Smart Commercial Control

User Guide

Version 1.0.0

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Welcome to Cognition Controls

At Cognition Controls we believe that technology is powerful and can assist in reducing energy consumption in the built environment while also managing the very human and subjective challenge of maintaining comfort. The Smart Commercial Control is purpose built for light commercial, retail and industrial buildings; and is applicable in both retrofits and new buildings.

Our solution provides HVAC professionals and property owners with tools and insights to better manage their customer's equipment and strengthen customer relationships. End users will find that the Smart Commercial Control in tandem with the Cognition Controls Dashboard provides remote control of comfort and useful tools and information to increase HVAC energy savings.

We thank you for trusting us with your building's comfort!

Please read all instructions carefully before installing the Smart Commercial Control and keep the instructions for future reference.

The Smart Commercial Control works with common 24 volt systems such as forced air, hydronic, heat pump, oil, gas, and electric. It will not work with millivolt systems or with 120/240 volt systems.

CAUTION: ELECTRICAL HAZARD
Can cause electrical shock or equipment damage. Disconnect power before beginning installation.

CAUTION: EQUIPMENT DAMAGE HAZARD
To prevent equipment damage, avoid cycling the compressor quickly.

CAUTION: MERCURY NOTICE
If this product is replacing a control that contains mercury in a sealed tube, do not place the old control in the trash. Contact your local waste management authority for instructions regarding recycling and proper disposal.

CAUTION: ELECTRONIC WASTE NOTICE
The product should not be disposed of with other waste. Check for the nearest authorized collection centers or authorized recyclers. The correct disposal of end-of-life equipment will help prevent potential negative consequences for the environment and human health.

FCC Regulations
This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular
installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/ TV technician for help.

Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

FCC RF Radiation Exposure Statement
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. To comply with FCC RF Exposure compliance requirements, this grant is applicable to only Mobile Configurations. The antennas used for the transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with
any other antenna or transmitter.

IC Notice
This device complies with Industry Canada's license-exempt RSSs. Operation is subject to the following two conditions:

1. This device may not cause interference; and
2. This device must accept any interference, including interference that may cause undesired operation of the device.

L’appareil est conforme au RSS d’exemption de licence d’Industrie Canada. Les opérations sont soumises aux deux conditions suivantes:

1. Cet appareil ne peut pas causer d’interférence; Et
2. l’appareil doit accepter toute interférence, y compris celles qui peuvent entraîner un fonctionnement indésirable de l’appareil.

IC Radiation Exposure statement

This device complies with Ic radiation exposure limits set forth for an uncontrolled environment .In order to avoid the possibility of exceeding the IC radio frequency exposure limits ,human proximity to the antenna shall not be less than 20 cm during normal operation.

L’appareil est conforme aux limites d’exposition au rayonnement IC spécifiées dans un environnement non contrôlé. Afin d’éviter la possibilité de dépasser la limite d’exposition aux RF
LC, le corps humain ne doit pas être à moins de 20 cm de l’antenne pendant le fonctionnement normal.

Overview

Power Check

The Smart Commercial Control is powered by the HVAC equipment it controls using the C-wire.

- **Pre-Install Check:** Before starting an installation, confirm the presence and functionality of the C-wire at the existing HVAC control.

- **No C-wire present:** In the absence of a C-wire, one will need to be installed. Further guidance can be found on cognitioncontrols.com under "Tools and Guides."

Getting Started

Each Smart Commercial Control has a unique QR code on the back of the enclosure. Scanning the QR code begins the installation process.

- **Scan the QR:** To begin an install, scan the unique QR code located on the back of the Smart Commercial Control.

- **Follow the step-by-step instructions:** The installation flow is a quick step-by-step to guide to successfully install The Smart Commercial Control.

- **Multiple Devices:** The QR code on each Smart Commercial Control is unique to that device. To ensure connection and configuration with the Cognition dashboard scan the QR code on each device to be installed.

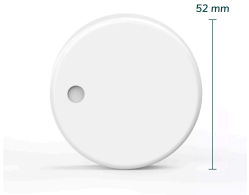
Pairing a Remote Sensor

A remote sensor can be quickly and easily paired with The Smart Commercial Control for enhanced management of tricky space.

- **Installation Considerations:** Be aware of factors that may obstruct accurate sensor readings such as installing directly above a heat-emitting source or direct exposure to sunlight. The sensor should be installed within 25 feet of the Cognition device.

- **Remote Sensor Pairing & Installation:** The Cognition remote sensor seamlessly pairs with the main device via wireless connectivity. Each sensor has a unique identifier (color & shape) on the back of its enclosure. This identifier will be critical for pairing the sensor during the device installation. Also, on the back of the sensor is a double-sided adhesive used to mount the sensor to the decided sensor location.

- **Optimal Remote Sensor Placement:** For ideal performance, place the remote sensor in the following manner:
    - In the same space as the Smart Commercial Control device it will be paired with.
    - Within a 25-foot radius of the Smart Commercial Control device it will be paired with.
    - Positioned at a height of approximately 5 feet from the ground.
    - Avoid direct exposure to sunlight and proximity to heat or cold-emitting equipment.
    - Prevent positioning the sensor between multiple walls, which may interfere with its functionality.



Cognition Remote Sensor

Connectivity

- **Cellular Connectivity Out of the Box:** Cognition utilizes cellular connectivity that is ready to use upon device installation.

- **Automatic Cellular Connection:** Typically, the device establishes a cellular connection within 5 minutes of installation.

- **Backup WiFi Option:** In cases where a cellular connection is not suitable, a backup WiFi option is available. Follow the WiFi installation steps provided during the installation process and for more details please refer to the Additional Information section of this user guide.
    - **IEEE Standards:** IEEE 802.11b/g/n compliant.
    - **Operating Channel Center Frequency Range:** 2412~2484MHz (2.4 GHz band).
    - **Bandwidth Support:** Supports 20MHz and 40MHz bandwidth in the 2.4GHz band.

- **Comfort Preferences Stored:** Once connected, your Smart Commercial Control device stores your comfort preferences. These preferences are used to manage your space even if cellular connectivity is temporarily unavailable.

- **Notification of Connectivity Issues:** In the unlikely event of an extended period without cellular connectivity, Cognition Controls will notify you of any issues to ensure continuous service. If your device experiences a connectivity issue it will continue to manage your space based on the last-stored comfort settings and preferences. Once connectivity is re-established it will fetch the latest settings and continue to manage your space.

Configuration

- **Device Configuration Time:** The Smart Commercial Control device typically takes 2 to 15 minutes to configure with the Cognition dashboard.

- **Configuration Completion:** You'll know the configuration is complete when the device screen displays the default device home screen.

Default Device Screen

- **HVAC Equipment Settings:** For specific HVAC equipment configurations, you can make adjustments through the Cognition Dashboard. Log in with your unique Cognition credentials and access the Equipment Page for the necessary settings.

Data Communication

- **No Listening or Photography Features**: The Smart Commercial Control device does **<u>not</u>** possess voice or picture recording capabilities.

- **Data Monitoring and Recording:** Within your space, the Smart Commercial Control device monitors, records, and tracks temperature and humidity readings. It also captures equipment relay settings, changes, and runtime data.

- **Data Transmission Frequency:** The device transmits this information to the secure Cognition Controls cloud every 10-20 minutes to manage device changes and consistently patrol zone performance.

- **Data Presentation:** In the Cognition dashboard, this data is displayed alongside additional contextual information, including real-time weather data.

- **Data Analysis:** The secure Cognition cloud employs proprietary data algorithms to analyze this information. It identifies when Alerts, Reminders, and other pertinent information should be provided to designated users.

On-Device Actions

- **Comfort Request using Buttons:** The buttons on the Smart Commercial Control device can be used to execute simple, temporary comfort adjustments. Any comfort request made using the device is considered temporary and will take precedence over the zone's comfort preferences in the Cognition Dashboard for a duration of 2 hours.
    - **Example Usage:**

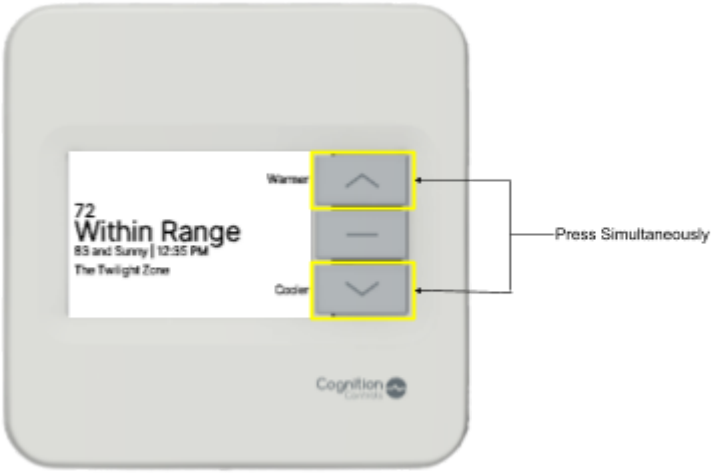
- Press the up or down button to raise or decrease the temperature, respectively.
- Continue pressing the buttons until the desired temperature is displayed on the screen.

- Push the "confirm" button to proceed.

- The screen will provide instructions for the next steps, including timing for the action and an option to cancel the request.

- **Potential Delayed Response:** Please be aware that there may be delays between a comfort request and a reaction from the Smart Commercial Control. This is to ensure that HVAC equipment best practices are followed.

- **Accessing the Installer Menu:** Accessing the device's menu can be done by simultaneously pressing the up and down buttons.



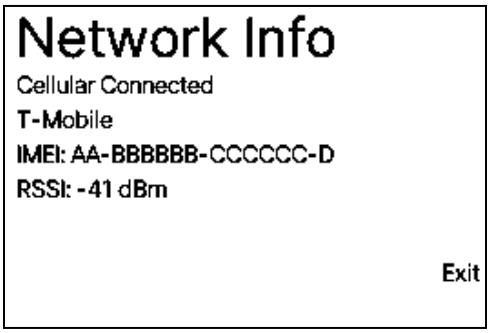
- **Navigating the Menu:** Once within the menu you can navigate using the bottom button to see all menu options. Below are images of all of the menu screens and a description of the menu options.

  Note: You have to close and re-enter the menu to revisit previous menu pages

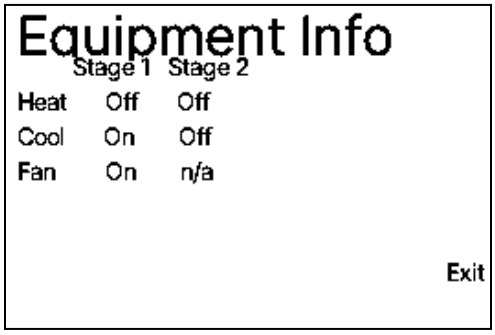
  - **Zone Info:** Provides information about the zone that the device controls

  - **Dashboard Link:** Provides QR Code that will navigate you to this zone on the Cognition dashboard

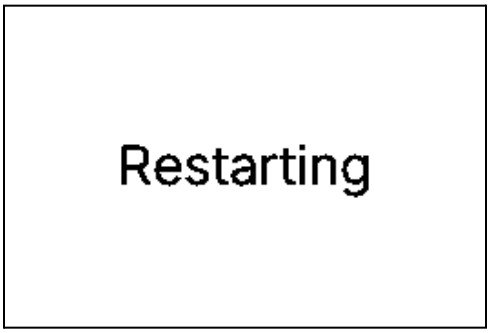
  - **Network Info:** Provides information about the device's network connection



  - **Equipment Info:** Provides information about the zone's HVAC equipment configuration



- **Re-enter WiFi Credentials:** This menu option will be used to set-up WiFi on your device. Please visit the “Additional Information” section of this document for the complete process on how to initialize a WiFi connection on your device.
- **Restart Device:** Restarts the Smart Commercial Control



- **Loss of Power:** If your device experiences a loss of power it will execute a safe power-down procedure and show an “No Power” note on the device screen. The device will also appear offline in the Dashboard and anyone that is a registered user to receive email alerts for the unpowered zone will get an email notifying that they’re zone has lost power. Once power is restored it will return to managing the space according to the last-stored comfort settings and preferences until new settings and preferences are received.

Cognition Dashboard

- **Cognition Dashboard:** This web-based tool is how you manage comfort, equipment and savings.

- **Zone Structure:** The dashboard organizes information by "zones" representing specific areas managed by HVAC units. Zones can be grouped into floors, tenants, or buildings.

- **Custom Names:** Customize zone and group names for better reference.

- **Dashboard Sections:**
  - **Overview:** Quick summaries of zone/group information.
  - **Comfort:** Manage comfort settings.
  - **Data:** Analyze historical space conditions.
  - **Energy:** Understand HVAC impact on energy.
  - **Equipment:** Manage equipment and track maintenance.

- **Dashboard Accessibility:** The Cognition Controls Dashboard is accessible on various devices, including smartphones, laptops, tablets, and desktops. Users can customize temperature settings and communication preferences.

Cognition Communications

- There are three types of Cognition communications: Alerts, Reminders and Information
  - **Alerts:**
    - **Purpose:** These are generated in response to "not normal" or "problematic" data from your space, based on real-time information.
    - **Objective:** Alerts are designed to promptly draw your attention to issues that may lead to emergency costs and discomfort.
    - **Example:** Equipment Issue and Power Issue Alerts

- **Reminders:**
    - **Purpose:** These are proactive notifications concerning future actions related to your space or HVAC equipment.
    - **Objective:** Reminders are intended to provide timely, valuable prompts to help you plan maintenance or make adjustments that reduce equipment wear and energy use.
    - **Example:** Air Filter Change and Holiday Reminders

- **Information:**
    - **Purpose:** Informational summaries offer valuable insights into your space's operation.
    - **Objective:** They deliver actionable insights to enhance your comfort while helping you save energy and time.
    - **Example:** Quarterly Energy Summaries

Permissions

- **Purchaser Access:** The purchaser has access to all dashboard views and communications.

- **Permission Management:** The purchaser can grant permissions to other users through the Admin menu in the Dashboard.

- **Scope of Permissions:** Permissions can be granted at a grouped-zone view or by individual zones, spanning the 5 types of dashboard information and 3 types of Cognition communications.

- **Delegation:** The purchaser can empower a new user to add more users and delegate their specific access rights.

Device Specifications

Cognition Controls is a cloud-based smart software solution that works with existing HVAC equipment to maintain comfort while also lowering HVAC energy and operating costs. Cognition insights, tools and alerts enable anyone to contribute to a more sustainable future. Please read this user guide thoroughly to ensure proper and appropriate use for maximum benefit.

Hardware Requirements

- 24Vac Thermostat Wiring with a powered C-wire
- Cellular connection (recommended) or WiFi connection

Technical Specifications

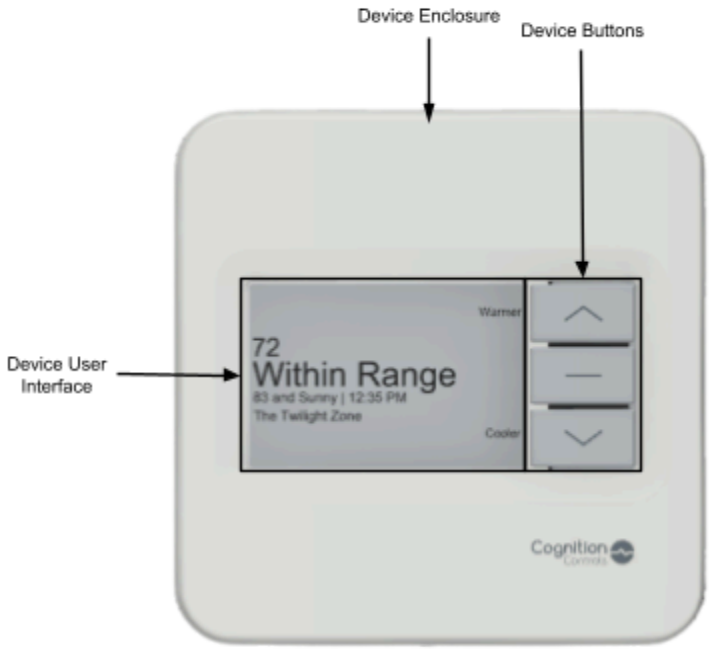
Category	Specification
Compatibility	The Smart Commercial Control works with most 24V heating and cooling systems, including packaged rooftop units, furnaces, air conditioners, boilers, and heat pumps with either forced air or radiant delivery.
Application	Conventional Furnace, Heat Pump - Air Source, Heat Pump - Water Source, Geothermal, Electrical Radiant
Stages	3 Heat/2 Cool, Heat Pump Reversing Valve, Accessory Equipment
Terminals	Rh, Rc, C, W1, W2, Y1, Y2, O/B, G, E, AC+, AC-
Accessory Support	Remote Temperature & Humidity Sensors, Humidifiers, Dehumidifiers, Air Purifiers
Input Voltage Range	20-30Vac
Operating Temperature & Humidity	**Temperature:** 32° - 122°F (0-50°C) **Humidity:** 0-90% Relative Humidity
Display	2.7” (68.58 mm) E-Paper Display
Size and Weight	**Height x Width x Depth:** 4.50” x 4.50” x 1.14” (114.30 mm x 114.30 mm x 28.96 mm) **Weight:** 6.72 oz (190.41 g)
IP Rating	IP40
Radios	LTE-M & 2.4GHz (802.11 b/g/n)
Battery Back-Up	Built-in rechargeable 780mAh lithium polymer battery

Smart Commercial Control Wire Terminals and Notes

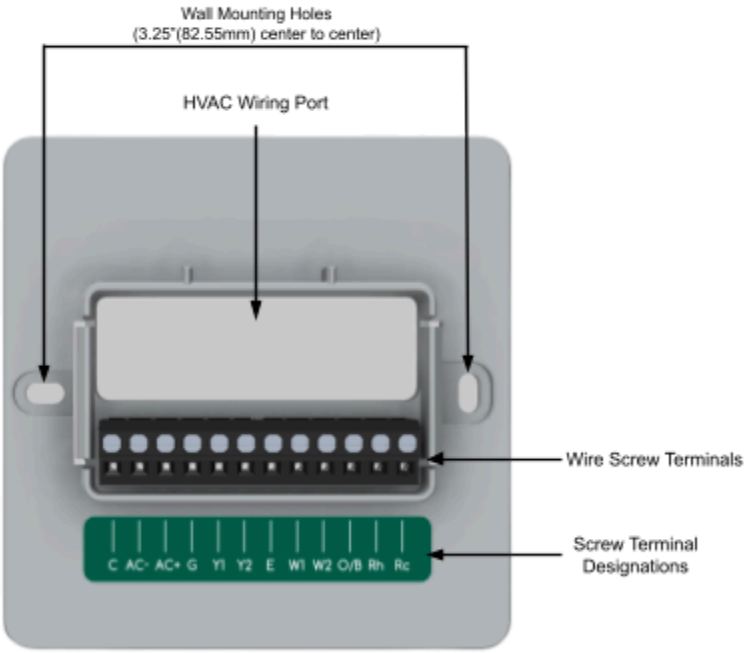
- The Smart Commercial Control operates the zone's HVAC equipment through connecting wires to the device's wall plate. When routing and terminating these wires into the designated wall plate terminals, ensure that the wires are secured tightly and no exposed copper from the wires are contacting each other.
- Below is a list of all of the Smart Commercial Control wire terminal designators and their expected uses.

Designator	Description
C	This is for the equipment's common wire, the C wire completes the 24Vac power circuitry and allows for the device to be powered.
Rh	This is for the power wire for the heating system. **If there is only one "R" wire for both the heating and cooling system, please be sure to connect the wire to either the Rh and Rc terminal and connect them together using the wire jumper provided in the package**
Rc	This is for the power wire for the cooling system.
W1	**Conventional:** Controls the first stage of heating, typically the main heating source (e.g., gas furnace or electric heating element). **Heat Pump:** Controls the first stage of auxiliary heat
W2	**Conventional:** Controls the second stage of heating in systems with multi-stage heating (e.g., a furnace with two heating elements). **Heat Pump:** Controls the second stage of auxiliary heat, often used when the temperature drops significantly and additional heating power is required.
Y1	**Conventional:** Controls the first stage of the cooling system, usually the compressor. **Heat Pump:** Controls the compressor for the first stage of cooling.
Y2	**Conventional:** Controls the second stage of cooling in systems with multi-stage cooling (e.g., air conditioner with two compressors). **Heat Pump:** Controls the compressor for the second stage of cooling. This is often used when additional cooling power is needed.
G	**Conventional:** Controls the fan (blower) in the air handler. **Heat Pump:** Controls the fan in the air handler during heating.
E	**Conventional:** Controls the third stage of heating in systems with multi-stage heating **Heat Pump:** Can be used to activate an emergency heat source (e.g., electric resistance heat) in a heat pump system.
O/B	**Conventional:** Not used. **Heat Pump:** Controls the reversing valve, which switches the heat pump between heating and cooling modes.

AC+ & AC-	These terminals can be used to control multiple different HVAC accessories such as dehumidifiers, humidifiers, economizers, ventilation systems, etc.



Smart Commercial Control Device



Smart Commercial Control Wall Plate

Device Installation

Included in Package

- Smart Commercial Control Device
- Smart Commercial Control Wall Plate (includes Wire Jumper)
- Wall Screws and Anchors
- Quick Start Guide

Installation Tools

- Smartphone with camera and access to the internet
- Phillips screwdriver
- Flathead screwdriver
- 3/16” drill bit and drill (optional)
- Voltmeter (optional)
- Hammer (optional)

Installing the Smart Commercial Control

It should take 5-10 minutes to install the Smart Commercial Control device. Below are the instructions on how to install the device:

- **It is highly recommended to power off your HVAC equipment when installing the Smart Commercial Control**
- Once ready to install your Smart Commercial Control, remove all materials out of the packaging and begin the installation by scanning the QR Code on the back of the Smart Commercial Control

ATTENTION
If you don’t scan the QR Code and go through the installation flow then your device will not function as intended!

- The QR code will lead you to the Cognition Controls installation flow, please follow all of the instructions carefully, as they are essential to configure the device properly with the HVAC equipment.
- Within the installation flow you will be walked through the following steps:
    - Removing the existing thermostat, if replacing an old thermostat
        - Taking pictures of existing wiring for reference (Optional)
        - Disconnecting wires from the pre-existing backplate
        - Removing the existing backplate from the wall
    - Inputting in the Installation Address/Location
    - Inputting in the Equipment Details Options:
        - **System Mode:** Auto (Default), Heat, Cool, Off
        - **Heat System:** None, Forced Air, Heat Pump, Radiant, Other
        - **Backup Heat:** None, Forced Air, Heat Pump, Radiant, Other
        - **Cool System:** None, Forced Air, Heat Pump, Other
        - **Cool Stages:** 0,1,2
    - Inputting in the Zone Name
    - Installing the Smart Commercial Controls Wall Plate to the wall
        - Log the Wall Plate wiring in the installation flow
        - Taking a picture of the Smart Commercial Control Wall Plate with HVAC wires connected for future reference (Optional)
    - Repowering on the HVAC equipment
    - Installing remote sensors (Optional)
        - To pair a sensor with the device, select the “pair sensor” option in the installation flow and follow the steps. Installing a sensor includes the following steps:
            - Within the installation flow selecting the correct sensor symbol indicator on the back of the sensor
            - Choosing an area free from factors that can impact an accurate reading. Ensure it is within 25 feet of the Smart Commercial Control device
            - Pulling the plastic tab to power on the sensor
            - Removing the adhesive from the back of the sensor and placing it in the desired location
    - Attaching the Smart Commercial Control device to the Wall Plate
        - Align the outer rim of the extrusion on the wall plate with the cavity on the back of the device and press the device in place such that the back of the device is flush with the wall plate.
        - The device should now be secured to the wall plate. The device should be parallel to the wall it is mounted on and the device should not be leaning forward
    - Confirming proper installation of the Smart Commercial Control
        - Once the device is installed, the installer will see the screen flashing from white to black a couple of times and will be greeted with this screen:
- Once the device has been installed properly, it will then automatically attempt to connect to the most optimal cellular network based on the location of the device.
    - This can take up to 15 minutes and you can see the status of the device within the “Building Installation Page” on the installation flow
- **The installer does not need to wait for the device to connect to the network in order to begin installing additional devices to other zones. They should proceed with the installation and ensure connectivity once all devices are installed within the building.**

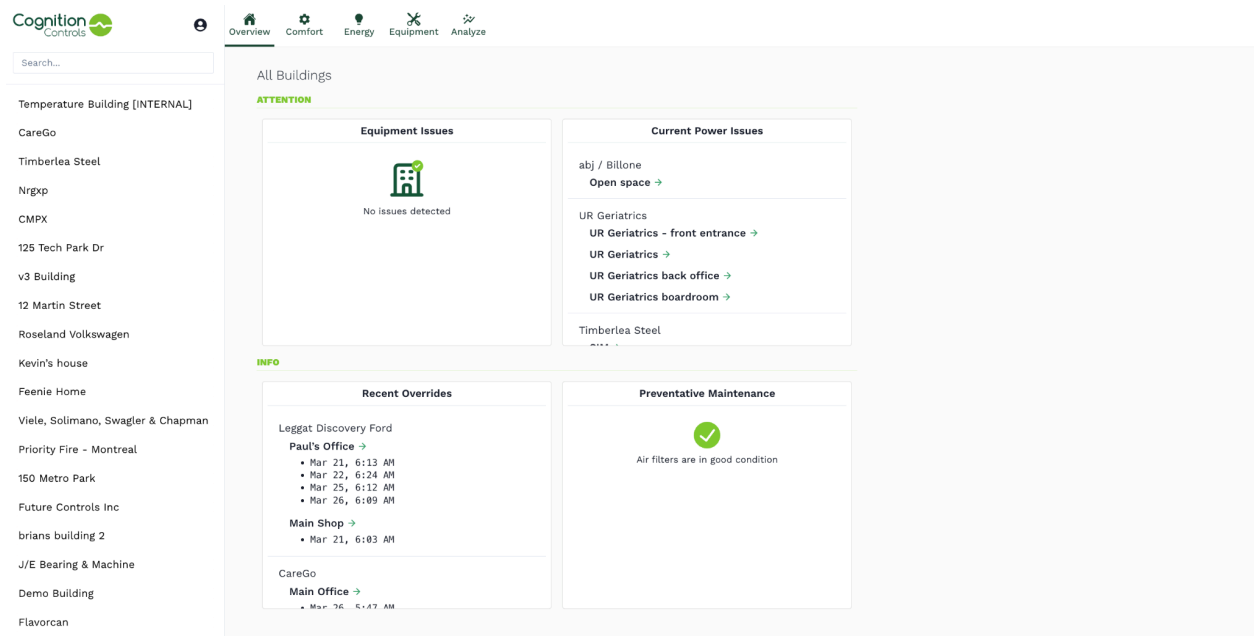
Navigating the Cognition Dashboard

The Dashboard left-hand menu is to navigate to the space - either zones or groups of zones such as a floor, building or tenant. The default view is an Overview of their selected space, which provides contextual information and glanceable insights to quickly navigate to where attention is required.

There are 5 informational views and each is designed to be insightful and easy to use:

- **Overview** - Glanceable status summary view of zone/group of zone information.
- **Comfort** - Manage comfort preferences and settings.
- **Data** - Interactive historical data to understand what happened in your space.
- **Energy** - Insights and tools to understand how HVAC equipment impacts energy usage.
- **Equipment** - insights and tools to manage equipment details, and track wear and tear and maintenance.

Overview:



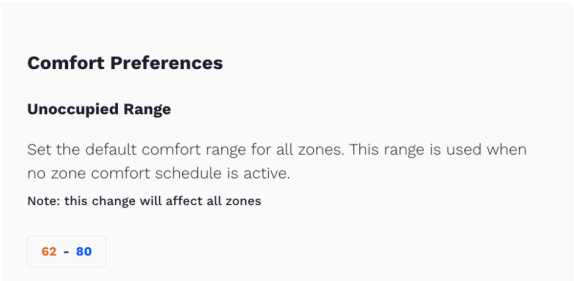
- If Cognition identifies a connectivity or equipment issue in the zone, it will be highlighted pink.
- If a building has a zone with an issue, the building is also highlighted pink.
- An equipment issue will automatically trigger an email to the Admin. The email will be documented in the Equipment view.

Comfort:
Granular controls to maximize energy savings during unoccupied times, and comfort when occupied.

<u>Managing with ranges</u>

<u>Unoccupied</u>
Unoccupied range is set by building.

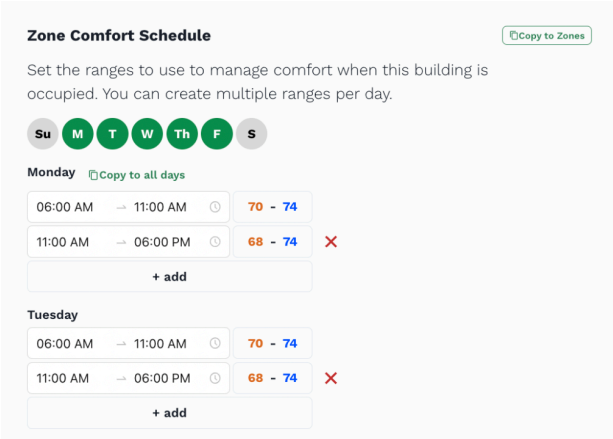
The Cognition solution automatically smooths the transition between unoccupied and occupied schedules to ensure that the space is at the desired temperature when occupied.



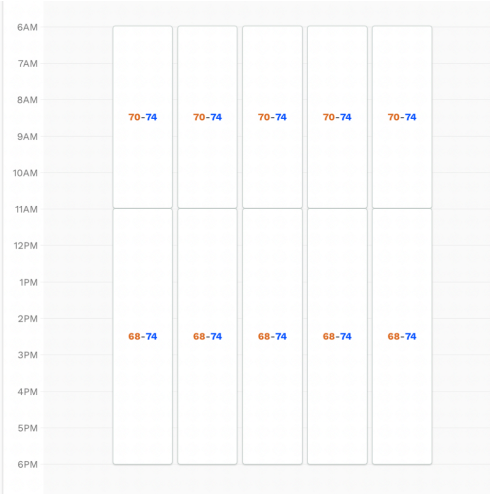
Occupied

Set by zone and can be tailored by day and by the hour.

- Select the day of the weeks that are occupied using the date buttons M, T, W, Th, F, Sa, S
- Select the time range and then the temperature range
- Preferences created for Monday can be copied to all days using the “Copy to all days” function



- As the user creates preferences, the calendar to the left will adjust to reflect the overall settings for the zone.



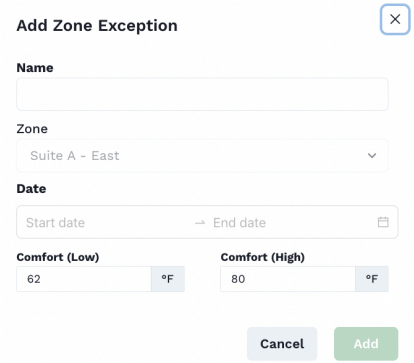
- Selections made for a single zone can be copied to all zones for ease.

Schedule Exceptions

Allow the user to maximize savings when the space is expected to be unoccupied, or to pre-plan a tighter comfort zone when an important event is taking place.

- Exceptions can be set a year in advance
- On the set date, Cognition automatically uses the exception to guide comfort actions in the space
- Once the date passes it automatically returns to the comfort schedule in the dashboard
- Exceptions can be deleted prior their date
- Exceptions can be edited prior to their date
- Past exceptions can be reviewed

- Select “Schedule Exception”
- Fill in the information required
- Select “Add”
- To edit or cancel an Exception, select it from the list and use the edit or discard icons.



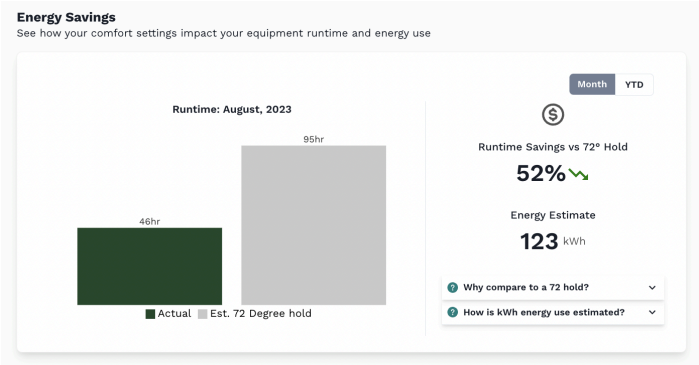
Data:
Remote Troubleshooting with a historical Data Analyzer of accurate, relevant weather, zone temperature, and HVAC equipment calls information, available by the hour, week or month. The accordion below the graph can be used to further refine the time horizon to be reviewed.

- Variables to show in the graph can be selected and deselected using the toggles at the top left
- The time horizon to view can be selected in the top right day, week, month, year. These can be further refined using the accordion at the bottom by pulling the left or right side toward the center
- Cross-hair follows the cursor for date, time and in-zone temperature and humidity details
- Heat and Cool equipment runtime indicators
- Green line indicates zone temperature
- Grey line indicates outside temperature
- Manual overrides are shown as a straight bright green line at the time they were initiated

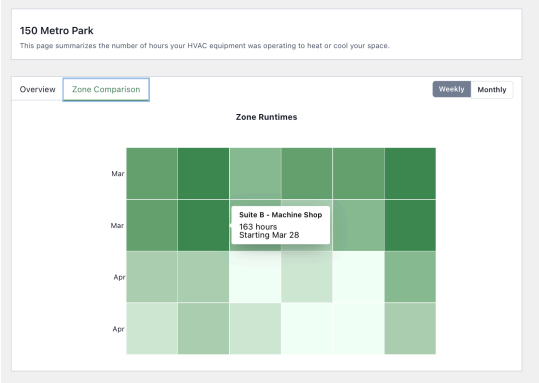
Energy

The Energy Summary provides Savings and Usage data and is best viewed at group of zones level.

Energy Savings provides Weekly and Monthly runtime information and comparisons vs. a 72 degree hold to illustrate savings. Runtime is also converted to a kW estimate to help connect HVAC operations to the utility bill.



Energy Usage is shown for a group of zones as a heat map of equipment runtime by zone and week or month to illustrate which zones are contributing to overall equipment runtime totals for the group. Hovering over a square provide granular detail on runtime hours

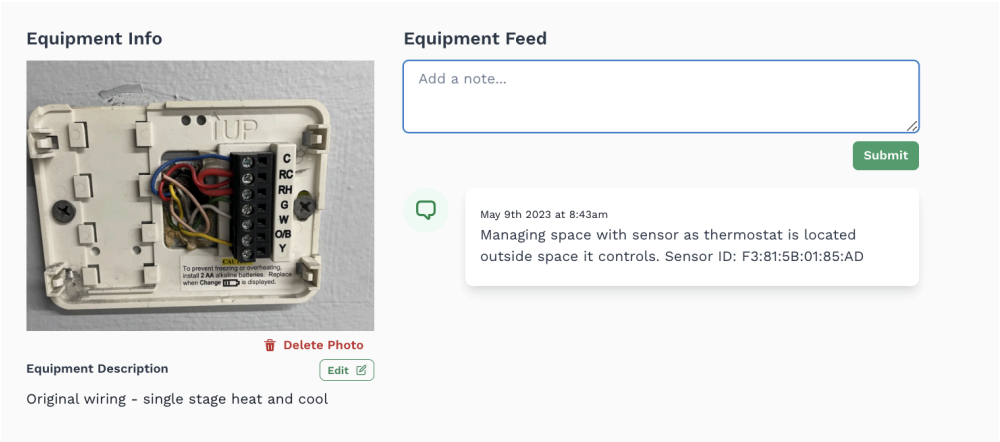


Equipment

The Cognition dashboard provides an easy to use, dedicated space to document and track important information about the HVAC equipment that helps with remote troubleshooting, conversations between HVAC Pros and tenants, and reduces operational overhead.

Wiring and Equipment Pictures can be uploaded for easy reference of existing device wiring and rooftop equipment.

Equipment Notes can be used to document equipment info such as type, brand, or year for easy reference. Enter notes about equipment operation, issues or requests, as well as maintenance checks. Notes are auto-time stamped and ordered from most to least recent. Notes provide information management and continuity across staff changes.



Quick References

https://cognitioncontrols.com/faq/