lines. High voltage is defined by Underwriter's Laboratories as being above 30V. The higher the voltage, the more likely it is to introduce interference, and the more important to avoid.
- If crossing a high voltage line is necessary, the sensor wiring should be run at right angles to prevent noise.
- Sensor mounted on same side of coil as distributor tube entry.



KE2 ControlledEnvironment

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Connecting sensor wires to controller

32 ■ The sensors are designed to be attached to the controller using screw terminals. Using a connector from the accessory kit, attach each sensor to the appropriate screw terminal.

■ Connect all sensors to a screw terminal.

■ Once connected, the sensors should be plugged into the proper location on the controller. The location can be determined from the label on the interior wall of the enclosure or from the Wiring Schematic.

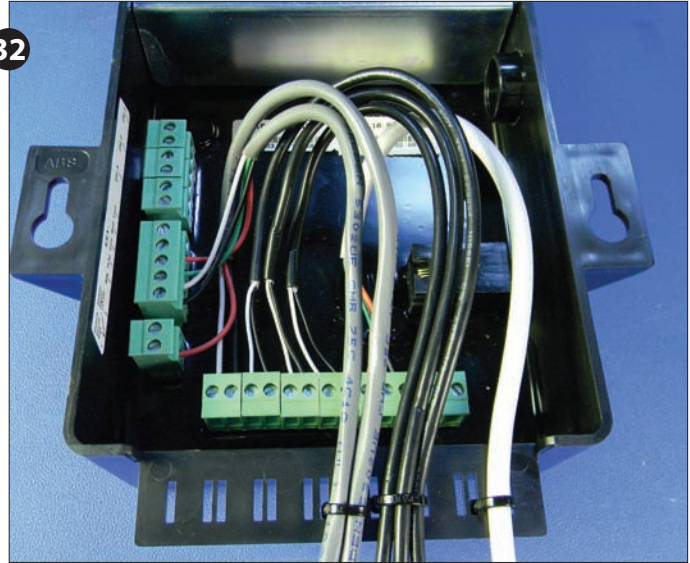
Strain relief

■ The enclosure has been designed with a strain relief bar to prevent the sensor wires from becoming unplugged from inadvertent contact.

■ Before securing the sensor wires, create a service loop as shown in Figure 32.

■ Using the cable ties from the accessory kit, securely fasten the sensor wires to the strain relief bar.

Note: Unused connectors should be placed (installed) in their respective location for future use.



Controller Mounting

33 ■ Locate the 4 stainless steel screws in the accessories kit

■ Install the 4 screws

■ Place the controller on the mounting screws and tighten down the screws.

33



Final Step

34 ■ Leave the installation instructions onsite in a convenient location, where it can be easily located, for future service.



KE2 Controlled Environment

Quick Start Guide

KE2 Controlled Environment - Diagram (back view)

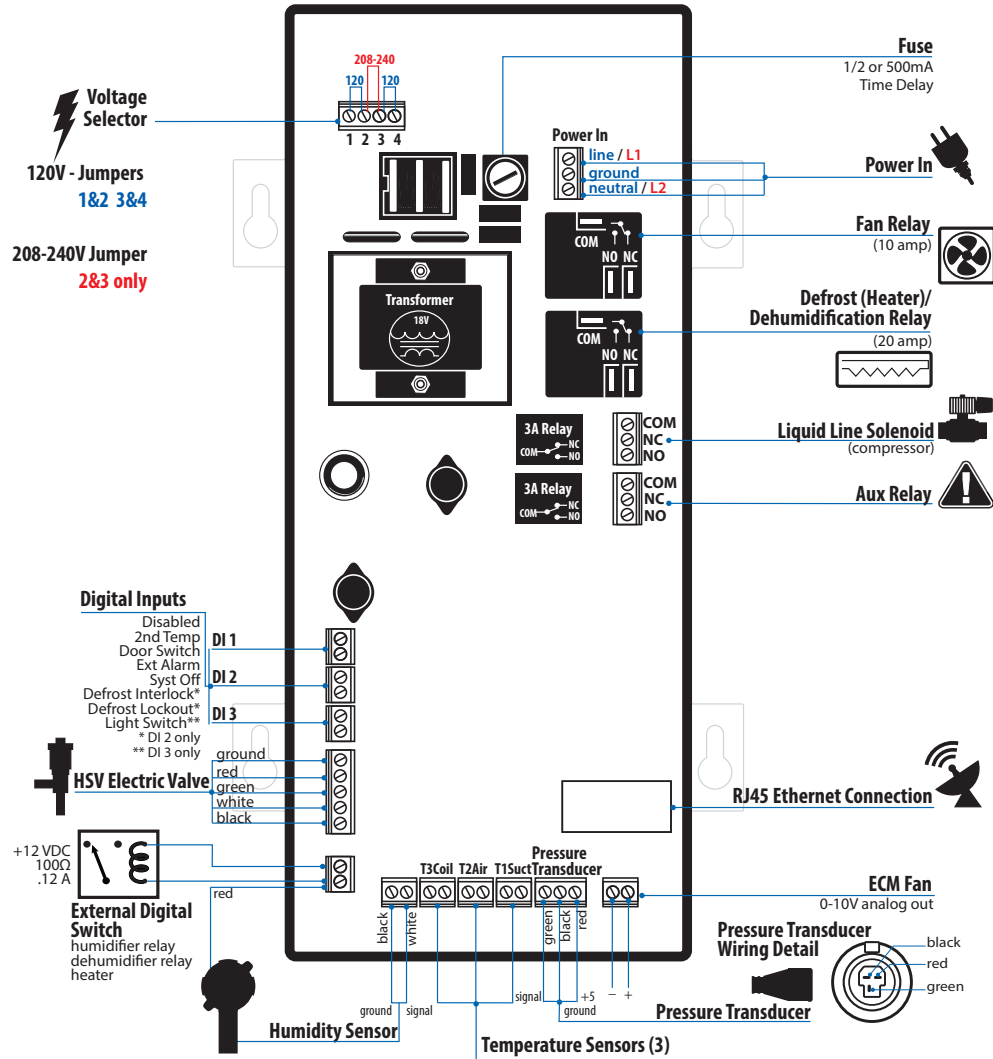


Table 1 - Specifications

Controller	
Input Voltage:	120V or 208 - 240V
Ambient Temp:	-40° to 140°F
Operating Temp:	-40° to 140°F
Display:	4-digit alphanumeric LED
IP Rating:	IP65
Inputs:	(3) temperature sensors (KE2 SKU 20200) (1) pressure transducer (KE2 SKU 20204) (1) humidity sensor (KE2 SKU 20651)
Relays:	20A resistive (defrost); 10A inductive (evaporator fan) (2) 3A inductive rated
Digital Input 1:	door contact, use 2nd air temp setpoint, disabled, system off, external alarm notification
Digital Input 2:	door contact, use 2nd air temp setpoint, disabled, system off, external alarm notification, defrost interlock, defrost lockout
Digital Input 3:	door contact, use 2nd air temp setpoint, disabled, system off, external alarm notification, light switch

Valve Type:	bipolar stepper motor (12V)
Communication:	Standard TCP/IP
Pressure Transducer	
Pressure Range:	0 to 150 psia
Proof Pressure:	450 psi
Burst Pressure:	1500 psi
Operating Temp:	-40° to 275°F
Temperature Sensor	
Sensor Specs:	-60° to 150°F moisture resistant package
Humidity Sensor	
Sensor Specs:	0% to 100% Relative Humidity



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Controller Navigation - Menu Structure



Indicator lights

- **Red light** - critical alarm (system off)
- **Yellow light** - non-critical alarm (system running)
- **Green light** - compressor on
- **Green flashing** - compressor waiting on timer to start/stop

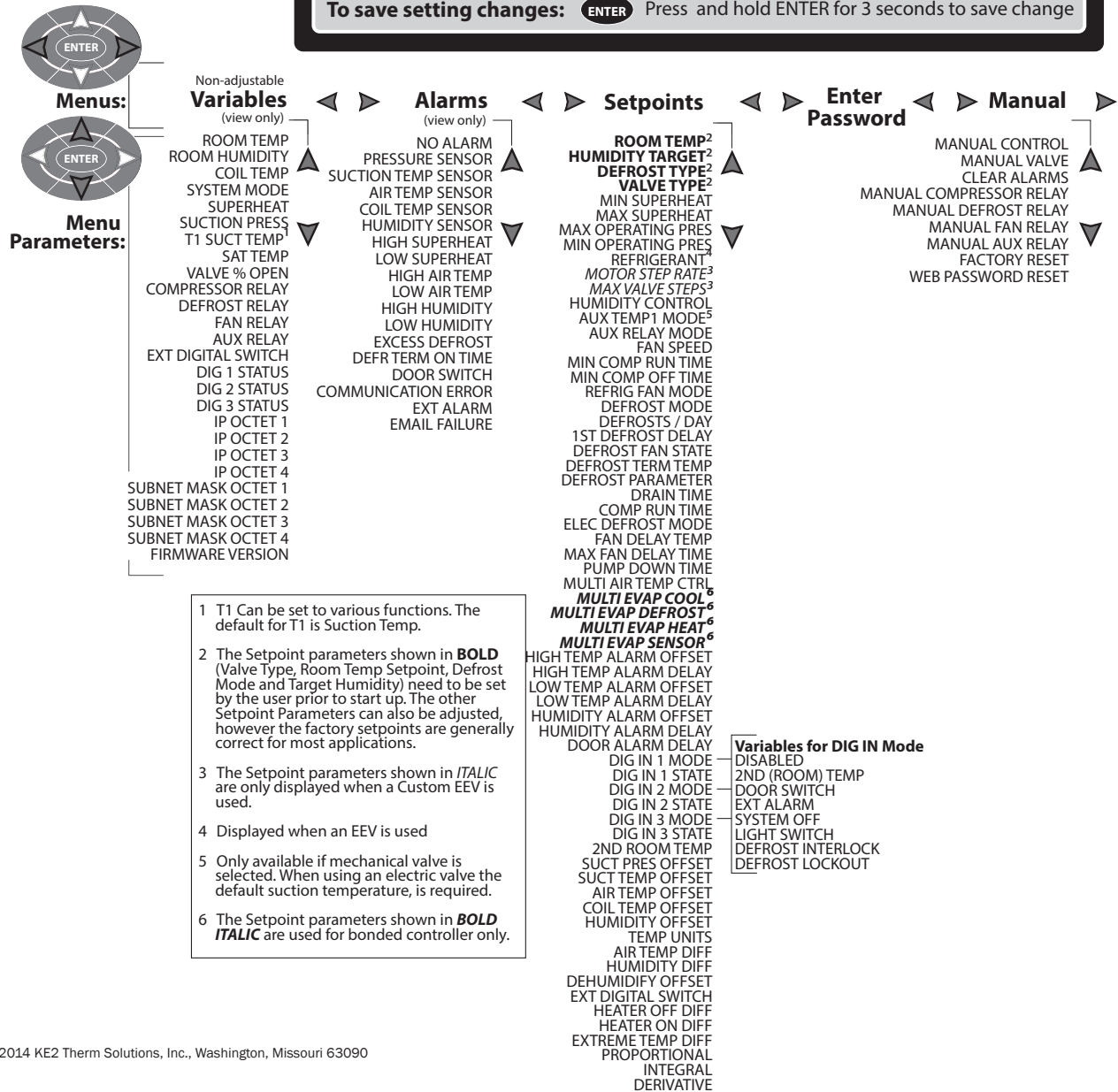
To move through controller menus:

- Left Arrow and Right Arrow**
Use to move between Menus
- Up Arrow and Down Arrow**
Scroll through Menu Parameters

To return to Main Menu: **BACK** Press BACK to return to the previous view.

To change settings: **ENTER** Press and hold ENTER for 3 seconds, when display begins blinking changes can be made

To save setting changes: **ENTER** Press and hold ENTER for 3 seconds to save change



1 T1 Can be set to various functions. The default for T1 is Suction Temp.

2 The Setpoint parameters shown in **BOLD** (Valve Type, Room Temp Setpoint, Defrost Mode and Target Humidity) need to be set by the user prior to start up. The other Setpoint Parameters can also be adjusted, however the factory setpoints are generally correct for most applications.

3 The Setpoint parameters shown in *ITALIC* are only displayed when a Custom EEV is used.

4 Displayed when an EEV is used

5 Only available if mechanical valve is selected. When using an electric valve the default suction temperature, is required.

6 The Setpoint parameters shown in **BOLD ITALIC** are used for bonded controller only.



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Mounting the Controller

Once the wiring has been run to the controller location, the controller can be connected. When installing the KE2 Controlled Environment, the (4) screws supplied in the kit may be preinstalled in the mounting surface. The controller has keyholes in each mounting tab to allow the controller to be installed over the screws. The mounting pattern can be seen in Figure 10.

User Interface

The KE2 Controlled Environment's onboard user interface uses a familiar 6-button arrangement to simplify navigation through the controller's menus. The menu has been grouped by category to provide an easy to program structure. By grouping the menu by each functional area, the user is not required to scroll through unrelated setpoints to access the desired functionality.

The **left** and **right arrows** move between the categories. When pressed while in a menu, the left and right arrows will move to the main screen or the adjacent menu.

The **up** and **down arrows** move the user through the available options for each group. All users are allowed access to the variable alarms. All other information is password protected to prevent unauthorized access to the controller's functionality.

Use **ENTER** button to save an input option when it has been changed. **Button must be held for 3 seconds to prevent accidental changes.** Changes may be discarded by waiting, to allow the controller to time-out and return to default screen, or pressing **BACK** button.

The **BACK** button is used to return to the previous screen. Pressing the **BACK** button twice at any time will return the user to the default view. **See Table 2 (following page).**

Controller Setup

Upon initially applying power to the controller, the controller will initialize, then automatically enter the **Introduction Mode**. The Intro Mode consists of as little as 4 setpoints that must be configured for KE2 Controlled Environment to begin controlling the system.

Table 1 shows the Intro Mode. The first setpoint the user is asked to enter is the desired **ROOM TEMP**. This is followed by the **TARGET HUMIDITY**, then **DEFROST TYPE**. The controller is designed to work with electric, hot gas, and off time defrosts. The last setpoint is the **VALVE TYPE**. The controller is defaulted to be used with a KE2 EEV, but may be used with a mechanical valve or a customer defined valve.

These are the only setpoints required to begin controlling the system, when applied on a single evaporator with a mechanical valve, **See Table 1.**

Adjusting Controller Parameters

The controller has the ability to access an abundance of information from the 4-digit alphanumeric display. However, the controller requires a password, adding a degree of protection from unwanted modifications. The controller will prompt the user for a password **PASSWORD** when the user attempts to access setpoints they do not have permission to change.

Table 2 shows the menu structure of the controller. The default display of the controller always displays the actual room temperature. Pressing the **up** and **down** arrows moves the display through the **VARIABLES** menu. See **Table 2**. By default, the controller only allows access to the room temperature. The **VARIABLES** menu consists of the current sensor readings and the relays' state. The **User Password (1111)** only provides access to the ROOM TEMP setpoint.

For the protection of the system, access to the **SETPOINT** and **MANUAL** control requires an **Installer Password (2222)**. Pressing the right or left arrow will move from the Variables menu to the next menu, shown in **Table 2**, a complete list of parameters are shown in **Table 3**.

Pressing the **BACK** key at any time will return the user to next level up the menu. A second press will either return to the **Main Menu** or to the room temperature reading.

Table 1 - Introduction Menu

Mechanical Valve TEV 4 steps	KE2 HSV (default) 5 steps	Custom EEV 7 steps
Room Temp	Room Temp	Room Temp
Target Humidity	Target Humidity	Target Humidity
Defrost Type	Defrost Type	Defrost Type
Valve Type	Valve Type	Valve Type
	Refrigerant	Refrigerant
		Step Rate
		Max Steps

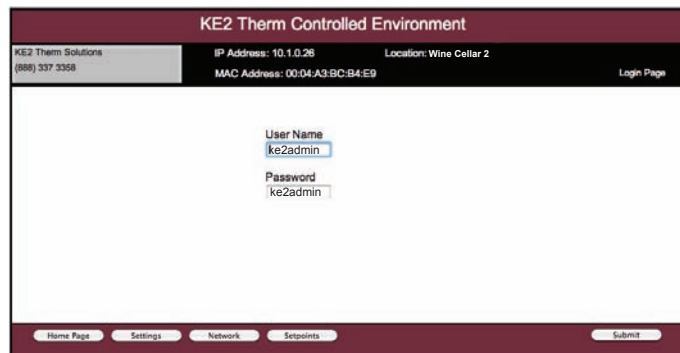
If using a standard/predefined EEV, the user will also be prompted to specify the **REFRIGERANT**. Once these have been set, the KE2 Controlled Environment will begin controlling EEV and the system. **Table 3**

Web Login

When accessing the controller using the webpage, the Username and Password are required.

The defaults are set as: **User:** ke2admin **Password:** ke2admin

IMPORTANT: The Password should be changed from the default for security purposes.





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Table 3 - Controller Menus and Menu Parameters
Setpoints Menu

Parameter Name	Description
ROOM TEMP	Room temperature to be maintained
HUMIDITY TARGET	Room humidity to be maintained
DEFROST TYPE	Method of defrost used on the evaporator coil: Electric, Air, Hot Gas with Liquid Line Solenoid/Compressor relay off, Hot Gas with Liquid Line Solenoid/compressor relay on
VALVE TYPE	Type of valve used on the system: mechanical, KE2 HSV (electric)
MIN SUPERHEAT	The low superheat value that the controller will override pressure control
MAX SUPERHEAT	The high superheat value that the controller will override pressure control
MAX OPERATING PRES	The maximum allowable suction pressure, (not applicable if VALVE TYPE = MECHANICAL)
MIN OPERATING SETPOINT	The minimum allowable suction pressure
REFRIGERANT	The type of refrigerant used in the refrigeration system
MOTOR STEP RATE	Step rate for the EEV in steps per second
MAX VALVE STEPS	Number of steps for full stroke of EEV
HUMIDITY CONTROL	Humidity sensor
AUX TEMP1 MODE	Configuration mode of the auxiliary temperature sensor if VALVE TYPE = MECHANICAL
AUX RELAY MODE	Configuration mode of the auxiliary relay.
FAN SPEED	Control variable fan speed by using setpoint as % off and on
MIN COMP RUN TIME	Minimum amount of time the liquid line solenoid/compressor relay must remain on after it is energized
MIN COMP OFF TIME	Minimum amount of time the liquid line solenoid/compressor relay must remain off before it can be energized again.
REFRIG FAN MODE	Fan operation while in refrigeration mode
DEFROST MODE	The method the controller uses to determine when to initiate a defrost.
DEFROSTS / DAY	If DEFROST MODE = SCHEDULED: The number of evenly spaced defrosts per day the controller will initiate.
1ST DEFROST DELAY	If DEFROST MODE = SCHEDULED: The amount of time from controller power up until the first defrost is initiated.
DEFROST FAN STATE	Whether or not to run the evaporator fans during defrost
DEFROST TERM TEMP	The temperature the coil sensor(s) must exceed in order to terminate defrost. The defrost relay is de-energized at this point.
DEFROST PARAMETER	The maximum amount of time the defrost relay will be energized for schedule defrosts.
DRAIN TIME	Time to be in drain mode (drip time)
COMP RUN TIME	If DEFROST MODE = RUN TIME: The amount of time liquid line solenoid/compressor relay is energized before the next defrost is initiated.
ELEC DEFROST MODE	If DEFROST TYPE = ELEC: Whether to leave the defrost relay energized during the defrost cycle or to utilize advanced defrost algorithm.
FAN DELAY TEMP	After defrost, the coil sensor reading must fall below this temperature set point in order for the controller to resume normal fan operation.
MAX FAN DELAY TIME	Maximum amount of time after defrost to resume normal fan operation.
PUMP DOWN TIME	Minimum amount of time between de-energizing the liquid line solenoid/compressor relay and energizing the defrost relay.
MULTI AIR TEMP CTRL	Set to use average or warmest air temp when multiple air temps are available
MULTI EVAP COOL	Select whether to sync bonded controllers or let run independently in COOL or OFF modes
MULTI EVAP DEFROST	Select whether to sync bonded controllers or let run independently in DEFROST or DRAIN modes
MULTI EVAP SENSOR	Select whether to SHARE or NOT SHARE sensor readings for bonded controllers
HIGH TEMP ALARM OFFSET	The number of degrees above ROOM TEMP for a HIGH TEMP ALARM condition.
HIGH TEMP ALARM DELAY	Minutes the room temperature must remain above ROOM TEMP + HIGH TEMP ALARM OFFSET before issuing a HIGH TEMP ALARM
LOW TEMP ALARM OFFSET	The number of degrees below ROOM TEMP for a LOW TEMP ALARM condition.
LOW TEMP ALARM DELAY	Minutes the room temperature must remain below ROOM TEMP - LOW TEMP ALARM OFFSET before issuing a LOW TEMP ALARM
HUMIDITY ALARM OFFSET	The %RH above or below ROOM HUMIDITY for HIGH HUMIDITY ALARM condition or LOW HUMIDITY ALARM condition
HUMIDITY ALARM DELAY	Time the %RH must remain above or below ROOM HUMIDITY, HUMIDITY DIFF, HUMIDITY ALARM OFFSET before issuing a HIGH HUMIDITY ALARM OR LOW HUMIDITY
DOOR ALARM DELAY	If DIG IN (1, 2 and/or 3) MODE = DOOR SWITCH: The amount of time, in minutes, before an alarm condition is initiated if door is open and room temperature is 5 degrees above ROOM TEMP + AIR TEMP DIFF
DIG IN 1 MODE	Sets the function of the digital input
DIG IN 1 STATE	Sets whether the switch activates when opened or closed
DIG IN 2 MODE	Sets the function of the digital input
DIG IN 2 STATE	Sets whether the switch activates when opened or closed
DIG IN 3 MODE	Sets the function of the digital input
DIG IN 3 STATE	Sets whether the switch activates when opened or closed
2ND ROOM TEMP	If DIG IN (1, 2 and/or 3) MODE = 2ND ROOM TEMP: This value becomes the ROOM TEMP setpoint when the digital input is active
SUCT PRES OFFSET	An offset added or subtracted from the suction line pressure transducer reading
SUCT TEMP OFFSET	An offset added or subtracted from the suction temperature sensor reading
AIR TEMP OFFSET	An offset added or subtracted from the room temperature sensor reading
COIL TEMP OFFSET	An offset added or subtracted from the coil temperature sensor reading
HUMIDITY OFFSET	An offset added or subtracted from the humidity sensor reading
TEMP UNITS	Units for temperature's display in °F or °C
AIR TEMP DIFF	The number of degrees above ROOM TEMP before the controller will go into REFRIGERATION mode
HUMIDITY DIFF	The number of %RH above or below before the controller will go into DEHUMIDIFICATION or HUMIDIFICATION mode
DEHUMIDIFY OFFSET	An offset from ROOM TEMP to keep cooling if humidity is above setpoint
EXT DIGITAL SWITCH	Provides external output to control: HEATER, HUMIDIFIER, or DEHUMIDIFIER RELAY
HEATER OFF DIFF	ROOM TEMP minus HEATER OFF DIFF setpoint turns heaters off
HEATER ON DIFF	ROOM TEMP minus HEATER ON DIFF setpoint turns heaters on
EXTREME TEMP DIFF	ADVANCED TOPIC: Call KE2 Therm for assistance
PROPORTIONAL	A coefficient to the valve control algorithm that increases valve responsiveness
INTEGRAL	A coefficient to the valve control algorithm that increases valve responsiveness
DERIVATIVE	Should not be adjusted unless instructed by KE2 Therm technical support

CUSTOM
EEV
ONLY

BONDED
CONTROLLERS
ONLY



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	Range	Default	Current
	-50°F to 90°F	55°F	
	0% to 100%	65%	
	ELEC, AIR, HOT GAS COMP ON, HOT GAS COMP OFF	AIR	
	MECHANICAL, KE2, CUSTOM	KE2	
	4 TO 20	5°F	
	20 to 60	25°F	
	10 to 150	150 PSIG	
	0 to 150 PSIG	0 PSIG	
	404A, R507, 407A, 407C, 422A, 422D, 134A, R22, R717, 438A, 408A, 409A, 407F, 410A, R744	404A	
	30 to 400 steps per second	200 steps per second	
	200 to 6400 steps	1300 steps	
	ON, OFF	ON	
	T1 SUCTION TEMP, MONITOR, TI ROOM TEMP, TI COIL TEMP	T1 SUCTION TEMP	
	ALARM RELAY, 2ND COMP RELAY, 2ND FAN RELAY, 2ND DEF RELAY 2 SPEED FAN CTL, LIGHTS RELAY, PERM DEF, HUMIDIFIER RELAY	ALARM RELAY	
	-100% to 100%	0%	
	0 to 15 minutes	2 minutes	
	0 to 15 minutes	5 minutes	
	ON WITH COMPRESSOR, PERMANENT, MANAGED	ON WITH COMPRESSOR	
	DEMAND, SCHEDULED, RUN TIME	DEMAND	
	0 to 8	4	
	0 to 240 minutes	120 minutes	
	ON/OFF	OFF if DEFROST TYPE = ELEC, HOT GAS COMP ON, HOT GAS COMP OFF ON if DEFROST TYPE = AIR	
	35°F to 90°F	50°F if DEFROST TYPE = ELEC, HOT GAS COMP ON, HOT GAS COMP OFF 40°F if DEFROST TYPE = AIR	
	0 to 90 minutes	25 minutes if DEFROST TYPE = ELEC 10 minutes if DEFROST TYPE = HOT GAS COMP ON, HOT GAS COMP OFF 40 minutes if DEFROST TYPE = AIR	
	0 to 15 minutes	2 minutes	
	0 to 24 hours	6 hours	
	PULSE, PERMANENT	PERMANENT	
	-40°F to 35°F	20°F	
	0 to 20 minutes	2 minutes; 0 if Room Temp Setpoint is > 35°F	
	0 to 10 minutes	0 minutes	
	WARMEST, AVERAGE	WARMEST	
	SYNC, INDEPENDENT	SYNC	
	SYNC, INDEPENDENT	SYNC	
	SHARED, NOT SHARED	SHARED	
	0°F to 99.9°F	10°F	
	0 to 120 minutes	60 minutes	
	0°F to 20°F	4°F	
	0 to 30 minutes	10 minutes	
	0% to 25%	5%	
Y ALARM	0 TO 360 minutes	120 minutes	
	0 to 180 minutes	30 minutes	
	DISABLED, 2ND ROOM TEMP, DOOR SWITCH, EXT ALARM, SYSTEM OFF	DISABLED	
	OPEN, CLOSED	OPEN	
	DISABLED, 2ND ROOM TEMP, DOOR SWITCH, EXT ALARM, SYSTEM OFF, DFR INTERLOCK, DFR LOCKOUT	DISABLED	
	OPEN, CLOSED	OPEN	
	DISABLED, 2ND ROOM TEMP, DOOR SWITCH, EXT ALARM, SYSTEM OFF, LIGHTS SWITCH,	DISABLED	
	OPEN, CLOSED	OPEN	
	-50°F to 90°F	-50°F	
	-5.0 to 5.0 psig	0.0 psig	
	-5.0°F to 5.0°F	0.0°F	
	-5.0°F to 5.0°F	0.0°F	
	-5.0°F to 5.0°F	0.0°F	
	-5% to 5% RH	0%	
	FAHRENHEIT/CELSIUS	FAHRENHEIT	
	0.1°F to 5°F	1°F	
	0% to 25%	5%	
	-20°F to 0°F	0°F	
	HEATER SWITCH, DEHUMIDIFY RELAY, HUMIDIFIER RELAY	HEATER	
	-99.9°F to 0°F	-99.9°F	
	-100°F to -0.1°F	-100°F	
	3	0 to 255	
	5	0 to 255	
	3	0 to 255	



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Manual Menu

Parameter Name	Description	Range	Default
MANUAL CONTROL	Force the controller into the next operating mode	REFRIGERATE, OFF, DEFROST, DRIP TIME, FAN DELAY	
MANUAL VALVE	Manually open or close the EEV in percentage increments	1% increment	
CLEAR ALARMS	Clear all active alarms		
MANUAL COMPRESSOR RELAY	Manually energize or de-energize liquid line solenoid /compressor relay	AUTO (ON/OFF), MANUAL OFF, MANUAL ON	AUTO
MANUAL DEFROST RELAY	Manually energize or de-energize defrost relay	AUTO (ON/OFF), MANUAL OFF, MANUAL ON	AUTO
MANUAL FAN RELAY	Manually energize or de-energize evaporator fan relay	AUTO (ON/OFF), MANUAL OFF, MANUAL ON	AUTO
MANUAL AUX RELAY	Manually energize or de-energize auxiliary relay	AUTO (ON/OFF), MANUAL OFF, MANUAL ON	AUTO
FACTORY RESET	Reset the controller to the factory default setpoints	RESET	
WEB PASSWORD RESET	Reset the web password to the factory default setpoints	RESET	

Variables Menu - Non Adjustable (view only)

Parameter Name	Description
ROOM TEMP	Room temperature as measured by the controller
ROOM HUMIDITY	Humidity as measured by the controller
COIL TEMP	Coil temperature as measured by the controller
SYSTEM MODE	Current operating status
SUPERHEAT	Superheat as calculated by the controller (requires suction pressure transducer and suction temperature sensor)
SUCTION PRESSURE	Suction pressure as measured by the controller
T1 SUCT TEMP	Suction temperature as measured by the controller
SAT TEMP	Saturation temperature as calculated by the controller
VALVE % OPEN	Percentage the EEV is open
COMPRESSOR RELAY	Current state of liquid line solenoid/compressor relay
DEFROST RELAY	Current state of the defrost relay
FAN RELAY	Current state of the evaporator fan relay
AUX RELAY	Current status of the Aux Relay
EXT DIGITAL SWITCH	Current status of the Ext Digital Switch
DIG 1 STATUS	Current status of the Digital Input #1
DIG 2 STATUS	Current status of the Digital Input #2
DIG 3 STATUS	Current status of the Digital Input #3
IP OCTET 1	The first three digits of the IP address
IP OCTET 2	The second three digits of the IP address
IP OCTET 3	The third three digits of the IP address
IP OCTET 4	The fourth three digits of the IP address
SUBNET MASK OCTET 1	The first three digits of the subnet mask
SUBNET MASK OCTET 2	The second three digits of the subnet mask
SUBNET MASK OCTET 3	The third three digits of the subnet mask
SUBNET MASK OCTET 4	The fourth three digits of the subnet mask
FIRMWARE VERSION	Current version of the firmware on the controller

Variables Menu Options for DIG IN MODE

DIG IN Setting	Status Displayed on Controller
DIG IN MODE = DISABLED	DISABLED
DIG IN MODE = 2ND (ROOM) TEMP	inactive = 2ND ROOM TEMP OFF; active = 2ND ROOM TEMP ON
DIG IN MODE = DOOR SWITCH	inactive = DOOR CLOSED; active = DOOR OPEN
DIG IN MODE = EXT ALARM	inactive = NO ALARM; active = EXT ALARM (x)
DIG IN MODE = SYSTEM OFF	inactive = SYSTEM ON; active = SYSTEM OFF
DIG IN MODE = LIGHT SWITCH	inactive = LIGHTS OFF; active = LIGHTS ON
DIG IN MODE = DEFROST INTERLOCK	inactive = DEFR AUTO; active = DEFR OFF
DIG IN MODE = DEFROST LOCKOUT	inactive = DEFR AUTO; active = DEFR LOCKED OUT

Alarms Status Menu - Non Adjustable (view only)

Parameter Name	Description
NO ALARM	No alarms active, everything is running correctly
PRESSURE SENSOR	Suction pressure sensor is shorted, open or pressure out of range
SUCTION TEMP SENSOR	Suction temperature sensor is shorted or open
AIR TEMP SENSOR	Return air temperature sensor is shorted or open
COIL TEMP SENSOR	Coil temperature sensor is shorted or open
HUMIDITY SENSOR	Humidity sensor is shorted or open
HIGH SUPERHEAT	Superheat above upper limit (Only with HSV)
LOW SUPERHEAT	Superheat below lower limit (Only with HSV)
HIGH AIR TEMP	Room temperature is above ROOM TEMP + AIR TEMP DIFF + HIGH TEMP ALARM OFFSET for longer than HIGH TEMP ALARM DELAY
LOW AIR TEMP	Room temperature is below ROOM TEMP - LOW TEMP ALARM OFFSET for longer than LOW TEMP ALARM DELAY
HIGH HUMIDITY	Room humidity is above ROOM HUMIDITY + HUMIDITY DIFF + HIGH HUMIDITY ALARM OFFSET for longer than HIGH HUMIDITY ALARM DELAY
LOW HUMIDITY	Room humidity is below ROOM HUMIDITY - LOW HUMIDITY ALARM OFFSET for longer than LOW HUMIDITY ALARM DELAY
EXCESS DEFROST	32 or more defrosts in 48 hours
DEFR TERM ON TIME	Defrost terminated on time instead of temperature for two consecutive cycles
DOOR SWITCH	If door is open and room temperature is 5 degrees above ROOM TEMP + AIR TEMP DIFF for DOOR ALARM DELAY time
COMMUNICATION ERROR	ONLY FOR BONDED CONTROLLERS: No communication between controllers for one minute or more
EXT ALARM	If DIG IN (1, 2 and/or 3) MODE = EXT ALARM : The digital input is in an active state
EMAIL FAILURE	Email alert was not confirmed by email server provided after seven consecutive attempts