Manuel d'instruction

Installation N.1.1
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KE2 EvaporatorEfficiency

Installation Instructions

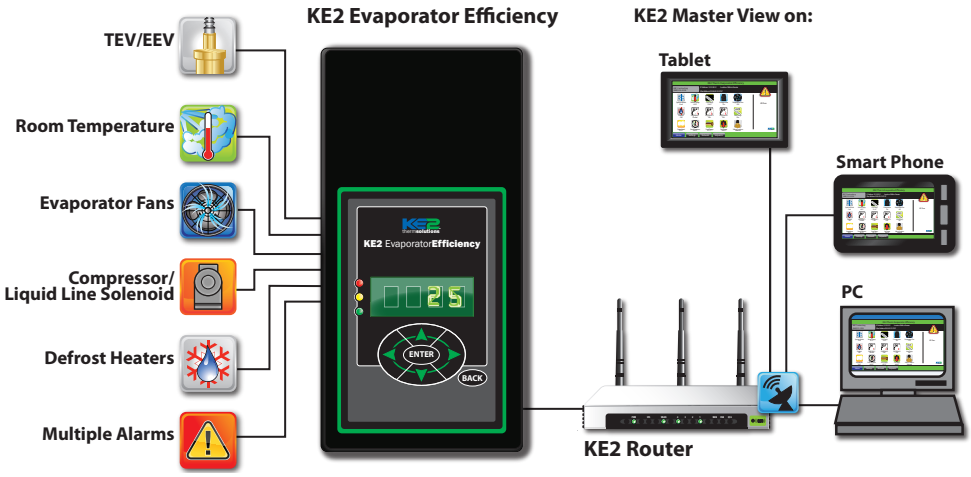
KE2 Therm Solutions
Providing Advanced Energy Saving Technology
for Commercial Refrigeration and AC Systems.

KE2 Evaporator**Efficiency**
Installation Instructions

Introduction

The KE2 Evaporator Efficiency (KE2 Evap) is an electronically operated evaporator controller engineered to save energy in refrigeration systems through precise control of superheat, space temperature, fan cycling, reducing compressor runtime, and implementing demand defrosts. The KE2 Evap offers quick payback, and a life expectancy that matches that of the system. The controller pays for itself, and then continues to pay dividends for the life of the system.

KE2 Evaporator Efficiency - Controls and Communicates



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Parts List

The following parts are included in the KE2 Evaporator Efficiency (KE2 Evap) controller kits:

- **Kit # 20178 with 120/208/230 VAC controller**
  - OR -
- **Kit #20222* with Beacon II replacement controller**

(2) Temperature sensors
part #20199

(1) Air sensor mount

(5) Self-tapping screws

(1) Installation Instructions

(4) 90 degree quick disconnect

* Beacon II kit includes an extra temperature sensor and pressure transducer.

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Location

The KE2 Evap was developed with ease of installation in mind. The controller is supplied in an enclosure, and encapsulated to protect the circuitry from moisture damage. This extra level of protection allows the controller to be installed in the refrigerated space.

When installing the controller, it may either be installed on an interior/exterior wall or on the evaporator. Many evaporators have sufficient space to install the controller on the face of evaporator or on its housing. Locating the controller as close to the evaporator as possible reduces the amount of wiring when converting existing systems, as well as when it is applied on new applications.

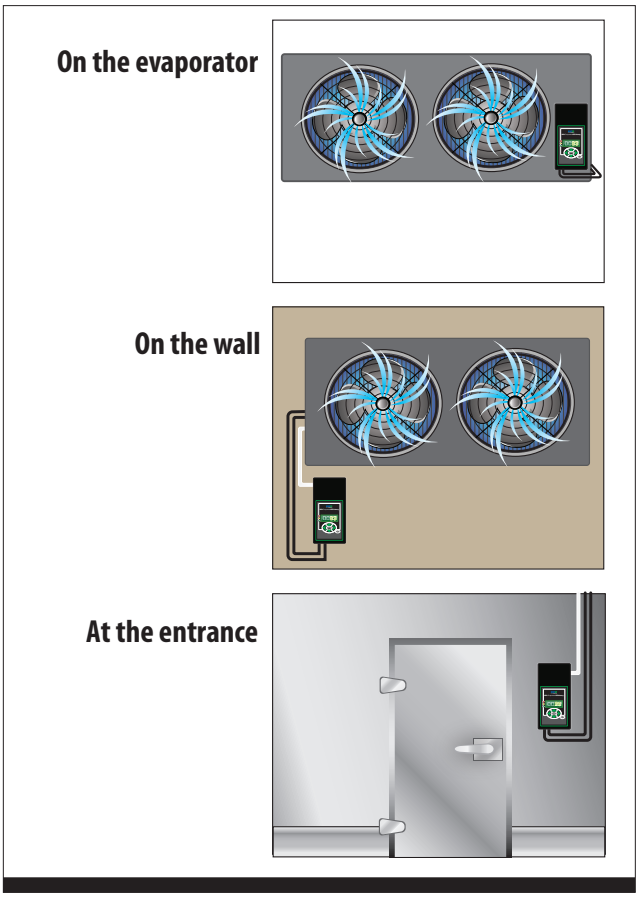
Users may find it beneficial to install the controller in a location providing easy access -- on the wall or near the entrance. This enables the user to easily view the display, and eliminates the need to use a ladder or lift to modify the setpoints or check alarms.

If viewing the temperature outside the walk-in or refrigerated room is desirable, the KE2 Evap may be used as a digital thermostat. The controller is then installed near the door of the space for easy viewing of the room temperature and/or system status. See **Figure 1** for locations.

If installing the controller on the face of the evaporator, preexisting knockouts on the evaporator should be used for installing the high voltage wiring. If knockouts do not preexist, hole(s) may be carefully cut into an unobstructed area of the evaporator case. If modifying the face of the evaporator is not feasible or desired, the controller's conduit knockouts may be used with ½ inch conduit.

The bottom side of the controller includes a cutout with cable tie slots providing a strain relief for the low voltage and sensor wires. Additional knockouts are available on either side if conduit is preferred.

Figure 1 - KE2 Evap Installation Locations



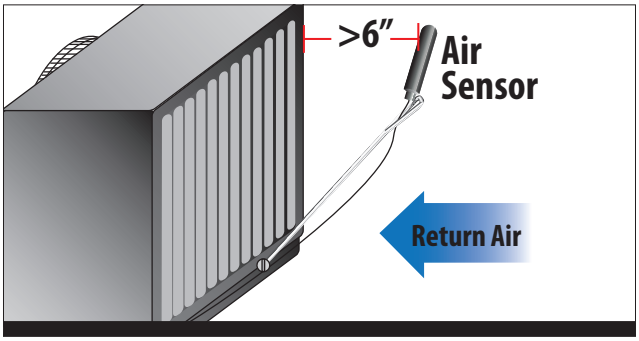
Installation & Wiring

The KE2 Evap is supplied with pluggable connectors for all connections. Pluggable connectors permit the controller to be placed in a safe location while the wiring is installed. They also simplify the wiring, allowing the wires to be fastened to the screw terminals in the open air. Once all wiring is completed using accepted wiring practices, it is plugged into the controller prior to final mounting.

Although there is one pressure transducer and four temperature sensor inputs, when used with mechanical valves (TEVs), KE2 Evap only requires the **(2) sensors supplied with the kit.** One sensor reads the return air temperature and the other measures the coil temperature. **NOTE! Sensor location is critical to the proper operation of the controller.**

Return Air Temperature Sensor - The air temperature sensor is installed in the return air of the evaporator using the included sensor mount. Most applications allow the sensor mount to be installed using an existing screw. On evaporators where using an existing screw is not possible, the included self-tapping screw may be used to secure the sensor mount to the evaporator. **Note: Be careful to avoid damage to an evaporator tube or causing a leak in the drip pan.** When installing, it is important to prevent the air sensor from coming into contact with the mounting bracket, cable ties, or any other solid material. **Figure 2** shows an example of how to mount the sensor. The sensor must be a minimum of 6 inches from the coil surface.

Figure 2 - Return Air Sensor Placement



After the sensor is installed, route the wire back to the controller location. When routing sensor wire, it is important to avoid interference from high voltage lines. If sensor wire is run parallel to the high voltage, there is a potential for inductance to affect the sensor reading. This is of particular concern with long wire runs. When extending sensors, use the 18 gage, shielded twisted pair. Sensor wires can be run beyond 100 feet when using special considerations. Contact KE2 Therm. After the wire has been successfully routed, it may be connected to the pluggable terminal on the controller.

Coil Temperature Sensor - As a critical input to the controller, it is essential the sensor is located at the **coldest point on the evaporator coil** for optimal operation. The coil sensor is an integral part of the control algorithm used to determine coil efficiency, to initialize defrosts, and to terminate defrosts.

KE2 Therm offers general guidance for sensor locations based on the coil construction. **Figure 3** shows the recommended locations for the coil sensor for each evaporator type.

When installing on draw through models, the sensor should be located behind the coil in the lower corner nearest the suction header. Blow through models should be installed on the front of the coil, in the upper corner also nearest to the suction header. When installing the sensor into the coil, the sensor should be positioned half way between the circuit tubes and, perpendicular to the face of the coil. When choosing the location, the sensor should not be located adjacent to the electric heating elements. Locating the sensor too close to the elements will cause false defrost termination temperatures. The sensor should be approximately half the distance between the heaters if possible. **Figure 4** shows the proper sensor placement.

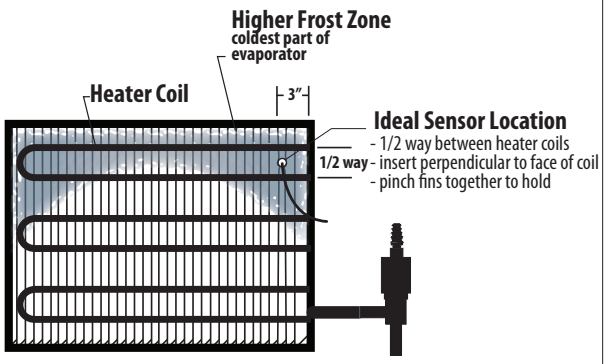
Due to the many factors influencing the evaporator performance, it is impossible for KE2 Therm to provide the proper location of every installation. However, the coil sensor is an integral part of the control algorithm used to determine coil efficiency to initiate, as well as, terminate defrosts. The coldest point in the coil can be identified from existing system knowledge or by monitoring the normal operation.

Controller Power - The high voltage wiring is protected by a metal shield screwed to the back side of the controller. The shield should be removed to gain access to the wiring connections, making note of the location of the screws. The screws in the upper corners are coarse thread screws, while the screw in the middle is a 4-40 machine screw.

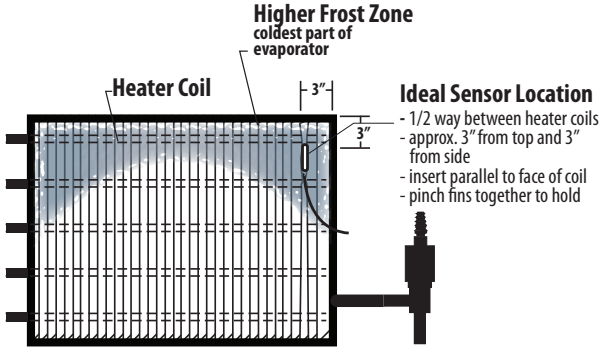
The controller accepts either 115V or 230V incoming power. The controller includes metal oxide varistors (MOVs), providing protection from voltage spikes. MOVs use the same technology commonly applied to protect consumer electronics. They function by filtering out voltages high enough to damage the board. When the voltage exceeds the allowed amount, the MOVs short to ground, protecting the circuitry. For additional protection, the board has a replaceable BK/MDL-1/4 fuse in line. The grey plug is accessible without removing the metal shield in the fuse

Figure 3 - Proper Sensor Location

Electric Defrost - Surface Heater



Electric Defrost - Dropped Tube



Air Defrost / Hot Gas Defrost

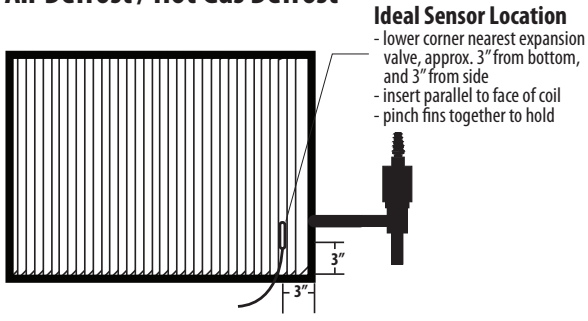
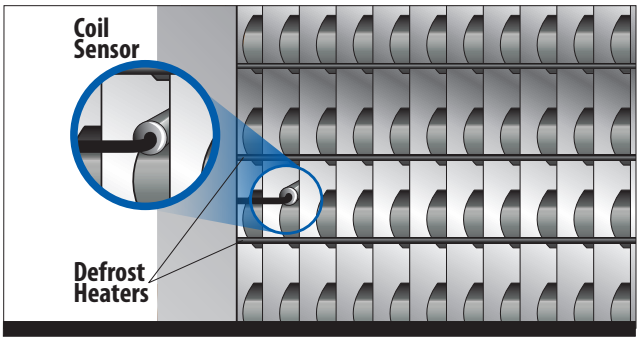


Figure 4 - Coil Sensor Placement



holder. Depress slightly and turn 1/4 turn counterclockwise to remove. Replace by depressing slightly and turning 1/4 turn clockwise. Do not overtighten.

The board uses a pluggable screw terminal connector to connect incoming power. The terminal is located in the top right corner of the controller when the terminals are facing the user. See **Figure 5**.

Fan and Defrost Relays - There are 2 larger relays on the controller with spade connectors. These are used for the evaporator fans and defrost heaters. Due to the spacing of the enclosure the spades require a 90 degree terminal. KE2 Therm has included (4) spade connectors to assist in wiring the relays.

Evaporator Fan Relay - The fan relay is rated 10A inductive at 240V. One leg of the incoming power for the fans should be connected to the COM terminal of the fan relay, the upper of the two larger relays. The remaining leg, (L2) should be connected to one lead of the fan. The remaining fan lead should be connected to the NO (Normally Open) terminal on the fan relay. See **Figure 7**.

Defrost Heater Relay - The heater relay is rated 20A resistive at 240V. One leg of the incoming power for the heaters should be connected to the COM terminal of the heater relay, the lower of the two larger relays. The remaining leg, (L2) should be connected to one lead of the heater. The remaining heater lead should be connected to the NO (Normally Open) terminal on the heater relay.

Compressor/Liquid Line Solenoid Relay - The compressor relay is rated at 3A induction at 240V. This relay uses the 3-position pluggable screw terminal to make the connection to the board. The relay is not intended to control the compressor directly. It is designed to be used to control the liquid line solenoid or as a pilot to the compressor contactor. One leg of the incoming power supply (L1) should be connected to COM terminal of the compressor relay, the upper of the two smaller relays. The remaining leg, (L2), should be connected to one lead on the solenoid/compressor contactor. The remaining lead, should be connected to the normally open (NO) position on the terminal.

Alarm Relay - The alarm relay is rated at 3A inductive at 240V. This relay uses the 3-position pluggable screw terminal to make the connection to the board. The relay may be used to connect an audible alarm, light, or to alert a 3rd party alarm system. One leg of the incoming power supply (L1) should be connected to COM terminal of the alarm relay, the lower of the two smaller relays. The remaining leg, (L2), should be connected to one lead on the alarm. The remaining alarm lead, should be connected to the normally open (NO) position on the terminal.

After all high voltage wiring is completed the metal shield must be replaced and screws tightened.

Additional Inputs

Suction Temperature Sensor - The suction temperature sensor is required when applying the controller with an electronic expansion valve. The sensor's proximity to the evaporator outlet differs slightly for electronically controlled valves from the placement of a TEV bulb. Due to the more refined control from an electronically controlled valve, the sensor must be placed as close to the outlet of the coil as feasible. Although the distance from the outlet is different, the nature of the refrigerant's flow through the tube remains unchanged, thus the orientation of the sensor remains at the 4 or 8 o'clock position. The sensor should be secured to the suction line using the included wire ties designed for low ambient operation.

Pressure Transducer - In addition to the suction temperature sensor, a pressure transducer is also required for superheat measurement when applying an electronic expansion valve. The pressure tap should be mounted on the top of a horizontal section of tube. It should be located near the suction sensor, approximately 3 inches downstream from the position of the temperature sensor.

Auxiliary Temperature Sensor -The auxiliary temperature sensor provides flexibility and may be used for any purpose desired by the user. The placement of the sensor is dependent on the requirements of the user's intended application. The Auxiliary Temperature sensor must be supplied by KE2 Therm.

Digital Inputs - The controller includes (3) digital inputs. See **Table 3** for configuration options.

Figure 5 - KE2 Evaporator Efficiency - Diagram (back view)

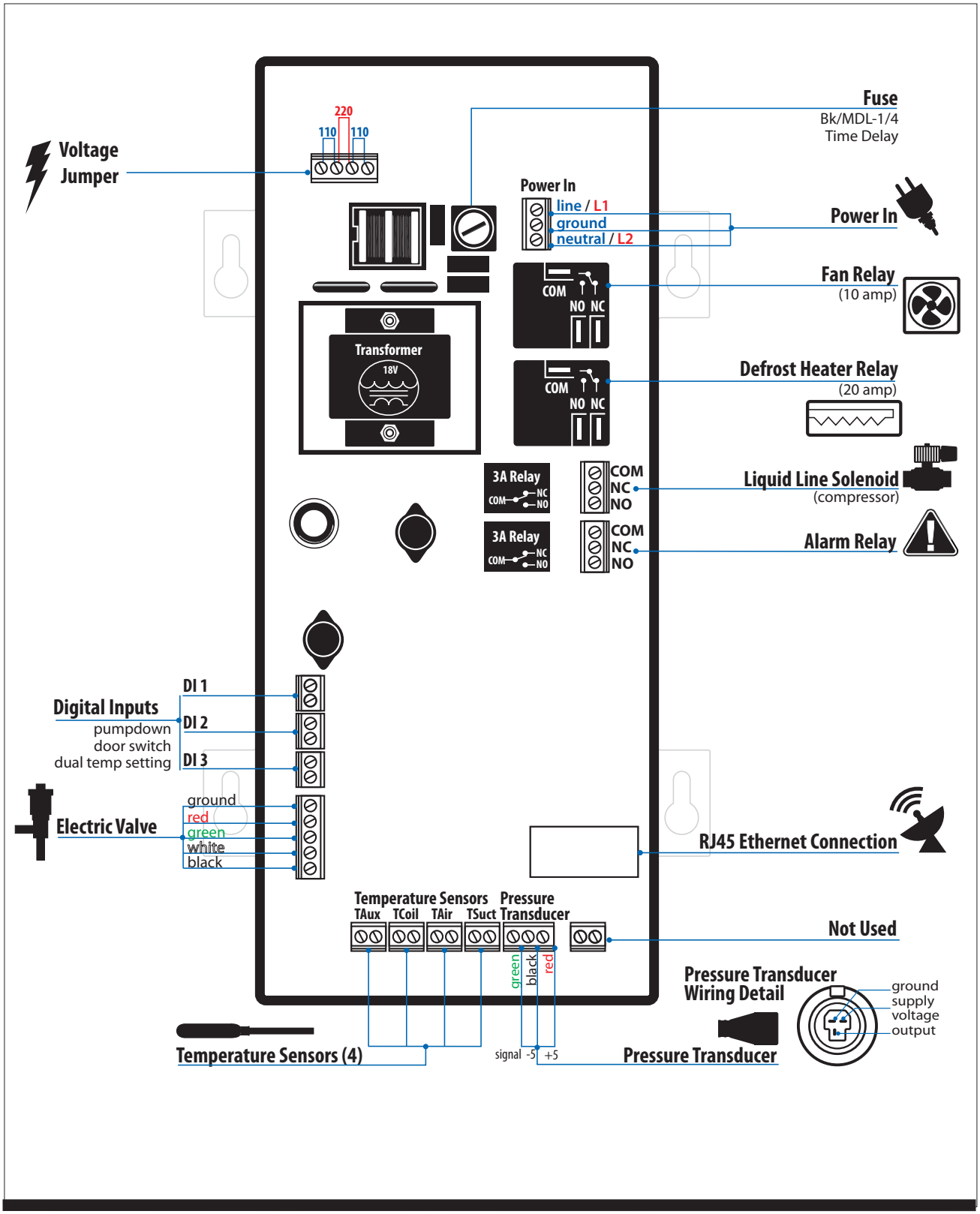


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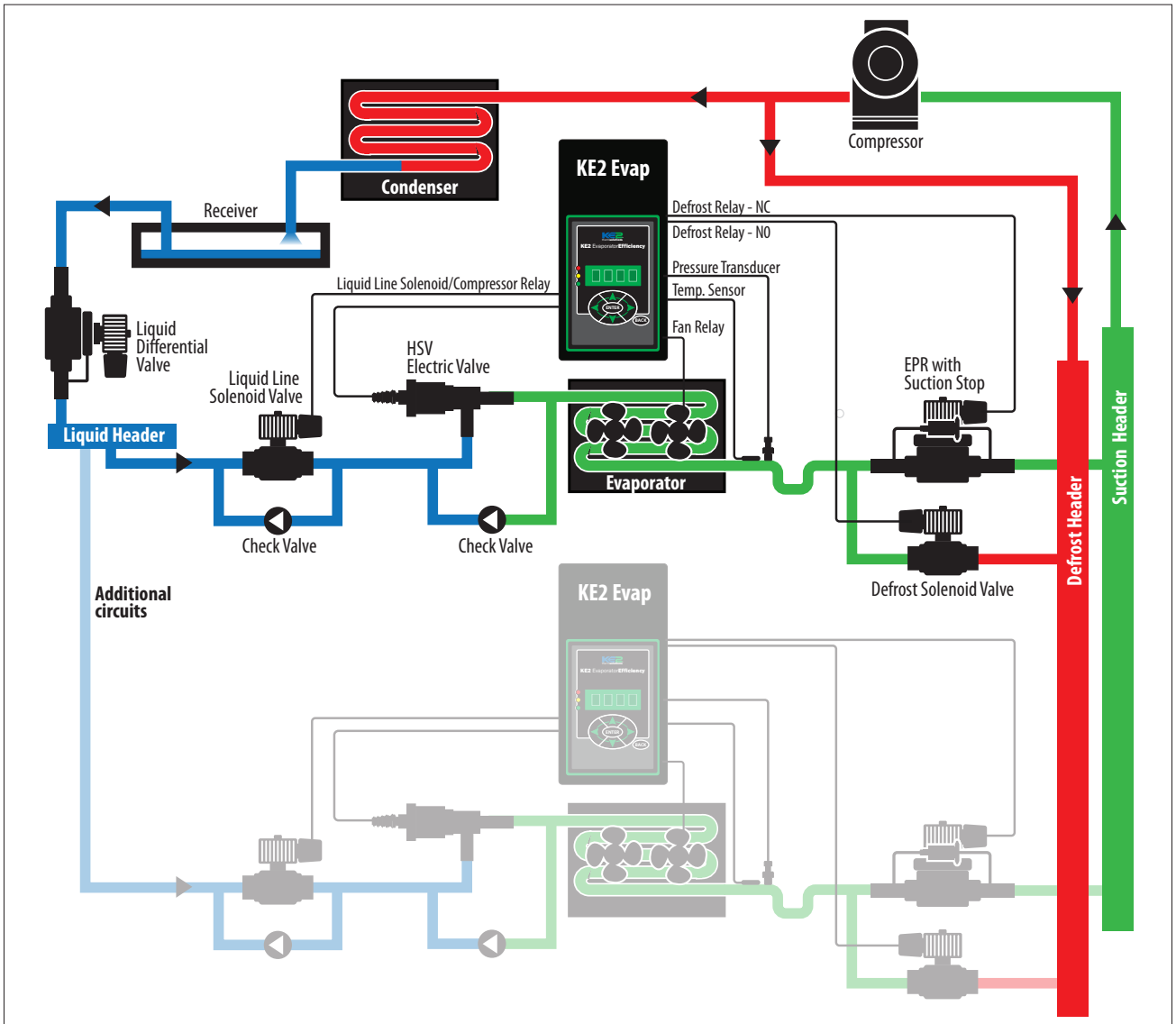
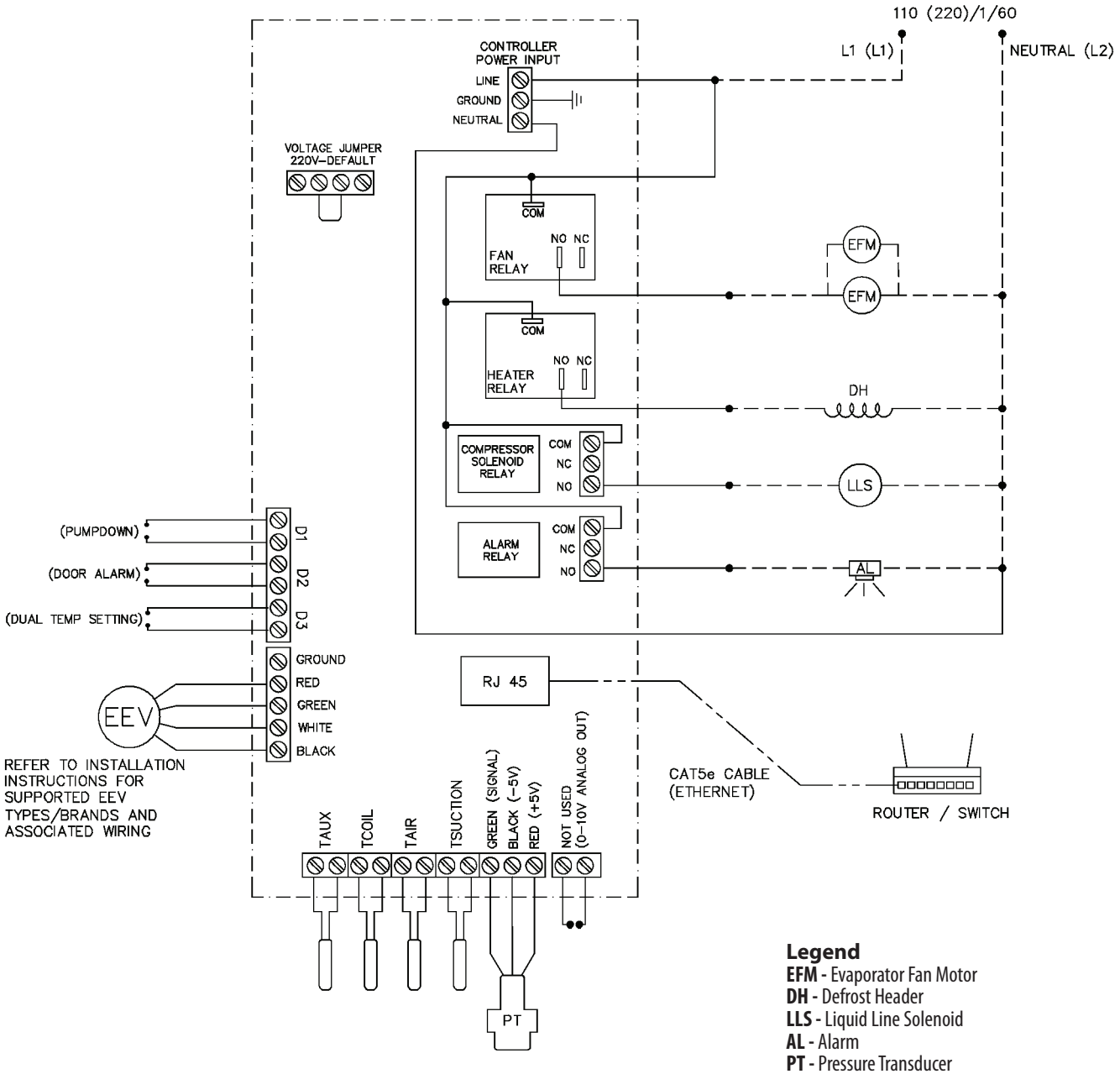
Figure 6 - Typical Piping Diagram - Hot Gas



Note: *Controllers must be bonded and* ***Multi Evaporator Defrost (MEVD)*** *setpoint must be set to* ***Independent (INDP)***

Piping shown for illustration purposes only.

Figure 7 - Wiring Schematic - Controller New Install



Legend
EFM - Evaporator Fan Motor
DH - Defrost Header
LLS - Liquid Line Solenoid
AL - Alarm
PT - Pressure Transducer
TSUCTION - Suction Temperature
TAIR - Return Air Temperature
TCOIL - Evaporator Coil Temperature
TAUX - Auxiliary Temperature
EEV - Electric Expansion Valve
D1 - Digital Input 1
D2 - Digital Input 2
D3 - Digital Input 3
- - - By others

All field wiring must conform to local codes

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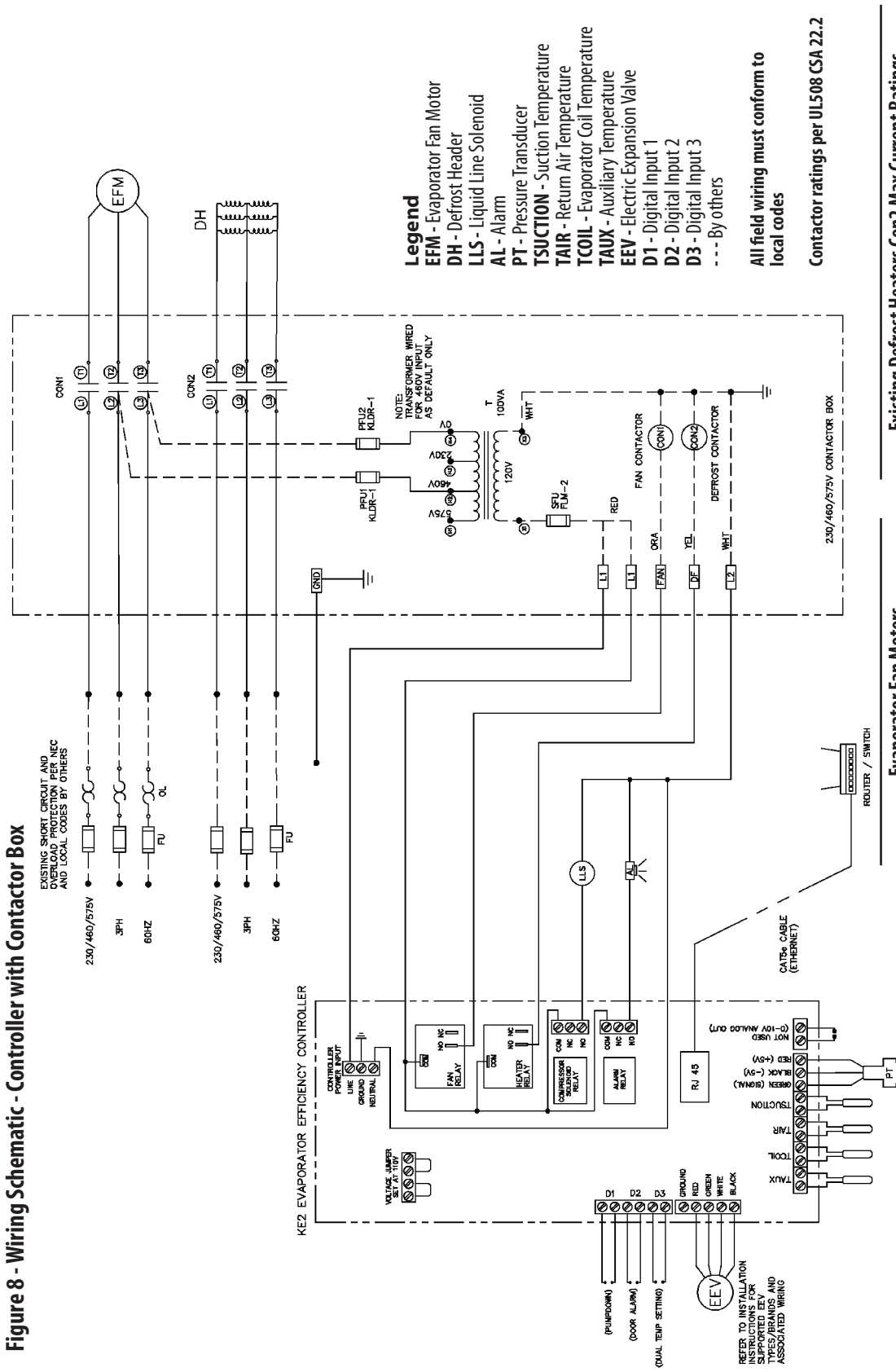
Figure 8 - Wiring Schematic - Controller with Contactor Box



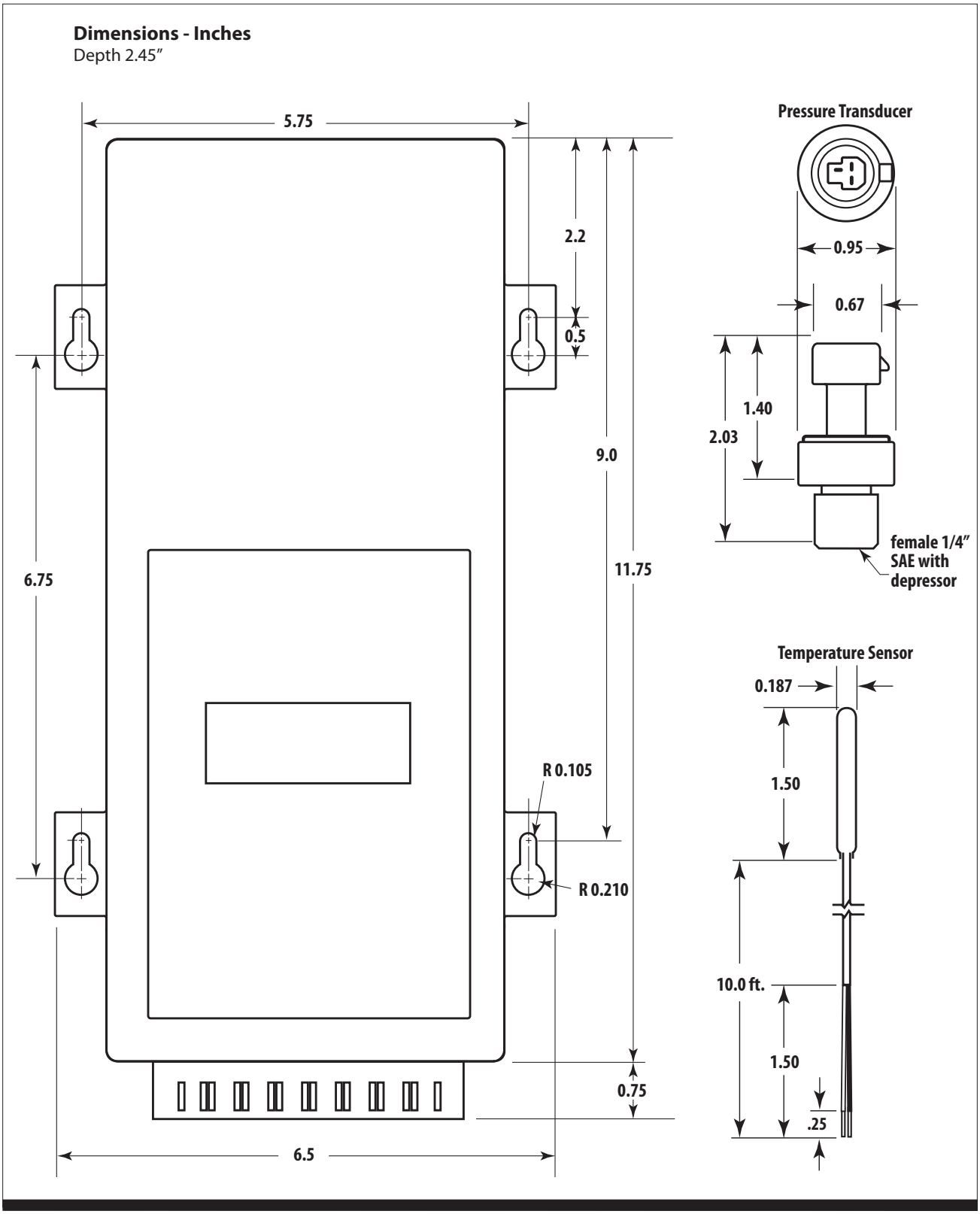
Evaporator Fan Motors Con1 Max HP & Amp Ratings (Total All Fans)

Voltage	Max HP	Max AMPS
230 3e	15	42
460 3e	30	40
575 3e	30	32

Existing Defrost Heaters Con2 Max Current Ratings (Amps are Total All Heaters)

Relay Box P/N	230V 3Ø	460V 3Ø	575V 3Ø
20217	54 Amps	52 Amps	52 Amps
20218	68 Amps	65 Amps	62 Amps
20219	80 Amps	77 Amps	62 Amps

Figure 9 - KE2 Evaporator Efficiency - Dimensions (front view)



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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 Evaporator Efficiency, 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 9.**

User Interface

The KE2 Evap'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 though 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.

The **ENTER** button is used to save an input option when it has been changed. **The enter button must be held for 3 seconds to prevent accidental changes.** Changes may be discarded by waiting, to allow the controller to timeout and return to default screen, or hitting the **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 **Quick Start Menu**. The Quick Start Menu consists of as little as 3 setpoints that must be configured for KE2 Evap to begin controlling the system.

Table 1 shows the Quick Start Menu. The first setpoint the user is asked to enter is the desired **room temperature**. This is followed by the **type of defrost**. 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 mechanical valve, but may be used with a variety of EEVs, including 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.**

Table 1 - Quick Start Menu

Mechanical Valve TEV 3 steps	Standard EEV 4 steps	Custom EEV 7 steps
Room Temp (RMSP)	Room Temp (RMSP)	Room Temp (RMSP)
Type of Defrost (DFMD)	Type of Defrost (DFMD)	Type of Defrost (DFMD)
Valve Type (VTYP)	Valve Type (VTYP)	Valve Type (VTYP)
	Refrigerant (REFT)	Refrigerant (REFT)
		Unipolar/Bipolar (MTYP)
		Step Rate (RATE)
		Maximum Steps (MAXS)

If using a predefined EEV, the user will also need to specify the **refrigerant type** under the **Setpoint Menu**. The KE2 Evap may also be applied to user defined EEVs. When this option is selected, the user will be prompted to select **motor type**, **step rate**, and **maximum number of steps**. Once these have been set, the KE2 Evap will begin controlling EEV and the system. **Table 3**

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 **PSWD** 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 **ENTER** button will display room temp **RMTP**. 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.

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Table 2 - Navigation Through the Controller Menu and Menu Paramenters

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

Menus:

Variables (view only) — Non-adjustable

Alarms (view only)

Setpoints*

Manual

Menu Parameters:

Variables	Alarms	Setpoints*	Manual
Room Temperature	Pressure Sensor Alarm	**Room Temp Setpoint**	Manual Control
Superheat	Suction Temp Sensor Alarm	Air Temperature Differential	Manual Valve Position
Pressure Suction	Air Temp Sensor Alarm	Minimum Run Time	Alarm Reset
Temperature Suction	Coil Temp Sensor Alarm	Minimum Off Time	Man.Comp./Liq. Line Relay Position
Temperature Saturation	Temperature 4 Sensor Alarm	Max. Operating Pressure Setpoint	Manual Defrost Relay Position
Temperature Coil	High Superheat Alarm	Defrost Type	Manual Fan Relay Position
Temperature Sensor 4	Low Superheat Alarm	Defrosts Per Day	DHCP Ethernet Connection
Valve Position	High Temp Air Alarm	Defrost Delay	Factory Settings
Current Status	Low Temp Air Alarm	**Defrost Mode**	
Relay Compressor	Defrost Term On Time Alarm	Defrost Fan State	
Relay Defrost	Door Switch Alarm	Defrost Termination Temp. Setpoint	
Relay Fan	Communication Alarm	Maximum Defrost Time	
Digital Input #1 Status	No Alarm	Drain Time (drip time)	
Digital Input #2 Status		Compressor Run Time	
Digital Input #3 Status		Electric Defrost Mode	
IP Address Quadrant 1		Fan Delay Temperature Setpoint	
IP Address Quadrant 2		Max Fan Delay Time	
IP Address Quadrant 3		Refrigeration Fan Mode	
IP Address Quadrant 4		Multi Evaporator Cool Mode	
Subnet Mask Quadrant 1		Multi Evaporator Temp Control	
Subnet Mask Quadrant 2		Multi Evaporator Defrost Mode	
Subnet Mask Quadrant 3		Multi Evaporator Sensor	
Subnet Mask Quadrant 4		High Temperature Alarm Offset	
		High Temperature Alarm Delay	
		Low Temperature Alarm Offset	
		Low Temperature Alarm Delay	
		Digital Input 1 Mode	
		Digital Input 1 State	
		Digital Input 2 Mode	
		Digital Input 2 State	
		Digital Input 3 Mode	
		Digital Input 3 State	
		Room Temp #2 Setpoint	
		Temperature 4th Type	
		Calibrate Pressure Sensor	
		Calibrate - Suction Temperature Sensor	
		Calibrate - Return Air Temperature Sensor	
		Calibrate - Coil Temperature Sensor	
		Calibrate - Auxiliary Temperature Sensor	
		Temperature Units	
		Valve Type	
		Motor Type	
		Step Rate	
		Maximum Steps for Full Stroke	
		Refrigerant Type	
		Superheat Setpoint	

* The Setpoint Paramenters shown in **bold** (Valve Type, Room Temp Setpoint and Defrost Mode) 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.

Table 3 - Controller Menus and Menu Parameters

Variables Menu - Non Adjustable (view only)

Parameter Name	Abbrev.	Description	Range
Room Temperature	RMTP	Return air temperature as read by the controller	-50 to 90 degrees F
Superheat	SUPH	Superheat as calculated by the controller when an EEV is selected	0 to 100 degrees F
Pressure Suction	PRES	Suction pressure as read by the controller	0 to 150 psia
Temperature Suction	TSUC	Suction temperature as read by the controller	-50 to 150 degrees F
Temperature Saturation	TSAT	Saturation temperature as calculated by the controller	-50 to 150 degrees F
Temperature Coil	TCOI	Coil temperature as measured by the controller	-50 to 150 degrees F
Temperature Sensor 4	TMP4	4th temperature as measured by the controller	-50 to 150 degrees F
Valve Position	VALV	Percentage the EEV is open	0 to 100%
Current Status	MODE	Mode controller is in	COOL, OFF, DEFROST, DRAIN, FAN DELAY
Relay Compressor	RLCM	Status of compressor relay	On/Off
Relay Defrost	RLDF	Status of defrost relay	On/Off
Relay Fan	RLFN	Status of evaporator fan relay	On/Off
Digital Input #1 Status	D1ST	Digital input #1 status	Open/Closed
Digital Input #2 Status	D2ST	Digital input #2 status	Open/Closed
Digital Input #3 Status	D3ST	Digital input #3 status	Open/Closed
IP Address Quadrant 1	IPQ1	The first three digits of the IP address	
IP Address Quadrant 2	IPQ2	The second three digits of the IP address	
IP Address Quadrant 3	IPQ3	The third three digits of the IP address	
IP Address Quadrant 4	IPQ4	The fourth three digits of the IP address	
Subnet Mask Quadrant 1	NET1	The first three digits of the subnet mask address	
Subnet Mask Quadrant 2	NET2	The second three digits of the subnet mask address	
Subnet Mask Quadrant 3	NET3	The third three digits of the subnet mask address	
Subnet Mask Quadrant 4	NET4	The fourth three digits of the subnet mask address	

Alarms Status Menu - ALST Non Adjustable (view only)

Alarm Status Parameters	Abbrev.	Description
Pressure Sensor Alarm	PRSA	Suction pressure sensor is shorted or open
Suction Temp Sensor Alarm	STSA	Suction temperature sensor is shorted or open
Air Temp Sensor Alarm	ATSA	Return air temperature sensor is shorted or open
Coil Temp Sensor Alarm	CTSA	Coil temperature sensor is shorted or open
Temperature 4 Sensor Alarm	T4SA	4th temperature sensor is shorted or open
High Superheat Alarm	HISH	Superheat is 2 degrees F or more above setpoint for 90 min; **OR** 7 degrees or more above setpoint for 90 min. if there is also a PRSA alarm.
Low Superheat Alarm	LOSH	Superheat is 2 degrees F or more below setpoint for 90 minutes; **OR** When there is also a PRSA alarm, if SH is 7 degrees F or more below setpoint for 90 minutes; **OR** Less than 3 degrees F for 5 minutes.
High Temp Air Alarm	HITA	Air temperature is above setpoint longer than delay time
Low Temp Air Alarm	LOTA	Air temperature is below setpoint longer than delay time
Defrost Term On Time Alarm	DTTA	Defrost terminated on time instead of temperature
Door Switch Alarm	DRSA	If TAIR* is 5 degrees F above RMSP* plus ADIF* for 5 minutes (*defined in Setpoints table)
Communication Alarm	COMA	No communication for 1 minute (only applies to bonded controllers)
No Alarm	NOAL	There are no active alarms

Manual Menu - MNMD

Parameter Name	Abbrev.	Description	Range	Default
Manual Control	MCTL	Change from REFR, OFF, DEFROST, DRAIN, FAN DELAY modes, manually		Auto
Manual Valve Position	MVLV	Manually open or close the electronic expansion valve	0 to 100%/Off	Off
Alarm Reset	ALST	Manually reset alarms	NA	NA
Manual Compressor/Liquid Line Relay Position	MCMP	Manually energize or de-energize compressor/liquid line relay	On/Off/Auto	Auto
Manual Defrost Relay Position	MDFR	Manually energize or de-energize defrost heater relay	On/Off/Auto	Auto
Manual Fan Relay Position	MFAN	Manually energize or de-energize evaporator fan relay	On/Off/Auto	Auto
DHCP Ethernet Connection	DHCP	DHCP enabled	Yes/No	No
Factory Settings	FACT	Return controller to factory settings		

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Setpoints Menu - STPT

Parameter Name	Abbreviation	Description
Room Temp Setpoint	RMSP	If TAIR goes below this setpoint, go into OFF mode
Air Temperature Differential	ADIF	If TAIR goes above this setpoint, go into REFR mode (must be greater than or equal to Cut Out Set Point)
Minimum Run Time	MRTM	After entering REFR mode, the minimum amount of time that controller must stay in REFR mode
Minimum Off Time	MOTM	After entering OFF or PUMP DOWN mode, the minimum amount of time that controller must stay in that mode
Maximum Operating Pressure Setpoint	MOP	If pressure reading rises to this setpoint, modulate valve to not allow pressure to go above setpoint, letting superheat rise if necessary. See superheat algorithm for more details
Defrost Type	DFTP (IDEF)	Initialize a defrost using a Defrost-On-Demand (DOD) algorithm, runtime, schedule
Defrosts Per Day	DFPD	Number of defrosts per day when schedule is selected
Defrost Delay	DFDL (DSRT)	Start time of the first defrost when schedule is selected, will evenly schedule rest of defrosts per day from this t
Defrost Mode	DFMD	Type of defrost either air, electric, hot gas defrost
Defrost Fan State	DFFN (FDMD)	Evaporator fans are either on or off during defrost
Defrost Termination Temperature Setpoint	DTSP	Temperature setpoint that the coil must rise above to terminate defrost
Maximum Defrost Time	MXDT	Maximum amount of time to be in defrost
Drain Time (drip time)	DRAN	Time to be in drain DRAN mode (drip time)
Compressor Run Time	CMRN	RTD Mode compressor run time between defrosts
Electric Defrost Mode	ELDM	Selects defrost heater operation mode
Fan Delay Temperature Setpoint	FDSP	Temperature set point that the coil must fall below to start fans after defrost
Max Fan Delay Time	MXFT	Maximum amount of time to delay fans turning on
Refrigeration Fan Mode	RFFN (FMPC)	Select whether the fans stay on or cycle during system off cycle.
Multi Evaporator Cool Mode	MEVC	Select type of multi evaporator control - options are synchronous SYNC or independent INDP
Multi Evaporator Temp Control	MEVT	Select temp control method for multi evaporator - options are average AVRG air temp or warmest temperature
Multi Evaporator Defrost Mode	MEVD	Coordinate defrost synchronous SYNC or 1 at a time INDP
Multi Evaporator Sensor	MEVS	(SHAR) share room temperature between controllers NSHR independent control
High Temperature Alarm Offset	HITA	The air temperature rises above the setpoint of the Room Air Setpoint plus the high temperature alarm offset
High Temperature Alarm Delay	HITD	If air temperature rises above the setpoint above, it must stay above for xx minutes until alarm is issued
Low Temperature Alarm Offset	LOTA	The air temperature falls below the setpoint of the Cut Out Air Setpoint plus the low temperature alarm offset
Low Temperature Alarm Delay	LOTD	If air temperature falls below the setpoint above, it must stay below for xx minutes until alarm is issued
Digital Input 1 Mode	DI1M	Door contact, use 2nd air temp setpoint, disabled, system off, external alarm notification
Digital Input 1 State	DI1S	Digital Input active state is open or closed
Digital Input 2 Mode	DI2M	Door contact, use 2nd air temp setpoint, disabled, system off, external alarm notification
Digital Input 2 State	DI2S	Digital Input active state is open or closed
Digital Input 3 Mode	DI3M	Door contact, use 2nd air temp setpoint, disabled, system off, external alarm notification
Digital Input 3 State	DI3S	Digital Input active state is open or closed
Room Temp #2 Setpoint	RMT2 (CSP2)	2nd return air setpoint for use with Digital Input
Temperature 4th Type	T4TP	Select the input type of the 4th temperature sensor input
Calibrate - Pressure Sensor	CLPS	An offset added or subtracted from the suction line pressure reading to calibrate, if needed
Calibrate - Suction Temperature Sensor	CLTS	An offset added or subtracted from the suction sensor's temperature reading to calibrate, if needed
Calibrate - Return Air Temperature Sensor	CLAS	An offset added or subtracted from the return air sensor's temperature reading to calibrate, if needed
Calibrate - Coil Temperature Sensor	CLCS	An offset added or subtracted from the coil sensor's temperature reading to calibrate, if needed
Calibrate - Auxiliary Temperature Sensor	CLT4 (CLMS)	An offset added or subtracted from the modifiable sensor's temperature reading to calibrate, if needed
Temperature Units	TUNI	Units for temperature's display in degrees F or degrees C
Valve Type	VTYP	Select the type of valve from a list MECH/CUSV/CARL/KV/E250/E100/ET12/SEH/SE50/SE30/SER-G/SER-1
Motor Type	MTYP	Whether the valve is a unipolar stepper or bipolar stepper
Step Rate	RATE	Number of steps per second to step valve
Maximum Steps for Full Stroke	MAXS	Number of steps to move the full stroke of the valve
Refrigerant Type	REFT	Type of refrigerant being used: 404A, R744, 410A, R717, R22, 134A, 422D, 422A, 407C, 407A, R507
Superheat Setpoint	SHSP	Setpoint where controller modulates valve to control superheat

only displayed when an EEV is used

	Range	Default	Current
	-50 to 90 degrees F	-10 degrees F	
	0 to 25 degrees F	1 degrees F	
	0 to 15 minutes	2 minutes	
e	0 to 15 minutes	5 minutes	
	10 to 150 psig	150 psig	
	Schedule SCHD/Runtime RTD/Demand DEMD	DEMD	
	0 to 8	3	
ime	0 to 240 minutes	120 minutes	
	Electric/Air/Hot Gas	Electric	
	ON/OFF	Off	
	35 to 90 degrees F	50 degrees F	
	0 to 90 minutes	30 minutes	
	0 to 15 minutes	2 minutes	
	0 to 24 hours	6 hours	
	PULS/PERM	PULS	
	-40 to 35 degrees F	20 degrees F	
	0 to 5 minutes	2 minutes	
	Permanent/Cycle	Cycle	
	SYNC/INDP	SYNC	
e WRMT	AVRG/WRMT	WRMT	
	SYNC/INDP	SYNC	
	SHAR/NSHR	SHAR	
	0 to 99 degrees F	10 degrees F	
	0 to 120 minutes	60 minutes	
	0 to 20 degrees F	4 degrees F	
	0 to 30 minutes	10 minutes	
	DOOR /2ND Setpoint SPT2/OFF/SOFF/XTA1	DOOR	
	Open/Close	Close	
	DOOR /2ND Setpoint SPT2/OFF/SOFF/XTA2	OFF	
	Open/Close	Close	
	DOOR /2ND Setpoint SPT2/OFF/SOFF/XTA3	OFF	
	Open/Close	Close	
	-50 to 90 degrees F	-50 degrees F	
	OFF/Monitor MONI/ Coil Temp CLTP/Air Temp ATP2	OFF	
	-5.0 to 5.0 psig	0.0 psig	
	-5.0 to 5.0 degrees F	0.0 degrees F	
	-5.0 to 5.0 degrees F	0.0 degrees F	
	-5.0 to 5.0 degrees F	0.0 degrees F	
	-5.0 to 5.0 degrees F	0.0 degrees F	
	FAHT/CELC	FAHT	
		Mechanical	
	Unipolar/Bipolar	Bipolar	
	30 to 400 steps/second	200 steps	
	200 to 6400 steps	1600 steps	
		R-404A	
	5 to 30 degrees F	8 degrees F	

Table 4 - Defrost Defaults

Setpoint	Electric	Air	Hot Gas
Defost Fan State:	Off	On	Off
Defrost Termination Temperature Setpoint:	50	40	50
Maximum Defrost Time	30	45	15
Electric Defrost Mode:	Pulse	Permanent	Permanent

Communication

The KE2 Evap uses standard TCP/IP communication. The controller is equipped with an RJ-45 female connector to connect to Ethernet cable.

To communicate with the controller, the user will use either a computer with a web browser or the KE2 MasterView. The information is stored on the controller, so special software is not required.

A standard Ethernet cable should be used between the peripheral device and the controller. One end is connected to the controller, and the other to the Ethernet port on the PC or MasterView. The Ethernet port will look similar to a telephone jack. The difference is the Ethernet port is larger with 8 wires instead of 6.

In installations where multiple evaporators are piped to a single condenser, networking the controllers is required. This prevents damage to the system by synchronizing the defrost cycles. Networked controllers have an additional safety layer to protect the system. When networked, the controllers share information, such as air temperature, to allow a controller in alarm mode to continue to provide refrigeration until the system is serviced.

When networking multiple controllers an ethernet switch or router is required. KE2 Network Router is available in a 4-port and KE2 Switch in an 8-port model. The KE2 Router includes wireless access. The 8-port switch should be used for larger networks. Multiple switches can be ganged together to create additional ports for the network. When necessary, the local Network Adminstrator should be contacted to facilitate the network installation.

Table 5 - Ethernet Specifications Summary

Specifications	Ethernet - Unshielded Twisted Pair (UTP)
Topology	star
Network Friendly	YES
Maximum Cable Length	330 feet (copper)
Maximum Data Rate	1,000 mbs
Native Internet	YES
Supported Devices	thousands
Response Time	milliseconds

For additional information on Ethernet Cable, consult IEEE 802.

Table 6 - Specifications

Controller	
Input Voltage:	120V or 240V
Ambient Temp:	-40° to 140°F
Operating Temp:	-40° to 140°F
Display:	4 digit alphanumeric LED
IP Rating:	IP65
Inputs:	4 temperature sensors (KE2 SKU 20199)
	1 pressure transducer (KE2 SKU 20201)
Valve Types:	unipolar and bipolar stepper motors (12V) (Beacon II is 21V)
Relays:	20A resistive (defrost heater) 10A inductive (evaporator fan)
	2–3A inductive rated cycles
Digital Inputs:	door switch (dry contact)
	dual temp setting (dry contact)
	loss of power
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

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