neptronic

Zoning System

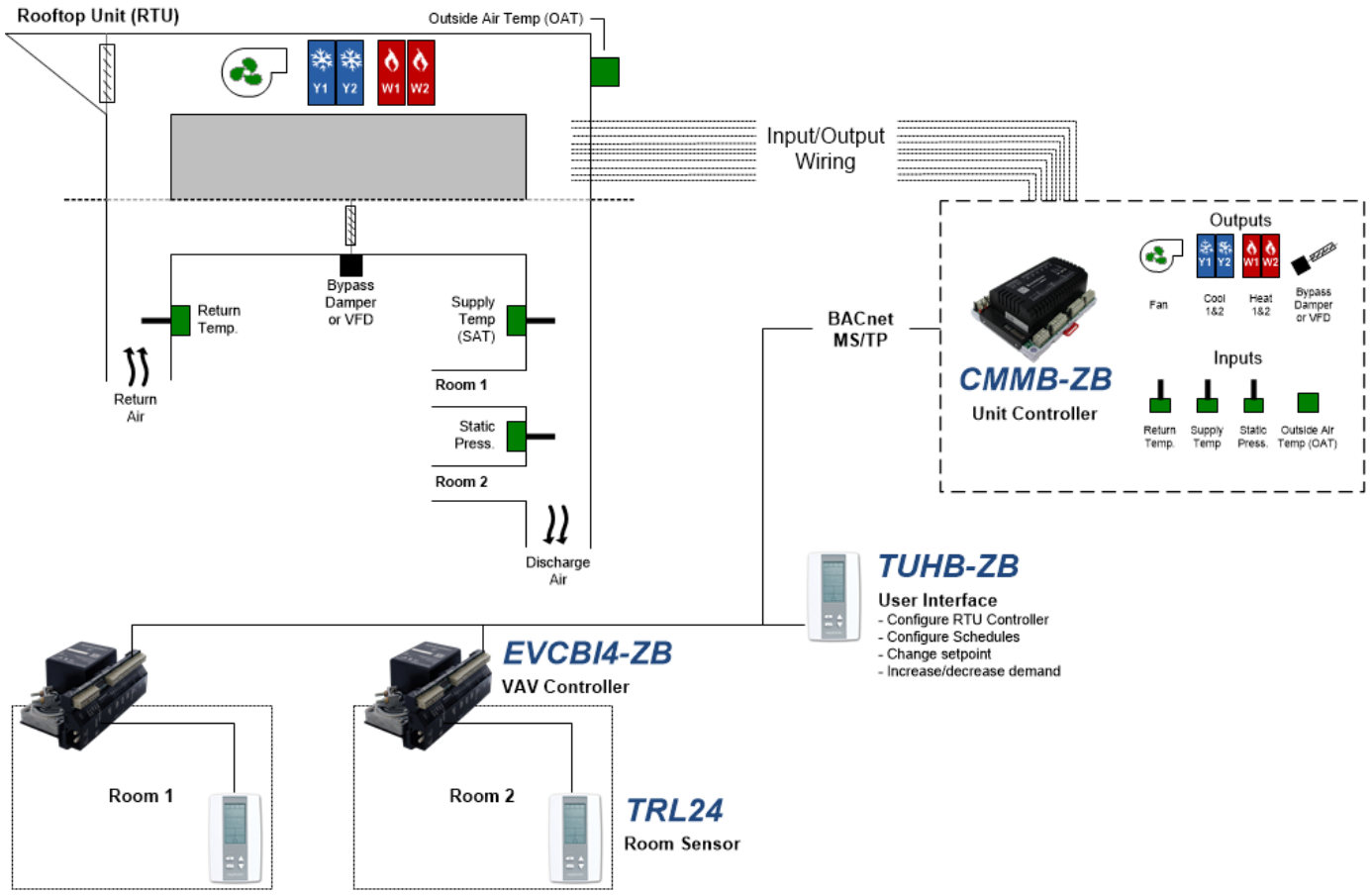
Quick Start Guide

System Overview

The Neptronic Zoning System consists of four products:

- Unit Controller (CMMB-ZB)
- User Interface (TUHB-ZB)
- VAV Zone Controller (EVCBI4-ZB)
- Zone Room Sensor (TRL24)

The Neptronic Zoning System provides a simple and efficient demand-based control of pressure independent and pressure dependent VAV zones with roof top units (RTU) in light commercial applications (2 to 20 tons). These products provide a local BACnet MS/TP communication bus to ensure data exchange of all required information between the zones and the RTUs, which permits seamless integration with a third party BMS system.



Features and Benefits

- **Online Web Selection Tool**
  Easily manage and order system components using Neptronic online web selection tool.

- **Plug and Play**
  - Pre-configured controllers
  - Pre-assembled mechanical components
  - Factory tagged (ID) zones and parts

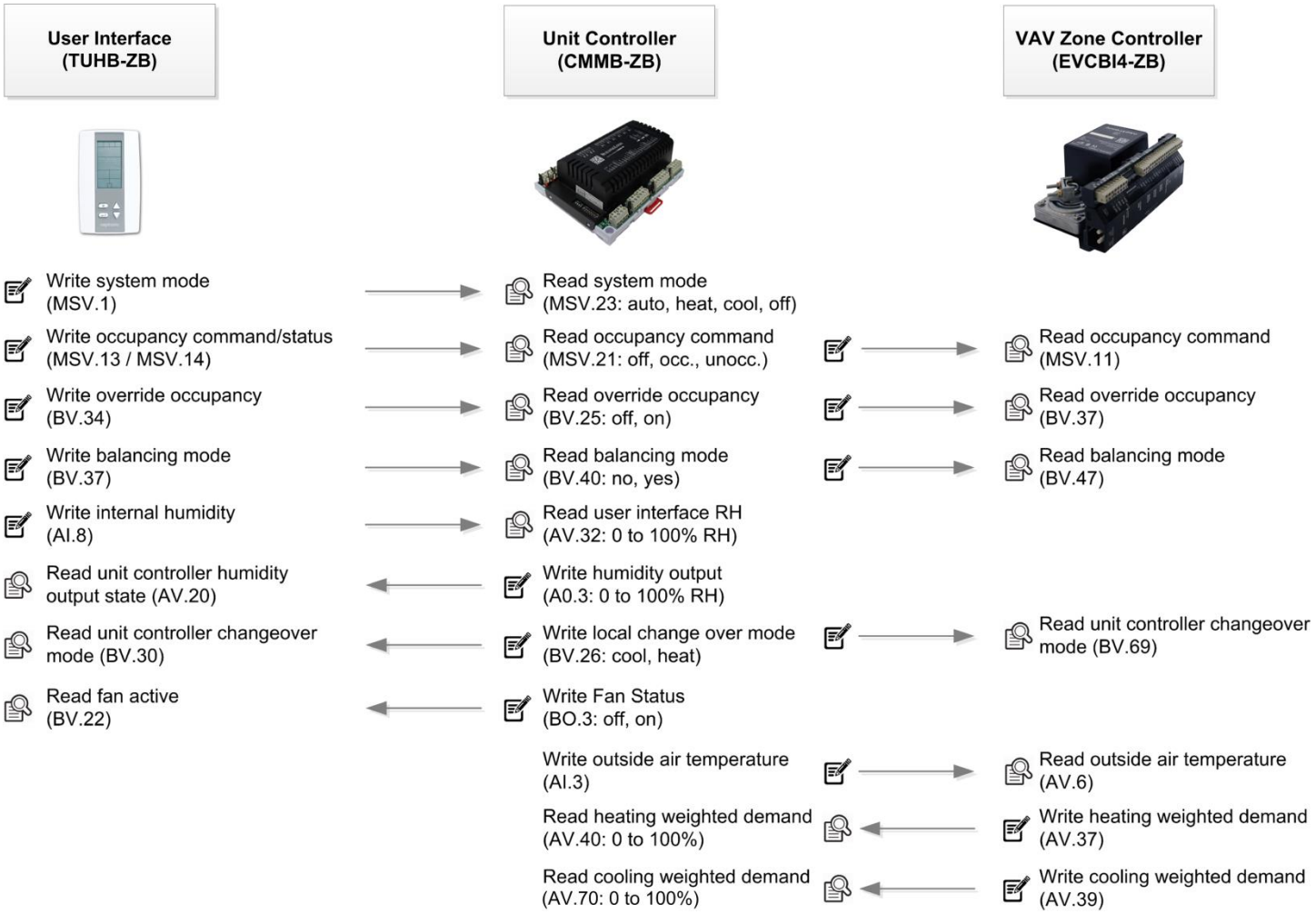
- **Get the Whole Kit**
  Everything you need for a light commercial application:
  - RTU Controller
  - VAV controllers and room sensors
  - Peripherals, such as actuators and temperature sensors
  - Duct heaters and humidifiers

- **Fully Scalable System**
  From small applications to up to 63 zones per BACnet MS/TP trunk. Other systems offer fixed hardwired zoning. Our system allows for simple additions of zones whenever needed.

- **Zone Management System**
  Simplify zone management with multiple operational functions, such as highest demand, demand averaging, smart fan control mode, anti-cycling, OAT lockouts and more

- **10 Inputs and 10 Outputs on Unit Controller**
  8 AI, 2 DI, 4 AO, and 6 BO

Controller Information Exchange



BACnet MS/TP Addressing and Baud Rate

Each controller on the BACnet network requires a unique identifier (MAC address), and all controllers must communicate using the same baud rate. The User Interface (TUHB-ZB) and the VAV Zone Controller (EVCBI4-ZB) controllers require an additional configuration to identify its connected Unit Controller (CMMB-ZB). Minimum required BACnet configurations:

User Interface (TUHB-ZB)

- AV.200 Cfg_MU_MSTP_MacAdd

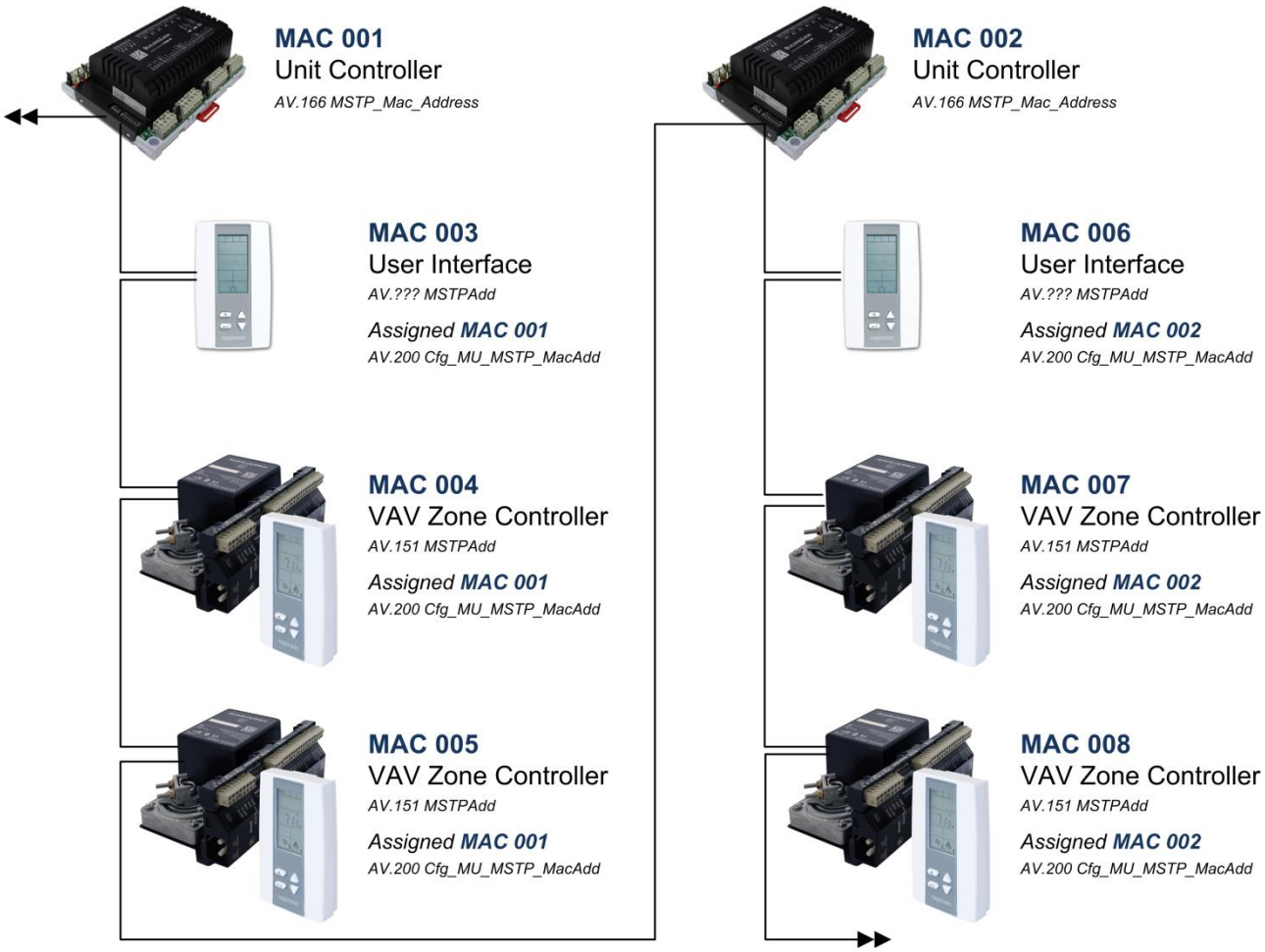
Unit Controller (CMMB-ZB)

- AV.165 MSTPBaudRate
- AV.166 MSTP_Mac_Address

VAV Zone Controller (EVCBI4-ZB)

- AV.200 Cfg_MU_MSTP_MacAdd
- AV.150 MSTPBaudRate
- AV.151 MSTPAdd

Zoning System



Operation Logic - RTU Heating & Cooling

Unit Controller (CMMB-ZB)

Since most systems are composed of internal and external zones, the RTU unit may be required to change modes to satisfy all the zones. The Neptronic Unit Controller uses a system of votes to determine the mode of the RTU.

Unit Controller (CMMB-ZB)

- MSV.12 Cfg_OperationLogic
  - Highest demand (takes into consideration only the highest demand of both modes)
  - Average of the 2 highest demands
  - Average of the 3 highest demands
  - Average of the 4 highest demands
  - Average of the 5 highest demands

VAV Zone Controller (EVCBI4-ZB)

Each Neptronic VAV Zone Controller has adjustable weighted cooling and heating demands. The weights are expressed in percentages and are individually configured. This means that a zone can have different weights for each of its modes.

VAV Zone Controller (EVCBI4-ZB)

- AV.36 Cfg_HeatingDemandBalance (range from 0-100% with increments of 10%)
- AV.38 Cfg_CoolingDemandBalance (range from 0-100% with increments of 10%)

There are many considerations to consider when applying weights to the zone controllers. The following are examples of configurations that can be used to maximize energy efficiency and comfort.

Zone Location (internal or external)

Most internal zone demands will be in cooling all year long. These zones will influence the cooling demand. However, they should not be part of the voting system in heating.

External zones are affected by outside conditions and have demands in cooling and heating depending on their orientation and on the time of day. These zones should have a vote in both cooling and heating.

Zone Function (e.g. office, cafeteria)

Zones affected by peak occupancy, such as conference rooms and cafeterias, should be part of the voting strategy. The authorized mode(s) depends on the location of the zone. Refer to Zone Location (internal and external) above.

Zones that supply air to less critical environments, such as photocopier rooms and hallways, would not be part of the voting system. Furthermore, some zone types can have a zero minimum airflow setpoint when in opposite mode to prevent overheating or undercooling of the zone. Note that these zones have no permanent occupancy. Refer to the local codes for more details.

Not all zones need to be part of the voting strategy. Consider only zones that have the highest peak loads. To avoid affecting the system, lower the voting weights of less critical zones.

Zone Importance

Critical zones should always be allowed to vote. The same would apply to zones that are considered important such as the president's office from whom you do not want to receive a call.

Rogue Zone - Undersized or Misconceived

Problematic zones can easily destabilize the entire system. An undersized zone, for example, can lock the RTU into cooling or heating mode since the zone is never satisfied and remains at 100% demand. These zones should be identified and removed from the voting system.

Zone Setpoint Range Limitation

If the zone temperature setpoint range is too wide, it will most likely unbalance the voting strategy of the system. Limiting the user setpoints within the 68˚F to 75˚F (20˚C to 24˚C) range reduces the possibility of locking the RTU in one mode due to the zone inability to reach the setpoint. Here are the configurations to limit zone setpoint range.

VAV Zone Controller (EVCBI4-ZB)

- AV.15 OccupiedTemperatureSetpoint (limited AV.16 and AV.17 configurations)
- AV.16 Cfg_MinSetpoint
- AV.17 Cfg_MaxSetpoint
- BV.2 Cfg_TempSetpointLock (locks AV.15 configuration. User cannot modify setpoint)

RTU Supply Air Temperature Cool & Heat Lockouts (SAT)

If the RTU is equipped with a bypass damper and most of the zones are satisfied, the VAV boxes will be at minimum airflow setpoints, forcing the bypass damper to recirculate more air. Since the bypass damper is located after the cooling and heating elements, the air is treated by the RTU before it is sent back into the return. Because the air is treated by the RTU more than once, it can overheat or undercool the supply air temperature to the zones. To prevent such conditions, we recommend limiting the high & low supply air temperatures by using SAT Heat Lock & SAT Cool Lock configurations.

Unit Controller (CMMB-ZB)

- AV.6 Cfg_SAT_HeatLock
- AV.7 Cfg_SAT_CoolLock

RTU Outside Air Temperature Cool & Heat Lockouts (OAT)

The following configurations are used to limit equipment cycling and energy consumption but at the expense of occupancy comfort. It is the user's responsibility to impose temperature lockouts or not. When properly configured, these settings reduce cooling and heating cycling to a minimum and save energy. The configuration values differ from one region to another, but the concept remains the same.

Unit Controller (CMMB-ZB)

- AV.4 Cfg_OAT_HeatLock locks out the RTU heating when outside temperatures are above setpoint.
- AV.5 Cfg_OAT_CoolLock locks out the RTU cooling when outside temperatures are below setpoint.

By default, there is no heat or cool lockout, which means that the RTU can switch between heating and cooling modes whenever needed regardless of the outside air temperature. Setting a lockout setpoint prevents the RTU from switching modes when outside temperatures can easily offset the building load. For example, if OAT Heat Lock is configured to 80˚F (26.7˚C), heating will no longer be available at the RTU when the outside temperature is above 80˚F (26.7˚C). The building temperature should slowly rise removing the need to heat the zones. The OAT Cool Lock works in the same manner but also has the help of the economizer free cooling to help cool down the required zones.

RTU Static Pressure Control

The Unit Controller (CMMB-ZB) can control a 0-10Vdc bypass damper or VFD based on pressure. The 0-10Vdc pressure transducer must be properly configured using the following configurations:

Unit Controller (CMMB-ZB)

- AV.1 Cfg_StaticPressureSetpoint: Default value 0.8"w.c.
- BV.15 Cfg_SPC_DeviceType: 0 = Bypass damper or 1 = VFD
- BV.66 Cfg_AO1Direction: 0 = Direct acting or 1 = Reverse acting
- MSV.1 Cfg_StaticPressureRange: Pressure range of the transducer

Install the pressure transducer probe at 2/3 of the run of the duct from the RTU or the hardest branch. An RTU equipped with a bypass damper maintains the pressure setpoint during occupied mode (the fan is always active in occupied mode). When in unoccupied mode, the RTU fan is off, the economizer damper is closed, and the bypass damper is fully open. When zones require the RTU to restart to maintain unoccupied temperature setpoints, the Unit Controller starts the fan and modulates the bypass damper to maintain the setpoint. The economizer remains closed.

Communication Failure Failsafe

The mode selection of the RTU is based on zone demands. If communication between the Unit Controller and the VAV Zone Controller is lost, the Unit Controller reverts to the return air temperature setpoint to drive the heating and cooling modes. We recommended configuring the following objects in case such an event occurs.

Unit Controller (CMMB-ZB)

- AV.10 Cfg_RAT_OccSetpoint
- AV.11 Cfg_RAT_UnoccHeatSetpoint
- AV.12 Cfg_RAT_UnoccCoolSetpoint

Zone Damper Position - Pressure Dependent

There are four (4) configurations to set in the VAV Zone Controller for pressure dependent applications.

VAV Zone Controller (EVCBI4-ZB)

- AV.88 Cfg_DamperMaxPositionCool
- AV.89 Cfg_DamperMaxPositionHeat
- AV.90 Cfg_DamperMinPositionCool
- AV.92 Cfg_DamperMotorMaxHeatFlow

Damper Maximum Position Cool

Represents the maximum damper position when the system is in cooling mode and the zone is in 100% cooling demand.

Damper Maximum Position Heat

Represents the maximum damper position when the system is in heating mode and the zone is in 100% heating demand

Damper Minimum Position Cool

Represents the minimum damper position when the system is in cooling or heating mode (at all times).

Damper Motor Maximum Heat Flow

This configuration is only available if the zones are equipped with a modulating duct reheat. It represents the maximum damper position when the system is in cooling mode, but the zone is requesting heat.

Note: In occupied zones, the HVAC standards dictate that a minimum airflow is required to supply the zone with a minimum of fresh air. In certain conditions, the standards allow the zone to have a zero minimum airflow setpoint. Refer to local codes for more details. Sometimes, when the system is in the opposite mode of the zone, the minimum damper position can create unwanted overheating and undercooling in the zone. BV.105 Cfg_NoMinPositionC_Over configuration bypasses the minimum position of the VAV when such events occur.

Zone Airflow Setpoints - Pressure Independent

There are four (4) configurations to set in the Zone Controller for pressure independent applications.

VAV Zone Controller (EVCBI4-ZB)

- AV.101 Cfg_AirflowKFactor
- AV.102 Cfg_AirflowMin
- AV.103 Cfg_AirflowCoolMax
- AV.105 Cfg_AirflowHeatMax

Airflow K Factor

Represents the airflow that the VAV box can deliver at 1" differential pressure. In most cases, it also represents the maximum airflow of the box. This configuration is critical and when properly configured, reduces airflow balancing time considerably.

Airflow Minimum

Represents the minimum airflow delivered to the zone at all times (no demand).

Airflow Cool Maximum

Represents the maximum airflow delivered at the zone when the system is in cooling mode and the zone is in 100% cooling demand.

Airflow Heat Maximum

Represents the maximum airflow delivered at the zone when the system is in heating mode and the zone is in 100% heating demand. If the zone is equipped with a duct reheat and the zone is in cooling mode, the VAV Zone Controller modulates from airflow minimum to airflow heat maximum setpoints while activating the duct reheat.

Zone Reheat Configurations

The VAV Zone Controller can control duct reheat coils and baseboard reheat. For proper control, configure the following objects accordingly:

VAV Zone Controller (EVCBI4-ZB)

- MSV.51 Cfg_DuctReheat
- MSV.52 Cfg_PerimeterReheat
- AV.160 Cfg_DuctOATHeatLock
- AV.161 Cfg_PerimeterOATHeatLock

Duct Reheat

Configure the duct reheat coil to 0-10Vdc modulating (direct or reverse), On/Off, Pulse, 2 stages or 3 stages.

Perimeter Reheat

Configure the baseboard reheat to 0-10Vdc modulating (direct or reverse), On/Off, or Pulse. *Note that if fan powered options are enabled, the baseboards options are no longer available.*

Duct OAT Heat Lock

By default, there is no duct heat lockout, which means that the duct reheat is used whenever needed regardless of the outside air temperature. Setting a duct heat lockout setpoint prevents activation of the duct reheat when outside air temperatures are above the setpoint.

Perimeter OAT Heat Lock

Same as *Duct OAT Heat Lock* above, but this setpoint applies to the perimeter (baseboard) reheat.

User Restrictions

The User Interface and VAV Zone Controller have configurations to limit the user's access to change setpoints, modes, and passwords. This is represented in a level format. For the EVCBI4-ZB, the user can be limited in the setpoint range and even have the setpoint locked (refer to zone setpoint range limitation). Here are the possible configurations for each controller;

VAV Zone Controller (EVCBI4-ZB)

- MSV.101 KeypadLockoutLevels

Level 0: No lockouts

Level 1: Arrow buttons locked

Level 2: Arrow buttons and mode locked

Level 3: Arrow buttons, mode, and password menu locked

Level 4: Arrow buttons, mode, password menu and program mode locked

User Interface (TUHB-ZB)

- MSV.101 KeypadLockoutLevels

Level 0: No lockouts

Level 1: Mode locked

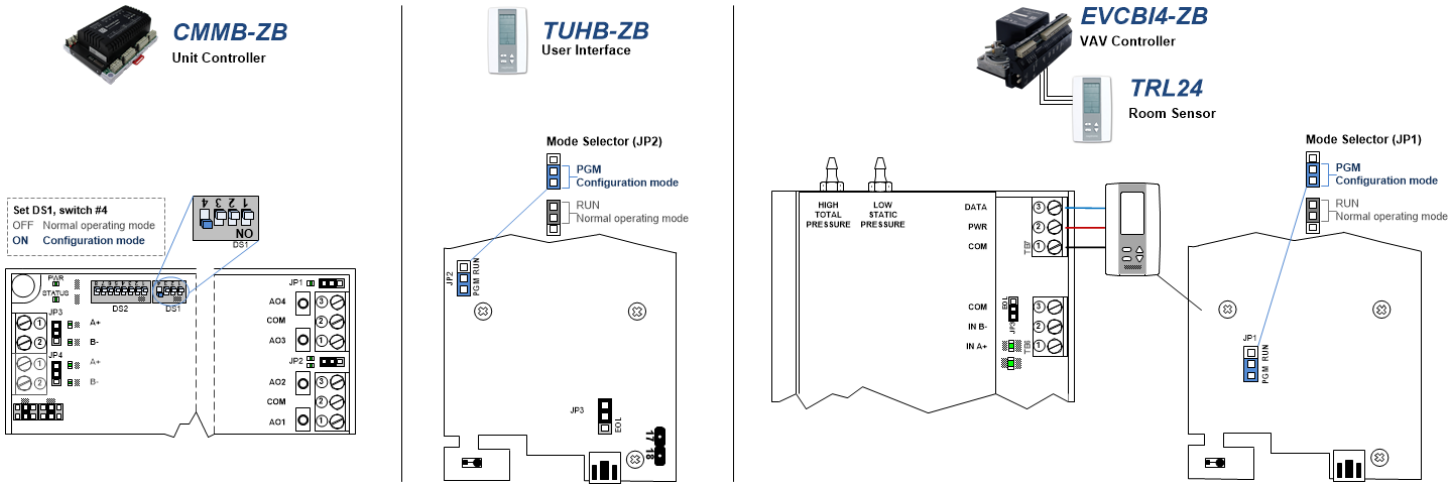
Level 2: Mode, schedule menu and password menu locked

Level 3: Mode, schedule menu and password menu locked

Configuration Mode

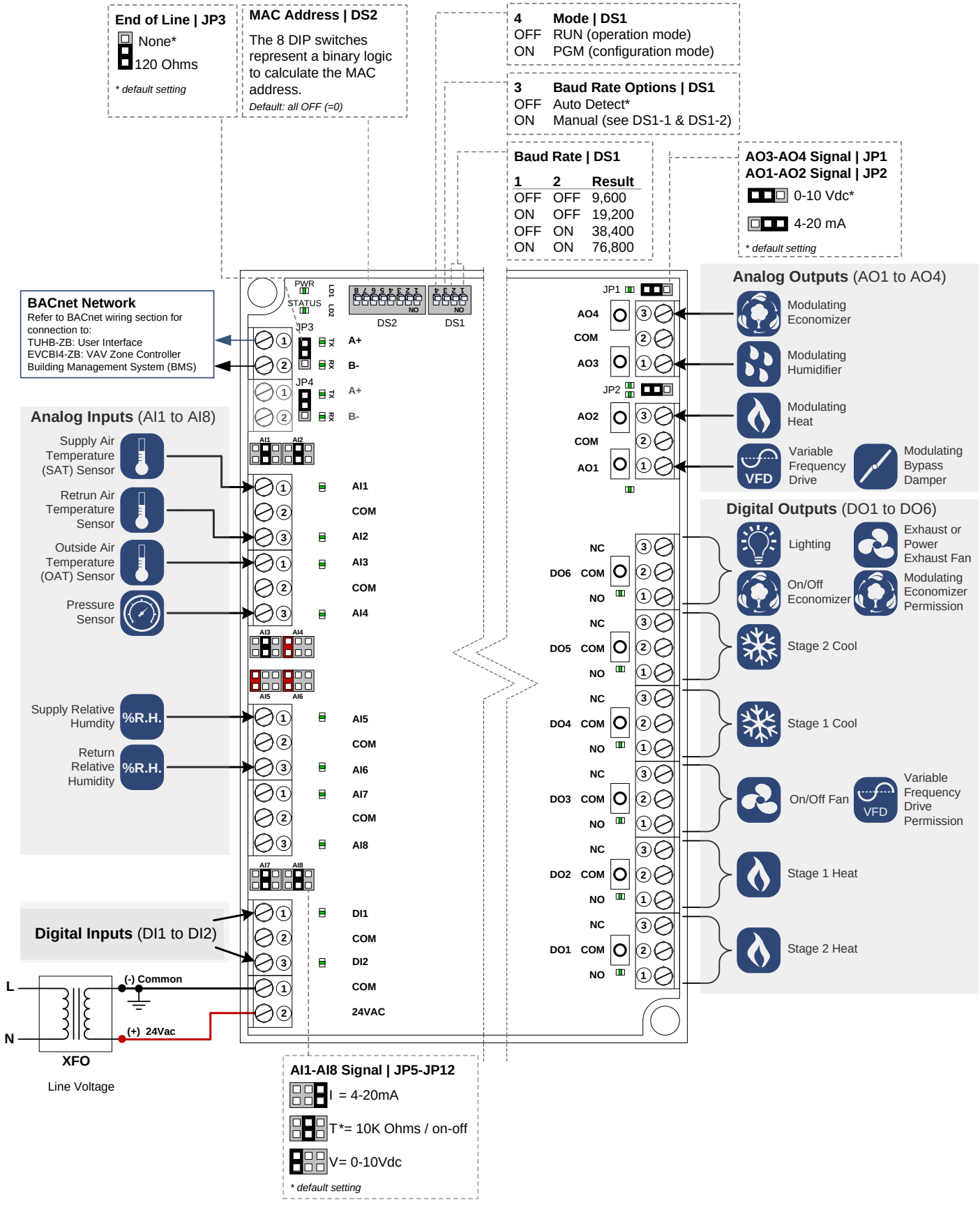
Each controller has a local menu for configuring most of the functions that appear in the BACnet Object List.

Important: You must set the system clock and schedule for automatic occupied and unoccupied modes located in the User Interface (TUHB-ZB).



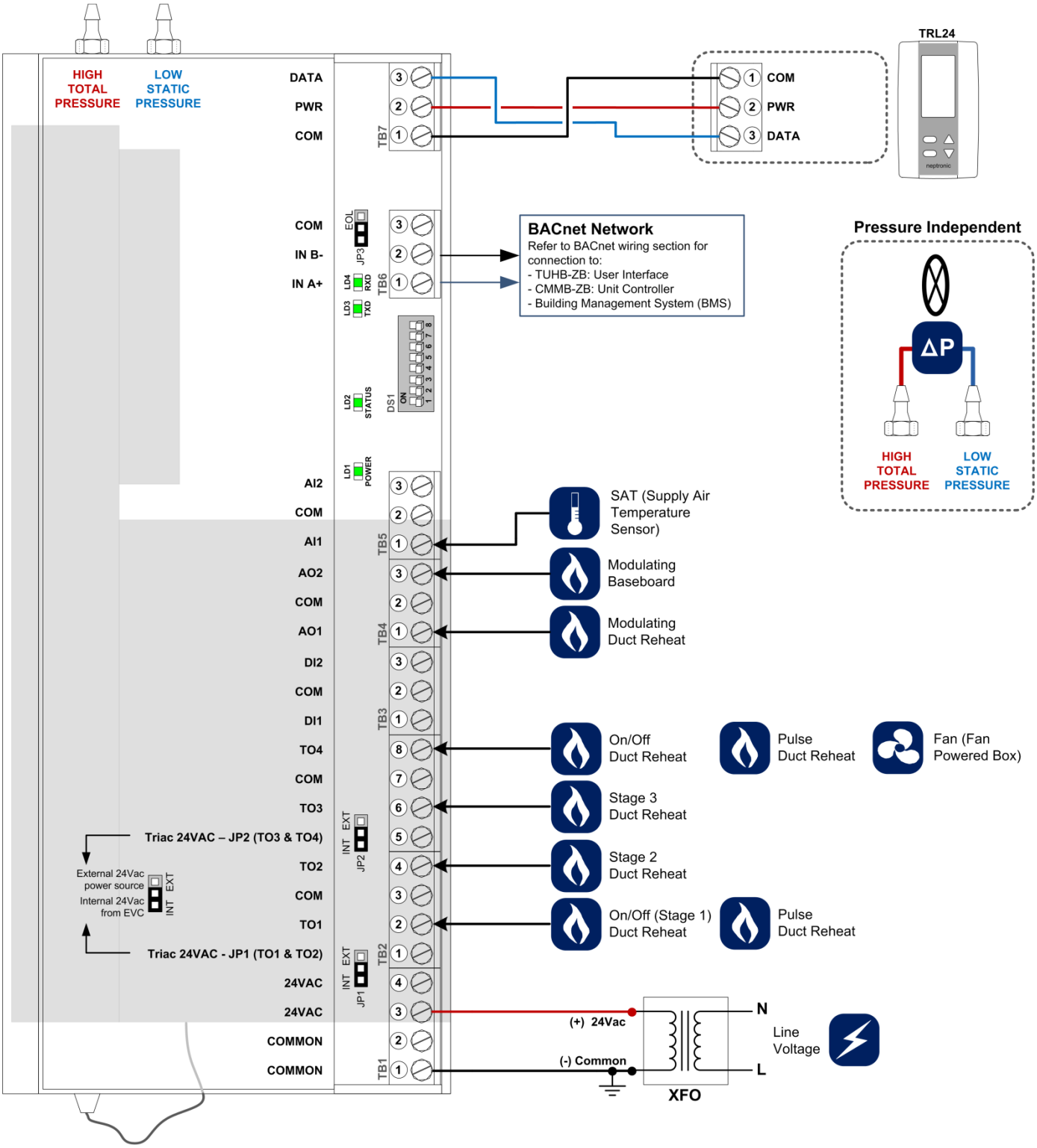
Unit Controller Wiring (CMMB-ZB)

We strongly recommend that all Neptronic products be wired to a separate grounded transformer and that transformer shall service only Neptronic products. This precaution will prevent interference with, and/or possible damage to incompatible equipment.

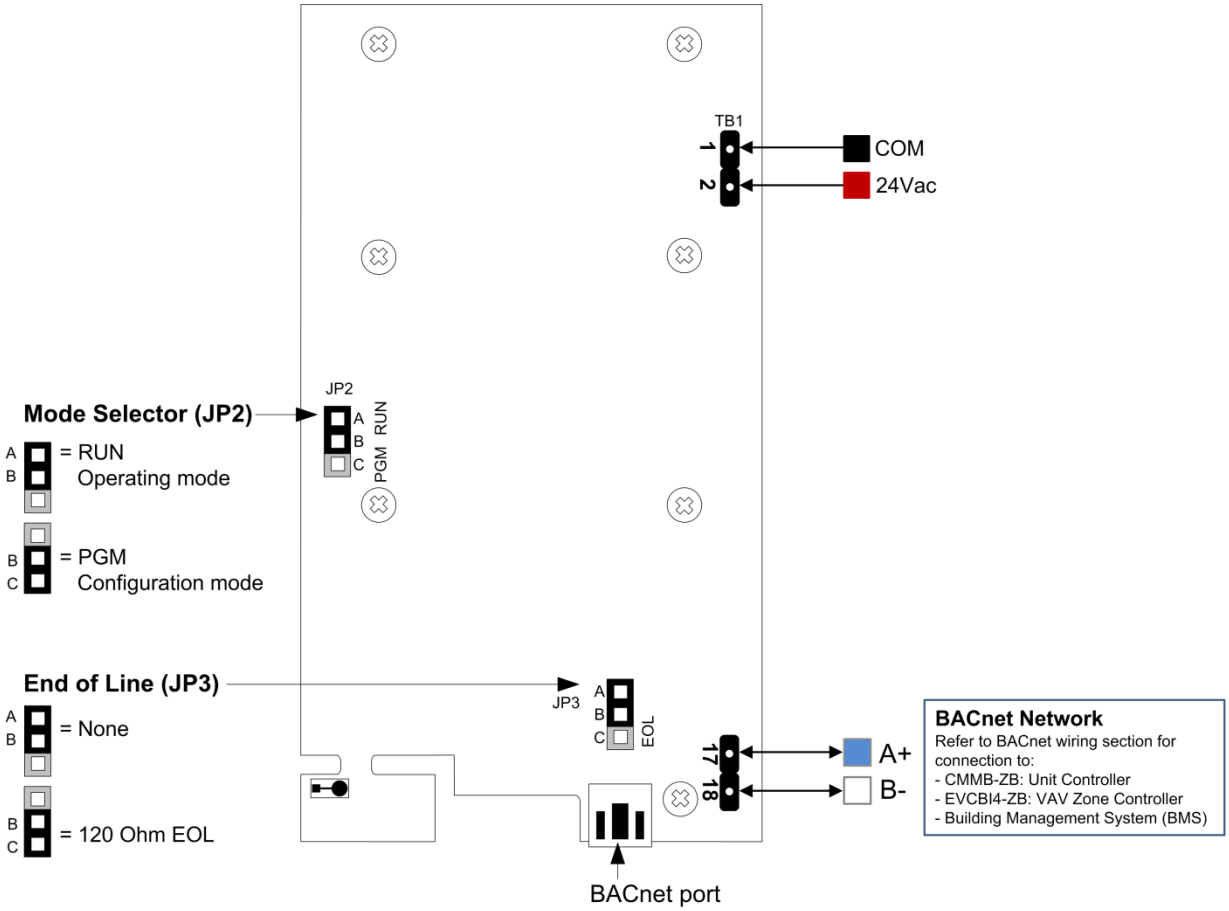


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User Interface Wiring (TUHB-ZB)



Notes



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