BZ424-LX - Configurable VAV MS/TP Controller

Controller Installation and Wiring Guide

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BZ424-LX - Configurable VAV MS/TP Controller

Disclaimer Notes

Please read the manual before proceeding to install this controller or any other Onyxx LX device. This manual applies to ***Onyxx LX UI software version 4.0*** and higher and using ***firmware version 2.182*** and higher.

All firmware updates must be done utilizing Supplied USB-COM adapter or USB to MSTP converter cable.

Installations shall be made by a certified technician and respect all local codes and regulations.

Electronic controls are static sensitive devices: discharge yourself properly before handling and installing a controller.

Any short circuit or incorrect wiring may damage the controller or the controlled equipment.

Double-check all wiring before applying power.

If a control failure could lead to personal injury and/or loss of property, it becomes the responsibility of the installer to add safety devices to protect against failures.

BZ424-LX - Configurable VAV MS/TP Controller

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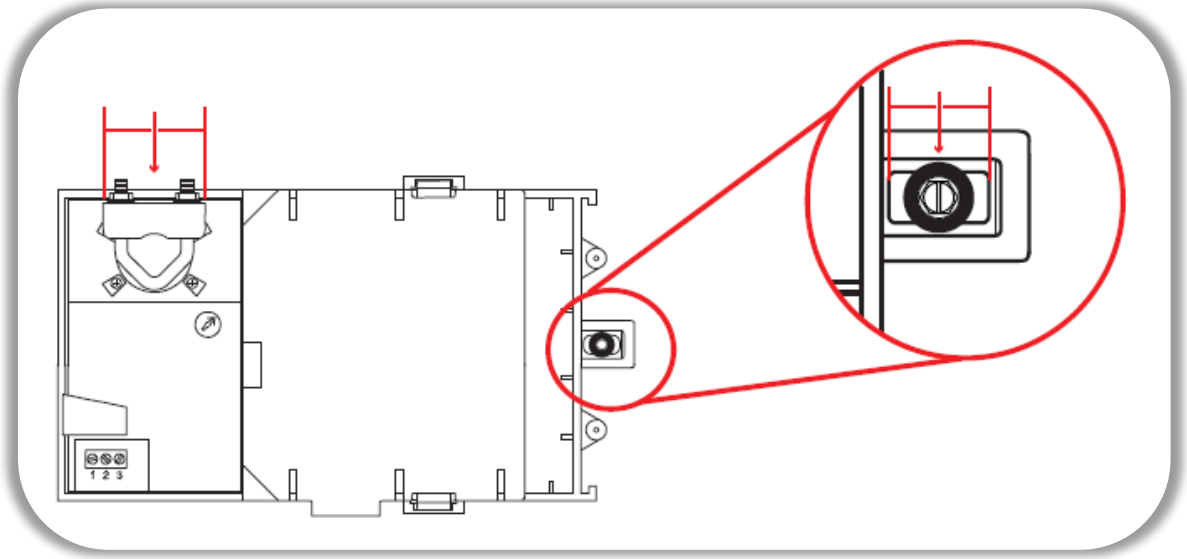
Installation

BZ424-LX Mounting Instructions



When securing the BZ424 to the ductwork or sheet metal, make sure that the rotor shaft bracket is centered, and the mounting screw is in the center of the slider. Because the clamp fixes to the shaft asymmetrically, this allows the unit to move with the shaft as the bracket slides back and forth.

Failure to properly position the screw will result in torsion and breakage of the unit.

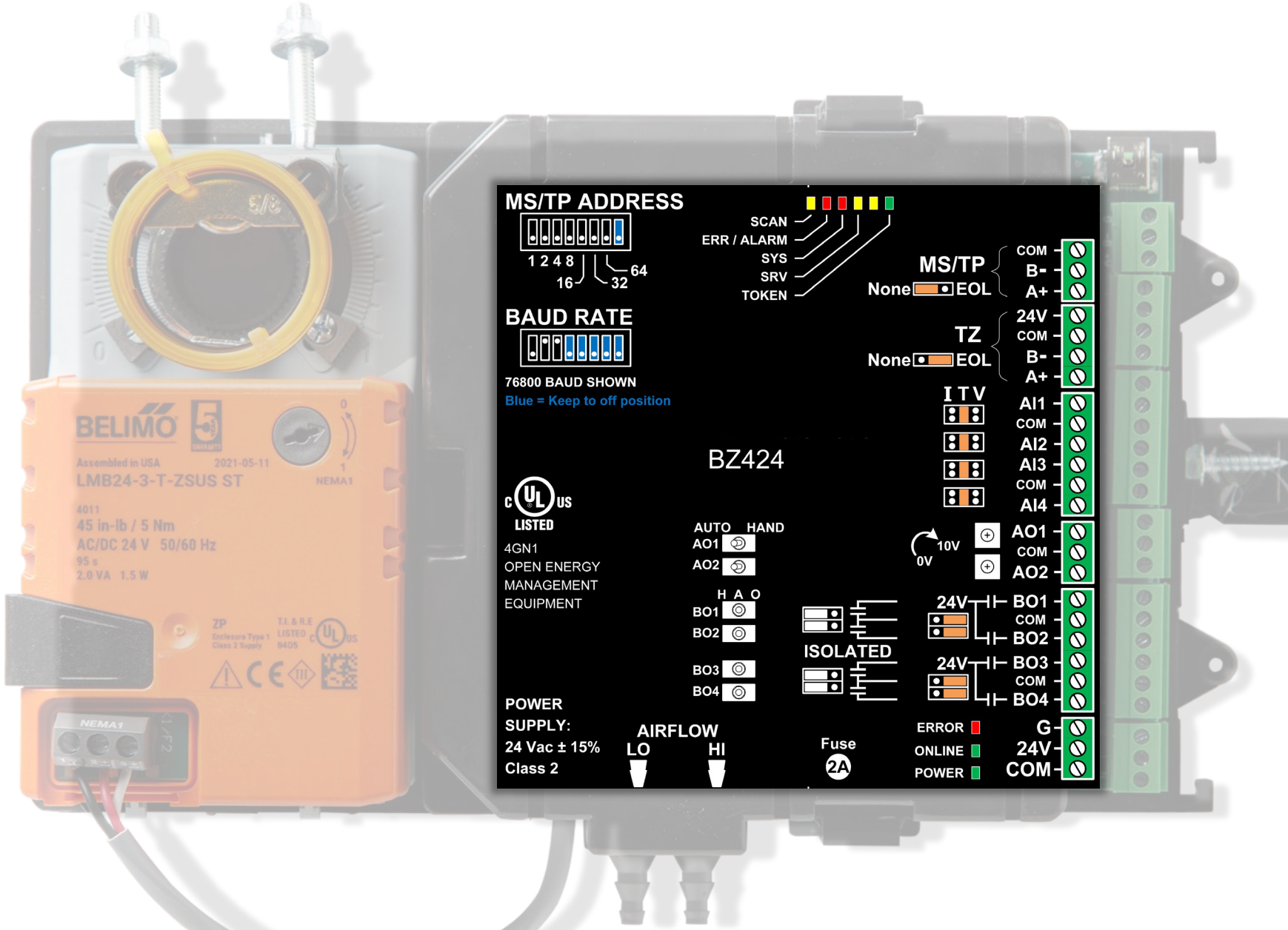
Short circuits or incorrect wiring may permanently damage the controller. Double check your wiring before applying power. If a control failure could lead to personal injury and/or loss of property, the installer must add safety devices and/or alarm systems to protect against failures.

Electronic controls are static sensitive devices; discharge yourself properly before manipulating and installing the device.

Interface
Product Label

The BZ424-LX consists of an actuator motor and various screw terminals, switches, and jumpers that let you configure the unit to your needs. Jumpers and switches are within the housing (internal), under a removable cover. A label on the removable cover helps you identify the internal interfaces.

Physical connectors (for mounting and cable connections) are accessible on the outside of the unit. This section describes all the user-adjustable interfaces of the BZ424-LX. Details for each section are provided further in this guide.



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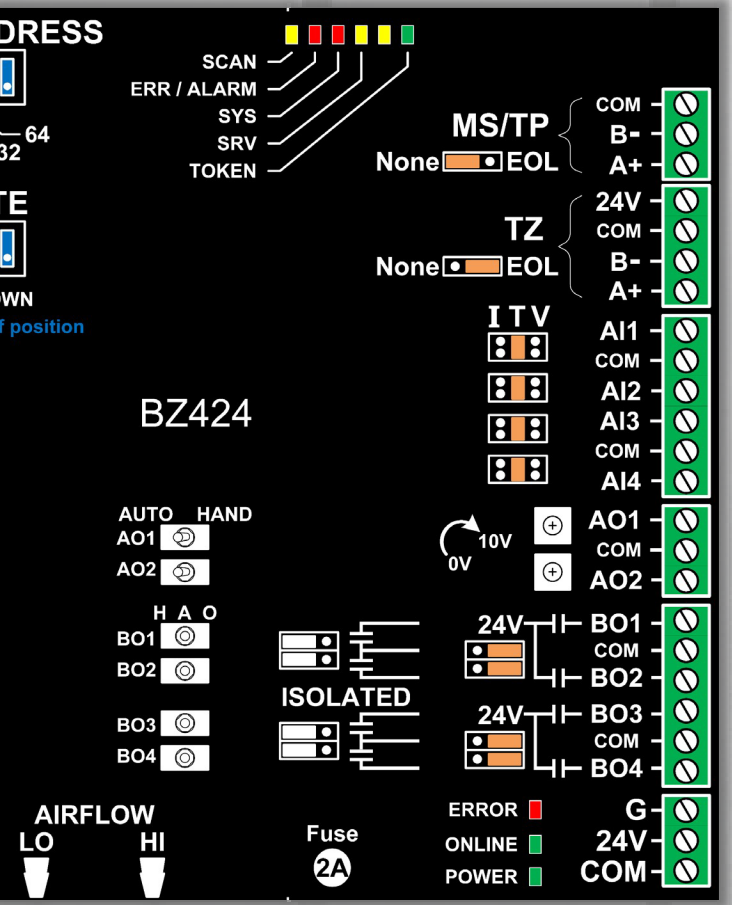
Installation

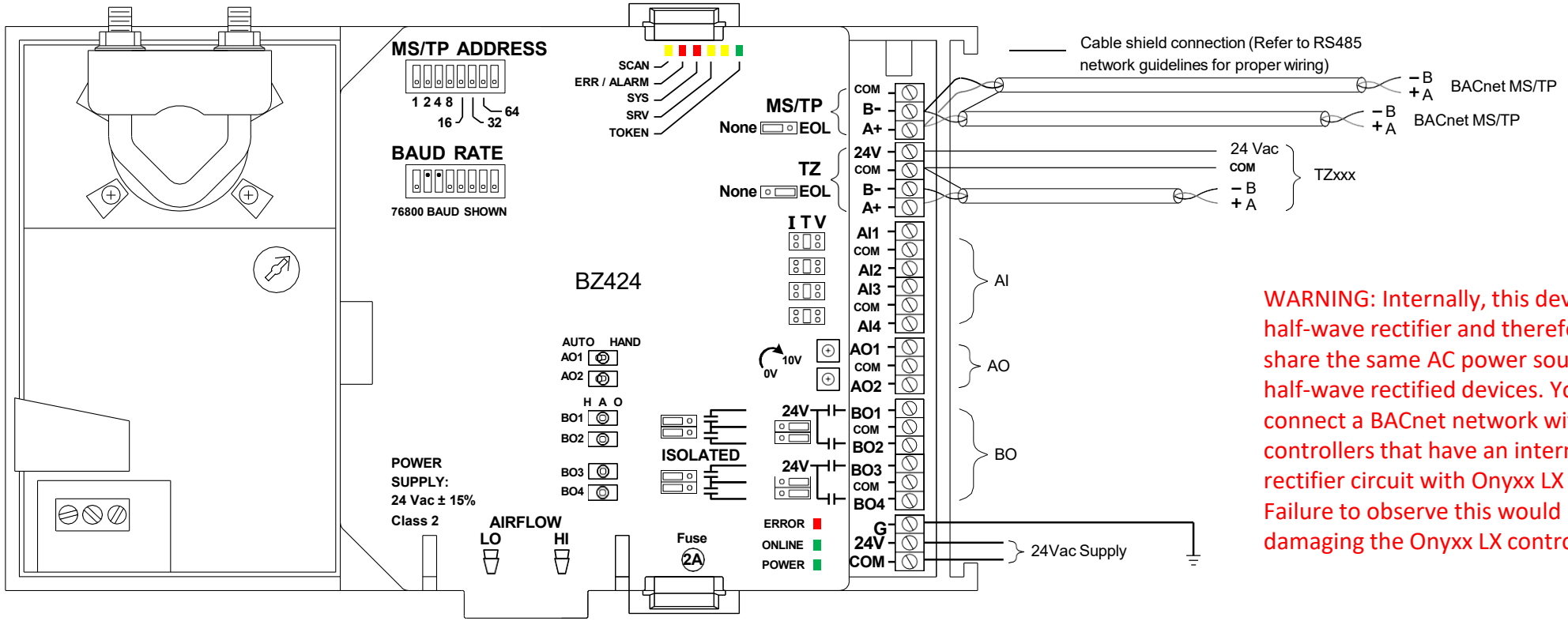
Wiring Instructions

Cables suitable for use in an RS-485 network should have an impedance of between 100 and 130 ohms, a capacitance between conductors of less than 30 pF per foot (100 pF per meter), and a capacitance between conductors and shield less than 60 pF per foot (200 pF per meter).



Connectors		Description
	Mini USB2 connector	Allows local access to the MS/TP network Requires a USB-485 cable adapter
	Common B- A+	BACnet MS/TP Comm Bus RS-485 Wire Required
	24V Common B- A+	TZ Comm Bus RS-485 Wire Required
	AI1 Common AI2 AI3 Common AI4	Analog Inputs Supported Wire Size 28-16 AWG
	AO1 Common AO2	Analog Outputs Supported Wire Size 28-16 AWG
	BO1 Common or (BO1,BO2) BO2 BO3 Common or (BO3,BO4) BO4	Binary Outputs Supported Wire Size 28-16 AWG
	Ground 24Vac Common	Input Power Wire size based on VA rating and distance fro

BACnet MS/TP, TZ Comm Bus, and Power Wiring



WARNING: Internally, this device utilizes a half-wave rectifier and therefore can only share the same AC power source with other half-wave rectified devices. You CANNOT connect a BACnet network with other controllers that have an internal full wave rectifier circuit with Onyxx LX controllers. Failure to observe this would result in damaging the Onyxx LX controllers.

The BZ424 can be powered using a Class 2, 24Vac transformer, or to a 24Vdc power source. If powering from a 24Vac transformer, do not ground either side of the transformer's secondary.

For maximum protection from electrostatic discharge or other forms of EMI connect each controller to earth ground using a #16 AWG and keep these wires as short as possible.

Proper grounding of a controller is important to ensure a high probability of surviving a nearby lightning strike as well as other possible electrical surges. For details on grounding within control panels, NFPA 79 and UL508A provide the required details.

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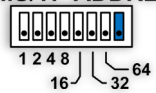
Installation

Jumper Settings

A

MS/TP ADDRESS



DIP switches DS2 configures the MS/TP address
The Values of the On Switches adds up
Possible Address : 1 - 127

BAUD RATE

76800 BAUD SHOWN
Blue = Keep to off position

DIP switches DS1 configures the Baud Rate (BPS)
Switches Configuration : Off = 0, On = 1
Available baud rates :
010 - 9600 BPS, 110 - 19200 BPS, 001 - 38400 BPS, 011 - 76800 BPS

B

MS/TP JP11

None EOL

EOL jumper: MS/TP Network end of line

C

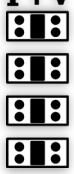
TZ JP10

None EOL

EOL jumper: Tzone Netwotk end of line

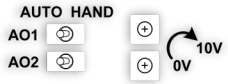
D

I T V

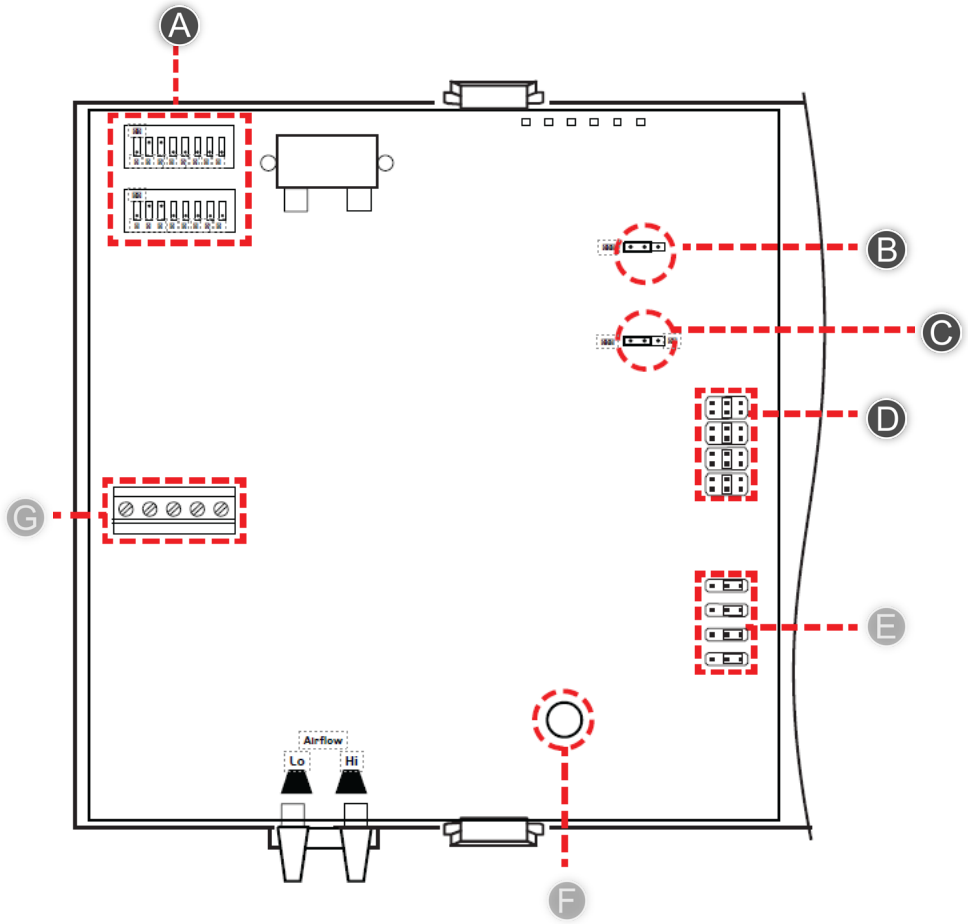


These jumpers are used to configure the analog input:
Left = mA 4 - 20 mA or 0 – 20 mA
Middle = Thermistor 10K Type 3 (std) or Type 2
Right = Vdc 0 – 10 V or 2 – 10 V

E



AO1 and AO2 Switches allow analog output bypass control when "HAND" is selected
Switch Left = AUTOMATIC
Switch Right = HAND (manual)
Counterclockwise for 0% (0V)
Clockwise for 100% (10V)



G

F

H

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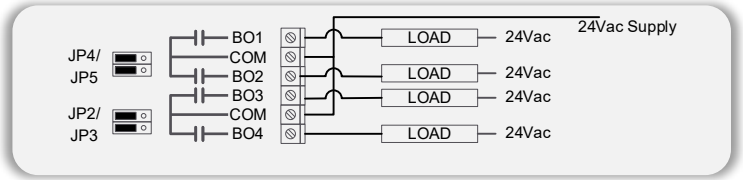
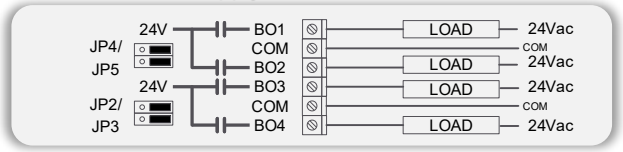
Installation
Jumper Settings

F

Isolated contacts



Internal 24Vac supply



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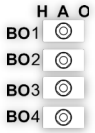


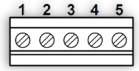
When used in conjunction with jumpers, switches SW1 to SW4 allow binary output bypass control and selection:
SW4 Overrides BO1
SW3 Overrides BO2
SW2 Overrides BO3
SW1 Overrides BO4

LEFT = manual On (Hand)
CENTER = automatic
RIGHT = manual output Off

H

Replaceable TR5R Fuse, Time-Lag type, 2.0 A
Littelfuse 37212000411

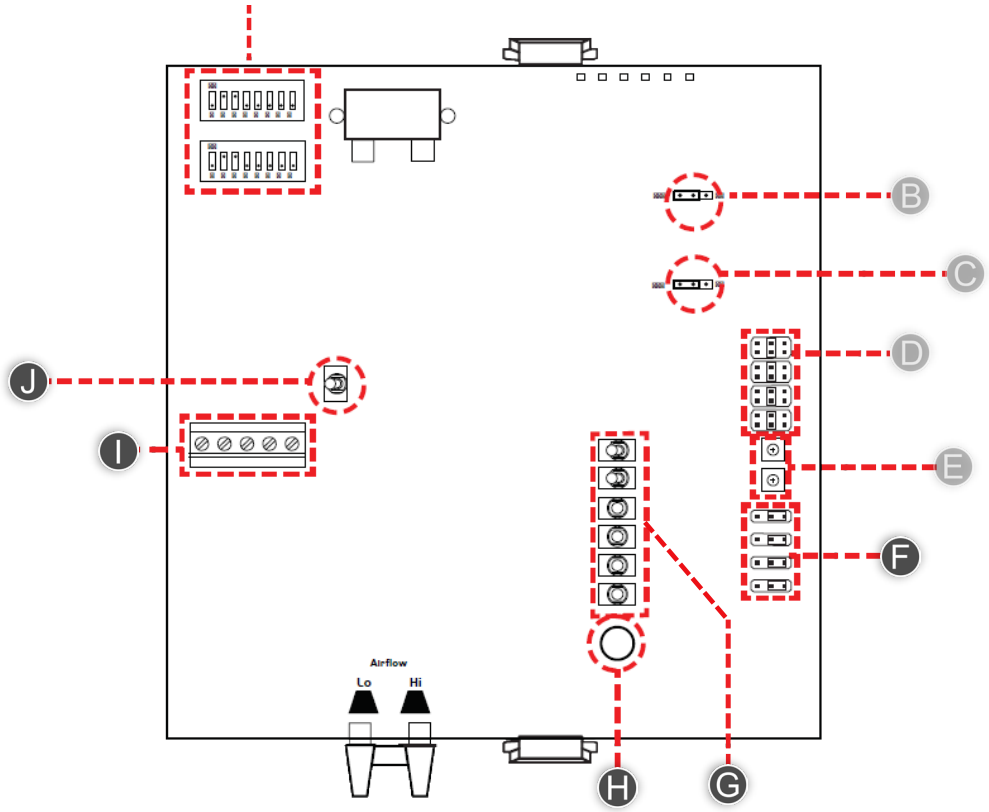
I



Actuator driver connector:
1 = 24V, 2 = AO , 3 = COM, 4 = Open , 5 = Close

J

Manual operation of the actuator
Hold the switch in the up or down position for 2 seconds, until a beep sounds.
This will completely force the actuator clockwise or counter clockwise for one hour.
A beep will sound every 5 seconds.
The bypass will automatically be cancelled after one hour.
To cancel before the hour, hold the switch in the up or down position for 2 seconds until a beep sounds.



recommend using pilot relays in any application utilizing Binary outputs as switching loads. *

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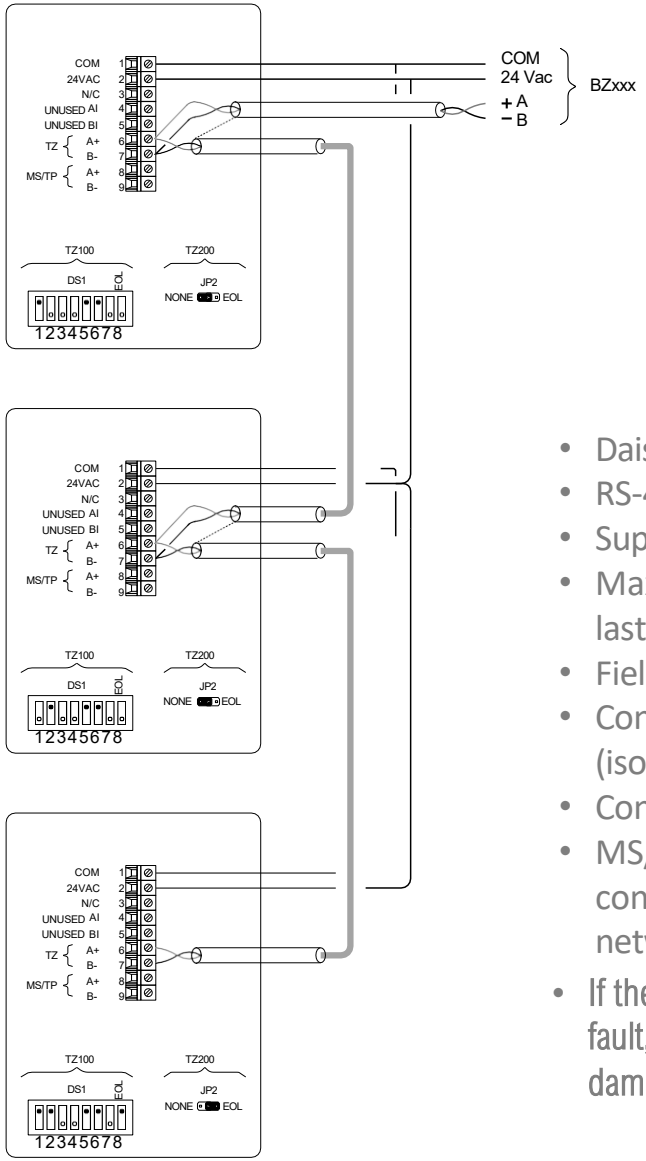
TZ Room Sensor Wiring



- Daisy-chain up to 3 TZ room sensors
- RS-485 wire required for communications wiring
- Supported Wire Size 28-16 AWG for power wiring, recommend 18 AWG
- Max total distance of communication wire of 300 ft from controller to last TZ room sensor
- Field verify Tzone addressing and EOL jumpers
- Connect shields together in the daisy-chain communication network (isolate them to avoid touching metal or electronic components)
- Connect shield to ground, at only one end of the network
- MS/TP A+ and B+ are optional; they are directly connected to the USB connector below the TZxxx. The goal is to allow access to the MSTP network from the special USB to MSTP adapter
- If there is a loss in communication to any of the TZ controllers, BV24 will indicate a fault, AV 41 will = - 40 °F and the fan, heating and cooling will be disabled, and the damper will return to minimum position.

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Sequence of Operation

Room Temperature

When using TZone sensors, up to three can be configured. The controller can be configured to control the average of all three TZone sensors, a maximum heating call, a maximum cooling, or individual outputs can be controlled by each TZone sensor, such as separate baseboard heat for particular spaces.

An ACI [A/AN-R2SO-RJ6-16-C5] wired sensor slider (0-5K = 65°F -85°F) with push-button override can be used by selecting AI-1 for Room Temp [MSV-17] and AI-2 for Room Temp Setpoint [MSV-18] in Onyxx LX UI setup.

A Trane Wired Sensor [BAYSENS074A] 1K room Dial setpoint (50°F -85°F) with push-button override / cancel and can be used by selecting AI-1(Trane) for Room Temp [MSV-17] and AI-2 (Trane) for Room Temp Setpoint [MSV-18] in SLC setup. This is to used with a Trane Tracer SC system writing Occupancy [BV-3] at present value. Timed Override Status can be read from [MSV-72] for Trane sequence of operation.

Occupied Cooling Control

During occupied mode and a call for cooling, the damper will modulate open to *Max Air Flow* setpoint (configurable), maintaining the Occupied Cooling Setpoint (74°F)
.

Occupied Heating Control

During occupied mode and a call for heating, the damper will modulate closed to *Min Air Flow* setpoint (configurable), maintaining the Occupied Heating Setpoint (72°F).

Outputs can be configured for additional heat, such as Hot Water, Staged Electric, Baseboard, or Modulating Electric Heat (SCR). As the room temperature drops below the heating setpoint, outputs are cycled on and off to maintain the Heating Setpoint.

When the Downstream T° sensor is configured, the outputs will cycle to maintain a discharge air setpoint of the High Limit Heating (default 95°F) setpoint until the space temperature is satisfied.

Unoccupied Cooling Control

During unoccupied mode and a call for cooling, the damper will modulate open to Max Air Flow setpoint (configurable), maintaining the Unoccupied Cooling Setpoint (80°F).

Unoccupied Heating Control

During unoccupied mode and a call for heating, the damper will modulate closed to Min Air Flow setpoint (configurable), maintaining the Unoccupied Heating Setpoint (65°F).

Sequence of Operation

Standby Cooling control

When a motion sensor is configured on an AI or a TZ200 room sensor is used with a PIR sensor, and motion is not sensed in the space for 60 min (cfg) Cooling will be maintaining the Cooling Setpoint plus the standby cooling offset.

Standby Heating control

When a motion sensor is configured on an AI or a TZ200 room sensor is used with a PIR sensor, and motion is not sensed in the space for 60 min (cfg) Heating will be maintaining the Heating Setpoint minus the standby heating offset.

Changeover Mode

***Requires Upstream T° sensor**

When *the ChangeOver Switching Type [MSV-25] is configured for None, the VAV will remain in cooling mode [MSV-26]. [MSV-26] is writable from BACnet to change mode externally at priority 9 or higher.*

When the Upstream T° sensor is installed, and the *ChangeOver Switching Type* [MSV-25] is configured for *Constant*, the VAV will change from heating to cooling mode, Regardless of room temp vs. setpoint, when the supply air from the primary unit is less than 75.2 °F (cfg).

When the Upstream T° sensor is installed, and the *ChangeOver Switching Type* [MSV-25] is set to *RoomT°+Offset*, the VAV will change from heating to cooling mode, regardless of room temp vs. setpoint; when the supply air from the unit is less than Room, the VAV will change from heating to cooling mode, regardless of room temp vs. setpoint, when the supply air from the unit is less than RoomT°+ Offset value 1°F (cfg).

Demand Limiting

Heating outputs can be limited to reduce energy consumption during peak times. The *Aux Output A-E Authorization* can be set to *MaxPower* or *Fan+MaxPower.*

When placed in this mode, the outputs will be allowed to modulate or cycle from 0-100% (100%). A network variable can modify this setpoint.

Fan Status

The fan status of the primary unit can be used as proof of airflow as status or to prevent outputs from operating when no airflow is detected. Set *Aux Output A-E Authorization* *Fan Status* or *Fan+MaxPwr.*

Sequence of Operation

No Condensate avoidance as set by MSV-70, set to None

Series Fan Powered Application (as set per MSV-13 Auxiliary output C, control type)

In both occupied & standby mode, the fan is always on.

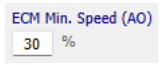
In Unoccupied mode, the fan will only start when there is a demand for heating. The fan can be configured with configuration point *AuxC Formula* to be either on/off or modulating. If configured on/off, the fan will start when there is a call for heat. When the call for heat is satisfied , the fan will stop. If configured modulating, the fan will start as soon as there is a heating demand (1%+) and will ramp up to 30% fan output. When the heating demand rises from 30%to 100%, the fan output will track the heating demand output. When the heating demand is 0%, the fan will stop.

Parallel Fan Powered Application (as set per MSV-13 Auxiliary output, control type)

In both occupied, standby & unoccupied modes, the fan will only start when there is a demand for heating. The fan can be configured with configuration point *AuxC Formula* to be either on/off or modulating. If configured on/off, the fan will start when there is a call for heat. When the call for heat is satisfied, the fan will stop. If configured modulating, the fan will start as soon as there is a heating demand (1%+) and will automatically ramp up to 30% fan output. When the heating demand rises from 30% to 100%, the fan output will track the heating demand output. When the heating demand is 0%, the fan will stop.

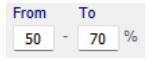
ECM Minimum Speed (AO)

If modulating fan is chosen, there is an ECM Minimum Speed setting that can be adjusted in Onyxx LX UI below Output C. The default is 30%.



Ramp adjustment boxes below Aux A thru Aux E

Ramp settings are preset to manufacturer recommendations. Adjustments can be performed at user risk and may result in undesirable behavior.



Sequence of Operation

Condensate avoidance as set by MSV-70, *other than None*

Series Fan Powered Application (as set per MSV-13 Auxiliary output C, control type)

In both occupied & standby mode, the fan is always on.

In Unoccupied mode, the fan will only start when there is a demand for heating or cooling. The fan can be configured with configuration point *AuxC Formula* to be either on/off or modulating. If configured on/off, the fan will start when unit is in occupied or standby mode. If configured modulating, the fan will be running at minimum fan speed regardless of occupancy and as soon as there is a heating or cooling demand (1%+) and will ramp up the fan output. When the heating or cooling demand rises from 30% to 100%, the fan output will track the heating or cooling demand output. When the heating demand is 0%, the fan will resume minimum fan speed.

Parallel Fan Powered Application (as set per MSV-13 Auxiliary output, control type) In both occupied & standby mode, the fan is always on.

In Unoccupied mode, the fan will only start when there is a demand for heating or cooling. The fan can be configured with configuration point *AuxC Formula* to be either on/off or

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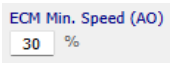
If modulating fan is chosen, there is an ECM Minimum Speed setting that can be adjusted in Onyxx LX UI below Output C. The default is 30%.



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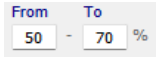


Demand Control Ventilation Application and Sequence (as set per AV66)

If the current CO2 measured reading from the TZ200HC zone sensor exceeds the CO2 setpoint [AV66], the damper will open to the maximum position and the fan will increase to 100% if using a Modulating Fan or On if Fan is On/Off type.

If the measured reading from the TZ200HC zone sensor reaches within 100ppm greater than the CO2 setpoint [AV66], the fan and damper will modulate toward normal operation in the BZ controller. Once the measured reading from the TZ200HC zone sensor is less than the CO2 setpoint [AV66], the BZ controller returns to normal operation.

Sequence of Operation

Maximum Airflow Flow [MaxAFpos] (as set per AV 3)

The maximum airflow flow setting can be set to a value no higher than 4999 CFM. When setting airflow, refer to the box/damper manufacturer rating for the correct size actuator motor. The actuator motor that is installed onboard the BZ424 is rated at 45 in-lb.

For assistance in calculating in-lb values you can use this guide from belimo.
https://www.belimo.com/mam/americas/technical_documents/Support%20material/how_to_size_a_damper_actuator.pdf

Minimum Airflow Flow (Heating) [When central system is in cooling] (as set per AV 5)

For boxes that are shut off only, or fan powered (either series or parallel) the heating minimum setting should be the same as the cooling minimum flow setting. Shut off boxes do not have the capability to heat and should not provide any less air than is required for ventilation. Fan-powered boxes will bring in return air to provide the required airflow for proper heating of the zone. Shut off boxes with reheat should have the heating minimum flow setting set at the level required for proper heating of the zone. This value is typically higher than the minimum cooling flow setpoint. In normal operation the box will modulate from maximum flow down to minimum cooling flow as there is less call for cooling, then will open to the heating minimum flow and open the heating coil on a call for heat.

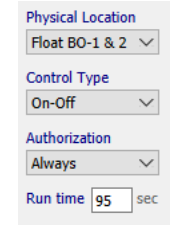
Minimum Airflow Flow (Cooling) [When central system is in Heating] (as set per AV 6)

The minimum cooling flow should be set based on the ventilation requirements for the zone based on the requirements of ASHRAE 62 or local codes. The minimum flow setting should be the same regardless if the box is configured as cooling only, cooling with reheat, or fan-powered.

zRuntime (as set per AV 0)

This setting is used to adjust the run time of the internal airflow actuator only. The default is 95 seconds.

The runtime for any of the external BOs is adjustable using Onyxx LX only via a Private VAR when applied using a floating output BO1/BO-2 or BO3/BO4. The default is 95 sec. There is a reference to AV-46 thru 50 but this does not write to the Private VAR. Do not write to these AVs in BACnet to adjust the runtime. Adjustment is solely through the Onyxx LX UI.



Sequence of Operation

Demand Control Ventilation Application and Sequence (as set per AV 66 and private VAR using SLC software interface)

If the current CO2 measured reading from AV-65, the selected zone sensor which is selected from the private VAR using SLC software interface *[app config/Dewpoint and CO2 tab]* exceeds the CO2 setpoint [AV66], the damper will open to the maximum position and if equipped and configured for series fan, the fan will increase to 100% if using a Modulating Fan or On if Fan is On/Off type.

C02 input location can be configured using a TZ200 series controller, an analog input [1-4] 0-10vdc [0-2000ppm fixed scale]. **(Using the private VAR using SLC software interface)**

Multiple CO2 Sensors from BZ424 Controllers that are controlling to a single RTU/AHU using a B[P]848 series controller

Multiple CO2 Sensors Controlling a Single AHU: Control will be based on the highest CO2 concentration measured in all spaces served by the air handler.

Please refer to the B[P] 848 series controllers Installation and user guide Demand Control Ventilation Application and Sequence for additional details.

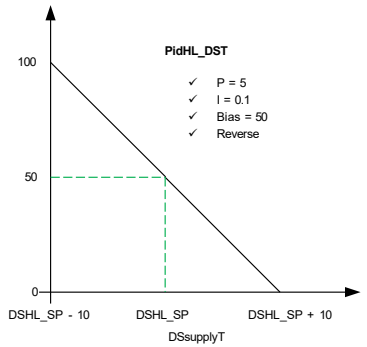
Condensate Avoidance Application and Sequence (as set per MSV-43, 70, 71 and AV 68, 69 & 71)

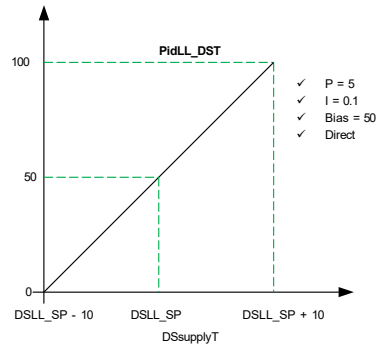
If the condensate detector [BV-5] indicates the presence of condensate in the drip pan, the BZ controller will close the chilled water damper valve and continue operating the fan and damper as normal. The BZ controller will return to normal operation when condensate is no longer detected.

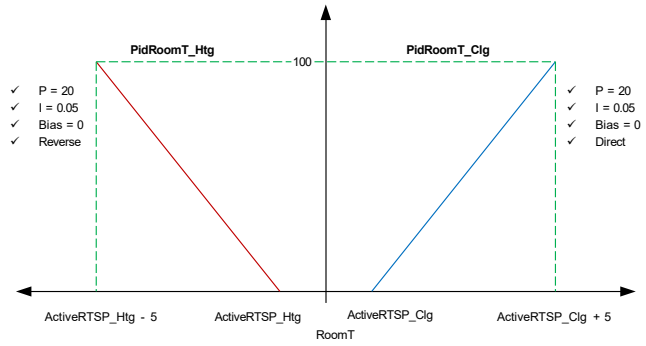
If the measured zone dewpoint (which requires a Humidity input] exceeds the entering chilled water temp (this must be selected to utilize this sequence) the BZ controller will close the chilled water damper valve and continue operating the fan and damper as normal. The BZ controller will return to normal operation when the zone dew point is less than 5 °F below the entering chilled water temperature.

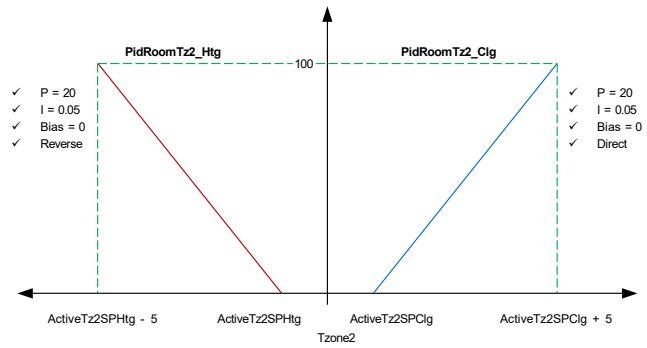
If the zone dewpoint rises above the dewpoint high limit, the ventilation damper will be modulated further open until the zone dewpoint drops back below the dewpoint low limit.

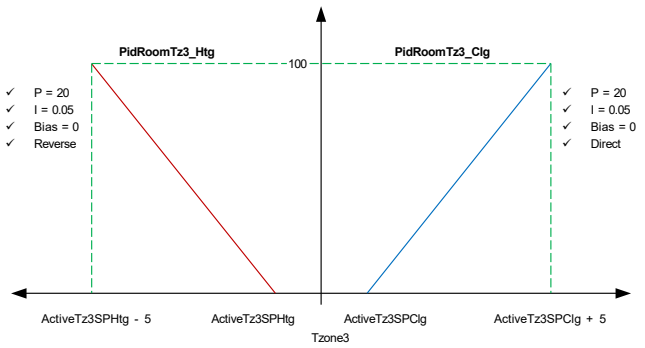
Sequence of Operation Details











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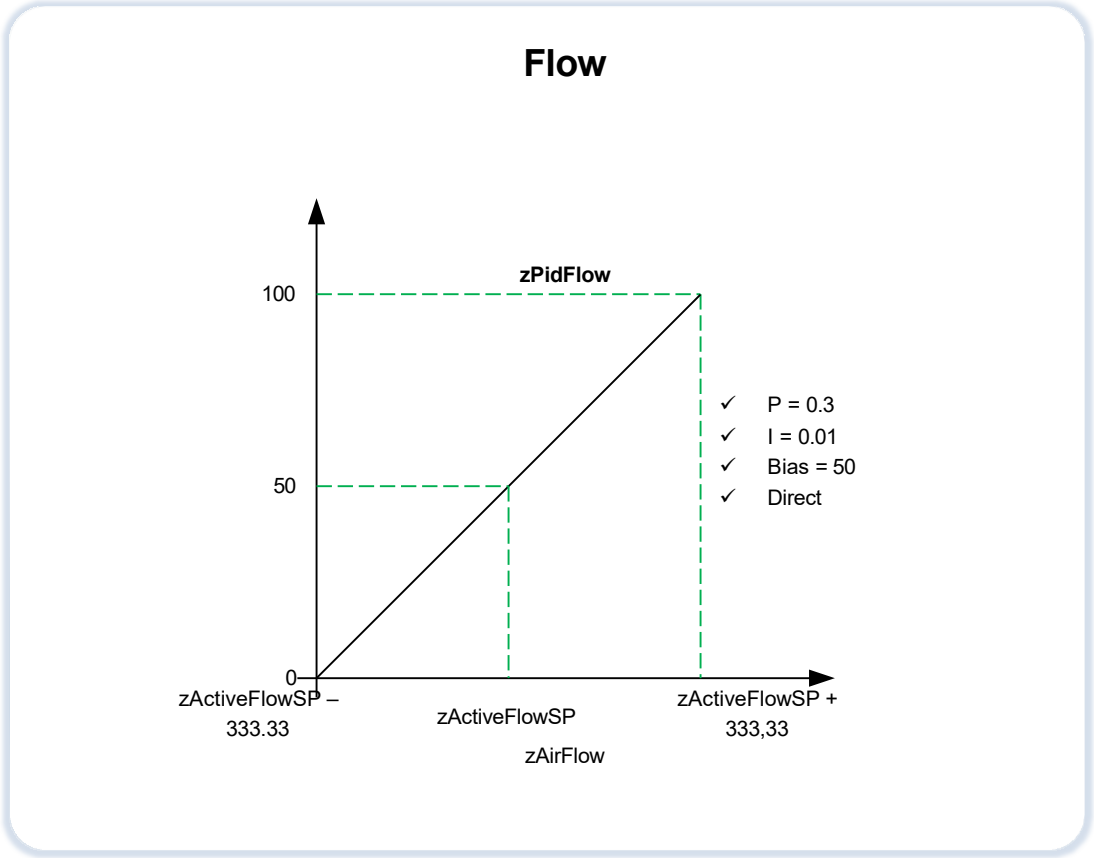
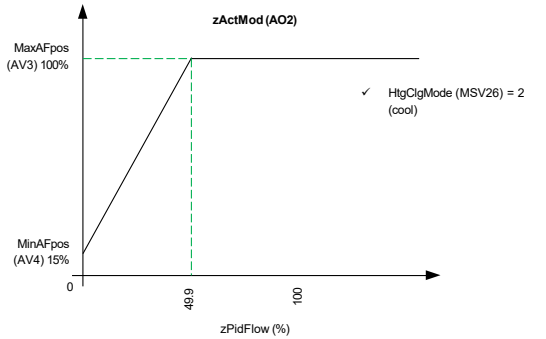
Sequence of Operation Details

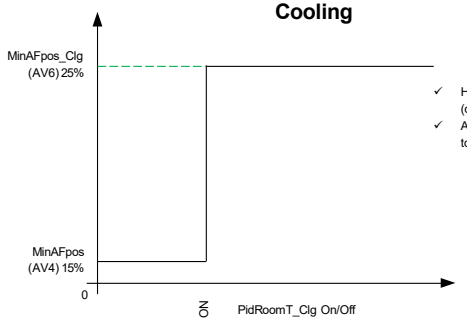


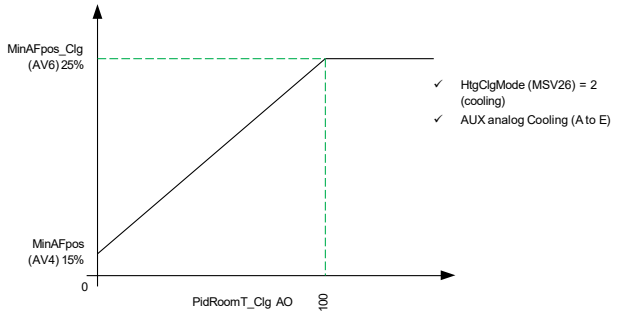
Sequence of Operation Details

Dependent Pressure Control
VAV_Type (MSV27) = 1



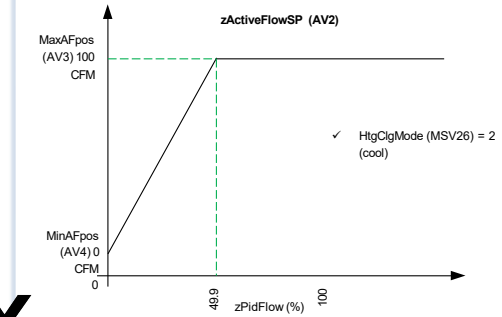
Cooling

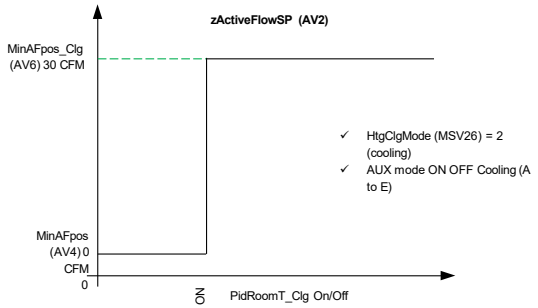


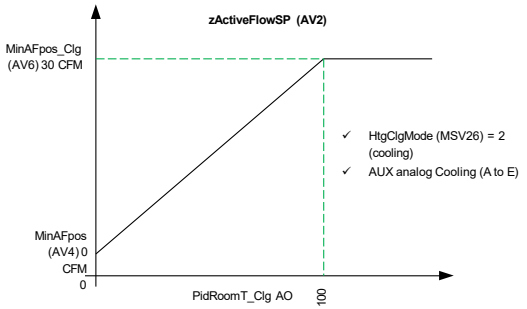


Control (%)
RoomT_Loc (MSV17):
1x Tzone.
PidRoomT_Clg
2x Tzone.
TzControlMode (MSV34):
Tzone1.
PidRoomT_Clg
Tzone2.
PidRoomTz2_Clg
Average.
(PidRoomT_Clg + PidRoomTz2_Clg) / 2.0
Maximum Htg
MIN(PidRoomT_Clg, PidRoomTz2_Clg)
Maximum Clg
MAX(PidRoomT_Clg, PidRoomTz2_Clg)
3x Tzone.
TzControlMode (MSV34):
Tzone1.
PidRoomT_Clg
Tzone2.
PidRoomTz2_Clg
Tzone3.
PidRoomTz3_Clg
Average.
(PidRoomT_Clg + PidRoomTz2_Clg + PidRoomTz3_Clg) / 3.0
Maximum Htg
MIN(PidRoomT_Clg, PidRoomTz2_Clg, PidRoomTz3_Clg)
Maximum Clg
MAX(PidRoomT_Clg, PidRoomTz2_Clg, PidRoomTz3_Clg)

Independent Pressure Control
VAV_Type (MSV27) = 2



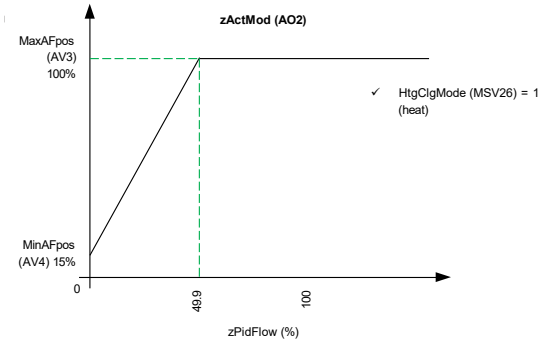


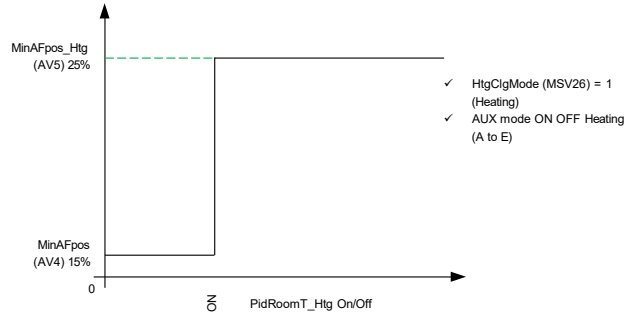


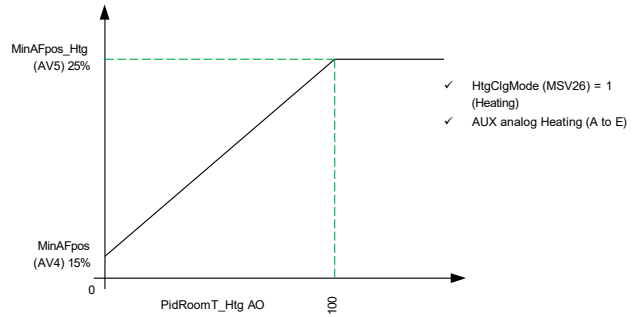
Sequence of Operation Details

Heating

Dependent Pressure Control
VAV_Type (MSV27) = 1

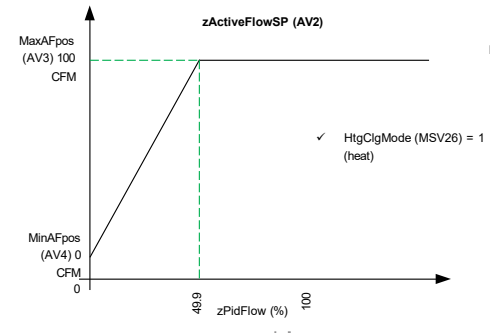


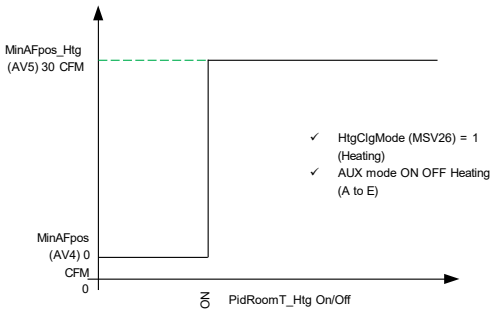


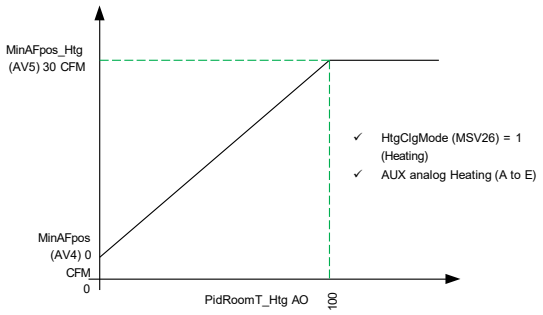


Control (%)
RoomT_Loc (MSV17):
1x Tzone.
PidRoomT_Htg
2x Tzone.
TzControlMode (MSV34):
Tzone1.
PidRoomT_Htg
Tzone2.
PidRoomTz2_Htg
Average.
(PidRoomT_Htg + PidRoomTz2_Htg) / 2.0
Maximum Htg
MIN(PidRoomT_Htg, PidRoomTz2_Htg)
Maximum Clg
MAX(PidRoomT_Htg, PidRoomTz2_Htg)
3x Tzone.
TzControlMode (MSV34):
Tzone1.
PidRoomT_Htg
Tzone2.
PidRoomTz2_Htg
Tzone3.
PidRoomTz3_Htg
Average.
(PidRoomT_Htg + PidRoomTz2_Htg + PidRoomTz3_Htg) / 3.0
Maximum Htg
MIN(PidRoomT_Htg, PidRoomTz2_Htg, PidRoomTz3_Htg)
Maximum Clg
MAX(PidRoomT_Htg, PidRoomTz2_Htg, PidRoomTz3_Htg)

Independent Pressure Control
VAV_Type (MSV27) = 2







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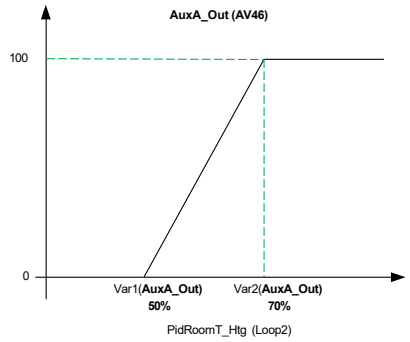
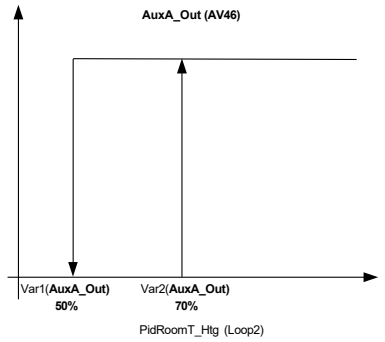
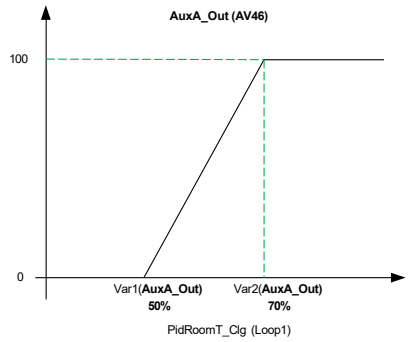
Sequence of Operation Details

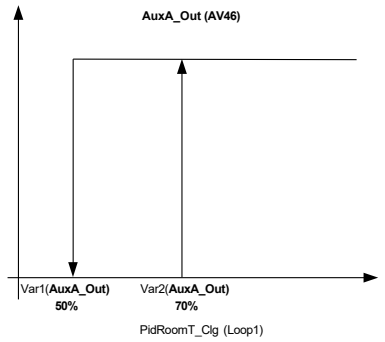


Aux A Heating



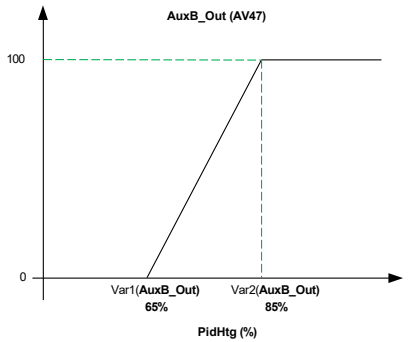


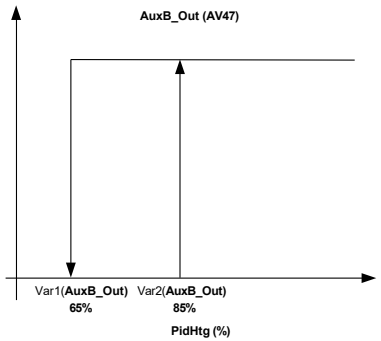
Aux A Cooling



Sequence of Operation Details

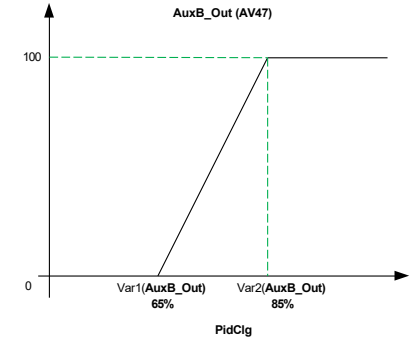
Aux B Heating

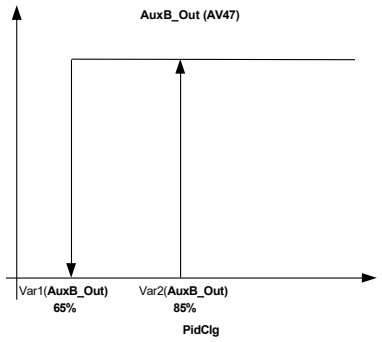




PidHtg (%)
RoomT_Loc (MSV17):
1x Tzone.
PidRoomT_Htg
2x Tzone.
TzControlMode (MSV34):
Tzone1.
PidRoomT_Htg
Tzone2.
PidRoomTz2_Htg
Average.
(PidRoomT_Htg + PidRoomTz2_Htg) / 2.0
Maximum Htg
MIN(PidRoomT_Htg, PidRoomTz2_Htg)
Maximum Clg
MAX(PidRoomT_Htg, PidRoomTz2_Htg)
3x Tzone.
TzControlMode (MSV34):
Tzone1.
PidRoomT_Htg
Tzone2.
PidRoomTz2_Htg
Tzone3.
PidRoomTz3_Htg
Average.
(PidRoomT_Htg + PidRoomTz2_Htg + PidRoomTz3_Htg) / 3.0
Maximum Htg
MIN(PidRoomT_Htg, PidRoomTz2_Htg, PidRoomTz3_Htg)
Maximum Clg
MAX(PidRoomT_Htg, PidRoomTz2_Htg, PidRoomTz3_Htg)

Aux B Cooling

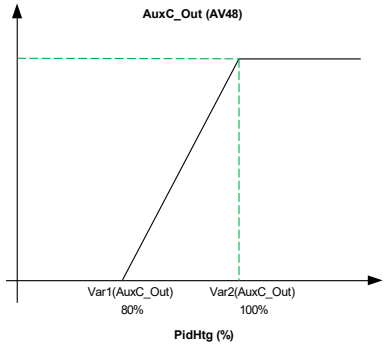


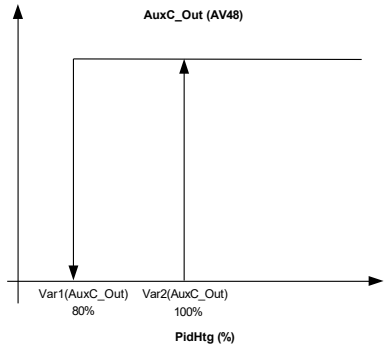


PidClg (%)
RoomT_Loc (MSV17):
1x Tzone.
PidRoomT_Clg
2x Tzone.
TzControlMode (MSV34):
Tzone1.
PidRoomT_Clg
Tzone2.
PidRoomTz2_Clg
Average.
(PidRoomT_Clg + PidRoomTz2_Clg) / 2.0
Maximum Htg
MIN(PidRoomT_Clg, PidRoomTz2_Clg)
Maximum Clg
MAX(PidRoomT_Clg, PidRoomTz2_Clg)
3x Tzone.
TzControlMode (MSV34):
Tzone1.
PidRoomT_Clg
Tzone2.
PidRoomTz2_Clg
Tzone3.
PidRoomTz3_Clg
Average.
(PidRoomT_Clg + PidRoomTz2_Clg + PidRoomTz3_Clg) / 3.0
Maximum Htg
MIN(PidRoomT_Clg, PidRoomTz2_Clg, PidRoomTz3_Clg)
Maximum Clg
MAX(PidRoomT_Clg, PidRoomTz2_Clg, PidRoomTz3_Clg)

Sequence of Operation Details

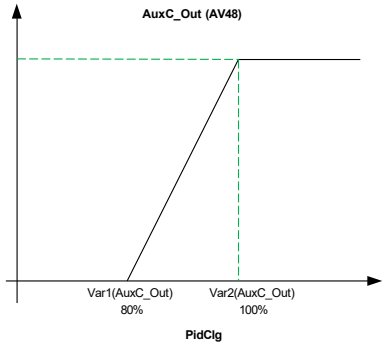
Aux C Heating

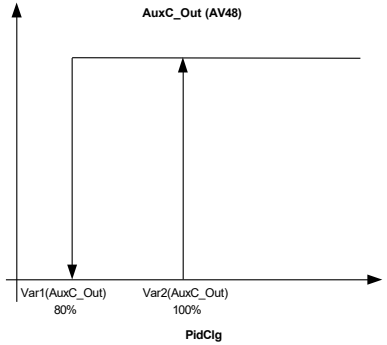




PidHtg (%)
RoomT_Loc (MSV17):
1x Tzone.
PidRoomT_Htg
2x Tzone.
TzControlMode (MSV34):
Tzone1.
PidRoomT_Htg
Tzone2.
PidRoomTz2_Htg
Average.
(PidRoomT_Htg + PidRoomTz2_Htg) / 2.0
Maximum Htg
MIN(PidRoomT_Htg, PidRoomTz2_Htg)
Maximum Clg
MAX(PidRoomT_Htg, PidRoomTz2_Htg)
3x Tzone.
TzControlMode (MSV34):
Tzone1.
PidRoomT_Htg
Tzone2.
PidRoomTz2_Htg
Tzone3.
PidRoomTz3_Htg
Average.
(PidRoomT_Htg + PidRoomTz2_Htg + PidRoomTz3_Htg) / 3.0
Maximum Htg
MIN(PidRoomT_Htg, PidRoomTz2_Htg, PidRoomTz3_Htg)
Maximum Clg
MAX(PidRoomT_Htg, PidRoomTz2_Htg, PidRoomTz3_Htg)

Aux C Cooling





PidClg (%)
RoomT_Loc (MSV17):
1x Tzone.
PidRoomT_Clg
2x Tzone.
TzControlMode (MSV34):
Tzone1.
PidRoomT_Clg
Tzone2.
PidRoomTz2_Clg
Average.
(PidRoomT_Clg + PidRoomTz2_Clg) / 2.0
Maximum Htg
MIN(PidRoomT_Clg, PidRoomTz2_Clg)
Maximum Clg
MAX(PidRoomT_Clg, PidRoomTz2_Clg)
3x Tzone.
TzControlMode (MSV34):
Tzone1.
PidRoomT_Clg
Tzone2.
PidRoomTz2_Clg
Tzone3.
PidRoomTz3_Clg
Average.
(PidRoomT_Clg + PidRoomTz2_Clg + PidRoomTz3_Clg) / 3.0
Maximum Htg
MIN(PidRoomT_Clg, PidRoomTz2_Clg, PidRoomTz3_Clg)
Maximum Clg
MAX(PidRoomT_Clg, PidRoomTz2_Clg, PidRoomTz3_Clg)

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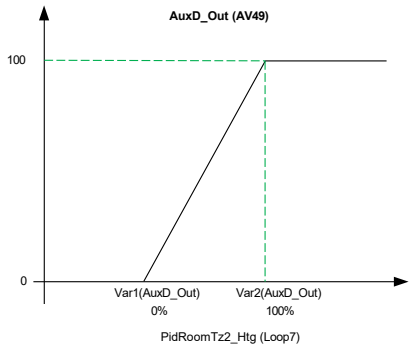
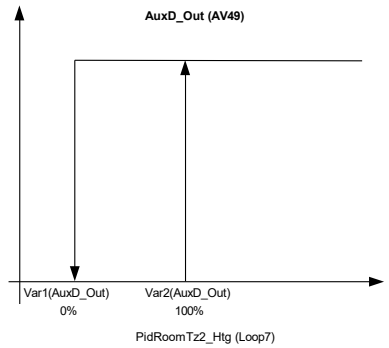
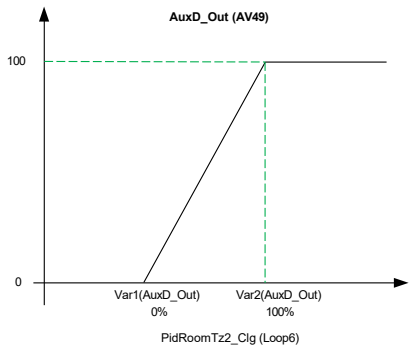
Sequence of Operation Details

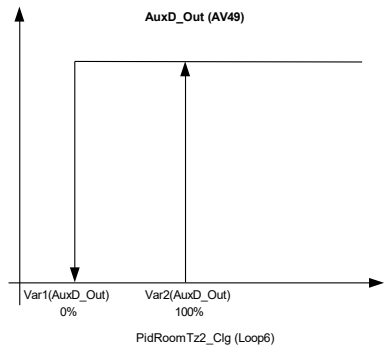


Aux D Heating





Aux D Cooling



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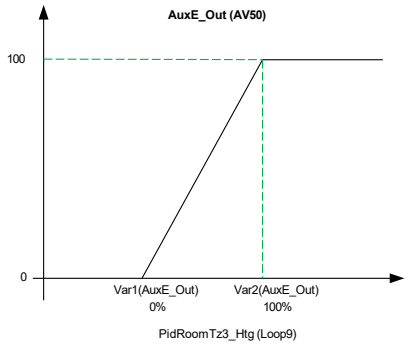
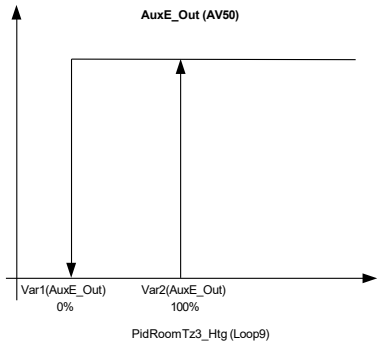
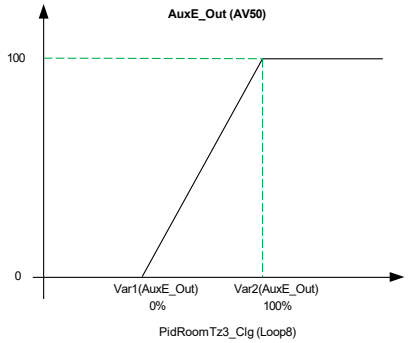
Sequence of Operation Details

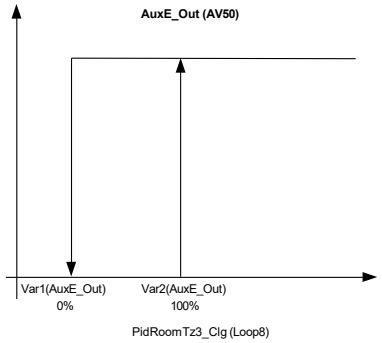


Aux E Heating





Aux E Cooling



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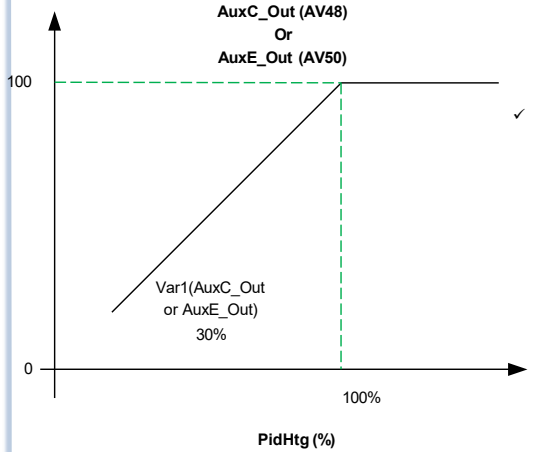
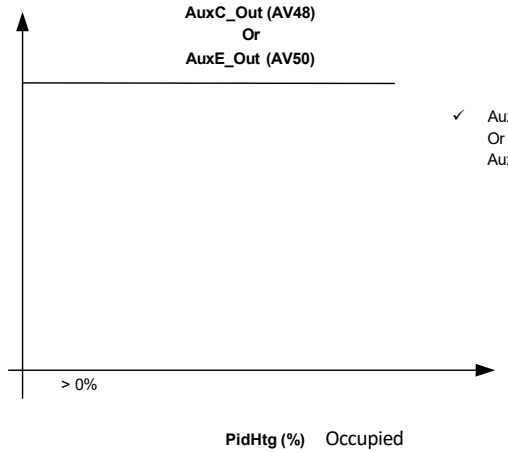
Sequence of Operation Details

Additional Sequence of Operation Details in notes on page 13 for non-condensate avoidance

AuxC_Type or AuxE_Type
Parallel Fan (7)



✓ AuxC_Formula (MSV14) != 4 **Analog**
Or
AuxE_Formula (MSV41) != 4 **Analog**

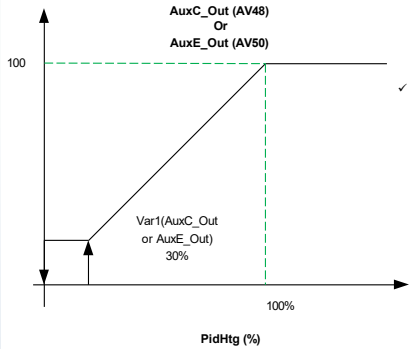


✓ AuxC_Formula (MSV14) == 4 **On/Off**
Or
AuxE_Formula (MSV41) == 4 **On/Off**

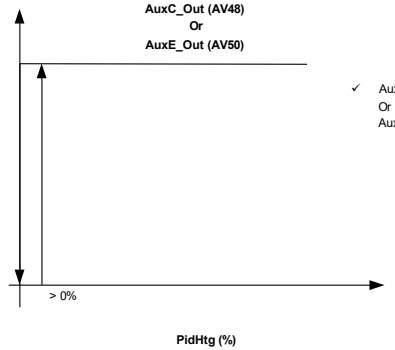
PidHtg (%) RoomT_Loc
(MSV17): 1x Tzone.
PidRoomT_Htg
2x Tzone. TzControlMode (MSV34):
Tzone1.
PidRoomT_Htg
Tzone2.
PidRoomTz2_Htg
Average.
(PidRoomT_Htg + PidRoomTz2_Htg) / 2.0
Maximum Htg
MIN(PidRoomT_Htg, PidRoomTz2_Htg)
Maximum Clg
MAX(PidRoomT_Htg, PidRoomTz2_Htg)
3x Tzone.
TzControlMode (MSV34):
Tzone1.
PidRoomT_Htg
Tzone2.
PidRoomTz2_Htg
Tzone3.
PidRoomTz3_Htg
Average.
(PidRoomT_Htg + PidRoomTz2_Htg + PidRoomTz3_Htg) / 3.0
Maximum Htg
MIN(PidRoomT_Htg, PidRoomTz2_Htg, PidRoomTz3_Htg)
Maximum Clg
MAX(PidRoomT_Htg, PidRoomTz2_Htg, PidRoomTz3_Htg)

Sequence of Operation Details

AuxC_Type or AuxE_Type
Series Fan (8)
Unoccupied and Standby mode



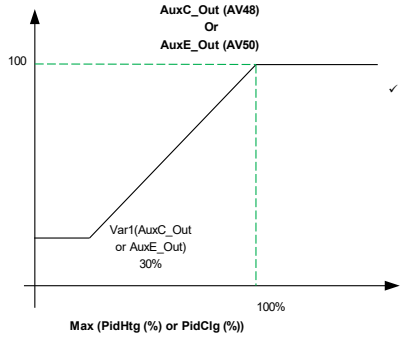
✓ AuxC_Formula (MSV14) != 4 **Analog**
Or
AuxE_Formula (MSV41) != 4 **Analog**



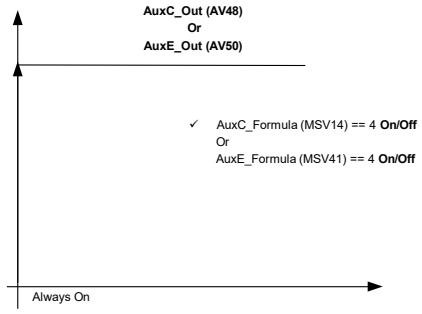
✓ AuxC_Formula (MSV14) == 4 **On/Off**
Or
AuxE_Formula (MSV41) == 4 **On/Off**

PidHtg (%)
RoomT_Loc (MSV17):
1x Tzone.
PidRoomT_Htg
2x Tzone.
TzControlMode (MSV34):
Tzone1.
PidRoomT_Htg
Tzone2.
PidRoomTz2_Htg
Average.
(PidRoomT_Htg + PidRoomTz2_Htg) / 2.0
Maximum Htg
MIN(PidRoomT_Htg, PidRoomTz2_Htg)
Maximum Clg
MAX(PidRoomT_Htg, PidRoomTz2_Htg)
3x Tzone.
TzControlMode (MSV34):
Tzone1.
PidRoomT_Htg
Tzone2.
PidRoomTz2_Htg
Tzone3.
PidRoomTz3_Htg
Average.
(PidRoomT_Htg + PidRoomTz2_Htg + PidRoomTz3_Htg) / 3.0
Maximum Htg
MIN(PidRoomT_Htg, PidRoomTz2_Htg, PidRoomTz3_Htg)
Maximum Clg
MAX(PidRoomT_Htg, PidRoomTz2_Htg, PidRoomTz3_Htg)

AuxC_Type or AuxE_Type
Series Fan (8)
Occupied mode



✓ AuxC_Formula (MSV14) != 4 **Analog**
Or
AuxE_Formula (MSV41) != 4 **Analog**



✓ AuxC_Formula (MSV14) == 4 **On/Off**
Or
AuxE_Formula (MSV41) == 4 **On/Off**

PidClg (%)
RoomT_Loc (MSV17):
1x Tzone.
PidRoomT_Clg
2x Tzone.
TzControlMode (MSV34):
Tzone1.
PidRoomT_Clg
Tzone2.
PidRoomTz2_Clg
Average.
(PidRoomT_Clg + PidRoomTz2_Clg) / 2.0
Maximum Htg
MIN(PidRoomT_Clg, PidRoomTz2_Clg)
Maximum Clg
MAX(PidRoomT_Clg, PidRoomTz2_Clg)
3x Tzone.
TzControlMode (MSV34):
Tzone1.
PidRoomT_Clg
Tzone2.
PidRoomTz2_Clg
Tzone3.
PidRoomTz3_Clg
Average.
(PidRoomT_Clg + PidRoomTz2_Clg + PidRoomTz3_Clg) / 3.0
Maximum Htg
MIN(PidRoomT_Clg, PidRoomTz2_Clg, PidRoomTz3_Clg)
Maximum Clg
MAX(PidRoomT_Clg, PidRoomTz2_Clg, PidRoomTz3_Clg)

Physical Inputs and Outputs (AIs, AOs, BIs & AOs)

Object Instance	Object name	Description	Default value	Tags	Minimum range value	Maximum range value	Inactive_Text	Active_Text
AI0	AI_1	Analog input 1	---	Status	0	4095		
AI1	AI_2	Analog input 2	---	Status	0	4095		
AI2	AI_3	Analog input 3	---	Status	0	4095		
AI3	AI_4	Analog input 4	---	Status	0	4095		
AI4	zAirFlow	Air flow sensor	xxx CFM	Status				
AO0	AO_1	Analog output 1	---	Status	0 %	100 %		
AO1	AO_2	Analog output 2	---	Status	0 %	100 %		
AO2	zActMod	Damper Actuator (modulating)	---	Status	0 %	100 %		
AO3	BO_1	Binary output 1	---	Status			Off	On
A04	BO_2	Binary output 2	---	Status			Off	On
AO5	BO_3	Binary output 3	---	Status			Off	On
AO6	BO_4	Binary output 4	---	Status			Off	On

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Analog Values

Object Instance	Object name	Description	Default value	Tags	Minimum range value	Maximum range value
AV0	zRunTime	Running time of the actuator (floating)	95 sec	Cfg	30 sec	480 sec
AV1	zDeadband	Deadband of the actuator	1 %	Cfg	1 %	5 %
AV2	zActiveFlowSP	Active flow setpoint	---	Status	0 CFM	2000 CFM
AV3	MaxAFpos	Maximum airflow (or position)	1000 CFM	Cfg	0 CFM	2000 CFM
AV4	MinAFpos	Minmum airflow (or position)	100 CFM	Cfg	0 CFM	2000 CFM
AV5	MinAFpos_Htg	Min. AF (or position) @ 100% heating	150 CFM	Cfg	0 CFM	2000 CFM
AV6	MinAFpos_Clg	Min. AF (or position) @ 100% cooling	100 CFM	Cfg	0 CFM	2000 CFM
AV10	RTSPmin_Occ	Minimum Room T° setpoint	59°F (15°C)	Cfg	32°F (0°C)	122°F (50°C)
AV11	RTSPmax_Occ	Maximum Room T° setpoint	82°F (28°C)	Cfg	32°F (0°C)	122°F (50°C)
AV12	RTSPclg_Occ	Room T° cooling setpoint, occupied	---	User	32°F (0°C)	122°F (50°C)
AV13	RTSPhtg_Occ	Room T° heating setpoint, occupied	---	User	32°F (0°C)	122°F (50°C)
AV14	RTSP_DeadBand	RTSP deadband between Clg and Htg	1.8°F (1°C)	Cfg	1.8°F (1°C)	18°F (10°C)
AV15	RTSPclg_Unocc	Room T° cooling setpoint, unoccupied	80°F (27°C)	User	32°F (0°C)	122°F (50°C)
AV16	RTSPhtg_Unocc	Room T° heating setpoint, unoccupied	65°F (18°C)	User	32°F (0°C)	122°F (50°C)
AV17	RTSPclg_STBdt	Standby mode, RTSP clg offset (pos.)	1.8°F (1°C)	Cfg	1.8°F (1°C)	18°F (10°C)
AV18	RTSPhtg_STBdt	Standby mode, RTSP htg offset (neg.)	-1.8°F (-1°C)	Cfg	-1.8°F (-1°C)	-18°F (-10°C)
AV19	ActiveRTSP_Clg	Active cooling room T° setpoint	---	Status	AV10	AV11
AV20	ActiveRTSP_Htg	Active heating room T° setpoint	---	Status	AV10	AV11

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Analog Values

Object Instance	Object name	Description	Default value	Tags	Minimum range value	Maximum range value
AV21	DSHL_SP	Downstream high limit setpoint	95°F (35°C)	Cfg	75°F (24°C)	122°F (50°C)
AV22	DSLL_SP	Downstream low limit setpoint	46°F (8°C)	Cfg	40°F (4°C)	70°F (21°C)
AV23	ChOver_SP	ChOver T° SP (constant or RoomT+X)	1.8°F (1°C)	Cfg	0°F (0°C)	70°F (21°C)
AV25	Calib_RoomT	Room T° calibration	0°F (0°C)	Cfg	-9°F (-5°C)	9°F (5°C)
AV26	Calib_RoomSP	Room T° Setpoint calibration	0°F (0°C)	Cfg	-9°F (-5°C)	9°F (5°C)
AV27	Calib_usT	Upstream T° calibration	0°F (0°C)	Cfg	-9°F (-5°C)	9°F (5°C)
AV28	Calib_dsT	Downstream T° calibration	0°F (0°C)	Cfg	-9°F (-5°C)	9°F (5°C)
AV30	K_Factor	Constant from Pitot characteristics	2900	Cfg	100	10000
AV31	DuctArea	Duct area	1.000 ft2	Cfg	0.08 ft2	2.2 ft2
AV33	MinOffTime_Htg	Minimum OFF time, heating (BO)	60 sec	Cfg	0 sec	300 sec
AV34	MinOffTime_Clg	Minimum OFF time, cooling (BO)	300 sec	Cfg	0 sec	300 sec
AV35	MotionTime	Motion sensor active time	60 min	Cfg	0 min	300 min
AV36	OvrTime	Occupancy override active time	60 min	Cfg	0 min	300 min
AV37	MaxPower	Maximum power allowed	100%	Cfg	0 %	100 %
AV38	OvrRemainTime	Override remaining time	---	Status	0 sec	18000 sec
AV39	ValidationErr	0 = no error	Internal use	Status	---	---
AV41	RoomT	Room Temperature	---	Status	32°F (0°C)	122°F (50°C)
AV42	RoomSP	Room Temperature Setpoint	72°F (22°C)	User	AV10	AV11

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Analog Values

Object Instance	Object name	Description	Default value	Tags	Minimum range value	Maximum range value
AV43	USsupplyT	Upstream supply T° (from main fan)	---	Status	32°F (0°C)	122°F (50°C)
AV44	DSsupplyT	Downstream supply T° (after reheat)	---	Status	32°F (0°C)	122°F (50°C)
AV46	AuxA_Out	Auxiliary output A	---	Status	0%	100%
AV47	AuxB_Out	Auxiliary output B	---	Status	0%	100%
AV48	AuxC_Out	Auxiliary output C	---	Status	0%	100%
AV49	AuxD_Out	Auxiliary output D, (Tzone #2)	---	Status	0%	100%
AV50	AuxE_Out	Auxiliary output E, (Tzone #3)	---	Status	0%	100%
AV52	EncodedVal1	Internal Use	---	Status	---	---
AV53	EncodedVal2	Internal Use	---	Status	---	---
AV55	ActiveTz2SPHtg	Active heating Tzone #2 setpoint	---	User	AV10	AV11
AV56	ActiveTz2SPClg	Active cooling Tzone #2 setpoint	---	User	AV10	AV11
AV57	ActiveTz3SPHtg	Active heating Tzone #3 setpoint	---	User	AV10	AV11
AV58	ActiveTz3SPClg	Active cooling Tzone #3 setpoint	---	User	AV10	AV11
AV64	RoomRH	Room relative humidity	---	Status	0%	100%
AV65	RoomCO2	Room carbin dioxide (CO2)	---	Status	0PPM	2000PPM

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Analog Values

Object Instance	Object name	Description	Default value	Tags	Minimum range value	Maximum range value
AV66	RoomCO2SP	Room CO2 Setpoint	---	User	0PPM	2000PPM
AV67	RoomCO2Dem	Room CO2 demand	---	Status	0%	100%
AV68	DewPtHL	Dewpoint Temperature High Limit	---	User	32°F (0°C)	122°F (50°C)
AV69	DewPtLL	Dewpoint Temperature Low Limit	---	User	32°F (0°C)	122°F (50°C)
AV70	DewPoint	Dewpoint Calculated Temperature	---	Status	32°F (0°C)	122°F (50°C)
AV71	DewPtOffset	Dewpoint Offset to close cooling valve	---	Status	32°F (0°C)	122°F (50°C)
AV72	Chillwater	Chilled Water Reading	---	Status	32°F (0°C)	122°F (50°C)

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Binary Values

Object Instance	Object name	Description	Default value	Tags	Inactive_Text	Active_Text
BV0	ActRotation	Actuator rotation direction	Direct	Cfg	Direct	Reverse
BV1	FanStatus	FanStatus	On	Status	Off	On
BV2	DewPtHL	Dewpoint Temperature High Limit	---	User	32°F (0°C)	122°F (50°C)
BV3	OccSched	Occupancy schedule	Day	Clg	Night	Day
BV4	OvrStatus	Occupancy override status	Inactive	Status	Inactive	Active
BV5	Cond_Status	Condensation Status from input	---	Status	Normal	Detected
BV10	SaveAndRestart	Saves Objects to Flash and restart	Off	Cmd	Off	On

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PID Loops

Object Instance	Object name	Description	Action	Kp	Ki	Bias
LOOP0	zPidFlow	Flow control PID loop	Reverse	0.3	0.01	50
LOOP1	PidRoomT_Clg	Room T° control loop, cooling	Direct	20	0.05	0
LOOP2	PidRoomT_Htg	Room T° control loop, heating	Reverse	20	0.05	0
LOOP3	PidHL_DST	Downstream high limit control loop	Reverse	5	0.1	50
LOOP4	PidLL_DST	Downstream low limit control loop	Direct	5	0.1	50
LOOP6	PidRoomTz2_Clg	Room T° control loop, cooling	Direct	20	0.05	0
LOOP7	PidRoomTz2_Htg	Room T° control loop, heating	Reverse	20	0.05	0
LOOP8	PidRoomTz3_Clg	Room T° control loop, cooling	Direct	20	0.05	0
LOOP9	PidRoomTz3_Htg	Room T° control loop, heating	Reverse	20	0.05	0

Multi-State Values

Object Instance	Object name	Description	Tags	Default value	State texts
MSV1	Units_Type	Units configuration (T° & Airflow)	Cfg	AutoDet	°F, CFM °C, CFM °F, LS °C, LS
MSV2	Tstor10K_Type	Thermistors type (std type 3 or type 2)	Cfg	Type 3 (std)	Type 3 (std) Type 2
MSV4	AuxA_Loc	Auxiliary output A physical location	Cfg	AO-1	None AO-1 AO-2 BO-1 BO-2 BO-3 BO-4 Float BO-1,2
MSV5	AuxA_Type	Auxiliary output A control type	Cfg	Elect. Reheat	None Elect. Reheat Water Reheat Elect. Bboard Water Bboard DX Cool Water Cool

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Multi-State Values

Object Instance	Object name	Description	Tags	Default value	State texts
MSV6	AuxA_Formula	Auxiliary output A formula	Cfg	0-10 VDC, Dir.	0-10 VDC, Dir. 0-10 VDC, Rev. 2-10 VDC, Dir. 2-10 VDC, Rev On-Off Pulse, Dir. Pulse, Rev.
MSV7	AuxA_Auto	Auxiliary output A authorization	Cfg	Always	Never Always FanStatus MaxPower Fan+MaxPwr
MSV8	AuxB_Loc	Auxiliary output B physical location	Cfg	BO-1	None AO-1 AO-2 BO-1 BO-2 BO-3 BO-4 Float BO-1,2

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Multi-State Values

Object Instance	FCU Object name	Description	Tags	Default value	State texts
MSV9	AuxB_Type	Auxiliary output B control type	Cfg	Elect. Bboard	None Elect. Reheat Water Reheat Elect. Bboard Water Bboard DX Cool Water Cool
MSV10	AuxB_Formula	Auxiliary output B formula	Cfg	Pulse, Dir.	0-10 VDC, Dir. 0-10 VDC, Rev. 2-10 VDC, Dir. 2-10 VDC, Rev On-Off Pulse, Dir. Pulse, Rev.
MSV11	AuxB_Auto	Auxiliary output B authorization	Cfg	Always	Never Always FanStatus MaxPower Fan+MaxPwr

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Multi-State Values

Object Instance	FCU Object name	Description	Tags	Default value	State texts
MSV12	AuxC_Loc	Auxiliary output C physical location	Cfg	BO-2	None AO-1 AO-2 BO-1 BO-2 BO-3 BO-4 Float BO-1,2
MSV13	AuxC_Type	Auxiliary output C control type	Cfg	Elect. Bboard	None Elect. Reheat Water Reheat Elect. Bboard Water Bboard DX Cool Water Cool Parallel Fan Series Fan
MSV14	AuxC_Formula	Auxiliary output C formula	Cfg	Pulse, Dir.	0-10 VDC, Dir. 0-10 VDC, Rev. 2-10 VDC, Dir. 2-10 VDC, Rev On-Off Pulse, Dir. Pulse, Rev.

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Multi-State Values

Object Instance	FCU Object name	Description	Tags	Default value	State texts
MSV15	AuxC_Auto	Auxiliary output C authorization	Cfg	Always	Never Always FanStatus MaxPower Fan+MaxPwr
MSV17	RoomT_Loc	Room T°physical location	Cfg	Tzone	None AI-1 AI-2 AI-3 AI-4 Tzone External AI-1 (Trane) AI-2 (Trane)
MSV18	RoomSP_Loc	Room setpoint location (occupied)	Cfg	Tzone	None AI-1 AI-2 AI-3 AI-4 Tzone External AI-1 (Trane) AI-2 (Trane)

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Multi-State Values

Object Instance	FCU Object name	Description	Tags	Default value	State texts
MSV19	USsupplyT_Loc	Upstream supply T° loc. (from main fan)	Cfg	AI-1	None AI-1, AI-2, AI-3 or AI-4 External
MSV20	DSsupplyT_Loc	Downstream supply T° loc (after reheat)	Cfg	None	None AI-1, AI-2, AI-3 or AI-4
MSV21	FanStatus_Loc	Fan status location	Cfg	None	None AI-1(BI), AI-2(BI), AI-3(BI) or AI-1(BI) External
MSV22	Motion_Loc	Motion sensor location	Cfg	None	None NO, AI-1 (BI) / NC, AI-1 (BI) / NO, AI-2 (BI) / NC, AI-2 (BI) NO, AI-3 (BI) / NC, AI-3 (BI) / NO, AI-4 (BI) / NC, AI-4 (BI) External
MSV23	Sched_Loc	Scheduler location	Cfg	None	None AI-1(BI), AI-2(BI), AI-3(BI) or AI-4(BI) External
MSV24	OccMode	Occupancy mode	Status	Occupied	Unoccupied Occupied Standby
MSV25	ChOver_Type	Changeover type	Cfg	RoomT°+Offset	None Constant RoomT°+Offset

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Multi-State Values

Object Instance	FCU Object name	Description	Tags	Default value	State texts
MSV26	HtgClgMode	Heating/cooling mode	Cfg	Cool	Heat Cool Unused
MSV27	VAV_Type	VAV box type (dependent/independent)	Cfg	Dependent	Dependent Independent Unused
MSV29	CoolingWeight	Cooling Weight in demand calculation	Cfg	1	0 to 10
MSV30	HeatingWeight	Heating Weight in demand calculation	Cfg	1	0 to 10
MSV34	TzControlMode	Control mode with multiple Tzone	Cfg	None	Tzone1 Tzone2 Tzone3 Average Maximum Htg. Maximum Clg.

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Multi-State Values

Object Instance	FCU Object name	Description	Tags	Default value	State texts
MSV35	AuxD_Loc	Auxiliary output D physical location	Cfg	None	None AO-1 AO-2 BO-1 BO-2 BO-3 BO-4 Float BO-1,2
MSV36	AuxD_Type	Auxiliary output D control type	Cfg	None	None Elect. Reheat Water Reheat Elect. Bboard Water Bboard DX Cool Water Cool
MSV37	AuxD_Formula	Auxiliary output D formula	Cfg	0-10 VDC, Dir.	0-10 VDC, Dir. 0-10 VDC, Rev. 2-10 VDC, Dir. 2-10 VDC, Rev On-Off Pulse, Dir. Pulse, Rev.

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Multi-State Values

Object Instance	FCU Object name	Description	Tags	Default value	State texts
MSV38	AuxD_Auto	Auxiliary output D authorization	Cfg	None	Never Always FanStatus MaxPower Fan+MaxPwr
MSV39	AuxE_Loc	Auxiliary output E physical location	Cfg	None	None AO-1 AO-2 BO-1 BO-2 BO-3 BO-4 Float BO-1,2
MSV40	AuxE_Type	Auxiliary output E control type	Cfg	None	None Elect. Reheat Water Reheat Elect. Bboard Water Bboard DX Cool Water Cool

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Multi-State Values

Object Instance	FCU Object name	Description	Tags	Default value	State texts
MSV41	AuxE_Formula	Auxiliary output E formula	Cfg	0-10 VDC, Dir.	0-10 VDC, Dir. 0-10 VDC, Rev. 2-10 VDC, Dir. 2-10 VDC, Rev On-Off Pulse, Dir. Pulse, Rev.
MSV42	AuxE_Auto	Auxiliary output E authorization	Cfg	None	Never Always FanStatus MaxPower Fan+MaxPwr

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Multi-State Values

Object Instance	FCU Object name	Description	Tags	Default value	State texts
MSV43	*Cond_Loc*	*Condensation detection input Location*	*Cfg*	*--*	*None* *AI-1* *AI-2* *AI-3* *AI-4*
MSV62	*RoomTSPType*	*Room Temp Setpoint Type (in Occupied)*	Cfg	*Central*	*Heating* *Central* *Cooling*
MSV70	*ChillWaterLoc*	*Chill Water Input Location*	*Cfg*	*None*	*None* *AI-1* *AI-2* *AI-3* *AI-4* *External*
MSV71	*HumLoc*	*Humidity reading Location*	*Cfg*	*None*	*None* *Tzone(s)* *External*
MSV72	*TimedOvrStatus*	*Timed Override Status*	*Status*	*Idle*	*Idle* *TimedOvrRequest* *TimedOvrCancel*

Please note that objects tagged as:

- Cfg: represent configuration properties of the device that are typically only set once during commissioning and start-up
- User: represent properties or objects that are typically manipulated by users of the controller
- Status: represent objects or properties that are ''typically'' meant to be displayed on graphics for various required visualization
- Cmd: represent objects that can be controlled directly by other BACnet external process

TZ Series Room Sensors

Object name	Description	Room T	Units	Status
Tzone1	Wall mount interface	Current Value	°F	Normal
Tzone2	Wall mount interface	Current Value	°F	Normal
Tzone3	Wall mount interface	Current Value	°F	Normal

RS-485 Network Guidelines

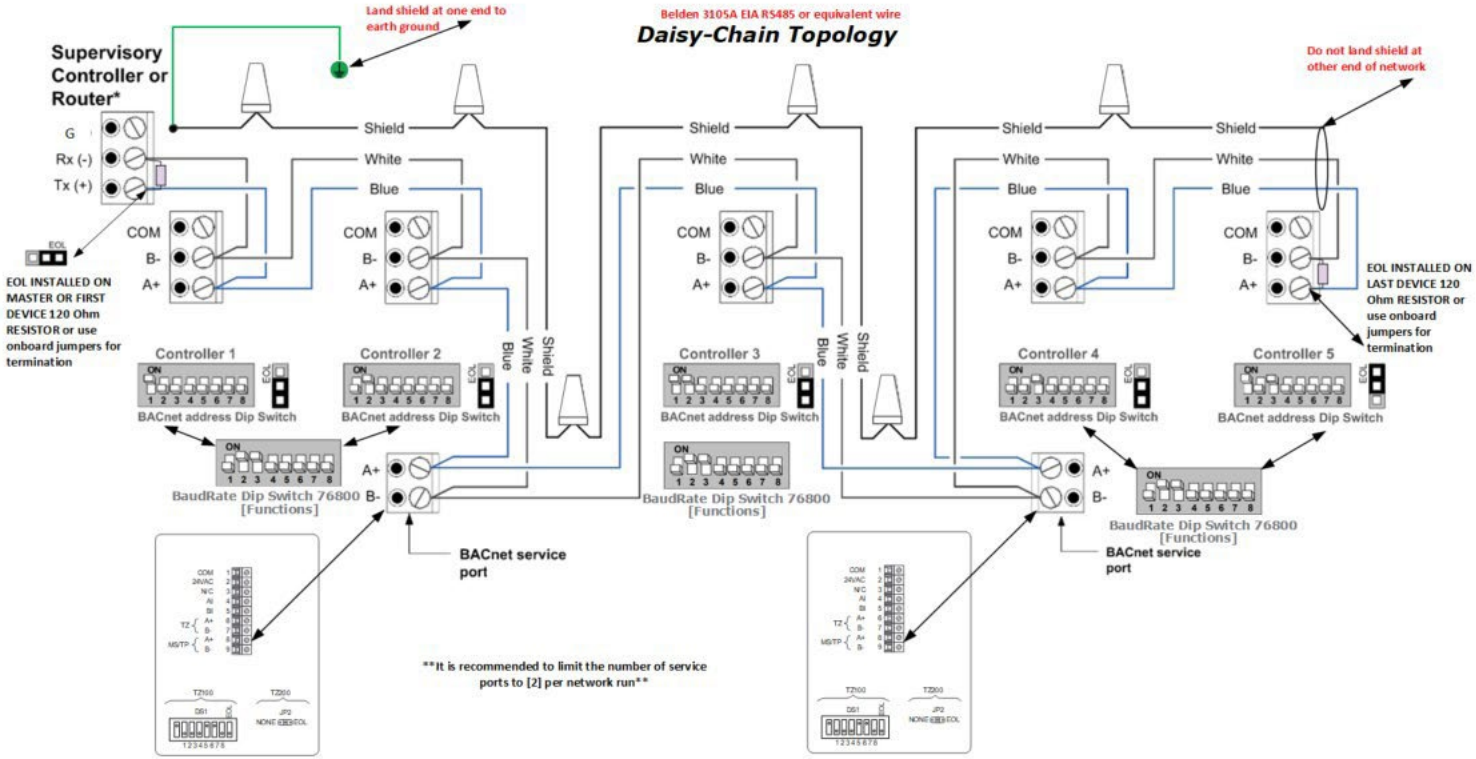
RS-485 Network Guidelines BZ Controllers

The best way to ensure a robust and reliable RS-485 network is to build it around a daisy-chain configuration.

Connecting a multidrop 485 network.

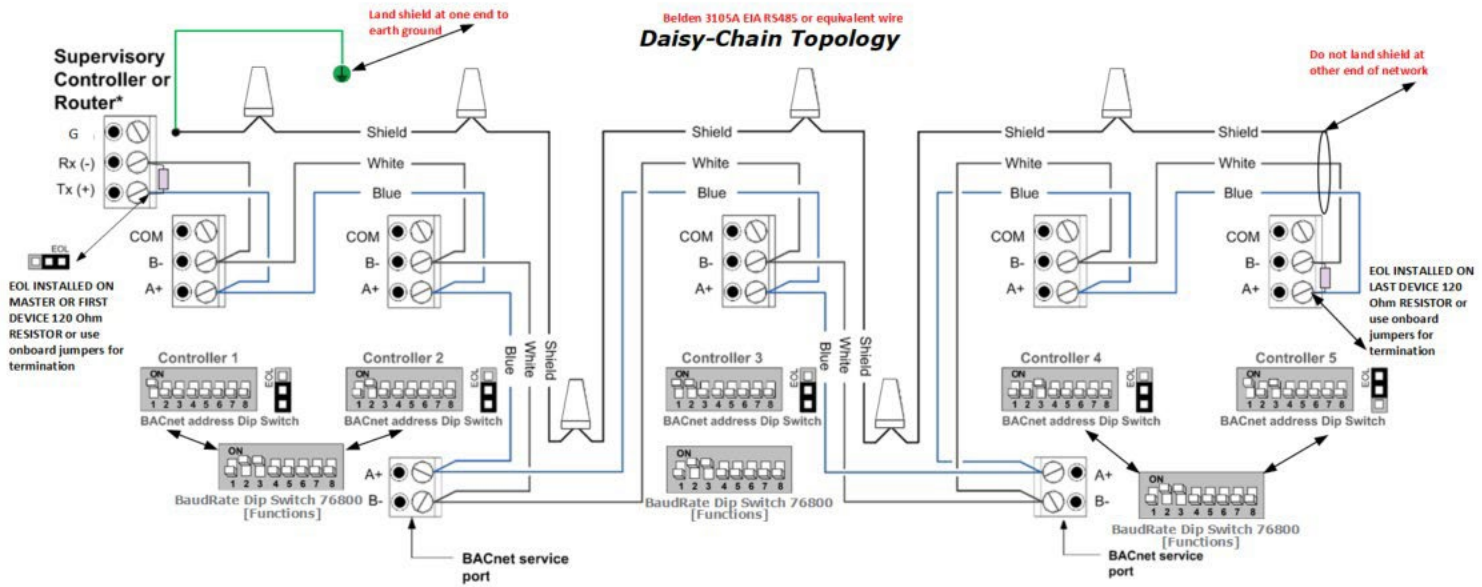
The EIA RS-485 Specification labels the data wires "A" and "B", but many manufacturers label their wires "+" and "-". In our experience, the "+" wire should be connected to the "A" line, and the "-" wire to the "B" line. Reversing the polarity will not damage a 485 device, but it will not communicate. This said, the rest is easy: always connect + to + and - to -.

Signal ground, don't forget it. While a differential signal does not require a signal ground to communicate, the ground wire serves an important purpose. Over a distance of hundreds or thousands of feet there can be very significant differences in the voltage level of "ground." The function of the signal ground wire is to tie the signal ground of each of the nodes to one common ground. If the ground voltage rises above 3 Vac, data will be lost and often the port itself will be damaged. However, if the differences in signal grounds is too great, further attention is necessary.



RS-485 Network Guidelines

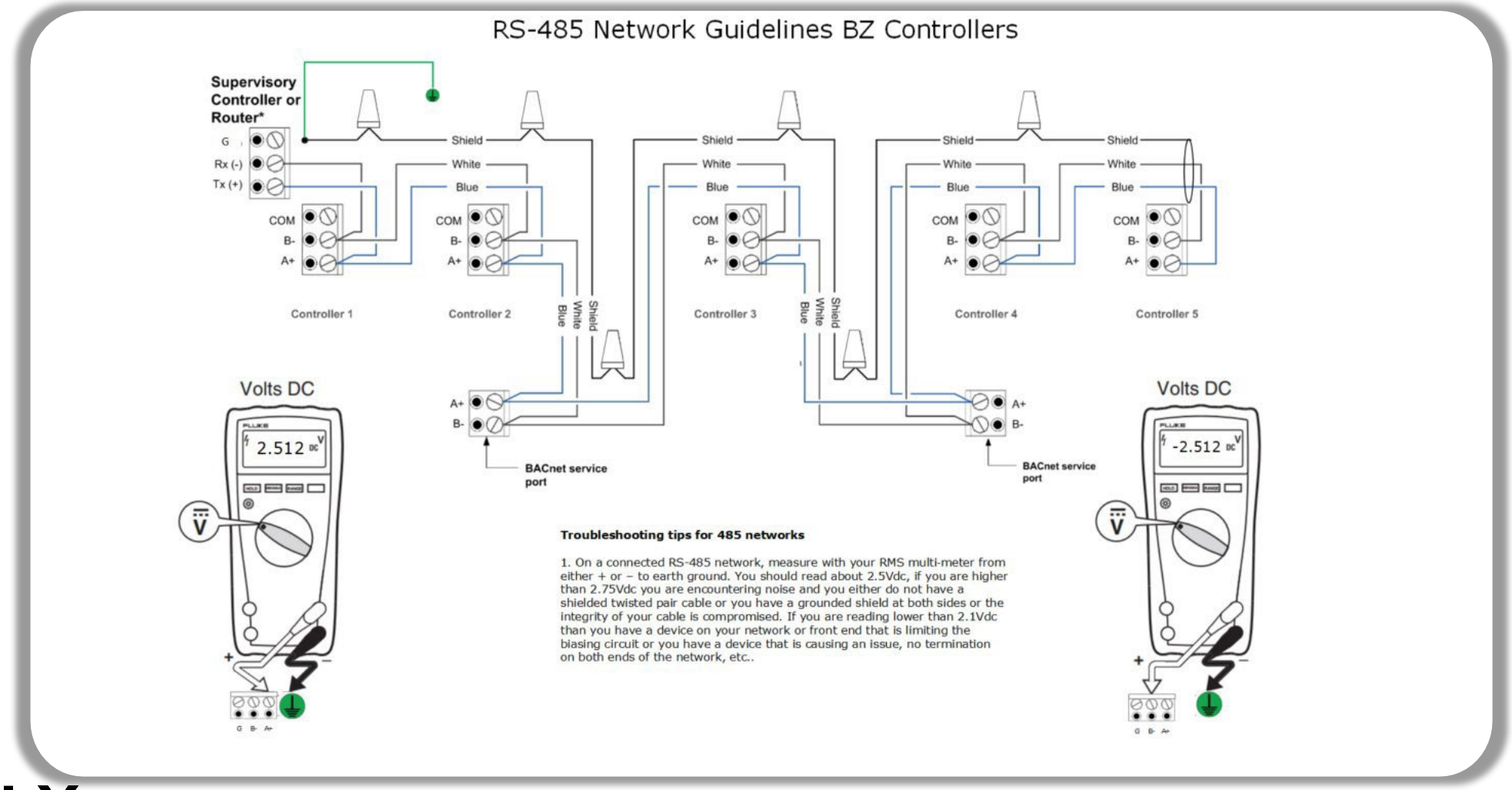
RS-485 Network Guidelines BZ Controllers



Troubleshooting tips for 485 networks

1. Ensure that the communication wire is Belden 3105A or equivalent [twisted shielded pair].
2. Ensure your polarity is validated on both sides of your coms cable at each device + to + and – to -.
3. Ensure you have a 120 ohm resistor on both your beginning master device and your last device (or onboard jumpers).
4. Ensure your shield is grounded only at one side and the source is a true earth ground [et. Building steel/beam, dedicated ground].
5. Make sure you are individually addressed on each device.
6. Make sure your Baud Rate is the same on all devices.

RS-485 Network Guidelines



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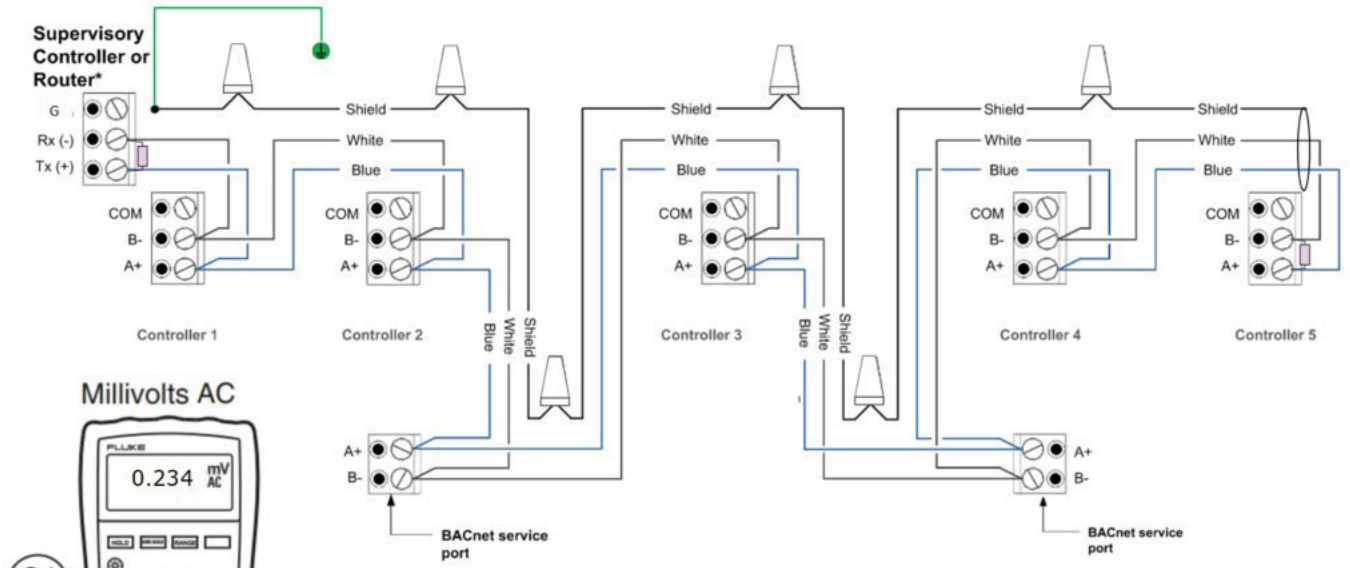
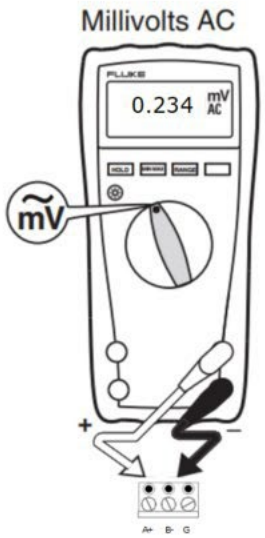
RS-485 Network Guidelines

RS-485 Network Guidelines BZ Controllers





Troubleshooting tips for 485 networks

1. Measure with your multi-meter from + to – with your RS-485 network connected. You should read between 200mVac to 600mVac average. If you read greater than 700mVac average then you may have a device that is compromising your network or you do not have your shield landed in one location or your controller grounded.

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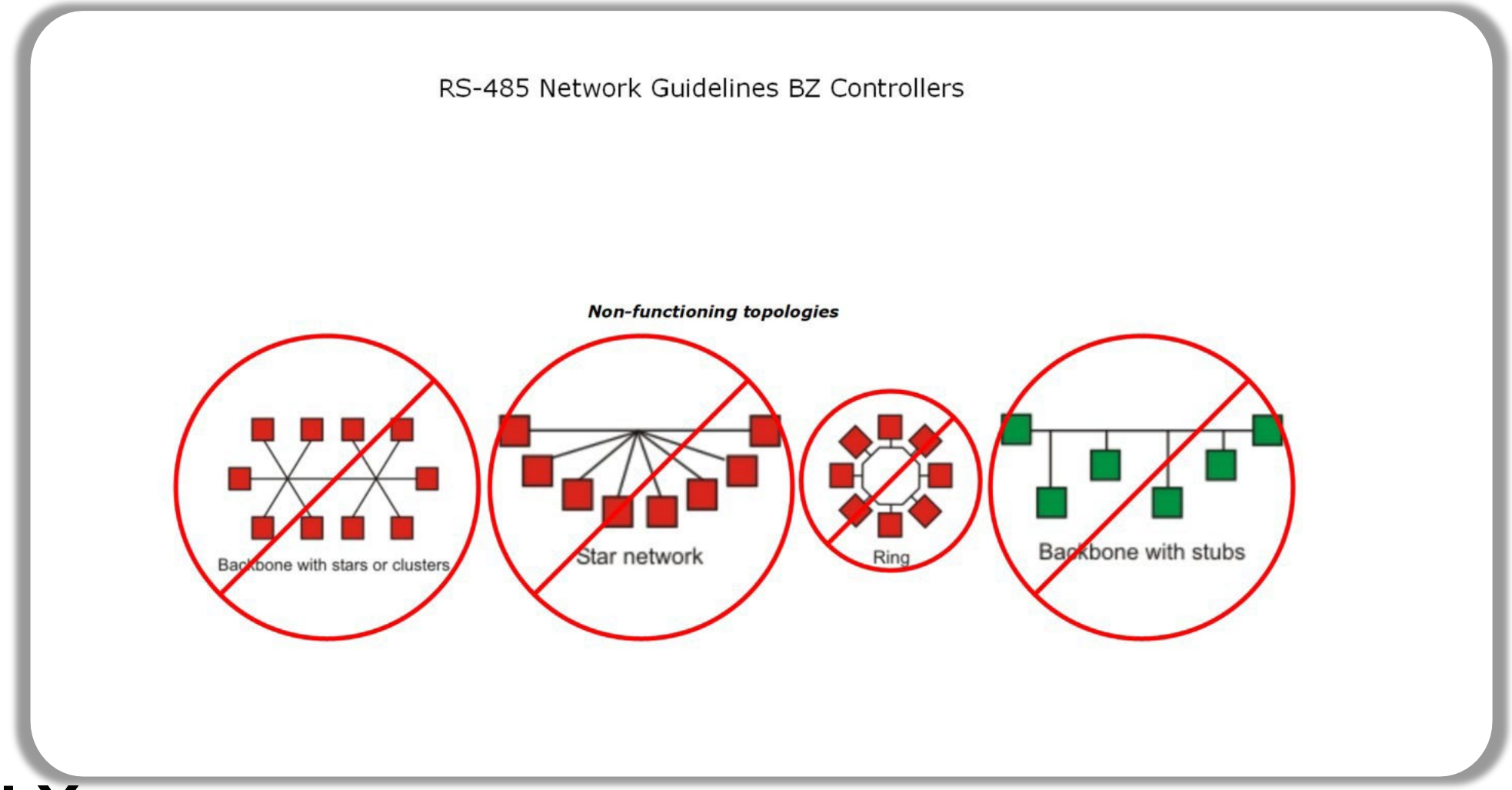
RS-485 Network Guidelines



Technical Specifications

Power supply:
- 24 VAC/VDC ± 15%; Class 2
- 2.0A Field replaceable fuse

Current consumption:
- 5 VA without output loading
- 48 VA Max (including Triac outputs (0.35A each)

Communication protocols:
- BACnet MS/TP
- BTL listed: B-ASC, BACnet Application Specific Controller
- Baud 9600, 19200, 38400, 76800 Bps (76800 default)
- Dip switch addressing
- EOL resistor built-in, jumper
- TZ Comm Bus
- Mini USB2 MS/TP network access (USB-485 cable adapter)

Hardware
- Microprocessor: STM32 (ARM CortexTM M3) 32 bits,
- CPU Speed: 72MHz
- Memory: 768 KB non-volatile Flash (application program)
- RAM: 96 KB RAM
- Real-time clock (RTC): Built-in capacitor (one-week backup)

Air Flow Sensor
- MEMS Omron D6F-PH
- 0 – 1 INWC / 250 Pa

Inputs:

2 Universal Inputs (AI/BI)
- Thermistor 10KΩ (type 2 or 3)
- Dry contact, 500 ms minimum (On-Off)
- Voltage 0 - 10 Vdc (Input impedance of 100 K Ω)
- Current 0 - 20 mA (internal resistance of 162 Ω)
- Resolution: 12 Bits (4096 segments)

Outputs:

4 Binary Outputs (Triac)
- External or internal powered (jumper selectable
- 10 to 30VAC/VDC, 0.35A max+
- Built-in thermal overcurrent protection
- (automatic reset)
- Supports PWM (Pulse-width modulation)

2 Analog Outputs
- Voltage 0 - 10 Vdc linear

Internal Actuator Outputs
- 2 BO Triac (Open/Close)
- 1 AO for analog actuators

Damper actuator:
- Motor: Belimo Brushless DC Motor
- Torque: 45 in/lb 5 Nm
- Shaft Diameter: 1/4″ to 5/8″ [6mm to 16mm]
- Noise Level: 35 dB(A)

Tzone wall interface:
- 3 Tzone room sensors max (daisy-chained)

Programming:
- Configurable using pre-loaded applications: Onyxx LX UI software

Mechanical:
- Dimensions:4.9″ x 8.5″ x 2.5″ 123 mm X 215 mm X 63 mm
- Stocking temperature: -30 °C to 50 °C / -22 °F to 122 °F
- Operating conditions: -25 °C to 45 °C / -13 °F to 113 °F 10% to 90% H.R. without condensation
- Weight: 744 g / 1.5 lb
- Enclosure: Black color, ABS material UL94-5V Material FR/ABS

Warranty: 1 year

Certifications:
- UL 916 Energy Management Equipment
- BTL listed: B-ASC, BACnet Application Specific Controller

WARNING: Internally, this device utilizes a half-wave rectifier and therefore can only share the same AC power source with other half-wave rectified devices.

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