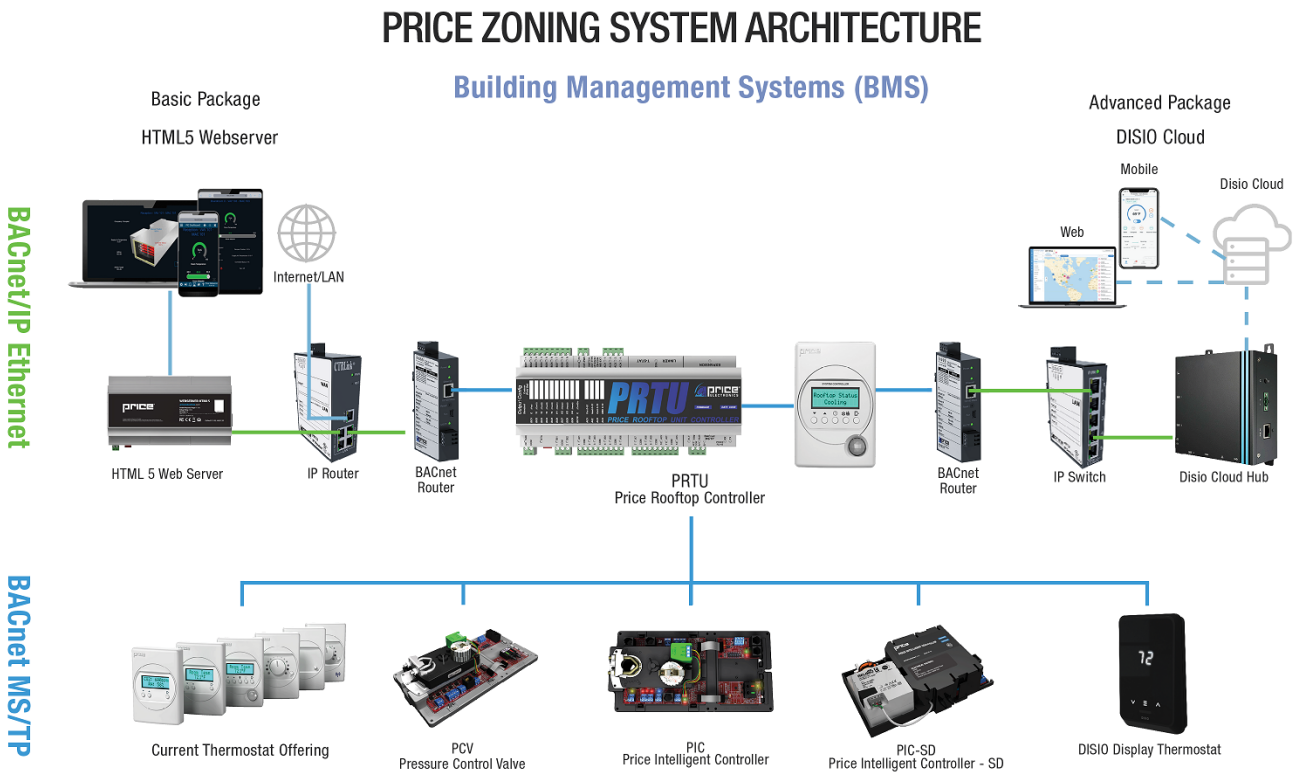
Suggested Specifications

Price Zoning System – Constant Volume Systems



PART 1

1. Price Zoning System for Constant Volume Systems

A. Application:

When designing a constant volume system, considerations should be taken to design the building based on external and interior zones. Designing a building with one rooftop to handle multiple zones and different load requirements can lead to comfort issues and cycle the rooftop unit which can affect the overall life and performance of the unit.

A constant volume rooftop unit delivers a constant volume of air to two or more zones ducted to it. These types of systems require some form of pressure control with a bypass damper designed into the system. Ducted either from the supply to the return or from the supply to an open return and relieve the excess air into the ceiling space. A static pressure probe shall be installed roughly 2/3 of the way down the main supply duct to accurately measure the duct static pressure and maintain the desired static pressure setpoint of the system. The bypass damper shall be sized to roughly 2/3 of the maximum design airflow of the rooftop unit.

Associated zone dampers (single duct, fan powered, or VAV diffusers) ducted from the rooftop unit shall modulate their dampers accordingly to vary the airflow to the spaces based on the demand from each thermostat in the zones. Alternate reheat coils can be designed into the perimeter spaces with high thermal loads to help achieve comfort when the rooftop unit is in cooling mode, or if additional heating is required. A Building Management System (BMS) can be implemented to monitor the building either locally or remotely for information and status of equipment. Trending and alarming can be set up to help achieve energy savings and better comfort within the building based on hysteresis.

A Price Zoning System can be used with any constant volume (CV) rooftop unit to create a zoning system and achieve optimal comfort within the areas in which the RTU serves.

Suggested Specifications

The Price Zoning System shall consist of any or all of the mentioned items:

- **Price Rooftop Unit Controller (PRTU)**
  - This is the supervisory controller that acts as a “voting strategy” controller.
  - Comes equipped with Motion sensor thermostat to sense occupancy and 7-day real-time clock scheduling
    - System Controller thermostat should be mounted in an open area like a hallway or reception area
    - c/w 35ft. plug & play CAT5e, CMP plenum rated cable
  - Utilizes BACnet MS/TP as the communication protocol, the PRTU can be set to poll the associated zones for space demand to relay that information to the RTU and turn on stages of heating and cooling as required
  - Stand-Alone strategy can also be implemented
    - **NOTE:** PRTU will default to Stand-Alone mode when less than 50% of the zones are present over BACnet network and control from the System Controller thermostat’s setpoint
  - Inputs
    - 2 x Binary (dry contact)
    - 12 x Analog (Thermistor & Voltage type)
  - Outputs
    - 10 x Binary (24vac)
    - 4 x Analog (0-10vdc)
  - Discharge and Return Air monitoring
  - Night Setback Operation

- **Bypass damper (PCV)**
  - Install at supply trunk and then duct to return duct, or duct as open return
  - Provided static pressure probe shall be mounted 2/3 of the way down the main duct to measure and control static pressure
  - Default static pressure setting of 0.15” w.c. may need to be adjusted to achieve optimal performance
  - Static pressure setpoint can be adjusted with a Price LCD thermostat connected to the Tstat (thermostat) jack of the PIC controller

- **VAV Zone Controllers (PIC or PIC-SD)**
  - Single Duct, Fan Powered, or Dual Duct Terminal unit controller with built in KMC or Belimo actuator rated for 40 in-lbs torque
  - Pressure Independent or Pressure Dependent control available
  - BACnet MSTP interface option available
    - Plug & Play NETC35 CAT5 cable provided with PIC controller
    - PIC-SD BACnet to be hardwired via 3-wire BACnet MS/TP

- **VAV Zone Controllers (DISIO Thermostat)**
  - Single Duct, Fan Powered, or Fan Coil unit controller
  - Pressure Independent or Pressure Dependent control available
  - BACnet MSTP interface option available
    - Hard wired terminals for 24VAC power, Input/Outputs and BACnet MS/TP communication

- **Price Web Server Building Management System (BMS)**
  - Small to medium sized BMS
  - HTML5 web-based server
  - Access via any Web Browser via smart phone, tablet or laptop
  - No software or USB keys required
  - Remote access via Static IP address
  - High resolution pre-built graphics
  - Multiple user access
  - Trending and Alarming functionality

- **DISIO Cloud Building Management System (BMS)**
  - Small to medium sized BMS
  - Cloud Based Solution
  - Two-Step Authentication – secure access
  - Access via any Web Browser via smart phone, tablet or laptop
  - No software or USB keys required
  - Remote access via Static IP address
  - High resolution pre-built graphics
  - Multiple user access
  - Trending and Alarming functionality
  - Subscription License available

PART 2 – PRODUCTS

2.01 Rooftop Unit Controller

A. Basis of Design: Price Industries, Inc.
   1. Rooftop Unit Controller: PRTU

2.02 Rooftop Unit Controller

A. Description:
   1. Furnish and install Price model [PRTU] rooftop unit controller in the configurations as indicated on the plans. Recommended to be mounted indoors and not in the rooftop unit.
   2. The rooftop unit controller shall be a proportional-integral (PI) controller for packaged rooftop unit control. The rooftop unit controller shall be digital and utilize a microcontroller with Electrically Erasable Programmable Read-Only Memory (EEPROM) for storing setup and calibration variables.
      a. All network connections shall be pluggable terminal blocks and/or RJ-45 jacks for error-proof field connections.
      b. Indicator light-emitting diodes (LED) shall be on all outputs to indicate current status. Each output shall be protected by a thermal fuse.
      c. The rooftop unit controller shall feature individual LEDs to show status of power, inputs, outputs, and shall be coded such that:
         1. GREEN LED = ACTIVE
         2. RED LED = FAULT
         3. YELLOW LED = NETWORK OVERRIDE.
      d. The rooftop unit controller shall be supplied with a backlit liquid-crystal display (LCD) thermostat having password protected menus that allow full configuration and setup of the controller in the field.
      e. The controller assembly shall include BACnet MS/TP connectivity.
      f. The rooftop unit controller shall function in either stand-alone mode (not networked to any zone controllers) or networked mode to poll zone controllers [Price Intelligent Controller – PIC, PIC-SD, Prodigy Smart Diffuser, or DISIO Thermostat] via BACnet MS/TP.
      g. Network polling mode shall include four preset strategies:
         1. Average polling, weighting each zone equally.
         2. Non-majority polling, giving specified zones more weight, i.e. board rooms or any temperature sensitive spaces.
         3. Optimal comfort mode, i.e. on a 1% call for cooling, cooling is enabled.
         4. Seasonal strategy.

B. Controller Operation:
   1. The rooftop unit controller shall poll each zone controller over BACnet, reading its zone PI to calculate rooftop unit PI and switch the rooftop into heating, cooling or neutral mode.
   2. In the case of network communication loss of less than 50% of network devices, the rooftop unit controller shall poll the remaining zones left on the network.
   3. If the Rooftop Unit Controller loses communication with more than 50% of the network devices, the Rooftop Unit Controller shall control based on the setpoint and zone PI local to the Rooftop Unit Controller's own thermostat, while still maintaining all other settings such as scheduling, temperature limits etc. Rooftop unit controllers calculating rooftop PI based on a sample measured from various single function space sensors with the sole purpose of reporting back to the rooftop unit controller shall not be accepted.

C. Construction:
1. The Rooftop Controller shall consist of the following but shall not be limited to:
   a. On-board real-time clock and calendar for scheduling.
   b. Super capacitor backup to maintain time clock operation during power failures. Battery backup shall not be acceptable.
   c. Discharge air temperature (DAT) monitoring.
   d. Return air temperature (RAT) monitoring.
   e. Two binary inputs with contact closure.
   f. Six analog 10k thermistor inputs.
   g. Six analog (0-10 VDC) inputs.
   h. Ten binary outputs rated at 0.5 amps each and protected with a thermal fuse indicating a red status LED on trip, with automatic recovery when fault is corrected.
   i. Switch for selecting binary output type (internal 24 VAC – HOT, COMMON or external power source).
   j. Four analog outputs (0-10 VDC) fully configurable for fan, heating, cooling and spare.
   k. Multi-level surge protection with user replaceable MINI type fuse.
   l. Pluggable terminal blocks to simplify wiring.
   m. BACnet MS/TP Client/Server stack for polling zones for data.
   n. LEDs for BACnet wiring fault, BACnet network fault, and MS/TP termination.

2. System Controller Thermostat:
   a. The LCD thermostat c/w motion sensor shall support one occupied/unoccupied schedule per day. The thermostat communication to the rooftop unit controller board shall be accomplished with one plenum rated CAT5 cable with RJ45 connections at 35ft. (Not to exceed 70ft.)
   b. The thermostat shall include onscreen menus and have the following features:
      1. Backlit 14x2 LCD thermostat with true character display.
      2. Motion sensor to allow automatic occupancy mode with adjustable timeout feature.
      3. Password protected menu.
      4. Easy to read MENU for system setup.
      5. Local thermistor with +/- 1 degree accuracy and room temperature adjustable offset.
      6. RJ45 plenum rated cable for fast, error free hookup.
      7. Setup Wizard to walk through setup of the PRTU when first powered up.
   c. The configurable LCD plus Keypad combination will allow for the following on screen functions/modes:
      1. Customer Mode:
         i. Setpoint adjustment (only if the rooftop unit controller is operating in standalone PI).
         ii. Date and time.
         iii. Current Mode (whether standalone or networked), current occupancy status (occupied, or unoccupied).
      2. Info Mode for Networked Controllers (display only – no adjustments):
         i. MAC address.
         ii. Network health (communication status).
         iii. Number of zones up.
         iv. Percent of zones polled, heating.
         v. Percent of zones polled, cooling.
         vi. Percent of zones polled, neutral.
         vii. Pending mode (heat, cool, or neutral).
         viii. Occupancy status.
      3. Service Mode (password protected):
         i. Strategy.
         ii. Setpoint.
         iii. Inputs.
         iv. Outputs.
         v. BACnet settings.
         vi. Thermostat setup.
         vii. Diagnostic (BACnet).
         viii. Polling.
         ix. Time/Date set.
         x. Schedule set.
         xi. Operation.
         xii. Setup Wizard.

D. Return Air Temperature and Discharge Air Temperature Probes:
   1. The rooftop unit controller shall be shipped complete with Discharge Air Temperature (DAT) and Return Air Temperature (RAT) probes to ensure that the rooftop unit does not overheat or overcool air past configurable heating and cooling limits by disabling stages of heat or cooling as required.
      a. These safety features shall be designed to prevent icing of coils and prevent high temperature limit tripping of HVAC equipment.
      b. Rooftop unit controllers without DAT and RAT probes with integrated safety programming as mentioned above shall not be accepted.

E. Electrical Requirements:
   1. The rooftop unit controller shall operate with 24 VAC power supplied by the rooftop unit transformer and shall be sized for a 12 VA external power load for the PRTU controller.

F. Interfacing to BMS/BAS/EMS:
   1. The VAV Zone Controller shall interface with the building management system (BMS) to allow remote monitoring of room parameters or permit settings adjustments over the building network.
   2. The BMS shall use BACnet MS/TP network protocol to status of equipment or devices. The use of BACnet protocol shall be native to the device and shall not require the use of an external gateway.
   3. The thermostat shall include the ability to change MAC address, device instance and baud rates (9600, 19200, 38400, 76800) for proper interfacing to a BACnet network.
   4. The rooftop unit controller shall support on board network termination for the MS/TP network.
   5. The associated VAV Zone Controller shall be BTL listed.
   6. Manufacturer shall be a member of BACnet International.
   7. All temperature set points and VAV airflows shall be adjustable from the BACnet network.
   8. The BACnet points shall include:
      a. Device Object.
      b. Analog Input (AI).
      c. Analog Output (AO).
      d. Binary Input (BI).
      e. Binary Output (BO).
      f. Multi-state (MSV).

G. Start-up & Commissioning:
   1. Factory start-up shall include verifying proper installation, testing and airflow control, setting all parameters and set points, and configuring and verifying network communication, as applicable.
   2. The Test and Balance (TAB) contractor shall be responsible for final verification of airflow measurement.

2.03 Pressure Control Valve

A. Basis of Design: Price Industries, Inc.

   1. VAV DDC Pressure Controller: Model PCV – Price Intelligent Controller

B. Description:
   1. Furnish and install Price model [PCV] variable air volume (VAV) pressure controller in the configurations as indicated on the plans to operate as a pressure controller.
   2. The VAV pressure controller shall be digital and utilizes a microcontroller with Electrically Erasable Programmable Read-Only Memory (EEPROM) for storing setup and calibration variables.
      a. Indicator light-emitting diodes (LED) shall be on all outputs to indicate current status.
      b. All connections shall be pluggable terminal blocks and/or RJ-12/RJ-45 jacks for quick field connections.
   3. Airflow control using the onboard actuator shall use highly accurate movements based on the current static pressure setpoint. When required, a minimum damper movement of 1000 milliseconds shall be used to reduce actuator wear and increase lifespan, and an adjustable default maximum step of 5000 milliseconds. The supplied stainless steel static pressure probe shall be mounted 2/3 of the way down the supply duct and connected to the HI side of the transducer utilizing 1/4” pneumatic tubing.

C. Airflow Transducer:
   1. The device shall be a digital temperature compensated ultra-low flow through transducer with an operating range of 0 to 2.0 inches water gauge (0 to 500 Pascal).
   2. Maximum airflow through the transducer shall be 0.00014 CFM at 0.01 inches water gauge.
   3. The device shall maintain an accuracy of plus or minus 4.5 percent of the reading. Sensors rated at plus or minus 5 percent of full scale will not be acceptable.
   4. The device must utilize digital sensor technology. Analog output sensors or sensors with an accuracy of less than 4.5 percent of the reading are not acceptable. Sensors with accuracy rated for span are not acceptable.

D. Actuator:

   1. The actuator shall be a 90 second at 60 Hz, 24 Volt AC, tri-state floating point type, with a torque rating of 40 inch-pounds (4.5 Newton- meters), a fully adjustable mechanical stop, and protected against stalling.
   2. The actuator shall be factory mounted and be provided with the controller mounted on 94V-0 fire rated plastic.
   3. The actuator shall be field replaceable without replacing/reprogramming the VAV pressure controller.

E. Electrical:
   1. The VAV pressure controller shall be factory calibrated and provided with a factory mounted and supplied 120/208/277 Volt AC to 24 Volt AC Class 2 transformer. No on-site sequence programming shall be required.

F. Interfacing to BMS/BAS/EMS:
   1. The VAV pressure controller shall interface with the building management system (BMS) to allow remote monitoring of system static pressure or permit settings adjustments over the building network.
   2. The BMS shall use BACnet MS/TP network protocol to view points or status of system static pressure. The use of BACnet protocol shall be native to the device and shall not require the use of an external gateway.
   3. An LCD-Setup Tool shall include the ability to change the MAC address, device instance and baud rates (9600, 19200, 38400, 76800) for proper interfacing to BACnet network.
   4. The VAV pressure controller shall support on board network termination for the MS/TP network.
   5. The VAV pressure controller shall be BTL listed.
   6. The manufacturer shall be a member of BACnet International.
   7. The static pressure set point and current static pressure value shall be visible from the BACnet network.
   8. The BACnet points shall include:
      a. Device Object.
      b. Analog Input (AI).
      c. Analog Output (AO).
      d. Binary Input (BI).
      e. Binary Output (BO).
      f. Multi-state (MSV).

VAV Zone Controllers

A. Basis of Design: Price Industries, Inc.

   1. VAV DDC Zone Controller: Model PIC

2.04 Price Intelligent Controller

B. Description:
   1. Furnish and install Price model [PIC] variable air volume (VAV) zone controller in the configurations as indicated on the plans.
   2. The VAV zone controller shall include fully adjustable analog outputs and hot/common switchable digital outputs from the control board utilizing a PI control loop to control dampers, electric reheat, and cold/hot water coils for the purpose of maintaining user defined airflow rates and space temperatures.
   3. The VAV zone controller shall be digital and utilize a microcontroller with Electrically Erasable Programmable Read-Only Memory (EEPROM) for storing setup and calibration variables.
      a. Indicator light-emitting diodes (LED) shall be on all outputs to indicate current status.
      b. All connections shall be pluggable terminal blocks and/or RJ-12/RJ-45 jacks for quick field connections.

   4. Airflow control using the onboard actuator shall use highly accurate movements based on the current airflow target. When required, a minimum damper movement of 1000 milliseconds shall be used to reduce actuator wear and increase lifespan, and an adjustable default maximum step of 5000 milliseconds.

C. Airflow Transducer:

1. The device shall be a digital temperature compensated ultra-low flow through transducer with an operating range of 0 to 2.0 inches water gauge (0 to 500 Pascal).
2. Maximum airflow through the transducer shall be 0.00014 CFM at 0.01 inches water gauge.
3. The device shall maintain an accuracy of plus or minus 4.5 percent of the reading. Sensors rated at plus or minus 5 percent of full scale will not be acceptable.
4. The device must utilize digital sensor technology. Analog output sensors or sensors with an accuracy of less than 4.5 percent of the reading are not acceptable. Sensors with accuracy rated for span are not acceptable.

D. Thermostat:

1. The controller package shall be provided with a thermostat for measuring zone temperature and shall feature local set-point adjustment with adjustable lockout ranges.
2. The thermostat connection shall be quick connection RJ-45 at both ends using factory supplied plenum rated (FT6) cable (type CMP).
3. The thermostat shall have an integral thermistor for accurate room air temperature measurement. Temperature measurement circuit shall include provision to specifically avoid self-heating in order to prevent temperature measurement error.
4. The thermostat shall be equipped with a liquid-crystal display (LCD) interface, and shall include two-line LCD display, RGB backlighting, beeper, RJ-12 service jack and plastic casing fire rated to 94V-0.
5. The device must utilize a password-protected menu formatted to permit access for parameter changes within the service menus.

2.05 Disio Display Thermostat Controller

E. Description:

1. DDC Zone Thermostat Controller shall be integral, wall mounted design without the need for a separate circuit board for inputs and outputs.
2. DDC Zone Thermostat Controller shall include 4 fully configurable universal outputs from the control board utilizing a PI control loop to control a VVT damper actuator, electric reheat, and cold/hot water coils for the purpose of maintaining a user defined space temperature.
3. DDC Zone Thermostat Controller shall include 4 fully configurable universal inputs capable of taking in 0-10VDC signals, binary 24 VAC signals, binary contact closure input, or 10 K ohm thermistors.
4. The DDC Zone Thermostat Controller shall be digital and utilize a microcontroller with EEPROM for storing setup and calibration variables. Screen shall utilize a 2 character, 7 segment display for setpoint and display information.
5. The controller package shall measure zone temperature and shall feature local set-point adjustment with adjustable lockout ranges.
6. The DDC Zone Thermostat Controller shall feature an easy-to-read screen which has a wedge design for an optimal viewing angle, thermostats with a screen parallel to the wall shall not be accepted.
7. Screen shall be solid piece of glass with capacitive touch buttons, thermostats with push buttons protruding from the face of the thermostat shall not be accepted.
8. Thermostat shall have an integral thermistor for accurate room air temperature measurement. Temperature measurement circuit shall include provision to specifically avoid self-heating to prevent temperature measurement error.

F. Interfacing to BMS/BAS/EMS:

1. The VAV Zone Controller shall interface with the building management system (BMS) to allow remote monitoring of room parameters or permit settings adjustments over the building network.
2. BMS shall use BACnet MS/TP network protocol to viewpoints or status of room space. The use of BACnet protocol shall be native to the device and shall not require the use of an external gateway.
3. Thermostat shall include ability to change MAC address, device instance and baud rates (9600, 19200, 38400, 76800) for proper interfacing to BACnet network.
4. Device shall support on board network termination for the MS/TP network.
5. The VAV Zone Controller shall be BTL listed.
6. Manufacturer shall be a member of BACnet International.
7. BACnet points shall include – Device Object, Analog Input (AI), Analog Output (AO), Binary Input (BI), Binary Output (BO), Multi-state (MSV). All temperature set points and minimum and maximum damper positions shall be adjustable from the BACnet network.

G. Actuator:

1. The actuator shall be a 90 second at 60 Hz, 24 Volt AC, tri-state floating point type, with a torque rating of 40 inch-pounds (4.5 Newton-meters), a fully adjustable mechanical stop, and protected against stalling.
2. The actuator shall be factory mounted and be provided with the controller mounted on 94V-0 fire rated plastic.
3. The actuator shall be field replaceable without replacing/reprogramming the VAV controller.

H. Electrical:

1. The controller shall be factory calibrated and provided with a factory mounted and supplied 120/208/277 Volt AC to 24 Volt AC Class 2 transformer. No on-site sequence programming shall be required.

Disio Cloud Package BMS

A. Basis of Design: Price Industries, Inc.
1. Disio Cloud Graphical Interface Package

2.06 Disio Cloud Package

A. Description:
1. The Disio Cloud shall allow a user to be able to log in to a cloud-based app over the internet to view the building's HVAC network and monitor/override certain values pertaining to all zone controllers, rooftop units or any BACnet device. The Disio Cloud shall also allow the ability to monitor any third party BACnet MS/TP devices on the network for information purposes only. The login shall be password protected and the network shall be secure with cloud data encrypted with the use of two-step authentication. The app shall also allow the user to view any other site the user has access to by selecting locations on a map on the home screen.
2. In addition to all HVAC zone controllers and RTU controllers, the optional Disio Cloud package shall include:
   a. Disio Cloud Hub.
   b. BACnet MS/TP Router.
   c. IP Switch.
   d. Industrial NEMA 1 enclosure for power and mounting BACnet IP support.
3. The Disio Cloud package shall allow remote access to building HVAC controls and conditions and allow the user to make adjustments to any writable points on any networked controller. The Disio Cloud shall come complete with preloaded graphics for all zone controllers, as well as the rooftop unit.
4. Preloaded graphics for each zone controller shall include, but not be limited to:
   a. Occupancy status.
   b. Supply air temperature.
   c. Airflow [**pressure independent controllers only**].
   d. Airflow target [**pressure independent controllers only**].
   e. Room setpoint.
   f. Room temperature.
   g. Damper position.
   h. Damper target [**pressure dependent controllers only**].
   i. Room setpoint override.
   j. Room load PI
5. Preloaded graphics for the rooftop unit controller shall include, but not be limited to:
   a. Occupancy status
   b. Temperature local to the rooftop controller thermostat
   c. Rooftop return air temperature
   d. Rooftop discharge air temperature
   e. Stages of heat/cool energized
   f. Rooftop status (heat/cool/neutral)
   g. Rooftop control polling strategy
   h. Number of zones
   i. Number of zones up
   j. Polled cooling demand, %
   k. Polled heating demand, %
   l. Polled deadband demand, %
   m. Network status (active, or down)
6. The Disio Cloud shall also be able to support custom graphics, such as building floor plans, for quickly locating zone conditions/points for a given space.

7. The Disio Cloud shall allow multiple users with different access levels to view/manage sites. Users and access levels shall be customizable by administrative level users.

I. Electrical Requirements:
   2. The Disio Cloud Hub and associated routers and switches shall operate with 24 VDC current protected power supply provided in the Disio Cloud panel enclosure. Contractor to provide 120 VAC field connection to panel.

J. Start-up & Commissioning:
   1. Start-up shall include verifying proper installation, configuring and verifying of network communication, and ensure that all graphics are created as per site requirements.
   2. Basic adjustments from the Disio Cloud shall be performed to ensure proper operation and communication to the BACnet device is achieved.

PART 3 – EXECUTION

3.01 Examination

3.01.1.1 Verify that conditions are suitable for installation.
3.01.1.2 Verify that field measurements are as shown on the drawings.

3.02 Installation

3.02.1.1 The mechanical contractor, controls contractor, or factory authorized commissioning contractor shall install and wire the components of the rooftop unit controller. This shall include the thermostat, rooftop unit controller, DAT and RAT probes, optional web server or DISIO Cloud package, associated routers, and all network wires and zone controllers.

3.02.1.2 The rooftop unit controller and optional BMS package shall be shipped in a Nema 1 enclosure for easy wall mounting and removal or reinstallation of the devices should it be necessary to relocate.

3.02.1.3 All BACnet networking of zone controllers to the rooftop unit controller shall be completed using factory shipped plenum FT6 rated CAT 5 cables with RJ45 ends to ensure uniform polarity and network coms throughout network, and to ensure error-proof installation.

3.02.1.4 The rooftop unit controller shall have the following cable and wire requirements:

3.02.1.5 Factory supplied 35-foot length of plenum rated (CMP) RJ-45 Cat 5 cable for connecting thermostat to the rooftop unit Controller.

3.02.1.6 Factory supplied 35-foot length of plenum rated (CMP) RJ-45 Cat 5 cable for networking to zone controllers (if networked, cables shall be included with zone controllers).

3.03 Installation

3.03.1.1 The mechanical contractor, controls contractor, or factory authorized commissioning contractor shall install and wire the components of the VAV pressure controller. This shall include the thermostat, airflow control devices, and all network wires.

3.03.1.2 The VAV pressure controller shall have the following cable and wire requirements:

3.03.1.3 Factory supplied 35-foot length of plenum rated (CMP) RJ-45 Cat 5 cable for connecting the LCD-SETUP Tool to the VAV pressure controller.

3.03.1.4 Factory supplied 35-foot length of plenum rated (CMP) RJ-45 Cat 5 cable for connecting the zone controllers (if required).

3.03.1.5 All other cables/wires to be provided by the installing contractor.

3.04 Installation

A. The mechanical contractor, controls contractor, or factory authorized commissioning contractor shall install and wire the components of the VAV zone controller. This shall include the thermostat, airflow control devices, and all network wires.

B. The VAV zone controller shall have the following cable and wire requirements:
   1. Disio - Network wiring shall be 3 wire connection consisting of 2 - low capacitance (17 pF or less) plenum rated, balanced twisted pairs
   2. Factory supplied 35 foot length of plenum rated (FT6) RJ-45 Cat 5 cable for connecting the thermostat to the zone controller.
   3. Factory supplied 35 foot length of plenum rated (FT6) RJ-45 Cat 5 cable for connecting the zone controllers (if required).
   4. All other cables/wires to be provided by the installing contractor.

3.05 Installation

A. The mechanical contractor, controls contractor, or factory authorized commissioning contractor shall install 120 VAC and bring power to the Disio Cloud control panel. The Disio Cloud Hub, and all associated routers, switches, breakers and power supplies are to be factory mounted and wired within panel.
B. The Disio Cloud control panel shall be shipped with separate top and bottom mounting rails for easy wall mounting and hanging of the control panel.
C. All BACnet networking of zone controllers to the rooftop unit controller shall be completed using factory shipped plenum rated CAT 5 cables with RJ45 ends to ensure uniform polarity and network coms throughout network, and to ensure error-proof installation.
D. The Disio Cloud shall have the following cable and wire requirements:
    1. Factory supplied 2-foot length of plenum rated (CMP) RJ-45 Cat 5 cable for networking the IP Router to the Disio Cloud Hub and associated BACnet MS/TP routers.

3.06 Start-Up and Commissioning

A. Start-up shall include verifying proper installation, testing and airflow control, setting all parameters and set points, and configuring and verifying network communication, as applicable.
B. The test and balance (TAB) contractor shall be responsible for final verification of airflow measurement and static pressure setpoint accuracy.

3.07 Field Quality Control

3.07.1 See Section 01 40 00 - Quality Requirements, for additional quality requirements.

3.08 Closeout Activities

3.08.1 The manufacturer or manufacturer's representative shall provide a minimum of four hours of owner training to facilities personnel or other parties as required.
3.08.2 See Section 01 79 00 - Demonstration and Training for additional closeout requirements.