Carrier

SENSING AND MONITORING

SYSTEM DESIGN GUIDE

Guidance for using the *ClimaVision Climate Control System* for:

▶ *Indoor Air Quality Management in Commercial Spaces*

INTRODUCTION TO THE CLIMAVISION DESIGN PHILOSOPHY

Carrier is on a mission to substantially reduce energy consumption in the world's commercial buildings while improving the comfort and health of the people who work there. ClimaVision achieves this through automation that adapts to change and data that engages people with insights they can use to maintain building systems and operations. To make that difference, automation and data must be present in a much greater percentage of the buildings than they are today, and this can only be accomplished by cutting cost and increasing value.

ClimaVision has adopted a works-out-of-the-box philosophy that redefines the state of the art. Instead of a BAS that can be programmed to do anything, we have created a Climate Control System that is pre-programmed to do most things. Within that pre-programmed manifesto, we still need to account for building variations. To account for these variations while keeping our works-out-of-the-box mantra, we have developed a hierarchy of ways to support variations:
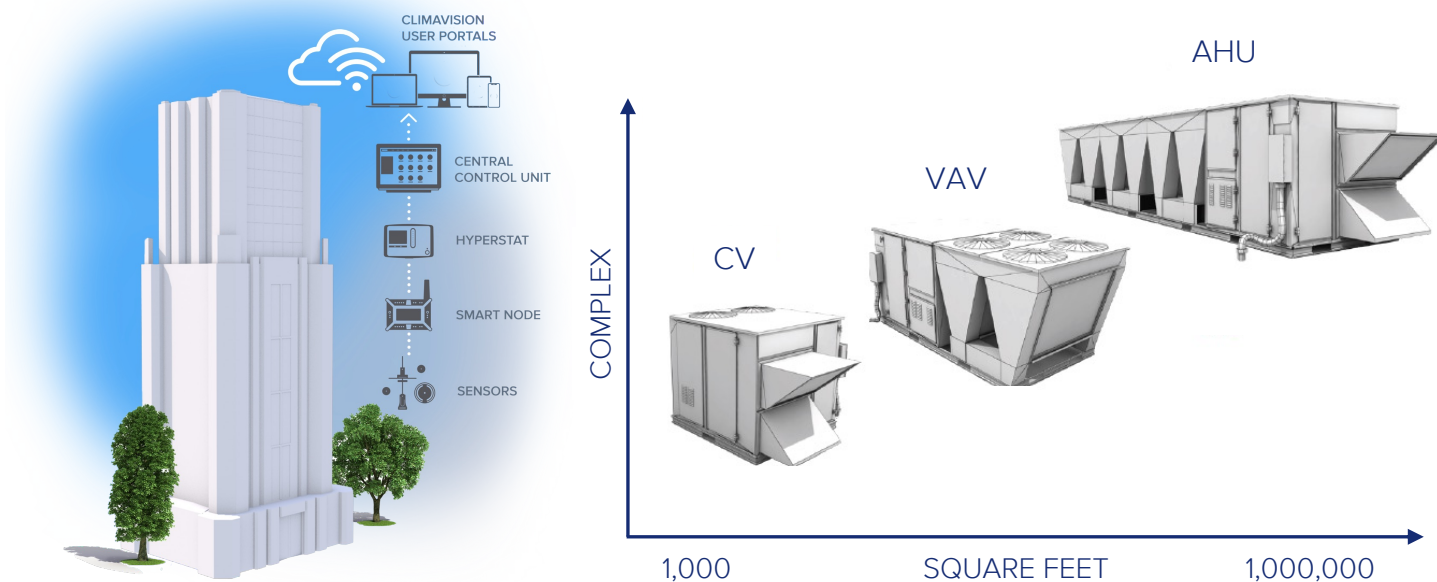
PROFILES — Software and firmware bundles that encapsulate sequences of operation for building systems and terminal equipment.

CONFIGURATIONS — Field settings within each profile that account for equipment differences in systems and terminal equipment.
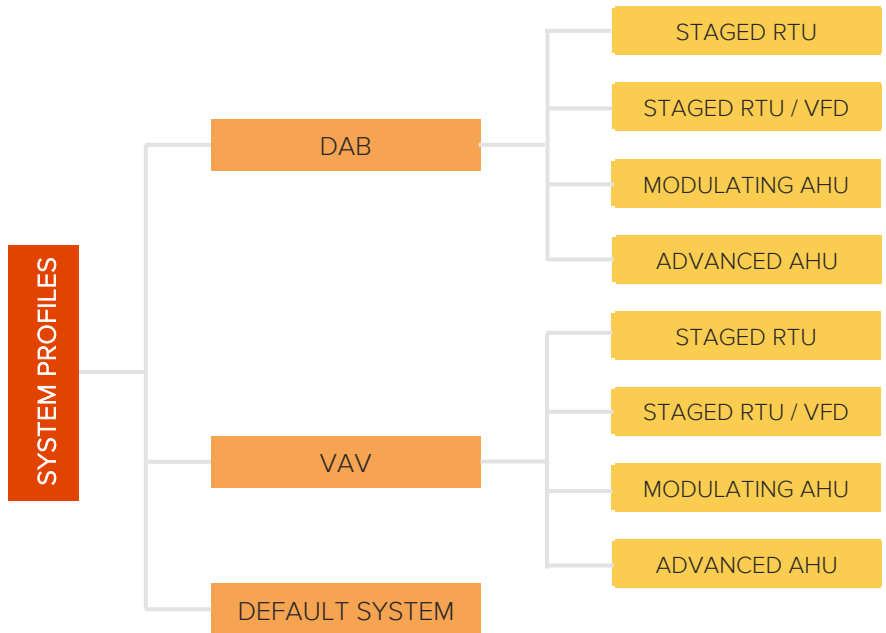
TUNERS — Units and factors within the algorithm supporting sequences of operation that fine-tune the behavior of the system and terminal equipment.

ANALYTICS & NOTIFICATIONS — Predefined analytics and notifications suitable for the selected profiles, and user-defined dashboards and alerts.
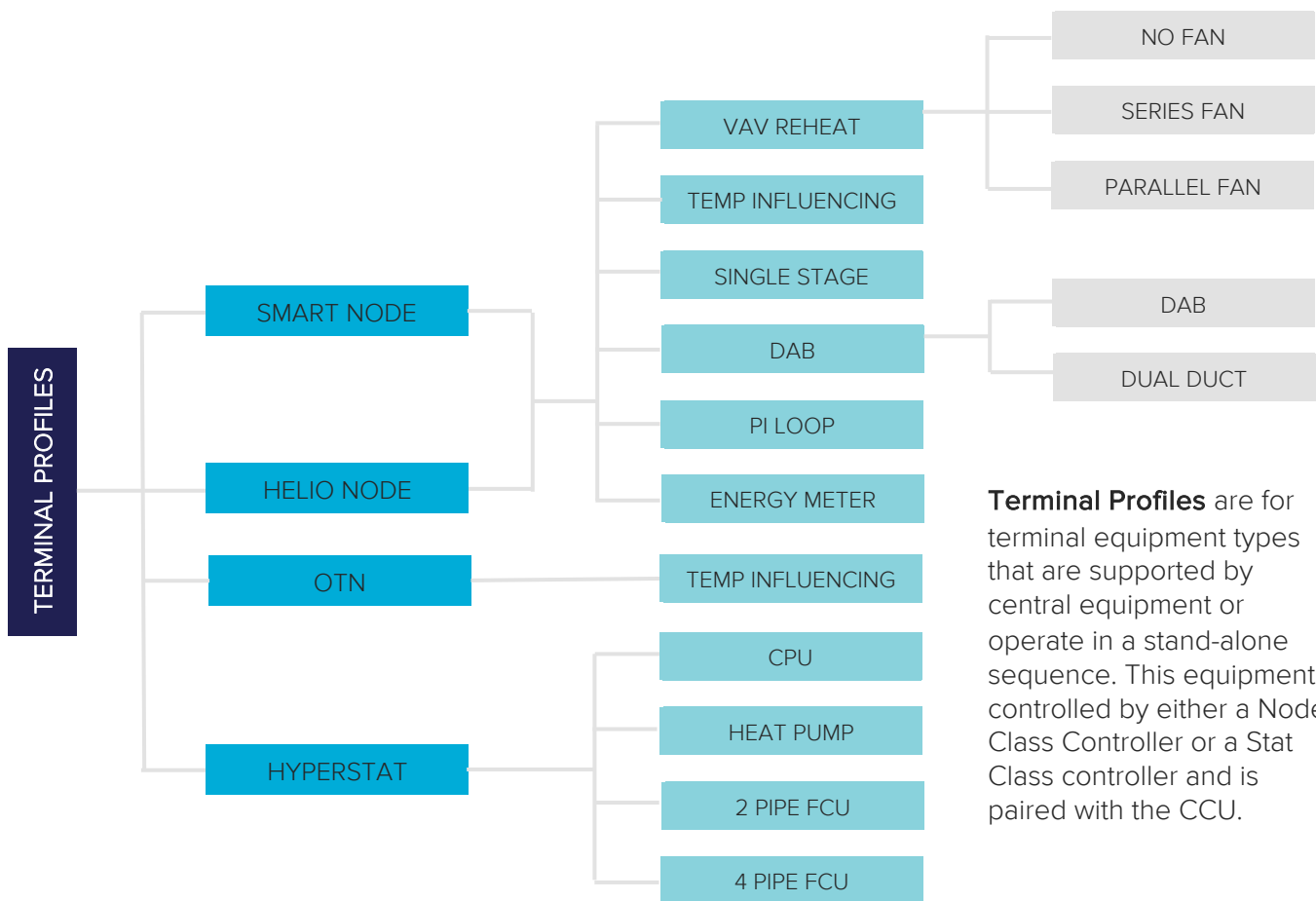
The System Design Guides Carrier has prepared are intended to help designers and sales teams determine which solutions are a fit with the type of systems that need control, and how Carrier provides them. The System Design Guide provides a high-level understanding of the requirements sufficient to prepare an initial design at the Profile level and a quotation for a project. Configurations are not discussed here; these would be found in a Submittal when the project arrives at that stage. Tuners are addressed during startup and ongoing support.

CLIMAVISION SYSTEM & TERMINAL PROFILES

System Profiles

- **SYSTEM PROFILES**
  - **DAB**
    - STAGED RTU
    - STAGED RTU / VFD
    - MODULATING AHU
    - ADVANCED AHU
  - **VAV**
    - STAGED RTU
    - STAGED RTU / VFD
    - MODULATING AHU
    - ADVANCED AHU
  - **DEFAULT SYSTEM**

System Profiles are for central HVAC equipment types that are controlled by a ClimaVision Central Control Unit (CCU), such as multi-zone air handlers.

Terminal Profiles

- **TERMINAL PROFILES**
  - **SMART NODE**
  - **HELIO NODE**
    - VAV REHEAT
      - NO FAN
      - SERIES FAN
      - PARALLEL FAN
    - TEMP INFLUENCING
    - SINGLE STAGE
    - DAB
      - DAB
      - DUAL DUCT
    - PI LOOP
    - ENERGY METER
  - **OTN**
    - TEMP INFLUENCING
  - **HYPERSTAT**
    - CPU
    - HEAT PUMP
   - 2 PIPE FCU
    - 4 PIPE FCU

Terminal Profiles are for terminal equipment types that are supported by central equipment or operate in a stand-alone sequence. This equipment is controlled by either a Node Class Controller or a Stat Class controller and is paired with the CCU.

The COVID Pandemic has elevated awareness and importance of Indoor Air Quality (IAQ) and it has become more important to provide IAQ sensors in commercial interiors. The need is for more than just sensing, but the display, analytics, and notifications for IAQ data that makes it useful.

ClimaVision provides packaged devices that provide bundles of IAQ sensors that are affordable and easily deployed. They connect to the cloud via a gateway and provide pre-configured analytics and notifications.
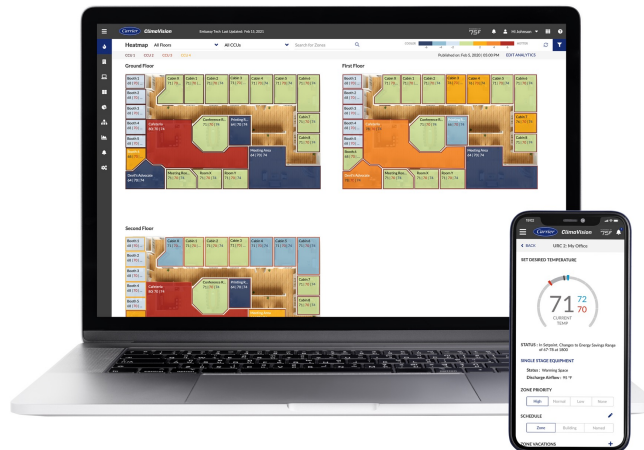
ClimaVision's user portal offers real-time insight into your buildings' energy, comfort, and air quality. Heatmaps are configurable to show other data such as humidity conditions ranging from normal, high, and dry.

FEATURES

▶ Up to eight onboard sensors for temperature, humidity, light, sound, volatile organic compounds (VOCs), CO_2, and particulate matter

▶ Preconfigured settings that work out of the box

▶ 900 MHz wireless mesh network for device communication

▶ Analog and digital inputs support many other sensor options

ADVANTAGES

▶ Adds IAQ monitoring and advanced sequences such as Demand Control Ventilation (DCV)

▶ Fast and easy installation

▶ No networking, no WiFi necessary

CLIMAVISION HYPERSTAT

With eight onboard sensors, the HyperStat is an all-in-one thermostat, humidistat, and IAQ sensing station. The HyperStat is part of ClimaVision's vertically-integrated Climate Control System, delivering multi-mode sensing, remote monitoring, and individual zone control for the comfort and productivity of building occupants. This device includes wireless mesh network communication and Bluetooth commissioning. The HyperStat can also be controlled with a third-party BMS via BACnet or Modbus via its RS-485 port.

Select the HyperStat for this bundle of IAQ sensing points:

▶ Temperature

▶ Humidity

▶ CO_2

▶ VOC

▶ Occupancy

▶ Light

▶ Sound

▶ Optional particulate matter
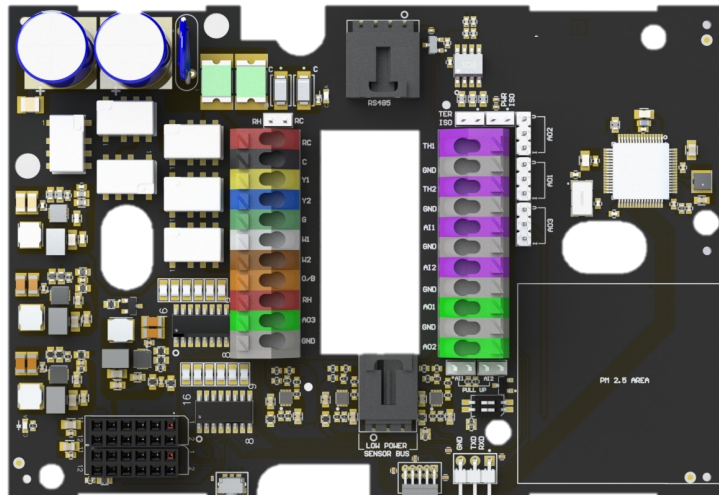
By adding optional sensors, other things can be monitored such as:

▶ Equipment status/power consumption with a current sensor

▶ Condensate overflow with a float switch

▶ Dirty filter status with a differential pressure sensor

▶ Open door and key card sensor

▶ Refrigerator/freezer monitor

CLIMAVISION HYPERSTAT

For IAQ sensing, simply select the Sense profile to obtain the sensor points provided. The Sense profile does not control or influence any HVAC equipment. In addition to the eight on-board sensors, the following can be used to obtain additional points:

► (2) Connectors

    ► (1) 3-Pin Digital Bus: ClimaVision digital sensors

    ► (1) 4-Pin Digital Bus (RS-485): BACnet or Modbus interface

► (2) Thermistors

    ► TH1 – TH2 Thermistor: 10K Type II or Generic-100 Ohm probe to detect air temperatures

► (2) Analog inputs from other devices, which can be configured to any of these points:

    ► 0-2 in. Pressure Sensor

    ► 0-0.25 Differential Pressure Sensor

    ► Airflow Sensor

    ► CO (0-100)

    ► NO2 (0-5)

    ► Current Transformer (0-10Amps)

    ► Current Transformer (0-20Amps)

    ► Current Transformer (0-50Amps)

    ► ION Meter o-1 million ions/cc

CLIMAVISION SMART NODE

The Smart Node is an equipment controller designed to be installed on or near terminal equipment – not in occupied spaces. It offers flexible software-defined configurations which can control a range of single and dual stage equipment across all ClimaVision application solutions. Each Smart Node is powered by 24V AC or DC and is designed to accept daisy-chain power. This device includes wireless mesh network communication and Bluetooth commissioning. The ClimaVision Smart Node has a 4-pin RS485 connector for a Schneider Energy Meter and a 3-pin digital sensor bus that can monitor ClimaVision digital sensors and up to 4 Multi Sensors (coming in 2022).

Select the ClimaVision Smart Node to monitor up to four Multi Sensors at once that are averaged together to obtain a better sample of a large interior space. Select the Single Stage Equipment (SSE) profile to obtain the desired sensor.

SMART NODE SENSOR OPTIONS

Sensors are wired to the Smart Node to support desired sequence of operation, monitoring and notifications. Any analog sensor may also be connected to the Smart Node, such as current transformers and third-party pressure transducers. The following ClimaVision digital sensors can be wired via digital and analog inputs:

WALL SENSOR

Perfect for drywall or other framed walls. Senses for temperature and humidity.
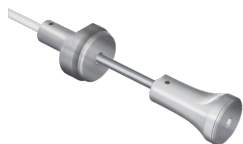

DUCT SENSOR

Placed in the return duct and senses for temperature and humidity.

FLUSH MOUNT SENSOR

Perfect for beams and concrete where sensor wire must be exposed. Senses for temperature and humidity.

CEILING SENSOR

For installs with limited wall space or zones with a lot of solar gain. Senses for temperature and humidity.

MULTI SENSOR

A digital multi-sensor with PIR occupancy and CO_2 in addition to temperature and humidity.

HYPERSENSE

Offers every sensor the HyperStat does, but connects to the Smart Node via the ClimaVision 4-pin digital sensor input for control.

DIFFERENTIAL PRESSURE SENSOR

Digital pressure transducer connected to the 3-pin digital bus. Compatible with Wall Sensors and Multi-Sensors on the same bus.

CLIMAVISION HELIO NODE

With five onboard sensors, the Helio Node is an all-in-one controller and IAQ sensing station. The Helio Node is part of ClimaVision's vertically integrated suite of intelligent building solutions, delivering multi-mode sensing, remote monitoring, and individual zone control for the comfort and productivity of building occupants.

The Helio Node is an equipment controller designed to be installed below the ceiling or on the walls of occupied spaces. It offers flexible software-defined configurations that can control a range of single and dual-stage equipment across all ClimaVision application solutions. Each Helio Node is powered by 24V AC or DC and is designed to accept daisy-chain power.

This device includes wireless mesh network communication and Bluetooth commissioning. The ClimaVision Helio Node has five onboard IAQ sensors, but also has a 4-pin RS485 connector for a Schneider Energy Meter and a 3-pin digital sensor bus that can monitor ClimaVision digital sensors and up to 4 Multi Sensors (coming in 2022). Select the Helio Node for sensing in spaces where there are no walls.

The Helio Node has the following onboard sensors:

► Temperature

► Humidity

► CO_2

► Occupancy

► Light

Helio Node typically does not need an external sensor, but in some applications, it is an advantage. If so, choose from the ClimaVision sensor options or third-party sensors needed to obtain the desired points:

► TH1 – TH2 - Air Temp

► 3-Pin Digital Bus: ClimaVision digital sensors

► 4-Pin Digital Bus (RS-485): ClimaVision Smart Sense or Schneider Energy Meter

► (2) Analog in

Select the Helio Node to monitor up to four Multi Sensors at once that are averaged together to obtain a better sample of a large interior space. Select the Temperature Monitoring profile to obtain the desired sensor. Choose from the aforementioned sensor options or any third-party sensors needed.
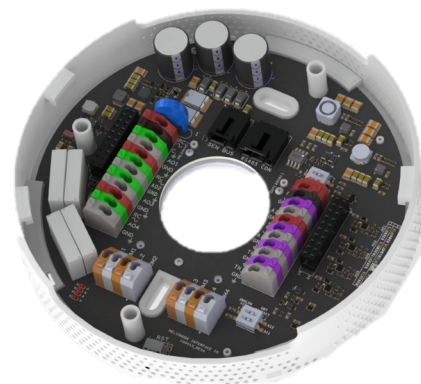
CLIMAVISION OCCUPANCY & TEMPERATURE NODE

ClimaVision Occupancy and Temperature Nodes (OTN) are battery-powered, wireless sensors for zone temperature, humidity, and occupancy that are wirelessly transmitted via the 900 MHz wireless mesh to the CCU for load calculations and central air handler control. The OTN is not a controller; the OTN is only for sensing, monitoring and influencing the load calculations in the CCU. Up to 48 OTNs can be paired with a CCU.

OTN AVAILABLE POINTS

► Temperature

► Humidity

► PIR Occupancy