

**Delivering the Ultimate Energy Management Solution
for Restaurants and Convenience Stores**

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SBE SUPPORT CONTACTS

- Jim Parker – Director of Deployment – 1st contact for all install support
480-297-5240 or jparker@smallboxenergy.com
- Jake B Parsons – Technical Support Manager – Jim’s back-up for install support
480-568-8675 or jparsons@smallboxenergy.com
- Matt Berbner – Product Manager – Jim will refer you to Matt depending on needs
480-247-0011 or mberbner@smallboxenergy.com

Web Access

Login Information: Will be provided by SBE CSM

URLS

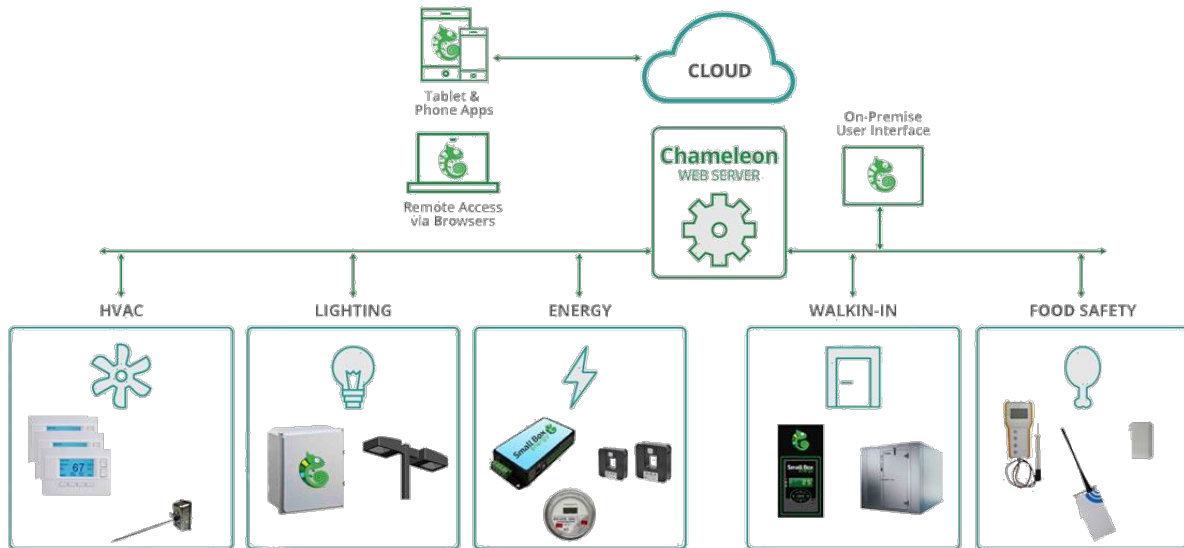
Mobile Install Link

<https://www.appsheet.com/newshortcut/d5086ba3-2efc-4d16-bba7-5237d1091dd5>

Browser Link

<https://www.appsheet.com/start/d5086ba3-2efc-4d16-bba7-5237d1091dd5>

SYSTEM OVERVIEW



Web server: Used to communicate to all devices through remote access

HVAC: Gives remote visibility and control, allows for remote setting of scheduling and temperature set points

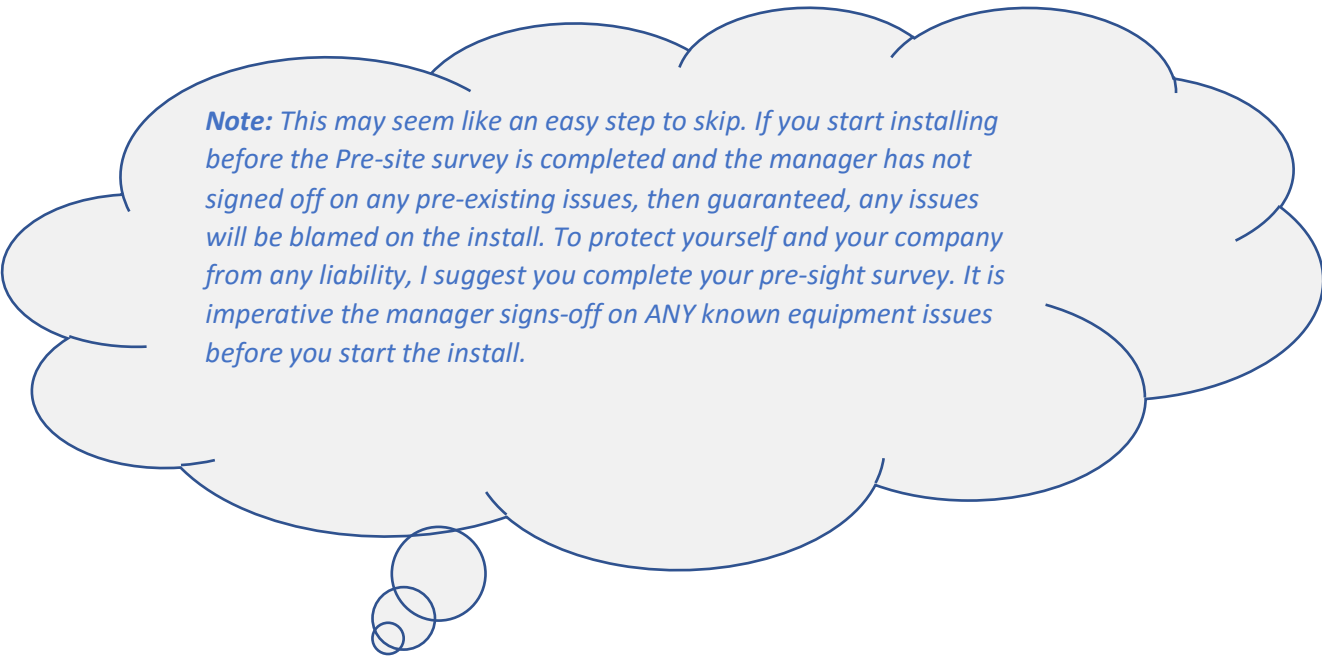
Food Safety: Alarm and alert high or low temperatures

Energy: Metered power consumption

Walk-in Refrigeration: Control and monitoring of refrigeration units

PRE-INSTALL SURVEY

- Review all product to be installed. Visually inspect store equipment that will have devices installed
- Record any and **ALL** visual defects of equipment that will be monitored or controlled
 1. Refrigeration: Ice buildup on coils, room not reaching set points
 2. HVAC: Units reaching set points dirty filters
 3. Food Safety: Reach-in units in good or bad condition
 4. Lighting: Are all the lights to be controlled working
- Take required pictures and load into pre-install check sheet.
 - HVAC thermostats and set points
 - Walk-in refrigeration, Cooler and Freezer
 - Current Lighting Control, Time Clocks and Photo Control and existing contactors
- Review listed items with the Manager and have them sign off to acknowledge any Pre-Install issues
- Submit check sheet



Note: *This may seem like an easy step to skip. If you start installing before the Pre-site survey is completed and the manager has not signed off on any pre-existing issues, then guaranteed, any issues will be blamed on the install. To protect yourself and your company from any liability, I suggest you complete your pre-sight survey. It is imperative the manager signs-off on ANY known equipment issues before you start the install.*

Tech Tip 1: Completing the Pre-Install Survey

SBE Installation app

Mobile Install Link (Allows mobile users to install the app on their devices)

<https://www.appsheet.com/newshortcut/d5086ba3-2efc-4d16-bba7-5237d1091dd5>

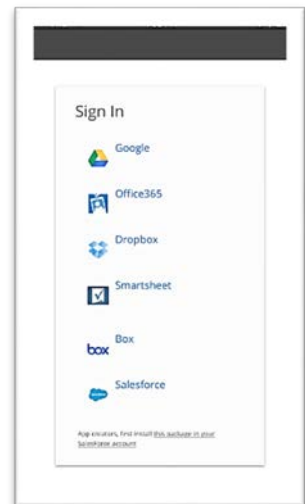
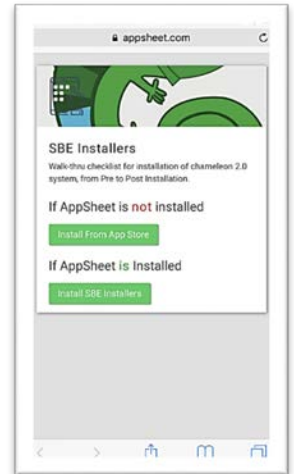
Browser Link

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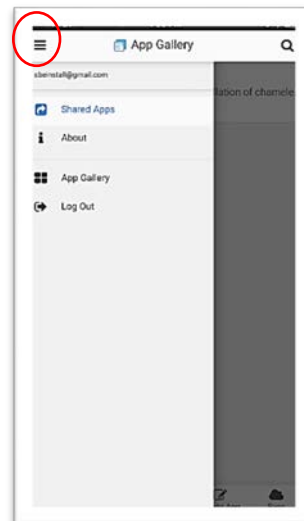
User name and password are google email credentials specific to your organization and should be provided by your DM. The same credentials are used by every user in your organization. Follow steps below to install the app on your mobile device:

iOS:

- Send this link to your mobile device so you can click on it from your mobile device <https://www.appsheet.com/newshortcut/d5086ba3-2efc-4d16-bba7-5237d1091dd5>
- Tap Install AppSheet
- Tap Install from App Store
- Open AppSheet
- **Choose Google**
- Choose Use Another Account
- Enter the email address provided by your DM and tap Next
- Enter the password provided by your DM and tap Next



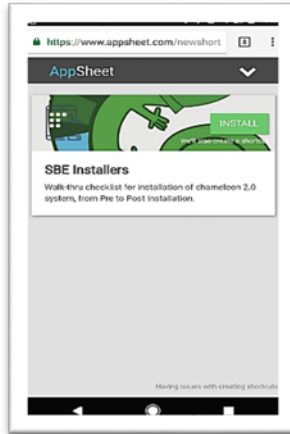
- Tap on the top left
- Choose Shared Apps
- Tap on SBE Installers
- Allow it to access your location
- Proceed to "Now that you've installed the app:"



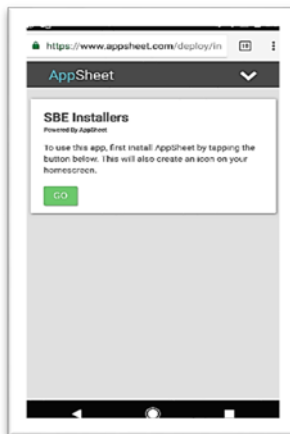
Android:

- Send this link to your mobile device so you can click on it from your mobile device
<https://www.appsheet.com/newshortcut/d5086ba3-2efc-4d16-bba7-5237d1091dd5>

- Tap Install



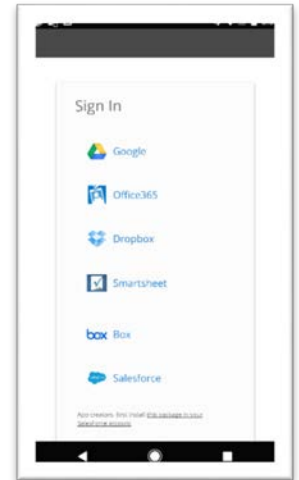
- Tap GO
- Install AppSheet



- Open AppSheet



- Choose Google
- Choose Use Another Account
- Enter the email address provided by your DM and tap Next
- Enter the password provided by your DM and tap Next



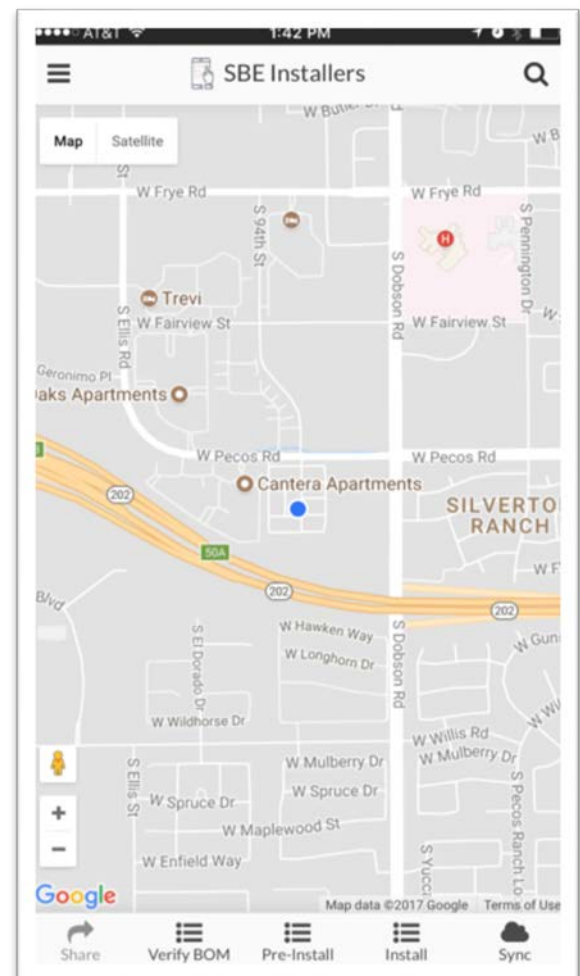
Now that you've installed the app:
The default screen should be your current location.

The app UI like the installation process is divided up into 3 sections/steps:

- **Verify BOM** – used to verify equipment specked against the actual equipment needed. The values in this section determine what the next two sections look like. For instance, if a location only has 2 thermostats noted in this section, the previous two sections will only ask for information on 2 thermostats etc. Many times, this section may have no changes necessary.
- **Pre-Install** – used to collect information on the location prior to any equipment being installed.
- **Install** – used to collect information after all equipment is installed.

Within each section, you'll be presented with a store number, map icon, phone icon, text bubble, and a right arrow on the far right. Use the map icon to open your mobile devices default navigation app and provide directions to the location. Use the phone and/or text icon to call and/or text the store contact on file. Use the right arrow to begin the process of completing the install step for that location.

When inside of any of the sections/steps, use the green pencil at the bottom, right to edit or input values in the information fields.



INSTALLATION PROCESS

Web Server

- Find a suitable location for the web server next to LCP
- Secure 6" din rail to wall
- Snap in webserver to din rail
- Plug power for webserver to outlet

Cradle Point (Optional)

- Confirm via the store manager or the Site Audit form whether the cradle point should be used.
- Cradle point should only be installed if client has not provided connectivity access.
- Confirm use of Cradle point with DM before installing.
- If needed, mount cradle point near webserver and connect to system.

Ethernet Switch (Optional)

- Mount optional Ethernet switch near web server for additional Ethernet ports
- Connect Ethernet cables to switch

Plug Strip (Optional)

- Only if extra power access is needed

Gesy Temperature Monitoring Receiver - 2.0

- Find a 110v outlet in an area in the kitchen central to the wireless temperature sensors, or next to the LCP if in the same area
- Mount receiver with antenna pointing downward
- Power device by plugging into outlet
- After steps above connect Modbus communication from Gesy receiver to webserver

Note: I always try to put webserver, Gesy Receiver, LCP, Cradle point together. Makes for a faster install



Tech Tip 2: Placement Tips for Faster Installs

Refrigeration Control

Walk-in Freezer

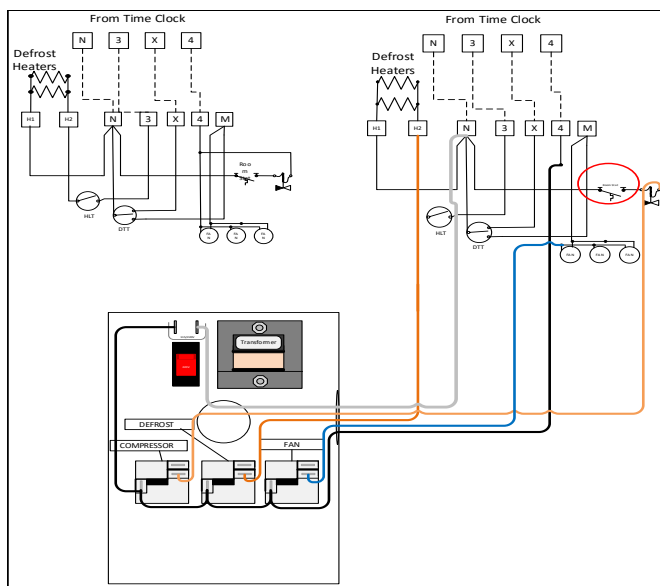
Cut over Cooling

- Remove cover to expose terminal board
- With power on, identify and remove fan switch leg from Terminal 4 (Fans should turn off)
- Label fan switch leg wire with blue marking tape
- With power on, Identify and remove solenoid valve switch leg from Terminal 4 (Solenoid should turn off)
- Label solenoid switch leg with yellow marking tape.
- Turn power off to evaporator before making final connections
- Connect power wire from terminal 4 of evaporator unit to power input of refrigeration controller
- Jump power from controller input power to “COM” of relays (Compressor, Fans, Defrost)
- Connect White wire from controller power to “N” power on evaporator unit
- Connect fan switch leg to “NO” terminal of FAN relay
- Connect Solenoid switch leg to “NO” terminal of Compressor relay
- At mechanical thermostat for solenoid, remove wires from terminal screws and wire nut together

Cut over Heating

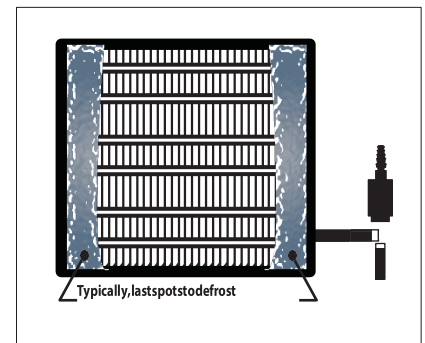
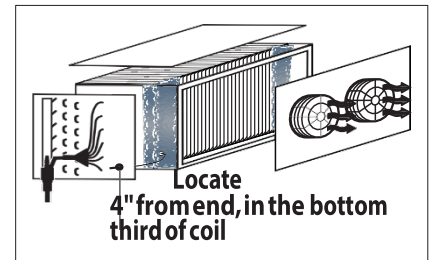
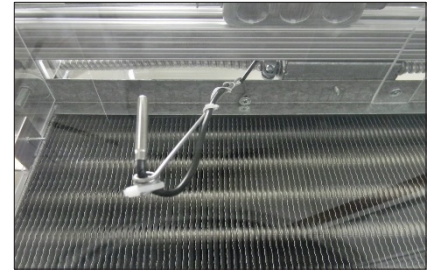
- Disconnect power to controller (stops compressor and fans).
- Pull heat strip wires from terminal 3 (or terminal opposite of “N”)
- Run heat strip switch legs to “NO” to defrost relay.

Walk -in Freezer



Installing temperature probes

- From the controller run “AIR TEMPERATURE PROBE” (Blue) to back of evaporator unit towards the middle of the unit between the fans
- Mount “AIR TEMPERATURE PROBE” 6 to 10 inches out away from where Air is drawn into the evaporator coil using the supplied bracket
- From the controller run the “COIL TEMPERATURE PROBES” to front of evaporator unit behind the fans where the air- flow is pushing out of the unit. This is the location where the coil will cool first through refrigerant lines and will be furthest from heating elements. Below is an image for air probe and coil sensor location for both the cooler and freezer.
- Insert first probe (Yellow) into left side of coil where ice will first appear. (On Freezers, the best location is in the upper left and right areas of the evaporator. About 4 “inches and 4” inches down. This will keep the sensors away from the heating elements. Make sure to fully insert probes into the coils
- Insert second probe (Green) into right side of coil opposite the first probe
- the first probe



Connecting Communication to Controller

- Run a three-conductor wire from Web server to Controller
At controller
- Connect Red wire to “A”
- Connect Black wire to “B”
- Connect ground wire to “SH”
At Web Server
- Connect Red wire to “B+”
- Connect Black wire to “A- “
- Connect ground wire to “GRD”

* Cat5e cable is also acceptable to run as a communication cable. Make sure to use same colors at both ends for connections

Configuration of the Controller

- Once controller is powered, press and hold the back button on the controller, TS will show on screen.

Temperature set point

- Press enter once
- Set temperatures for controller using the up and down arrows, use enter button to scroll octet's right to left: 36 for coolers, 0 for Freezers
- Press and hold the enter button until screen returns to the tS menu

Set defrost type

- Press the down arrow once (The DtyP will show on screen)
- Press up or down arrow to select the type of defrost desired (Electric for Freezers, Air for Coolers)
- Press and hold enter button until screen returns to the DtyP menu

Scheduled defrost

- Press down arrow down once (The dFiT will show on the screen)
- Press enter once
- Press up or down arrow to Schd,
- Press and hold enter until returns to previous screen

Defrost termination set point

- *Freezers only:* Scroll down to DtsP
- Press enter to change set point to 70.0 degrees
- Press and hold the enter button to save setting and return to previous screen

Modbus addressing

- Scroll down using down arrow unit you find the Adr menu
- Press enter once
- Set Modbus address for controller using the up and down arrows, use enter button to scroll octets. 30 for Coolers, 31 for Freezers

Final Step

- Remove defrost pins from time clock
- Sign with name and date inside time clock cover
- Repower unit and test to ensure units cools down
- Set unit into manual defrost by pressing and holding BACK and ENTER buttons at the same time. Test heat strips to ensure they are working.

Walk-in Cooler

Cut over Cooling

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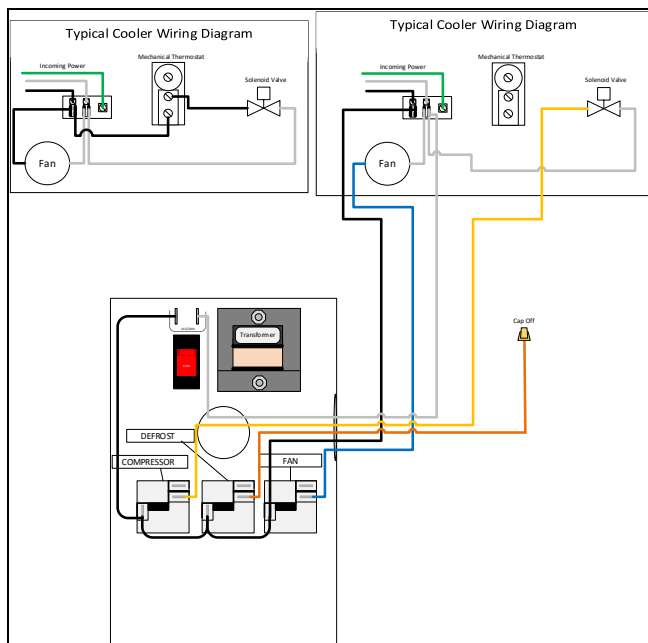
Ok coolers are easy because they don't have heat strips, right? Well most of the time

Well they can be a bear sometimes. Some are 110vac and while others are 220vac Just remember to utilize the same rules you used for the Freezer

1. Where is my power (this would be the incoming power from the breaker)
2. Identify fan switch leg
3. Identify solenoid switch leg test power to ground to determine voltage 110v or 220v,
 - if 110v connect ground wire from controller to the neutral wire on the incoming power.
 - If 220v connect the white wire to the second line of power.

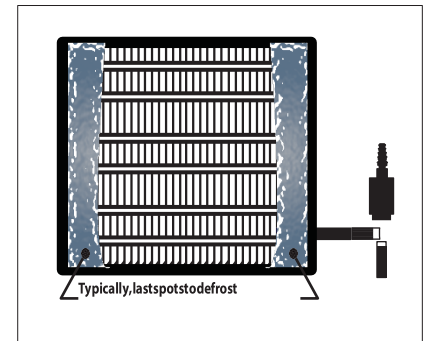
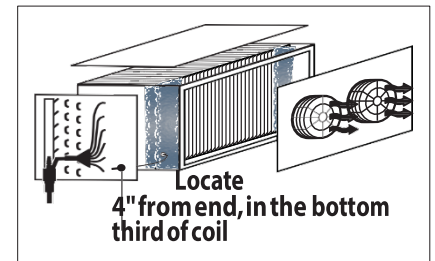
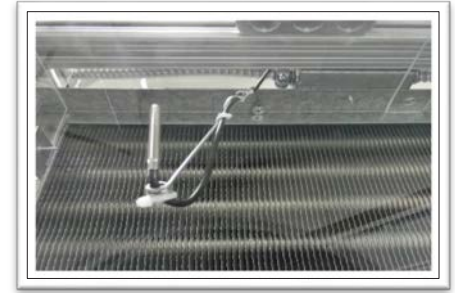
Tech Tip 7: Temperature sensors

Walk-in Cooler



Installing temperature probes

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- Press and hold enter until returns to previous screen

Defrost termination set point

- *Electric Defrost only:* Scroll down to DtsP
- Press enter to change set point to 70.0 degrees
- Press and hold the enter button to save setting and return to previous screen

Modbus addressing

- Scroll down using down arrow unit you find the Adr menu
- Press enter once
- Set Modbus address for controller using the up and down arrows, use enter button to scroll octets. 30 for Coolers, 31 for Freezers

Final Step

- Remove defrost pins from time clock
- Sign with name and date inside time clock cover
- Repower unit and test to ensure units cools down
- Test defrost: Set unit into manual defrost by pressing and holding BACK and ENTER buttons at the same time. Once in defrost the fans should continue running while compressor is turned off.

Note: Please see "Cheat Sheet Below" for navigation from face plate

Controller Navigation - Menu Structure

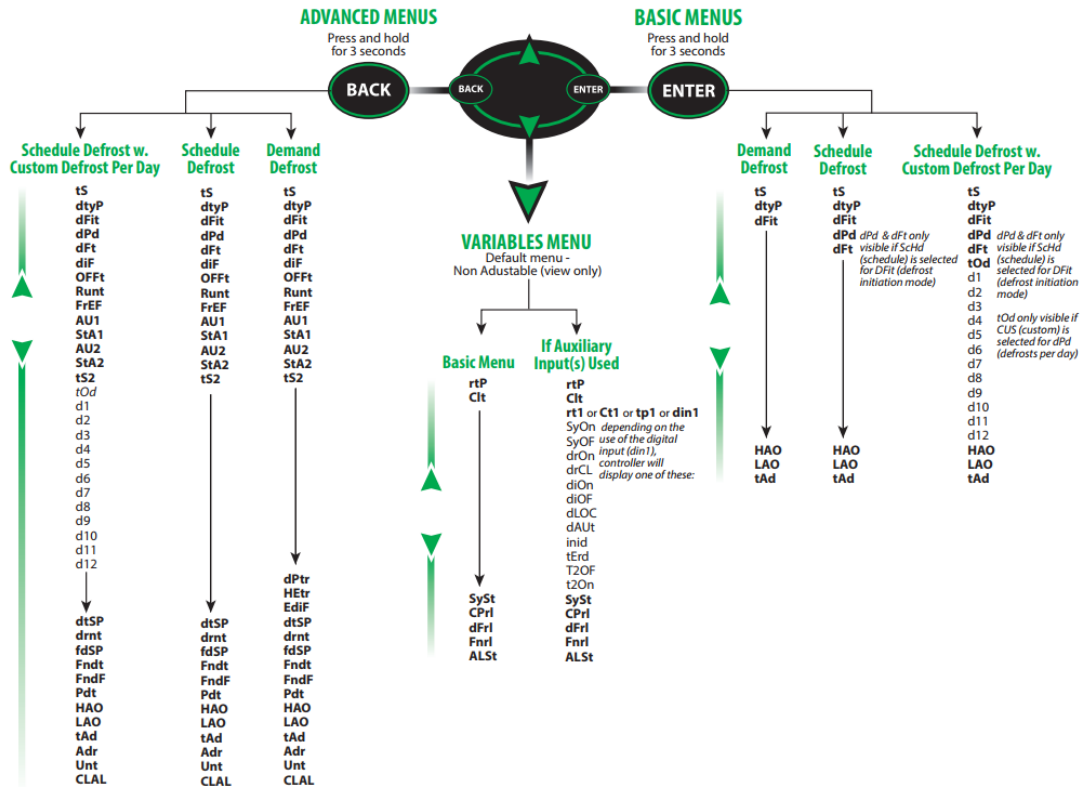


Indicator lights

- **Red light** - Basic Menu - not used
- **Yellow light** - non-critical alarm (system running)
- **Green light** - compressor on
- **Green flashing** - compressor waiting on timer to start/stop

- 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 **▼** 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.

Accessing the Menus



Lighting Control Panel

Locate current lighting control. Typically, this is a time clock or a photo cell.

- Time clocks for exterior lighting are usually mounted in the manager's office
- Photocells are always on the roof

Mount lighting panel

- Using the mounting hardware provided with the LCP mount in an accessible location near current lighting

Connect 110v to power lighting control

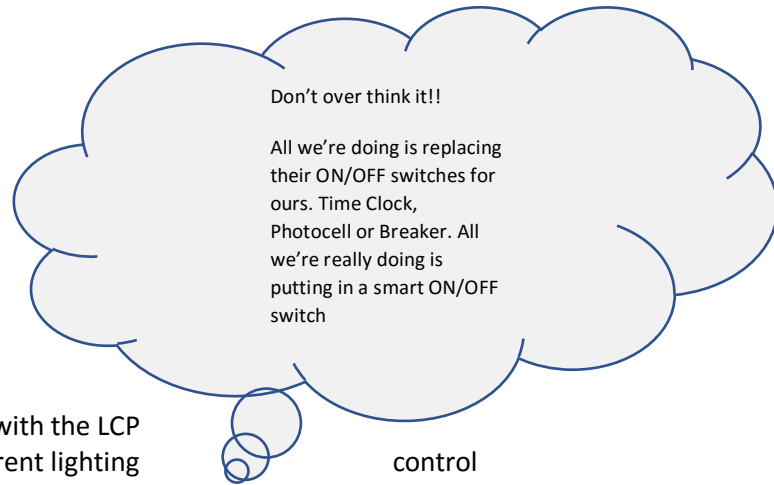
- From the breaker panel run 110v power to the lighting control panel
- label breaker EMS

Connect Modbus communication

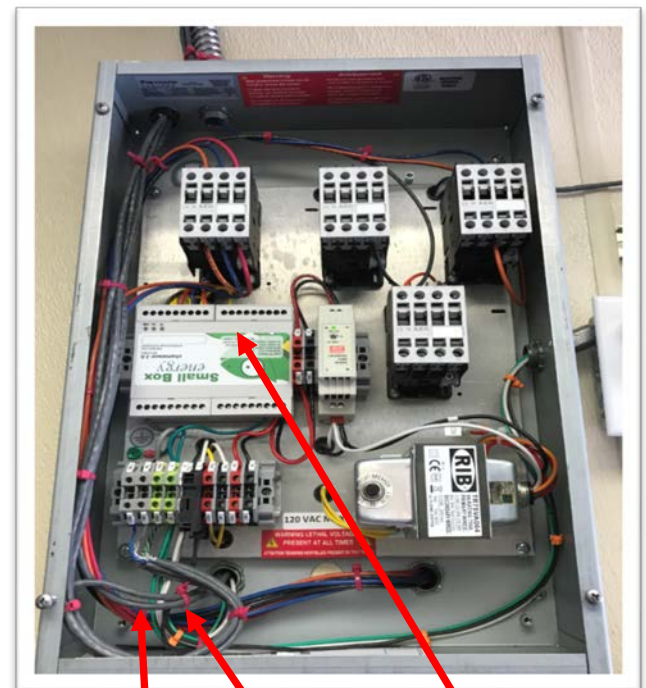
- From the lighting panel run a 3-conductor wire (recommendation is a wire that has Black, Red, and Ground or Shield) to the power meter
- Connect the Red wire to "RS+" of the Modbus terminal
- Connect the Black wire to "RS-" or the Modbus terminal
- Connect the Green or Shielded wire to Ground terminal, RSG

Cutting over the lighting

- Run line/load from lighting panel lighting contactor to controls of current lighting
- Remove time clock or photocell control from system
- Test connection to ensure functionality of lighting



Tech Tip 9: Don't Over Think the Lighting Panel



Modbus communication

110vac power

Line/load connections

Power Meter

Locating main service feeders

- Main service feeders are the main power feed to the building including all electrical subpanels. These are usually located within the customer side of the MDP or Switch Gear. The service main can be located outside of the building or with in the building footprint depending on structure layout.

Installing the CT's or Current transducers

Split core CT's

- Unbolt the screws holding the CT together
- Remove jumper bar at CT
- Wrap the open end of the CT around the power buss bar for "A" phase of power
- Reinsert jumper bar and re-bolt CT together
- Repeat this process for phases "B" and "C"
- Label each set of wire leads for which phase they are attached
 - Black= Phase "A"
 - Red= Phase "B"
 - Blue= Phase "C"
- Route CT Wires to meter and connect



Rope CT's

- Un-fasten the connected CT
- Wrap the CT around the power buss bar for "A" phase of power
- Re-fasten CT together
- Repeat this process for phases "B" and "C"
- Label each set of wire leads for which phase they are attached
 - Black= Phase "A"
 - Red= Phase "B"
 - Blue= Phase "C"
- Connect 24vdc for the DC terminals of the lighting panel to each Rope CT. This can be daisy chained between the CT's
- Route CT Wires to meter and connect



Connecting CT's to Meter

- At the meter. Connect the white wire of CT "A" to terminal lug "A" marked with a white dot
- Connect the black wire of CT "A" to terminal lug "A" marked with a black dot
- Follow the same Steps for CT's "B" and "C"

Installing and powering the meter

- Once the meter is mounted with-in the electrical panel, connect three phase power to the meter from open or unused breaker
 - Green to ground

- White to Neutral
- Black to Phase "A"
- Red to Phase "B"
- Blue to Phase "C"

Communication

- From the webserver or lighting panel run a 3-conductor wire (recommend a wire that has Black, Red, and Ground or Shield) to the power meter
- Connect the Red wire to "B+"
- Connect the Black wire to "A-"
- Connect ground wire to "C"
- Turn power on to the meter



Testing

- Each Status light should blink green
- If- solid green= no connection
- If flashing Red = Ct flipped in wrong direction, this can be reversed by switching the white and black wires at the meter
- Once all status lights are blinking green your good to go

Thermostats

Identify wires in original thermostat

- Remove cover plate of thermostat
- Note connections by taking a picture
- Identify 24vac power by testing wires connected to terminal Rc/Rh
- Identify Common by testing wire connected to terminal X, C, or Rx

Note: if thermostat is battery powered there may not have a ground wire present at the thermostat. If this is the case, a new wire must be run from HVAC unit to the thermostat.



Connecting SBE Thermostat

- Remove wires from old thermostat connections
- Reattach to wires to new thermostat
 - G= Fan
 - RC/RH= 24v power
 - Y1= Cooling stage 1
 - Y2= Cooling Stage 2
 - W1= Heating Stage 1



- W2=Heating Stage 2
- C= common
- RS1/RS1= Remote room temperature sensor
- RS2/RS2= Discharge temperature sensor
- Reattach face plate to power thermostat

Configuration of thermostats

Set time

- Press MENU
- Set the time and date
- Press done when complete

Change schedules to “N”

- From the MENU screen press and hold the two center buttons at the bottom of the screen to access the configuration menu
- Press select the system settings in the configuration menu
- Down arrow to Sched Enable and change to “N”
- Press done after change

Change sensors to out

- Down arrow to the Remote Sensors Tab
- Press Select
- Down arrow to RS2 Location
- Change to “out”
- Press done after changes

Set cooling and heating stages

- Scroll to Mechanical Settings tab
- Press select
- Down arrow to 2nd Stage heat. Change to “y” (Always set this)
- Down arrow to 2nd Stage Cool. Change to “y” (Always set this)
- Press done when completed

Disable Filter Status

- From the MENU screen arrow, down to user settings and press select.
- Down arrow to Filter Service and press select.
- Press – until it says “Service Interval Disabled”
- Press done when completed

Return to home screen

- Press done several times unit screen returns home page

Calibrate room/discharge sensors

- Press menu and scroll to user settings
- Press select



- Down arrow to sensor calibration
- Adjust room sensors and discharge sensors based on readings from laser temperature gun.
- Press done until you return to home screen.

Food Safety

Mounting the Receiver

- Find a location near the kitchen or were the Sensors will be installed
- Using the supplied bracket install on wall (antenna pointed down)
- Plug receiver into power source
- Connect Modbus cable to Web Server



Wireless Temperature Sensors

- Create a label for each Sensor to be placed and apply to the front of the sensor
- Record 5-digit ID from back of Sensor
- Apply two-sided sticky tape to back of Sensor (recommended 3M exterior adhesive)
- Clean area where sensor will be placed thoroughly
- Attach sensor to area
- Take picture of where sensor is located for future reference for that location



Connecting to webserver

- Note the MAC address on the label located on the side of the Web server
- Connect an Ethernet cable from your laptop to your Ethernet switch
- Connect an Ethernet cable from the webserver and Cell router or Ethernet switch, this should already be determined by client IT
- Connect laptop to same LAN network via Ethernet switch
- Send Web Server MAC to the SBE Deployment Manager to configure



Note: DM will guide you on when to start next steps, preferred connection of webserver early in install process to allow DM to confirm communication with webserver and ability to name devices in webpages

Commissioning Devices to system

Accessing the webserver from laptop

- Open web browser
- Input IP address given to you by your DM
- Enter, this should open the internal Webpages for commissioning



Adding Modbus Devices to System

- Open the device tab
- Open I/O Control (this is your lighting panel)
- Scroll to bottom of page and add 21 in the add device tab
- Select add device
- Repeat this process for the rest of the Modbus devices using the Modbus address list below
 - I/O (lighting panel): **21**
 - Wattnode (Power Meter): **50**
 - Freezer controls- Cooler: **30**
 - Freezer Controls- Freezer: **31**
 - Remote Temps (Wireless receiver): **1**



Note: Once device is commissioned, check status of device. Tx: should rise in value while Err: stays static, if this is not the case then there is a wiring issue between the devices and the Web Server

Adding ZigBee Thermostats to System

1. Adding thermostats to ZigBee network

- At thermostat, press menu
- Press and hold the 2 center buttons 2-3 seconds until second set of menus appear
- Using the down arrow, scroll down to “Zigbee Install”, press select
- When prompted “Add Zigbee Thermostat” select YES
- Select done to return to first menu
- Scroll down to Zigbee network and open. This will tell you if the thermostat was commission to the Zigbee channel
- Refresh internal Webserver pages and open Zigbee tab. You should see the values for the thermostat you added

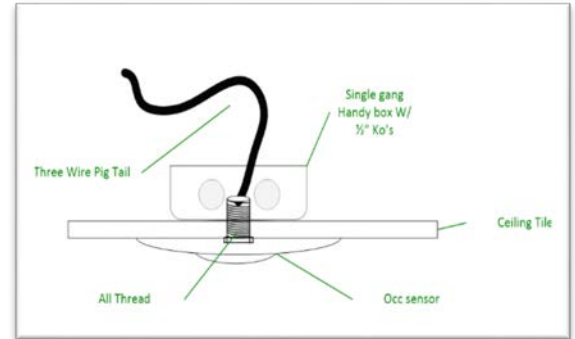
Checkout

- Complete all information requested from the checkout application link that is provided at the beginning of this manual.

Optional Devices: Occupancy Sensor

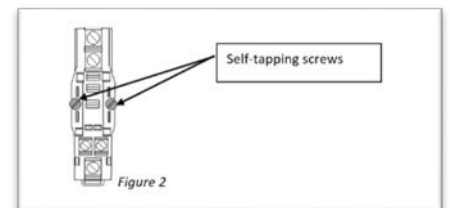
1. Mounting the Occupancy sensor

- Find a location that is near the area you want to activate the sensor. Example would be by back door so that when activated, the kitchen lights will turn on.
- Remove the sensor from packaging
- Locate a spot near the back door in ceiling area
- Cut 7/8" hole in the ceiling tile at the mounting location
- In ceiling above grid, set the j-Box over the hole
- Attach the mounting base through the 7/8" hole to the j-box above
- Put the gasket and locknut along with the connector, and twist the locknut until the mounting base is tight to the ceiling
- Pull the wire harness through base hole
- Secure sensor face plate to base plate (*Figure 1*)
- From j-box run a three-wire harness in 1/2" flex to the LCP panel (Black Red Blue)
- Connect (wire nut) matching colors in j-box and install cover plate



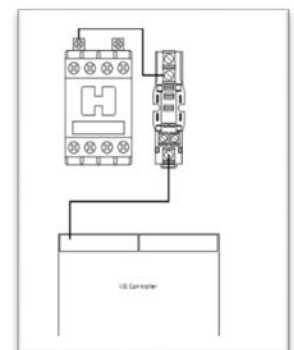
2. Mounting Relay Base in LCP

- Place the relay base next to the contactor zone to be controlled by the OCC sensor
- Use self-tapping screws and secure base to back plate of the LCP



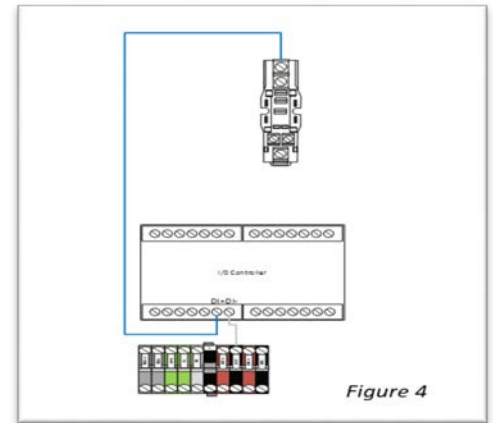
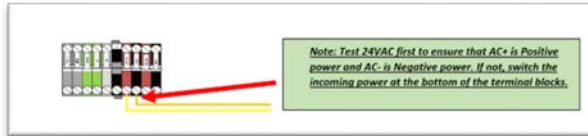
3. Conversion of the control wire from the I/O device to the relay base

- Remove and reroute the control wire from the A1 terminal on the contactor and secure to the bottom screw terminal at the bottom of the relay base
- Connect a wire from the top screw terminal at the top of the relay base to the A1 terminal on the contactor



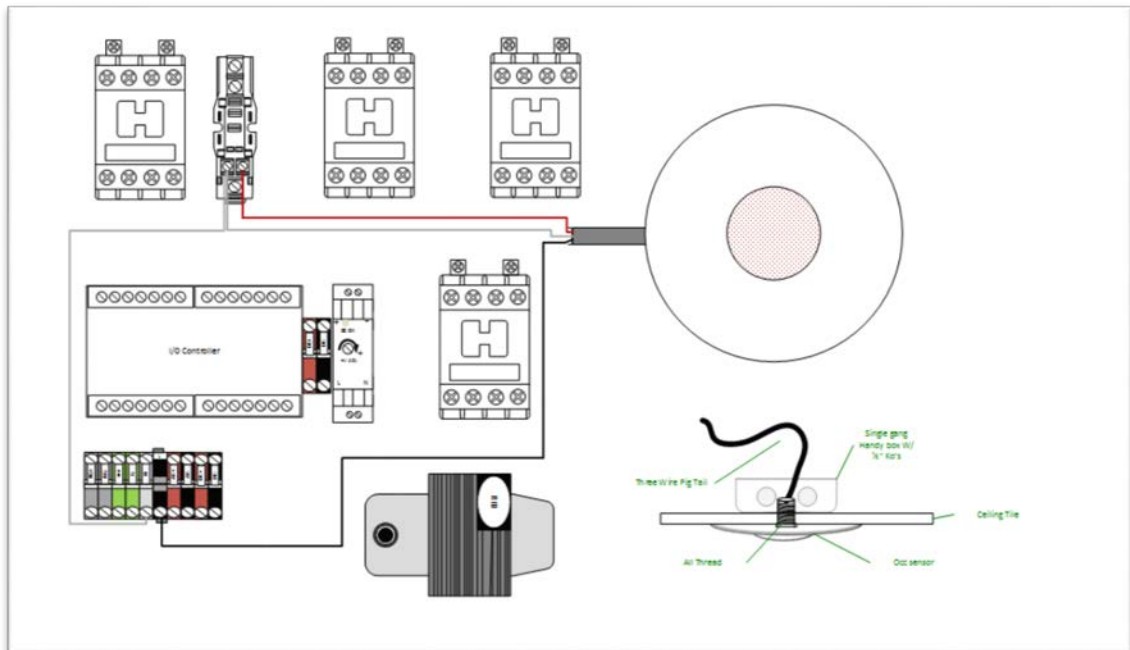
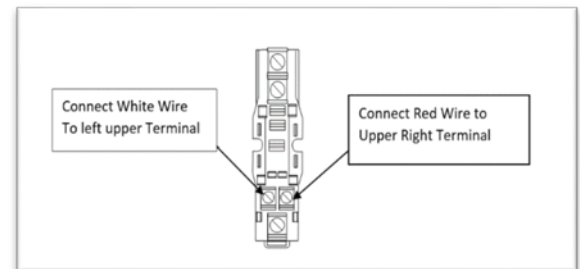
4. Digital Input Connections

- Connect a wire from D+ of the I/O controller to the bottom screw terminal at the top of the relay base.
- Connect a wire from the D- to the AC- terminal below the I/O controller.



5. OCC Connections in LCP

- Drill ½" hole at entrance area in LCP
- Insert KO bushing to protect from wire damage or qualified means of entrance termination such as a two-screw connector
- Connect **black** wire from the sensor to the power(Black) terminal at bottom left of panel (**make sure panel is powered off**) (Figure 3)
- Connect the **white** wire from the sensor to the upper left terminal on the relay block
- Connect a **white** wire from base unit to neutral (N) Terminal (Figure 3)
- Connect **red** wire to right terminal of relay base (Figure 2)



6. Install IDEC Relay

- Once wiring is completed, insert the IDEC relay into the base unit
- Re-power lighting panel

7. Sensor Adjustment

- After test period is complete you can adjust the potentiometer per the ambient specifications

Note: There is a 40 second warm up period when unit is first powered on, LED Flashes

8. Dip Switch settings

- The Sensor has 4 DIP switches for setting the sensitivity and time delay features.

Sensitivity	1	◀
100%	↑	
50%	↓	

50%, the sensor coverage is smaller, just about half of the widest range
 100%, the maximum range of the sensor

8. Time Delay Settings Dip Switch 2,3,4

Time Delay	2	3	4	◀
Test / 15 Seconds	↓	↓	↓	
5 Minutes	↓	↓	↑	
10 Minutes	↓	↑	↓	
15 Minutes	↓	↑	↑	
20 Minutes	↑	↓	↓	
25 Minutes	↑	↓	↑	
30 Minutes	↑	↑	↓	

↓ =OFF ↑ =ON

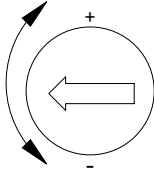
◀ = Factory Settings

9. Light Level Adjustment

The factory default is at “+” which is the maximum regardless of ambient light level. The load is to be automatic turned ON and OFF only per the occupancy and vacancy. By turning the light level knob (as shown in figure 5) toward THE “-“, if there is adequate ambient light, the load cannot be turned on even if there is occupancy detected.

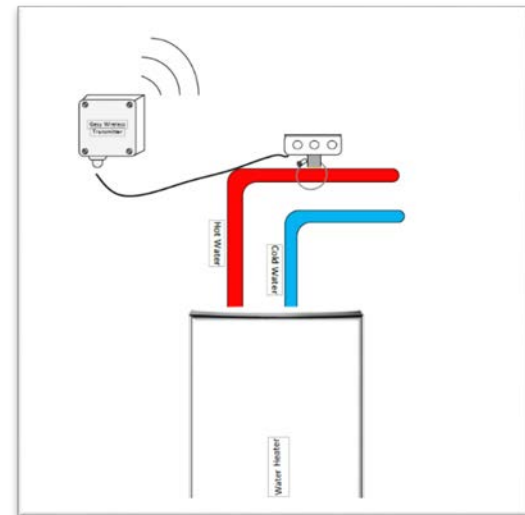
Therefore:

- Avoid mounting sensor close to windows
- Adjust during the daylight hours when the ambient light is at desired levels



Optional Devices: Water heater temperature sensor

- Mount Gesy transmitter with in site of the Gesy receiver
- Mount Strap-on temperature sensor to the HOT side of the water pipe coming out of the water heater
- Run and connect a two-conductor shielded cable between the two devices
- Commission transmitter device using the same process as the wireless temperature sensors.
- Confirm correct readings in Web pages



Optional Devices: Photocell, This would be for extra control of exterior lighting

1. Mounting: Mount photocell on top of building facing north
2. Connections: Run Low volt three conductor wire from LCP to photocell location.
3. Connect wires at photocell
 - Black= Power to (line) photocell
 - Red= Switch leg (load) from photocell
 - White= Neutral
4. Connect wires at LCP from Pigtail
 - Black= Power to (line) photocell
 - Red= Switch leg (load) from photocell
 - White= Neutral

