

This reference should remain on site with the installed OEM controller.

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Accessories

Remote Displays	
Part Number	Description
154099	Standard Remote Display w/ cable

Temperature Sensors	
Part Number	Description
154101	Temperature Sensor Pack, 3 Color 15 ft
151553	Temperature Sensor – NTC Thermistor Assembly, 10 ft. (black)
154105*	Temperature Sensor - Yellow 45 inches
154104*	Temperature Sensor - Green 45 inches
154103*	Temperature Sensor - Blue 45 inches
154096*	Temperature Sensor - Black 45 inches

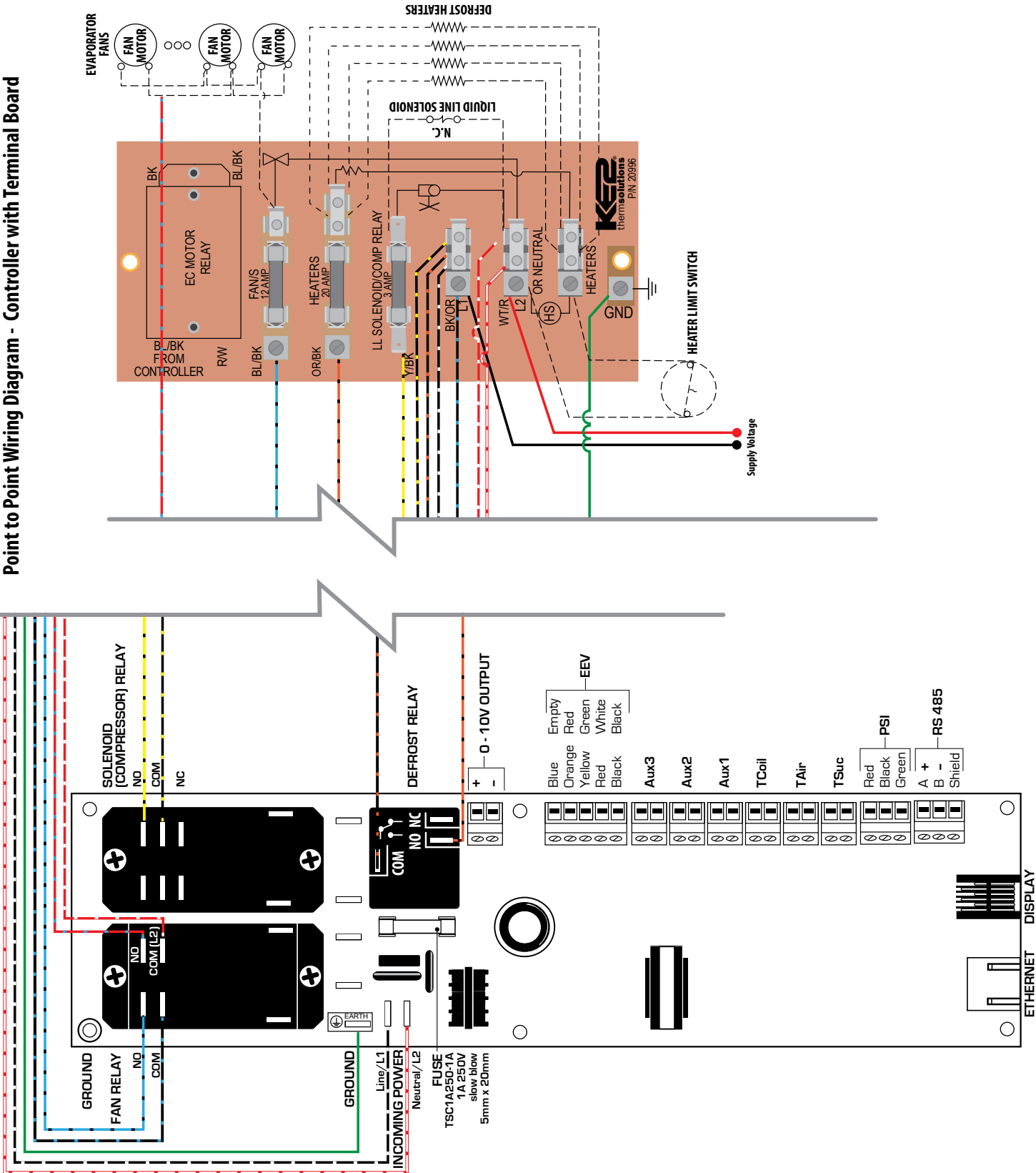
Wireless Router	
Part Number	Description
158712	KE2 SmartGate

Pressure Transducer	
Part Number	Description
151552	Pressure Transducer – 0 to 150 psia, 10 ft. leads

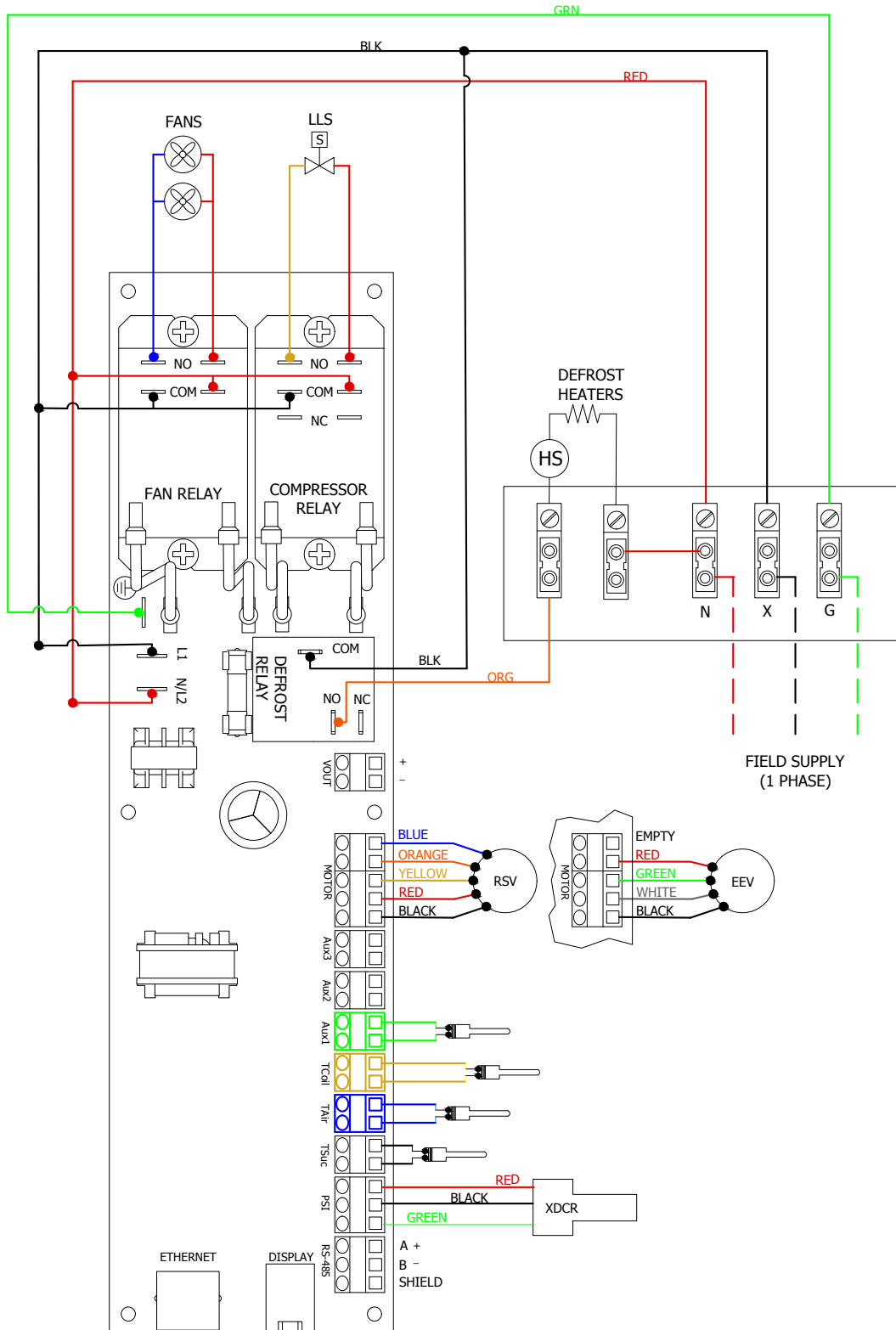
RSV - Refrigeration Stepper Valves	
Part Number	Description
154097	RSV-130 3/8 x 1/2 ODF - 5ft
166190	RSV-130 3/8 x 1/2 ODF - 10ft
166186	RSV-220 3/8 x 1/2 ODF - 40ft
166187	RSV-320 1/2 x 1/2 ODF - 40ft

* Special Order. Minimum purchase required.

Point to Point Wiring Diagram - Controller with Terminal Board



Wiring Diagram - Controller without Terminal Board



Wiring Diagram - Controller without Terminal Board



Menus and Parameters

BASIC Setpoints Menu

Abbreviation	Scrolling Text*	Full Name	Min	Max	R-404A	R-449A	Description
tS TS	ROOM TEMP	Room Temp Setpoint	-50.0 °F	90.0 °F	0.0 °F	0.0 °F	Walk-in freezer or cooler room temp to be maintained
rFG RF	REFRIGERANT	Refrigerant	N/A	N/A	R-404A	R-449A	Type of refrigerant used: see table below
dtY DTY	DEFROST TYPE	Defrost Type	N/A	N/A	ELE/Ai	ELE/Ai	Type of Defrost for Evap: ELE for Electric/ Ai for off time/ HGn for hot gas w/comp on/ HGF for hot gas w/comp off. Freezer/cooler.

ADVANCED Setpoints Menu

Abbreviation	Scrolling Text*	Full Name	Min	Max	R-404A	R-449A	Description
tS TS	ROOM TEMP	Room Temp Setpoint	-50.0 °F	90.0 °F	-10/35°F	-10/35°F	Walk-in freezer or cooler room temp to be maintained
dtY DTY	DEFROST TYPE	Defrost Type	N/A	N/A	Electric/ Air	Electric/ Air	Type of Defrost for Evap: ELE for Electric/ Ai for off time/ HGn for hot gas w/comp on/ HGF for hot gas w/comp off
Edt EDT	VALVE TYPE	Expansion Valve Device Type	N/A	N/A	Mechanical	Mechanical	Type of valve used on system: mechanical, pre-configured electric, custom EEV configuration
rFG RF	REFRIGERANT	Refrigerant	N/A	N/A	R-404A	R-449A	Type of refrigerant used: see table below
ind IND	DEFROST MODE	Defrost Initiation Mode	N/A	N/A	Demand	Demand	Mode to initiate a defrost: dnd=demand / SCH=Schedule / rnt=comp run time
dPd DPD	DEFROSTS / DAY	Defrosts per day	0	8	5	5	If DEFROST MODE = SCH: Number of evenly spaced defrosts per day the controller will initiate.
dtP DTP	DEFROST TERM TEMP	Defrost Term Temp	35.0 °F	90.0 °F	50.0 °F/40	50.0 °F/40	The temperature the coil sensor(s) must exceed in order to terminate defrost. The controller's defrost mode is complete at this point. Freezer/cooler.
dEF DEF	DEFROST PARAMETER	Defrost Parameter	0	90	30/40	30/40	If DEFROST MODE = DEMAND: Coefficient to Defrost algorithm. Freezer/cooler.
dtL DTL	MAX DEFROST TIME	Max Defrost Time	0 min	90 min	45/40 min	45/40 min	If DEFROST MODE = SCH: The maximum amount of time the defrost relay will be energized. (Not available if DEFROST MODE = DEMAND). Freezer/cooler.
drn DRN	DRAIN TIME	Drain Time	0 min	15 min	2 min	2 min	Time to be in drain mode (drip time)
Stt STT	SUPERHEAT	Superheat	5.0 F°	30.0 F°	8.0 F°	8.0 F°	Target superheat value. Not available on Basic Display
LPt LPT	LOW PRESSURE CUT OUT TIME	Low Pressure Cut Out Time	0 min	15 min	0 min	0 min	Only applies when non-mechanical valve selected; 0=Disabled
LPC LPC	LOW PRESSURE CUT OUT	Low Pressure Cut Out	-5.0 psig	138.0 psig	8.0 psig	4.0 psig	Displays when LOW PRESSURE CUTOFF TIME (LPt) is greater than zero. And, only applies if non-mechanical valve is selected
LPd LPD	PRESS DIFF FOR LPCO	Pressure Differential for LPCO	1.0 psig	20.0 psig	15.0 psig	12.0 psig	Displays when LOW PRESSURE CUTOFF TIME (LPt) is greater than zero. And, only applies if non-mechanical valve is selected
rnt RNT	COMP RUN TIME	Compressor Run Time	0 hrs	24 hrs	6 hrs	6 hrs	When rnt selected, number of hours of cooling before starting defrost
Htn HTN	ELECTRIC DEFROST MODE	Electric Defrost Mode	N/A	N/A	PUL/Prn	PUL/Prn	If DEFROST TYPE = ELE: Whether to leave the defrost relay energized during the defrost cycle or to utilize advanced defrost algorithm. PUL = Pulse, Prn = Permanent. Freezer/cooler.
HAo HRO	HIGH TEMP ALARM OFFSET	High Temp Alarm Offset	0 F°	99.9 F°	10.0 F°	10.0 F°	The number of degrees above ROOM TEMP for a HIGH TEMP ALARM condition.
HAd HRD	HIGH TEMP ALARM DELAY	High Temp Alarm Delay	0 min	120 min	60 min	60 min	Minutes the room temperature must remain above ROOM TEMP + HIGH TEMP ALARM OFFSET before issuing a HIGH TEMP ALARM
LAo LRO	LOW TEMP ALARM OFFSET	Low Temp Alarm Offset	0 F°	20.0 F°	4.0 F°	4.0 F°	The number of degrees below ROOM TEMP for a LOW TEMP ALARM condition.
LAd LRD	LOW TEMP ALARM DELAY	Low Temp Alarm Delay	0 min	30 min	10 min	10 min	Minutes the room temp must remain below ROOM TEMP-LOW-TEMP ALARM OFFSET before issuing a LOW TEMP ALARM
dAd DRD	DOOR ALARM DELAY	Door Alarm Delay	0 min	180 min	30 min	30 min	If AU IN (1, 2 and/or 3) MODE = dor The amount of time, in minutes, before an alarm condition is initiated, if door is open & room temperature is 5 degrees above ROOM TEMP + AIR TEMP DIFF
AU1 RU1	AUX IN 1 MODE	Aux Input 1 mode	N/A	N/A	Disabled	Disabled	See Auxiliary Input Modes table
A1A R1R	AUX IN 1 STATE	Aux Input 1 state	N/A	N/A	Closed	Closed	oPn= active if input is an open / CLo=active if input is shorted
AU2 RU2	AUX IN 2 MODE	Aux Input 2 mode	N/A	N/A	Disabled	Disabled	See Auxiliary Input Modes table
A2A R2R	AUX IN 2 STATE	Aux Input 2 state	N/A	N/A	Closed	Closed	oPn= active if input is an open / CLo=active if input is shorted
AU3 RU3	AUX IN 3 MODE	Aux Input 3 mode	N/A	N/A	Sys Off	Sys Off	See Auxiliary Input Modes table
A3A R3R	AUX IN 3 STATE	Aux Input 3 state	N/A	N/A	Closed	Closed	oPn= active if input is an open / CLo=active if input is shorted
tS2 TS2	ROOM TEMP	2nd room temp SP	-50.0 °F	90.0 °F	-50.0 °F	-50.0 °F	If AU IN (1, 2 and/or 3) MODE = (t2n) 2ND ROOM TEMP: This value becomes the ROOM TEMP setpoint when the digital input is active
Unt UNT	TEMP UNITS	temperature units	N/A	N/A	Fahrenheit	Fahrenheit	Units for temperature's display in °F or °C; FAH = Fahrenheit, CEL = Celsius
EdF EDF	EXTREME TEMP DIFF	Extreme Temp Diff.	0 °F	99.9 °F	20.0 °F	20.0 °F	ADVANCED TOPIC: Call for assistance
CLA CLR	CLEAR ALARMS	Clear Alarms	N/A	N/A			Press and hold to clear all active alarms
diA DIR	DIAGNOSTICS MODE	Diagnostics Mode	N/A	N/A			Energizes each relay individually for 60 seconds: fan relay, defrost relay, compressor relay

ADVANCED Setpoints Menu (continued)

Abbreviation	Scrolling Text*	Full Name	Min	Max	R-404A	R-449A	Description
FAC FRC	FACTORY RESET	Factory reset	N/A	N/A			Press and hold to reset the controller to the factory default setpoints
PAS PRS	WEB PASSWORD RESET	Web password reset	N/A	N/A			Press and hold to reset the web password to the factory default
SA SR	SMART ACCESS	Smart Access	N/A	N/A	Disabled	Disabled	Turn Smart Access on or off: EnA to enable smart access / diS to disable Smart Access
dHC DHC	DHCP	DHCP Mode	N/A	N/A	Enabled	Enabled	Turn DHCP mode on or off: EnA to enable DHCP mode / diS to disable DHCP mode
Not Available on Basic Display	MOTOR TYPE	Motor Type	Unipolar or Bipolar		Unipolar	Unipolar	Unipolar if unipolar stepper used, Bipolar if bipolar stepper used
	MOTOR STEP RATE	Motor Step Rate	30	400	40	40	Motor Step rate for custom valve. Not available on Basic Display
	MAX VALVE STEPS	Max Valve Steps	200	6400	500	500	Full stroke steps for custom valve. Not available on Basic Display
	MAX OPERATING PRES	Max Operating Pres	10.0 psi	150.0 psi**	35/150 psi	35/150 psi	Freezer/cooler
	FAN SPEED	Fan Speed	-100.0%	100.0%	0.0%	0.0%	Fan speed %. Not available on Basic Display
	MIN COMP RUN TIME	Min Comp Run Time	0 min	15 min	2 min	2 min	Minimum Compressor Run Time. Not available on Basic Display
	MIN COMP OFF TIME	Min Comp Off Time	0 min	15 min	5 min	5 min	Minimum Compressor Off Time. Not available on Basic Display
	REFRIG FAN MODE	Refrigeration Fan Mode	Manage, Permanent, ON with Compressor, Title 24		ON with compressor	ON with compressor	Managed = manage fans during refrig cycle; Permanent = fans ON permanent during refrig cycle; On with Compressor = manage fans in OFF then ON in refrig; Title 24 = cycle fans based on Title 24 regulations
	1ST DEFROST DELAY	1st Defrost Delay	0 min	240 min	120 min	120 min	First Defrost Delay. Not available on Basic Display
	DEFROST FAN STATE	Defrost Fan State	ON or OFF		OFF(E)/ON(A)	OFF(E)/ON(A)	OFF = fans off during defrost; ON = fans ON during defrost
	FAN DELAY TEMP		-40.0 °F	35.0 °F	20.0 °F	20.0 °F	Fan delay temp. Not available on Basic Display
	MAX FAN DELAY TIME	Max Fan Delay Time	0 min	20 min	2 min	2 min	Max fan delay time. Not available on Basic Display
	PUMP DOWN TIME	Pump Down Time	0 min	90 min	0 min	0 min	Minimum amount of time between de-energizing the liquid line solenoid/compressor relay and energizing the defrost relay.
	MULTI AIR TEMP CTRL	Multi Air Temp Control	Warmest or Average		Warmest Air	Warmest Air	Warmest air = use the warmest air temp from bonded controls; Average air = use the average air temp from bonded controls
	MULTI EVAP COOL	Multi Evap Cooling	Synchronized or Independent		Synchronized	Synchronized	Synchronized = synchronize bonded controller in refrigeration mode; Independent = bonded controllers control temperature independently in refrigeration mode.
	MULTI EVAP DEFROST	Multi Evap Defrost	Synchronized or Independent		Synchronized	Synchronized	Synchronized = synchronize bonded controller in defrost mode; Independent = bonded controllers defrost independently
	MULTI EVAP SENSOR	Multi Evap Sensor	Shared or Un-shared		Shared	Shared	Shared = share sensor readings from bonded controllers; Un-shared = use local sensor readings only
	SUCT PRES OFFSET	Suct Pres Offset	-5.0 F°	5.0 F°	0.0 F°	0.0 F°	An offset added or subtracted from the suction line pressure transducer reading, if needed
	SUCT TEMP OFFSET	Suct Temp Offset	-5.0 F°	5.0 F°	0.0 F°	0.0 F°	An offset added or subtracted from the suction temperature sensor reading, if needed
	COIL TEMP OFFSET	Coil Temp Offset	-5.0 F°	5.0 F°	0.0 F°	0.0 F°	An offset added or subtracted from the coil temperature sensor reading, if needed
	AIR TEMP OFFSET	Air Temp Offset	-5.0 F°	5.0 F°	0.0 F°	0.0 F°	An offset added or subtracted from the room temperature sensor reading, if needed
	AUX 1 OFFSET	AUX1 Temp Offset	-5.0 F°	5.0 F°	0.0 F°	0.0 F°	When Aux1, Aux2, or Aux 3 are used as a temperature sensor, an offset is added or subtracted from the reading.
	AUX 2 OFFSET	AUX2 Temp Offset	-5.0 F°	5.0 F°	0.0 F°	0.0 F°	
	AUX 3 OFFSET	AUX3 Temp Offset	-5.0 F°	5.0 F°	0.0 F°	0.0 F°	
	PROPORTIONAL	Proportional	0	255	3	3	A coefficient to the valve control algorithm that increases valve responsiveness as the value increases
	INTEGRAL	Integral	0	255	5	5	A coefficient to the valve control algorithm that increases valve responsiveness as the value increases
	DERIVATIVE	Derivative	0	255	3	3	Should not be adjusted unless instructed by Master-Bilt
	AIR TEMP DIFF	Air Temp Differential	0.1	5.0	1.0 F°	1.0 F°	The number of degrees above ROOM TEMP before the controller will go into REFRIGERATION mode
	DEFROST FAN STATE	Defrost Fan State	Off	Off	On	On	Fan state during the defrost cycle
	MULTI AIR TEMP CTRL	Multi Evaporator Air Temp Control	Average	Warmest	Warmest	Warmest	Select control method to use with multiple room temperature sensors
	MULTI EVAP COOL	Multi Evaporator Cool Control	Sync	Independent	Sync	Sync	Select type of multi evaporator control - options are synchronous or independent
	MULTI EVAP DEFROST	Multi Evaporator Defrost Control	Sync	Independent	Sync	Sync	Select whether to have all bonded controllers initiate defrost mode at the same time or independently.
	MULTI EVAP SENSOR	Multi Evaporator Sensor Sharing	Shared	Not Shared	Not Shared	Not Shared	Select whether or not to share room temperature, coil temperature and suction pressure sensor data with bonded controllers.

* Scrolling Text is available when using the Combo Display

First Time Setup - Types of Control & Smart Access

Abbreviation	Scrolling Text*	Full Name / Description
Ed ED	ELECTRIC DEFROST /TEV	Electric Defrost w/Mechanical valve
EdE EDE	ELECTRIC DEFROST /EEV	Electric Defrost w/Electric Valve
Ad AD	AIR DEFROST /TEV	Air Defrost w/Mechanical Valve
AdE ADE	AIR DEFROST /EEV	Air Defrost w/Electric Valve
SA SA	SMART ACCESS MODE	SmartAccess (Enabled/Disabled)

*Scrolling Text is available when using the Combo Display coming 2019.

System Modes

Abbreviation	Scrolling Text*	Full Name
rEF REF	REFRIGERATE	Refrigeration
ddF DDF	DEFROST DELAY FAN	Defrost Delay Fans
dEF DEF	DEFROST	Defrost
drn DRN	DRAIN TIME	Drain Time
FdL FDL	FAN DELAY	Fan Delay
SoF SDF	SYSTEM OFF	System Off (External System Off)
oFF OFF	OFF	Off (Satisfied on Temperature)

*Scrolling Text is available when using the Combo Display coming 2019.

Auxiliary Input Modes

Abbreviation	Scrolling Text*	Full Name	Description
diS DIS	DISABLED	Disabled	Not used
rtP RTP	ROOM TEMP	Room Temp	Room temp as measured by TAIR Input
CLt CLT	COIL TEMP	Coil Temp	Coil Temp as measured by TCOIL Input
oni ONI	MONITOR	Monitor Temp	Monitoring Temp as measured by Aux Input
t2n T2N	2ND (ROOM) TEMP	2nd Temp	Inactive=2nd room temp SP off (t2F)/Active=2nd room temp SP on (t2n)
dor DOR	DOOR SWITCH	Door Switch	Inactive=Door Closed (dCL)/Active=Door Open (don)
EA1/EA2/EA3 EA1 EA2 EA3	EXTERNAL ALARM 1 EXTERNAL ALARM 2 EXTERNAL ALARM 3	External Alarm	Active=EAO / Inactive=EAF
SoF SDF	SYSTEM OFF	System Off	Inactive=System On (Son)/Active=System Off (SoF)
dFi DFI	DEFROST INTERLOCK	Defrost Interlock	Inactive=Defrost Heaters normal (AUT)/Active=Defrost Heaters Off (oFF)
dFL DFL	DEFROST LOCKOUT	Defrost Lockout	Inactive=Defrost Normal (AUT)/Active=Defrost Not Allowed (dLo)

*Scrolling Text is available when using the Combo Display coming 2019.

Variables Menu

Abbreviation	Scrolling Text*	Full Name	Description
rtP RTP	ROOM TEMP	Room Temp	Room Temperature as measured by controller
CLt CLT	COIL TEMP	Coil Temp	Coil Temperature as measured by controller
SYS SYS	SYSTEM MODE	System Mode	Current operating status
SHt SHT	SUPERHEAT	Superheat	Superheat as calculated by the controller
PrS PRS	SUCTION PRESSURE	Suction Pressure	Suction Pressure as measured by controller
SUt SUT	T1 SUCTION TEMP	Suction Temp	Suction Temperature as measured by controller
SAt SAT	SATURATION TEMP	Saturation Temp	Saturation Temperature as calculated by controller
oPn OPN	VALVE % OPEN	Valve% Open	Percentage EEV is open
Cor COR	COMPRESSOR RELAY	Compressor Relay	Current status of LLS/compressor relay
dEr DER	DEFROST RELAY	Defrost Relay	Current Status of Defrost relay
FAR FAR	FAN RELAY	Fan Relay	Current Status of Fan relay
AU1 AU1	DIG 1 STATUS	Aux Input 1	Current Status/Temperature as measured by controller at Aux input 1
AU2 AU2	DIG 2 STATUS	Aux Input 2	Current Status/Temperature as measured by controller at Aux input 2
AU3 AU3	DIG 3 STATUS	Aux Input 3	Current Status/Temperature as measured by controller at Aux input 3
iP1 IP1	IP OCTET 1	IP Address Part 1	First 3 digits of IP address
iP2 IP2	IP OCTET 2	IP Address Part 2	Second 3 digits of IP address
iP3 IP3	IP OCTET 3	IP Address Part 3	Third 3 digits of IP address
iP4 IP4	IP OCTET 4	IP Address Part 4	Fourth 3 digits of IP address
Fir FIR	FIRMWARE VERSION	Firmware Version	Current Version of firmware on controller

*Scrolling Text is available when using the Combo Display coming 2019.

Refrigerants

Abbreviation	Full Name
R22	R-22
134	R-134a
42d	R-422D
42A	R-422A
40C	R-407C
40A	R-407A
507	R-507
404	R-404A
513	R-513A
450	R-450A
449	R-449A
448	R-448A
744	R-744
410	R-410A
407	R-407F
409	R-409A
408	R-408A
438	R-438A
717	R-717
452	R-452A

Valve Types

Abbreviation	Scrolling Text* & Full Name	Description
tHr THR	MECHANICAL	Traditional Thermostatic Expansion Valve
HS HS	HSV	Hybrid Stepper Valve
rS RS	RSV	Refrigeration Stepper Valve
SEi SEI	SEI	Sporlan Valve with 1,600 steps
SEr SER	SER	Sporlan Valve with 2,500 steps
CrL CRL	CAREL	Carel Valve with 500 steps

*Scrolling Text is available when using the Combo Display coming 2019.

Alarm Status Menu

Abbreviation	Scrolling Text*	Full Name	Description
PSA PSR	PRESSURE SENSOR	Pressure Sensor Alarm	Suction pressure sensor is shorted, open or pressure out of range
SSA SSR	SUCTION TEMP SENSOR	Suction Sensor Alarm	Suction temperature sensor is shorted or open
ASA ASR	AIR TEMP SENSOR	Air Sensor Alarm	Return air temperature sensor is shorted or open
CSA CSR	COIL TEMP SENSOR	Coil Sensor Alarm	Coil temperature sensor is shorted or open
HSR HSH	HIGH SUPERHEAT	High Superheat Alarm	Superheat above upper limit
LSR LSH	LOW SUPERHEAT	Low Superheat Alarm	Superheat below lower limit
HtA HTR	HIGH AIR TEMP	High Temperature Alarm	Room temperature is above ROOM TEMP + AIR TEMP DIFF + HIGH TEMP ALARM OFFSET for longer than HIGH TEMP ALARM DELAY
LtA LTR	LOW AIR TEMP	Low Temperature Alarm	Room temperature is below ROOM TEMP - LOW TEMP ALARM OFFSET for longer than LOW TEMP ALARM DELAY
EdF EDF	EXCESS DEFROST	Excess Defrost Alarm	32 defrosts or more within 48 hours
dtT DTT	DEFR TERM ON TIME	Defr Term on Time Alarm	Defrost terminated on time instead of temperature for two consecutive cycles
dor DOR	DOOR SWITCH	Door Open Alarm	If door is open and room temperature is 5 degrees above ROOM TEMP + AIR TEMP DIFF for DOOR ALARM DELAY time
CoA COR	COMMUNICATION ERROR	Communication Error	ONLY FOR BONDED CONTROLLERS: No communication between controllers for one minute or more
EA1 ER1	EXTERNAL ALARM 1	External Alarm 1	If AU1 IN MODE = EXT ALARM: The digital input is in an active state
EA2 ER2	EXTERNAL ALARM 2	External Alarm 2	If AU2 IN MODE = EXT ALARM: The digital input is in an active state
EA3 ER3	EXTERNAL ALARM 3	External Alarm 3	If AU3 IN MODE = EXT ALARM: The digital input is in an active state
EFL EFL	EMAIL FAILURE	Email Failure Alarm	Email alert was not confirmed by email server provided after seven consecutive attempts
A1A R1R	AUX1 SENSOR	AU1 Temp sensors Alarm	AU1 temperature sensor is shorted or open
A2A R2R	AUX2 SENSOR	AU2 Temp sensors Alarm	AU2 temperature sensor is shorted or open
A3A R3R	AUX3 SENSOR	AU3 Temp sensors Alarm	AU3 temperature sensor is shorted or open
Pdt PDT	PUMPDOWN TIMEOUT	Pump Down Timeout	Max time for LPCO pumpdown exceeded
SCC SCC	SHORT COMP CYCLE	Short Compressor Cycle	Compressor is started an excessive number of times to maintain suction pressure
LPA LPR	LOW PRESSURE	Low Pressure Alarm	Suction pressure dropped below expected point excessive number of times
PrF PRF	N/A	Process Failure	Basic Display is not communicating to the controller





*Scrolling Text is available when using the Combo Display

Specifications

Controller	
Input Voltage:	100VAC - 240VAC
Ambient Temp:	-40°F to 140°F (-40°C to 60°C)
Operating Temp:	-40°F to 140°F (-40°C to 60°C)
Inputs:	(3) temperature sensor (3) multi-use (temp sensor or digital input) (1) pressure sensor input
Valve Types:	unipolar and bipolar stepper motors (12V)
Relays:	1-20A resistive (defrost) (2) 10A inductive
Auxiliary Input 1:	room temp, coil temp, monitor, 2nd temp setpoint, door switch, external alarm, system off, defrost interlock, defrost lockout
Auxiliary Input 2:	
Auxiliary Input 3:	
Communication:	Standard TCP/IP

Pressure Transducer - pn 20201 (10 ft lead) or pn 20204 (40 ft lead)	
Pressure Range:	0 to 150 psia
Proof Pressure:	450 psi
Burst Pressure:	1500 psi
Operating Temp:	-40°F to 275°F (-40°C to 135°C)
Temperature Sensor - 3 pack pn 21151 (15 ft leads) or pn 21066 (40 ft leads)	
Sensor Specs:	-60°F to 150°F (-51°C to 65°C) moisture resistant package

Navigation Using the Basic Display

Indicator lights	 Red light - critical Alarm (system not running)  Yellow light - non-critical alarm (system running)  Green light - compressor on  Green flashing - compressor waiting on timer to start/stop
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- Access Setpoint mode by pressing and holding the **ENTER** button until tS (temperature setpoint) displays on the screen
- Use the **▲** up and **▼** down arrows to scroll through the available setpoints.
- Press **ENTER** to view the current setting.
- Use the **▲** up and **▼** down arrows to change the setpoint. Press **ENTER** to move between the digits to accelerate the changes.
- Press **ENTER** and hold to confirm each setpoint change.
- Press **BACK** to escape.

User Interface

The KE2 Evap OEM board has multiple methods of user input. Most controllers ship with the Basic Display. This display uses a familiar menu structure to allow service technicians to change the major setpoints. The setpoints may also be accessed using the controller's webpages.

The ▲ and ▼ arrows move the user through the available options for the Variables Menu. If alarms are present, they will be displayed and can be viewed using the up and down arrows.

Basic Menu:

Pressing and holding the **ENTER** button enters the **Basic Setpoints** menu.

Advanced Menu:

Pressing and holding the **BACK** button enters the **Advanced Setpoints** menu.

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 time-out and return to default screen, or by pressing the **BACK** button. The **BACK** button is used to return to the previous screen. Pressing the **BACK** button several times will return the controller to the default view.

Controller Setup

Upon initially applying power to the controller, the controller will initialize, then automatically enter **Introduction Mode**. The Introduction Mode consists of four **Types of Control** options:

- Ed** - Electric Defrost with Mechanical TEV
- Ede** - Electric Defrost with Electric Expansion Valve
- Ad** - Air Defrost with Mechanical TEV
- AdE** - Air Defrost with Electric Expansion Valve

Step 1 - Using the ▲ and ▼ arrows, moves the user through the available **Types of Control** options. Once the preferred option is displayed press and hold the **ENTER** button for 3 seconds.

Note: For mechanical valve control, Ed and Ad options, continue to Step 4. For Ede and AdE control options continue to Steps 2, 3, & 4.

Step 2 - Next, the controller prompts for the **Expansion Valve Type**, and displays **rs (RSV)**. If you this is the correct selection, press and hold the **ENTER** button for 3 seconds. If not, use the ▲ or ▼ arrow to move to the correct valve.

With correct electric valve displayed, press and hold **ENTER** for three seconds.

Note: Custom valve setup is not available from the Basic Display.

Step 3 - The controller now prompts for the **Refrigerant Type** and displays **404 (R-404a)** as the default. Change this value by pressing the ▲ or ▼ arrow. Once you have the correct value, press and hold **ENTER** for three seconds.

Step 4 - The fourth prompt is whether **SMART ACCESS** is **ENABLED** or **DISABLED**. **SMART ACCESS** allows you to easily view your controller online. (See pages 16 & 17 for more information.) Make your selection by using the ▲ or ▼ arrow, and then press and hold **ENTER** for **three seconds**. **THESE ARE THE ONLY SETPOINTS REQUIRED TO BEGIN CONTROLLING THE SYSTEM.**

Additional Setpoints

For the majority of users, the Basic Display will provide the necessary parameters to setup the controller.

From the default display, pressing the ▲ and ▼ arrows will cycle through the **Variables** menu. The **ENTER** button will toggle between the variable name and value.

Changing Setpoints

Pressing and holding the **ENTER** button will enter the **Basic Setpoints** menu. Press **ENTER** button to toggle between setpoint and value.

Pressing and holding the **BACK** button will enter the **Advanced Setpoints** menu. Press **ENTER** button to toggle between setpoint and value.

When the parameter value is displayed it may be changed by using ▲ and ▼ arrows, and **ENTER** buttons. The ▲ and ▼ arrows will increase or decrease numerical values, and will scroll through the available options, on the non-numerical setpoints.

Press and hold the **ENTER** button for 3 seconds to save the displayed value.

To abort changes, press the **BACK** button to return the parameter abbreviation.

Manual Valve Control

Press and hold the **BACK** button & ▼ arrow to put the EEV in **Manual Control** mode. ▲ and ▼ arrows will control the valve opening. **ENTER** will advance to the next digit, and **BACK** will exit this mode.

Manual Defrost

Pressing and holding the **BACK** and **ENTER** buttons will put the controller into **Defrost (next mode)**.

Diagnostics Mode

The KE2 Evap OEM has been programmed with a diagnostics mode. When activated, the controller energizes each relay for 60 seconds. When the compressor relay is on the EEV will regulate to the Superheat setpoint.

Display Firmware

Pressing and holding all 4 buttons (▲ ▼ **BACK** and **ENTER**) will show the display's firmware revision (**dir** – **Display Revision**)

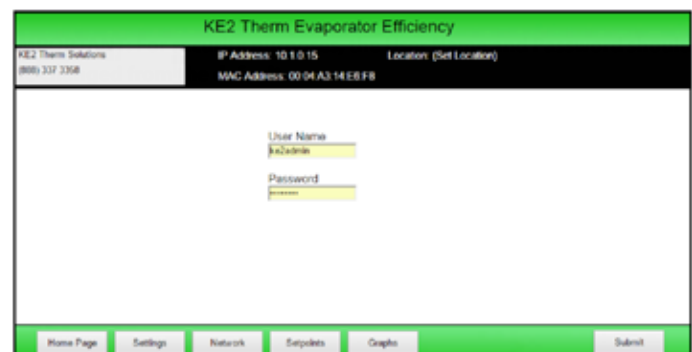
Display Options

Simultaneously pressing and holding the ▲ and ▼ arrows will show the address of the display (reserved for future versions).

Web Login

The User Name and Password are required when accessing the controller using the webpage.

The defaults are: **User Name:** ke2admin **Password:** ke2admin



The screenshot shows a web browser interface for the KE2 Therm Evaporator Efficiency. At the top, it says "KE2 Therm Solutions (800) 337 2308". Below that, it displays the IP Address (10.0.0.15) and MAC Address (00:04:A3:14:E8:F8). The main content area has a "User Name" field with "ke2admin" entered and a "Password" field with "ke2admin" entered. At the bottom, there are navigation buttons: "Home Page", "Settings", "Network", "Setpoints", "Graphs", and a "Submit" button.

Introduction to Smart Access

Smart Access provides quick and easy, real time access to your refrigeration systems, 24/7

Now it's easier than ever to monitor and adjust your KE2 Evap OEM remotely. While the Evap OEM's free connectivity is still available, we recognize that some customers prefer the simplicity and convenience of Smart Access to enjoy the benefits of the controller's communication capability.

For a nominal monthly fee, Smart Access provides easy, real time access to your refrigeration system 24/7. No port forwarding. No VPN.

All the KE2 Evap OEM needs is a physical connection to the network router with a cat 5 cable. Once enabled, Smart Access quickly connects to your personal web portal, hosted by KE2 Therm, and provides a "customized" dashboard of all the controllers you setup with Smart Access.

Benefits of Smart Access

- Smart Access auto launches, and often eliminates costly IT support
- Doesn't require port forwarding or a vpn
- Customized dashboard lets you view all your controllers on one page
- It's easier than ever to set up every controller you service to provide alarm notifications via text or email
- Easy setup of remote monitoring & system control



Screen shot of a single Evap connected through Smart Access.

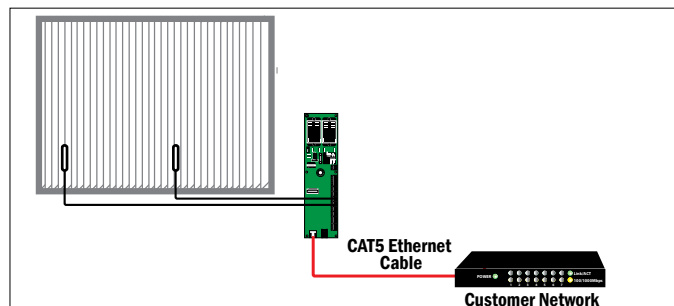


Screen shots of Smart Access dashboard. Controller and system information is displayed for all of the controllers on the portal.

Smart Access - Online Access In 3 Easy Steps

Preliminary

Connect the KE2 Evap OEM to the customer's network.



Step 1 Enable Smart Access in the Setpoints menu

- After the initial Introduction Mode setup, press and hold the **ENTER** button.

- Press the **▲** arrow two times to view **SA** (abbreviation for Smart Access). Press **ENTER**, then use the **▲** arrow to change **dis** (disabled) to **EnA** (enabled)

Press and hold the **ENTER** button for 3 seconds to save the change.

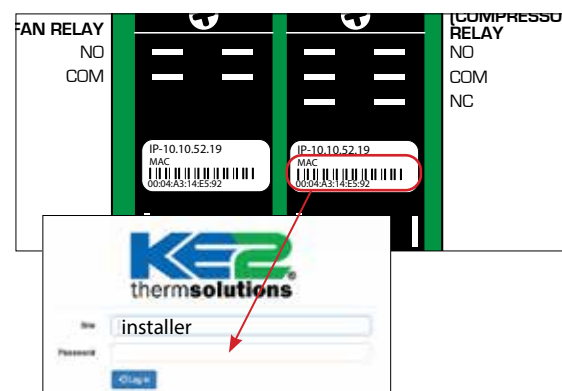
Step 2 Go to smartaccess.ke2therm.net

- Using your PC, tablet or smartphone, enter <http://smartaccess.ke2therm.net> in the web browser's address bar.

Step 3 Enter default information and click Log In button

Site: installer

Password: controller's Mac Address (from sticker on back of controller)



Alphabetical List of Abbreviations

Abbreviation	Full Name	Type	Description
A1A A1R	Aux Input 1 state	Setpoint	oPn= active if input is an open / CLo=active if input is shorted
A1A A1R	AU1 Temp sensor Alarm	Alarms	AU3 temperature sensor is shorted or open
A2A A2R	Aux Input 2 state	Setpoint	oPn= active if input is an open / CLo=active if input is shorted
A2A A2R	AU2 Temp sensor Alarm	Alarms	AU2 temperature sensor is shorted or open
A3A A3R	Aux Input 3 state	Setpoint	oPn= active if input is an open / CLo=active if input is shorted
A3A A3R	AU3 Temp sensor Alarm	Alarms	AU3 temperature sensor is shorted or open
Ad AD	Air Defrost w/Mechanical valve	Type of Control	System operates with default values for Air Defrost and Mechanical Valve
AdE ADe	Air Defrost w/EEV	Type of Control	System operates with default values for Air Defrost and Electric Valve
Ai AI	Air Defrost (Off time)	Setpoint	Option for evaporator Defrost Type (dtY) - Air Off time Defrost is used; other options Electric (ELE), Hot Gas w Compressor On (HGN), or Hot Gas with Compressor Off
ASA ASR	Air Sensor Alarm	Alarms	Return air temperature sensor is shorted or open
AU1 AU1	Aux Input 1	Variables	Current status/temperature as measured by controller at Aux1 input
AU1 AU1	Aux Input 1 mode	Setpoint	Options for configuring the Auxiliary Input, see Auxiliary Input Modes table
AU2 AU2	Aux Input 2	Variables	Current Status/Temperature as measured by controller at Aux2 input
AU2 AU2	Aux Input 2 mode	Setpoint	Options for configuring the Auxiliary Input, see Auxiliary Input Modes table
AU3 AU3	Aux Input 3	Variables	Current Status/Temperature as measured by controller at Aux3 input
AU3 AU3	Aux Input 3 mode	Setpoint	Options for configuring the Auxiliary Input, see Auxiliary Input Modes table
AUt AUT	Defrost Interlock -Heaters Normal	Auxiliary Input	Inactive = defrost heaters normal
AUt AUT	Defrost Lockout - Defrost Normal	Auxiliary Input	Inactive = defrost will occur by normal controller logic
CEL CEL	Celsius	Setpoint	Option for the units for the temperature display in degrees - Celsius or Fahrenheit (FAH)
CLA CLR	Clear Alarms	Setpoint	Press and hold to clear all active alarms
CLo CLo	Closed	Setpoint	Option under Auxiliary Input State
CLt CLT	Coil Temp	Variables	Coil temperature (TCoil Sensor) as measured by the controller
CLt CLT	Coil Temp	Auxiliary Input	Coil Temp as measured by Aux input
CoA CoR	Communication Alarm	Alarms	ONLY FOR BONDED CONTROLLERS: No communication between controllers for one minute or more
Cor CoR	Compressor Relay	Variables	Current state of liquid line solenoid/compressor relay
CrL CrL	Carel	Valve Type	Carel valve with 500 steps
CSA CSR	Coil Sensor Alarm	Alarms	Coil temperature sensor is shorted or open
dAd DAO	Door Open Alarm Delay	Setpoint	If AU IN (1, 2 and/or 3) MODE = dor 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
dCL DCL	Door Switch - Door Closed	Auxiliary Input	Door switch indicates door is closed
ddF DDF	Defrost Delay Fan	System Mode	At defrost, but prior to the defrost heaters turning on, the fans will continue running for several minutes, using stored cooling in the coil. Once the coil reaches room temp, the fans will stop, and the heaters will turn on and begin the electric defrost.
dEF DEF	Defr Parameter	Setpoint	if DEFROST MODE = DEMAND: Coefficient to Defrost algorithm
dEF DEF	Defrost	System Mode	Controller is performing a defrost cycle
dEr DER	Defrost Relay	Variables	Current state of the defrost relay
dFi DFI	Defrost Interlock Switch	Auxiliary Input	Inactive=Defrost Heaters normal (AUT)/Active=Defrost Heaters Off (OFF)
dFL DFL	Defrost Lockout Switch	Auxiliary Input	Inactive=Defrost Normal (AUT)/Active=Defrost Not Allowed (dLO)
dHC DHC	DHCP	Setpoint	Turn DHCP mode on or off: EnA to enable DHCP mode / DiS to disable DHCP mode
diA DIA	Diagnostics Mode	Setpoint	Energizes each relay individually for 60 seconds: fan relay, defrost relay, compressor relay
diS DIS	Disabled	Auxiliary Input	Input is not used by the controller
dLo DLO	Defrost Lockout - Defrost not allowed	Auxiliary Input	Active = Defrost not allowed while signal is active
dnd DND	Demand Defrost	Setpoint	Option for Defrost Initiation Mode (ind) - when Demand Defrost (dnd) selected, system defrosts only when dictated by decrease in evaporator efficiency; other options for (Ind) are Scheduled (SCH) or Compressor Run Time (rnt)
don DON	Door Switch - Door Open	Auxiliary Input	Door switch indicates door is open
dor DOR	Door Switch	Auxiliary Input	Inactive=Door Closed (dCL)/Active=Door Open (don)
dor DOR	Door Open Alarm	Alarms	If door is open and room temperature is 5 degrees above ROOM TEMP + AIR TEMP DIFF for DOOR ALARM DELAY time
dPd DPD	Defrosts per day	Setpoint	If DEFROST MODE = SCH: The number of evenly spaced defrosts per day the controller will initiate.
drn DRN	Drain Time	Setpoint	Time to be in drain mode (drip time)
drn DRN	Drain	System Mode	Time after defrost to allow moisture to drain from coil
dtL DTL	Max Defrost Time	Setpoint	If DEFROST MODE = SCH: The maximum amount of time the defrost relay will be energized. (Not available if DEFROST MODE = DEMAND)
dtP DTP	Defr Term Temp	Setpoint	The temperature the coil sensor(s) must exceed in order to terminate defrost. The controller's defrost mode is complete at this point.
dtT DTT	Defr Term on Time Alarm	Alarms	Defrost terminated on time instead of temperature for two consecutive cycles
dtY DTY	Defrost Type	Setpoint	Type of Defrost for Evap: ELE for Electric/ Ai for off time/ HGN for hot gas w/comp on/ HGF for hot gas w/comp off
EA1 ER1	External Alarm Switch	Auxiliary Input	Active=EAo / Inactive=EAF
EA1 ER1	External Alarm 1	Alarms	If AU1 IN MODE = EXT ALARM: The digital input is in an active state
EA2 ER2	External Alarm 2	Alarms	If AU2 IN MODE = EXT ALARM: The digital input is in an active state
EA3 ER3	External Alarm 3	Alarms	If AU3 IN MODE = EXT ALARM: The digital input is in an active state
EAO ER3	External Alarm Switch Active	Auxiliary Input	External Alarm switch is receiving Active signal

Alphabetical List of Abbreviations (continued)

Abbreviation	Full Name	Type	Description
EAf ER3	External Alarm Switch Inactive	Auxiliary Input	External Alarm switch is not receiving external signal
Ed ED	Electric Defrost w/Mech. valve	Type of Control	System operates with default values for Electric Defrost with Mechanical Valve
EdE EDE	Electric Defrost w/EEV	Type of Control	System operates with default values for Electric Defrost with Electric Valve
EdF EDF	Extreme Temp Diff	Setpoint	ADVANCED TOPIC: Call us for assistance
EdF EDF	Excess Defrost Alarm	Alarms	32 defrosts or more within 48 hours
Edt EDT	Valve Type	Setpoint	Type of valve used on the system: mechanical, pre-configured electric, custom EEV configuration
EFL EFL	Email Failure Alarm	Alarms	Email alert was not confirmed by email server provided after seven consecutive attempts
ELE ELE	Electric Defrost	Setpoint	Option for evaporator Defrost Type (dtY) - Electric defrost heaters used; other options, Hot Gas w Compressor Off (HGF), Hot Gas with Compressor On (HGN) or Air Off time Defrost (Ai)
EnA ENR	Enabled	Setpoint	Enabled - Option to allow connection with Smart Access
FAC FRC	Factory reset	Setpoint	Press and hold to reset the controller to the factory default setpoints
FAH FRH	Fahrenheit	Setpoint	Option for units for the temperature display, in degrees - Fahrenheit or Celsius (CEL)
FAr FRR	Fan Relay	Variables	Current state of the fan relay
FdL FDL	Fan Delay	System Mode	Coming out of defrost, the LLS relay will be energized, and the coil will pulldown until it reaches 20°F, or 2 minutes, before the fans turn on. This allows any moisture on the coil to re-freeze, keeping it from spraying and forming ice drops on the walk-in's surfaces.
Fir FIR	Firmware Version	Variables	Current version of the firmware on the controller
HAd HRD	High Temp Alarm Delay	Setpoint	Minutes the room temperature must remain above ROOM TEMP + HIGH TEMP ALARM OFFSET before issuing a HIGH TEMP ALARM
HAo HRD	High Temp Alarm Offset	Setpoint	The number of degrees above ROOM TEMP for a HIGH TEMP ALARM condition.
HGF HGF	Hot Gas Defrost w. Compressor Off	Setpoint	Option for evaporator Defrost Type (dtY) - Hot Gas defrost used with the Compressor Off; other options Electric (ELE), Hot Gas w Compressor On (HGN), or Air Off time Defrost (Ai)
HGn HGF	Hot Gas Defrost w. Compressor On	Setpoint	Option for evaporator Defrost Type (dtY) - Hot Gas defrost used with the Compressor On; other options Electric (ELE), Hot Gas w Compressor Off (HGF), or Air Off time Defrost (Ai)
HS HS	HSV	Valve Type	HSV, Hybrid Stepper Valve
HSH HSH	High Superheat Alarm	Alarms	Superheat above upper limit
HtA HTR	High Temperature Alarm	Alarms	Room temperature is above ROOM TEMP + AIR TEMP DIFF + HIGH TEMP ALARM OFFSET for longer than HIGH TEMP ALARM DELAY
Htn HTN	Electric Defrost Mode	Setpoint	If DEFROST TYPE = ELE: Whether to leave the defrost relay energized during the defrost cycle or to utilize advanced defrost algorithm.
ind IND	Defrost Ini Mode	Setpoint	Mode to initiate a defrost: dnd=demand / SCH=Schedule / rnt=comp run time
iP1 IP1	IP Address Part 1	Variables	The first three digits of the IP address
iP2 IP2	IP Address Part 2	Variables	The second three digits of the IP address
iP3 IP3	IP Address Part 3	Variables	The third three digits of the IP address
iP4 IP4	IP Address Part 4	Variables	The fourth three digits of the IP address
LAd LRD	Low Temp Alarm Delay	Setpoint	Minutes the room temperature must remain below ROOM TEMP + LOW TEMP ALARM OFFSET before issuing a LOW TEMP ALARM
LAo LRD	Low Temp Alarm Offset	Setpoint	The number of degrees below ROOM TEMP for a LOW TEMP ALARM condition.
LPA LPR	Low Pressure Alarm	Alarms	Suction pressure dropped below expected point excessive number of times
LPC LPC	Low Pressure Cut Out	Setpoint	Only applies when non-mechanical valve selected
Lpd LPD	Press Diff for LPCO	Setpoint	Only applies when non-mechanical valve selected
Lpt LPT	Max Time for LPCO	Setpoint	Only applies when non-mechanical valve selected
LSH LSH	Low Superheat Alarm	Alarms	Superheat below lower limit
LtA LTR	Low Temperature Alarm	Alarms	Room temperature is below ROOM TEMP - LOW TEMP ALARM OFFSET for longer than LOW TEMP ALARM DELAY
oFF OFF	Off	System Mode	System has satisfied on temperature
oFF OFF	Defrost Heaters Off	Auxiliary Input	Defrost heaters are being interrupted by external input
oni ONI	Monitor Temp	Auxiliary Input	Monitoring Temp as measured by Aux Input
oPn OPN	Valve% Open	Variables	Percentage the EEV is open (only available if EEV is selected)
oPn OPN	Open	Setpoint	Option under Auxiliary Input State
PAS PRS	Web password reset	Setpoint	Press and hold to reset the web password to the factory default
Pdt PDT	Pump Down Timeout	Alarms	Max time for LPCO pumpdown exceeded
PrF PRF	Process Failure	Alarms	Display is not communicating to the controller
Prn PRN	Permanent	Setpoint	Option when Defrost Type (dtY) is set for Electric (ELE) - Permanent (Prn) means defrost relay is energized during the entire defrost cycle; other option Pulse (PUL) uses the advanced defrost algorithm to cycle the relay
PrS PRS	Suction Pressure	Variables	Suction pressure as measured by the controller (only available if suction pressure transducer installed)
PSA PSR	Pressure Sensor Alarm	Alarms	Suction pressure sensor is shorted, open or pressure out of range
PUL PUL	Pulse	Setpoint	Option when Defrost Type (dtY) is set for Electric (ELE) - Pulse (PUL) uses the advanced defrost algorithm to energize the defrost relay during the defrost cycle; other option Permanent (Prn)
rEF REF	Refrigeration	System Mode	Indicates the system is currently in Refrigeration mode
rFG RFG	Refrigerant	Setpoint	Type of refrigerant used: see table below
rnt RNT	Compressor Run Time	Setpoint	Option for Defrost Initiation Mode (ind) - when Compressor Run Time (rnt) selected, number of hours of cooling before starting defrost; other options for (Ind) are Demand Defrost (dnd) or Scheduled (SCH)
rS RS	RSV	Valve Type	(RSV) Refrigeration Stepper Valve
rtP RTP	Room Temp	Variables	Walk-in freezer or cooler room temperature (TAir Sensor) as measured by the controller

Alphabetical List of Abbreviations (continued)

Abbreviation	Full Name	Type	Description
rtP RTP	Room Temp	Auxiliary Input	Room temp as measured by Aux Input
SA SR	Smart Access	Setpoint	Turn Smart Access on or off: EnA to enable Smart Access / DiS to disable
SAt SRT	Saturation Temp	Variables	Saturation temperature as calculated by the controller (requires pressure transducer and T1 sensor)
SCC SCC	Short Compressor Cycle	Alarms	Compressor is started an excessive number of times to maintain suction pressure
SCH SCH	Scheduled Defrost	Setpoint	Option for Defrost Initiation Mode (ind) - when Scheduled (SCH) selected, system defrosts on a programmed schedule; other options for (Ind) are Demand Defrost (dnd) or Compressor Run Time (rnt)
SEi SEI	SEI	Valve Type	Sporlan Valve with 1,600 Steps
SEr SER	SER	Valve Type	Sporlan Valve with 2,500 Steps
SHt SHT	Superheat	Variables	Superheat as calculated by the controller (requires suction pressure transducer and TSUC sensors)
SoF SOf	System Off Switch	Auxiliary Input	Inactive=System On (Son)/Active=System Off (SoF)
SoF SOf	System Off	System Mode	System has been turned off by external signal
Son SOn	System Off Switch - System On	Auxiliary Input	Inactive=System On (Son)/Active=System is running normally
SSA SSR	Suction Sensor Alarm	Alarms	Suction temperature sensor is shorted or open
Stt STT	Superheat	Setpoint	Superheat setpoint
SUt SUT	Suction Temp	Variables	Suction Temperature as measured by controller
SYS SYS	System Mode	Variables	Current operating status
t2F T2F	2nd Room Temp Setpoint Off	Auxiliary Input	System is controlling to Room Temp setpoint
t2n T2N	2nd Temp Switch	Auxiliary Input	Inactive=2nd room temp SP off (t2F)/Active=2nd room temp SP on (t2n)
tHr THR	Mechanical	Valve Type	Thermostatic Expansion Valve
tS TS	Room Temp SP	Setpoint	Walk-in freezer or cooler room temperature to be maintained
tS2 TS2	2nd room temp SP	Setpoint	If AU IN (1, 2 and/or 3) MODE = (t2n) 2ND ROOM TEMP: This value becomes the ROOM TEMP setpoint when the digital input is active
Unt UNT	Temperature Units	Setpoint	Units for temperature's display in °F or °C