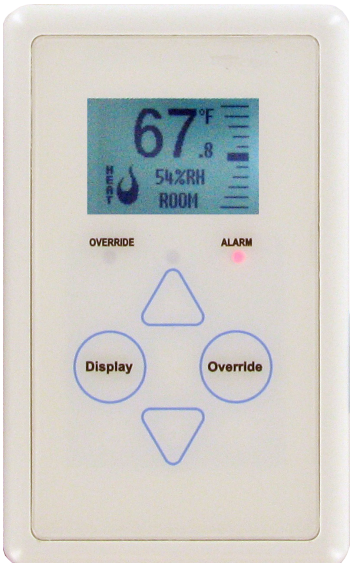
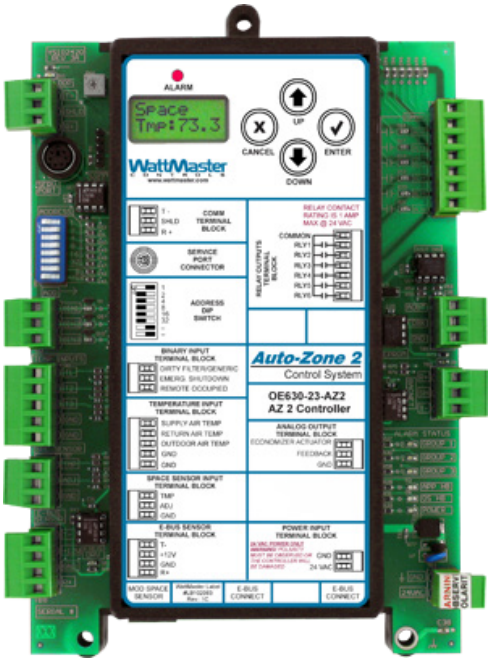
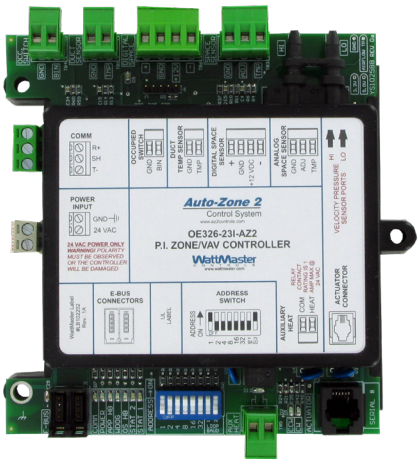
Auto-Zone 2

Control System





Installation & Operations Guide



Auto-Zone 2

Control System

www.az2controls.com

AAON, Inc.
8500 NW River Park Drive · Parkville , MO 64152
Toll Free Phone: 866-918-1100
PH: (816) 505-1100 · FAX: (816) 505-1101 ·
E-mail: marketing@aaon.com
Visit our web site at www.az2controls.com
Form: G026090

Table Of Contents

Table Of Contents

Appendix

Capabilities

Overview

The concept behind Auto-Zone 2 (AZ 2) is the same as when we designed the original Auto-Zone system over 15 years ago; to provide engineers, contractors, and end users a control system with many of the benefits of building automation without the high cost and complexity.

The Auto-Zone 2 system can be used to provide a complete system solution for Zoning, VAV, Single Zone VAV and CAV applications or a combination of these applications. For each of these applications, a single unit controller—the AZ 2 Controller (along with various expansion module options)—can be configured to provide the type of control you need for each HVAC unit on your system.

Features

The Auto-Zone 2 Controller is designed with 3 sensor inputs, 3 binary inputs, 1 analog output, 1 fan relay and 5 configurable relays, 2 E-BUS ports and a space temperature sensor connector (for backward compatibility with modular space temperature sensors). Each Auto-Zone 2 Controller can be configured for control of VAV Units (with or without Zone/VAV Controllers) and Constant Volume Units.

Simple constant volume applications can be configured using only the Auto-Zone 2 Controller. If the application requires more inputs and/or outputs, the EM1, EM2 & EM3 optional expansion modules are available to provide for additional analog, binary, or digital inputs and outputs as required.

The available expansion module configurations allow for 6 additional binary inputs, 4 additional analog inputs, 6 additional analog outputs, and up to 11 additional binary (relay) outputs. The various expansion modules plug into the Auto-Zone 2 Controller by means of a modular cable. Jumpers located on the base boards near each expansion module socket must be set according to the board type installed on that socket.

Applications

Constant Air Volume Unit

The Auto-Zone 2 can be configured to activate a Constant Volume Supply Fan. In most cases, this is a very basic unit with Space Temperature control. For this application only an AZ 2 Controller is required

Variable Air Volume Unit

The AZ 2 Controller can be configured to control a VFD Supply Fan for Duct Static Pressure control when a HVAC unit is going to be installed with VAV Terminal units. VAV applications are typically designed for occupied Cooling with Morning Warm-up Heating. The AZ 2 Controller will also require the EM1 Expansion Module for this application.

The AZ 2 Controller also has the ability to be configured for Duct Static Pressure Control by control of the Supply Fan VFD for the purpose of maintaining proper Duct Static Pressure in response to varying filter loading conditions that might be encountered in applications like a clean room design.

Zoning Unit

The Auto-Zone 2 can be configured to be used as a variable temperature variable volume zoning system controller. Either a Bypass Damper or VFD is used for control of duct static pressure. Up to 16 voting zones are able to be connected to each AZ 2 Controller local loop. The AZ 2 Controller will also require the EM1 Expansion Module for this application.

Single Zone VAV Unit

In this application, the AZ 2 Controller will modulate the Supply Fan VFD to maintain the Space Cooling or Heating Setpoint while the unit's cooling or heating source is modulating to maintain the appropriate Supply Air Setpoint. This sequence will operate optimally when the HVAC unit has modulating heating and cooling. Staged heating and cooling should not be used and will not provide satisfactory performance. The AZ 2 Controller will also require the EM1 Expansion Module for this application.

Configurations

- Celsius/Fahrenheit Temperature Display
- Application Type
  - Constant Volume
  - Single Zone VAV
  - VAV
  - Zoning
- Configurable CV Control Source
  - Space Temperature
  - Return Air Temperature
- Fan Cycling
  - Cycle Fan
  - Continuous Fan
- Static Pressure Control
  - VFD
  - Bypass Damper
  - VFD Filter Loading
- Supply Fan Proof Of Flow
- Supply Air Setpoint Reset
  - Space Temperature
  - Return Air Temperature
  - Outdoor Air Temperature
  - Main Fan VFD
  - Remote Signal
- Adjustable SAT Reset Rate
- Dehumidification Control
  - Dehumidification in Vent Only
  - Dehumidification in Cooling, Heating & Vent Mode
  - Dehumidification Control in Unoccupied Mode
- Reheat (for Dehumidification)

  * Staged
  * Modulating (Configurable Voltage Range)
  * Adjustable PI Loop for Modulating
- Humidifier Control
  * On/Off Output
  * Modulating Output (Adjustable Voltage Range)
  * Unoccupied Mode
- Heat Pump Operation
  * Air To Air
  * Water Source
- Heat Pump (Air to Air and Water Source Heat Pump) Reversing Valve
  * Fail to Cool
  * Fail to Heat
- Heat Pump (Air to Air and Water Source Heat Pump) Heat/Auxiliary Heat/Emergency Heat - Type
  * Staged Only
- Heating And Cooling Type
  * Staged
  * Modulating (Configurable Voltage Range)
  * Modulating (Configurable Voltage Range) and Staged
  * Adjustable PI Loop for Modulating
- Economizer Control
  * Normal
  * CO_2 Reset
- Economizer Selectable Enable Source
  * Outside Air Drybulb
  * Outside Air Wetbulb
  * Outside Air Dewpoint
- Economizer Configurable Voltage Output Range
- Economizer Configurable for Unoccupied Use
- Building Pressure Control
  * On/Off
  * Modulating (Voltage Range Configurable)
- Configurable Binary Alarm Input
  * Generic Alarm
  * Dirty Filter Alarm
  * Water Proof of Flow
- Emergency Shutdown Feature
- Adjustable Daylight Savings Time Dates
- Adjustable Mechanical Heat/Cool Alarm
  * Time Adjustable
  * Temperature Adjustable
  * Disable/Enable
- All Forms of Heating & Cooling Use Cool Staging Delays (Economizer, Modulating, Staged)
  * Stage Up
  * Stage Down
  * Minimum Run Time
  * Minimum Off Time
- Adjustable Additional Time Delay for Aux. Heat
- Adjustable Additional Time Delay for Emergency Heat
- Information Broadcast to Zone/VAV Boxes
  * Supply Air Temperature
  * Fan Status
  * Heat Status
  * Clock
  * Schedule
- Configurable Morning Warm Up Broadcast
  * Force all Boxes to Max Damper Position/CFM
  * Force all Boxes to Fixed Damper Position/CFM
- Configurable Building Pressure Reading Broadcast
  * Broadcast to Local Loop Only
  * Broadcast to All Loops
- Space Temperature Broadcast
  * Broadcast to Local Loop Only
- CO2 Broadcast
  * Broadcast to Local Loop Only
- Configurable Indoor RH % Broadcast
  * Broadcast to Local Loop Only
- Outdoor RH % Broadcast
  * Broadcast to All Loops
- Outdoor Air Temperature Broadcast
  * Broadcast to All Loops
- Adjustable Trend Log Rate
- Configurable Relays for Non-Heat Pump Unit
  * Not Used
  * Cool Stage

    * Heat Stage
    * Morning Warm Up
    * Reheat
    * Humidifier
    * Exhaust Fan
    * Alarm
    * Occupied
    * Economizer
    * Preheat
    * Low Ambient
- Configurable Relays for Heat Pump Unit
    * Not Used
    * Compressor Stage
    * Aux Heat Stage
    * Emergency Heat Stage
    * Reversing Valve
    * Morning Warm Up
    * Reheat
    * Humidifier
    * Exhaust Fan
    * Alarm
    * Occupied
    * Economizer
    * Preheat
    * Low Ambient

Setpoints (All Setpoints are Adjustable)

- Space/Return Air Temperature Setpoints
- Night Offsets
- HVAC Mode Deadband
- Supply Air Setpoints (Cooling & Heating)
    * Setpoint
    * Reset Limit
- Reset Source Setpoints
    * High Temperature
    * Low Temperature
- Stage Off Deadband for Cooling & Heating
- VFD Speed Cooling and Heating Lockouts
- Main Fan VFD Minimum Speed
- Supply Air Safety Shutdown
    * If High, Shut Off All Heat and Leave Fan Running
    * If Low, Shut Off Entire Unit
- Fan Starting Delay
- Static Pressure or Filter Loading Setpoint
    * Proportional Window
    * Calculated Time Period
- Building Pressure
    * Setpoint
    * Deadband
- Indoor Humidity
    * RH Setpoint
    * RH Deadband
- Economizer
    * Minimum Position
    * Maximum at High CO_2
- Ambient CO_2 Setpoint
    * Offsets from Ambient for Damper Control
    * Altitude Setpoint for Reading Accuracy
- Morning Warm Up
    * RAT Target
    * Warm-up Max Length
- Selectable Schedule
    * Internal
    * From GPC-XP
- Push Button Override Duration
- Space Sensor Slide Adjust
- All Temperature Sensors Calibration Offsets

Status

- Application Type Displayed
- Schedule Mode Displayed
- HVAC Mode Displayed
- Space/Return Air Temperature Displayed with Current Space Setpoints
- Cool and Heat Total from Polling Device
- Number of Mavericks from Polling Device
- Detailed Cooling Section Status
    * Cooling Enabled
    * Locked Out by Outdoor Air Temperature
    * Locked Out by VFD

  - * Locked Out by Proof of Flow
  - * Low Supply Air Temperature Cutoff
  - * Emergency Shutdown
- Detailed Heating Section Status
  - * Heating Enabled
  - * Locked Out by Outdoor Air Temperature
  - * Locked Out by VFD
  - * Locked Out by Proof of Flow
  - * Hi Supply Air Temperature Cutoff
  - * Emergency Shutdown
- Detailed Economizer Status
  - * Disabled by Schedule
  - * Enabled
  - * Disabled by Outdoor Air Temperature
  - * Enabled and Reset by CO_2
  - * Disabled and Reset by CO_2
  - * Emergency Shutdown
- Supply Air Temperature and Current Setpoint Displayed Together
- Cooling Physical Output Status
  - * Number of Stages
  - * Modulating Cool Position
- Heating/Aux Heat Physical Output Status
  - * Number of Stages
  - * Modulating Heat Position
- Current Return Air Temperature
- Current Slide Adjust Value
- Indoor RH and Setpoint Displayed Together
- Reheat Physical Output Status
  - * Number of Stages
  - * Modulating Reheat Position
- Humidifier Physical Output Status
  - * On/Off Status
  - * Modulating Humidifier Status
- Outdoor Temp and RH Status
- Outdoor Wetbulb and Dewpoint Status
- Static Pressure Current Setpoint and Fan Speed
- Economizer Position and Current Minimum Position Setpoint
- Current CO_2 and Setpoints
- Building Pressure, Setpoint, and Exhaust Fan Speed, On/Off status
- Relay Status
- Alarm Status

Alarms

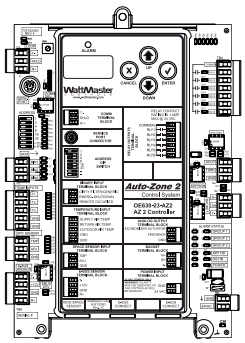
- **Sensor Failure**
  - * Shorted Supply Air Sensor
  - * Open Supply Air Sensor
  - * Shorted OAT Sensor
  - * Open OAT Sensor
  - * Missing OAT Broadcast
  - * Shorted Space Sensor
  - * Open Space Sensor
  - * Digital Space Missing
  - * Shorted Return Air Sensor
  - * Open Return Air Sensor
  - * High Static Pressure
  - * Missing OA RH Broadcast
  - * Building Pressure Sensor
  - * Missing Space RH Broadcast
  - * Missing Space Temp Broadcast
  - * Suction Pressure Sensor Missing
  - * CO^2 Sensor Missing
- **Mechanical Failure**
  - * Mechanical Cooling Failure
  - * Mechanical Heating Failure
  - * Fan Proving Failure
  - * Emergency Shutdown
  - * Dirty Filter
  - * Hi/Lo Supply Air Shutdown (Requires Manual Restart)
  - * Hi Static Shutdown (Requires Manual Restart)
  - * Water Proof Of Flow
- **Miscellaneous Alarms**
  - * Low Supply Air Temperature
  - * Hi Supply Air Temperature
  - * Control Temp Alarm
  - * Missing Polling Device
  - * Missing Expansion Board #1
  - * Missing Expansion Board #2
  - * Missing Expansion Board #3
  - * Generic Alarm
  - * Missing Zone Alarm

System Devices & Related Components

AZ 2 Controller
ASM01938

The AZ 2 Controller is the base HVAC unit controller. It provides 5 user-configurable relays, 3 binary inputs, 4 analog inputs, and 1 analog output. It allows for the addition of the EM1, EM2 & EM3 Expansion Modules for additional heating and cooling staging capabilities, zoning capabilities, and other functions.

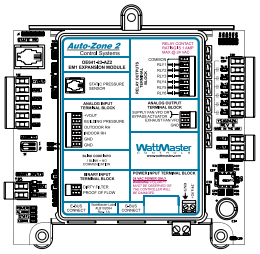
NOTE: Set-up, configuring, and monitoring of the AZ 2 Controller requires one of the following communication interfaces:
Prism 2 Front-End Software used with a personal computer or AZ 2 System Manager TS.



AZ 2 EM1 Expansion Module
ASM01939

The EM1 Expansion Module provides additional control options beyond the AZ 2 Controllers standard features. The additional options are:

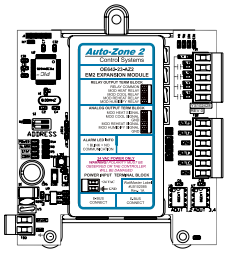
- Zoning Or VAV Control
- Drybulb, Dewpoint or Wetbulb Economizer Control
- Proof of Flow Alarm
- Dirty Filter Alarm
- Single Zone VAV Control
- Building Pressure Control



AZ 2 EM2 Expansion Module
ASM01940

The EM2 Expansion Module provides additional control options beyond the AZ 2 Controllers standard features. The additional options are:

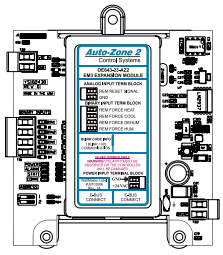
- Modulating Heating & Cooling
- Modulating Reheat
- Modulating Humidification



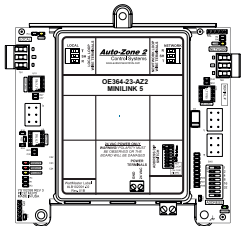
AZ 2 EM3 Expansion Module
ASM01941

The EM3 Expansion Module provides additional control options beyond the AZ 2 Controllers standard features. All Forced inputs require a contact closure from a BAS controller or other device. The additional options are:

- Forced Heating and/or Cooling
- Forced Dehumidification
- Forced Humidification
- Remote SAT Reset Signal
  (Requires a 0-10 VDC Signal From BAS Controller Or Other Device)

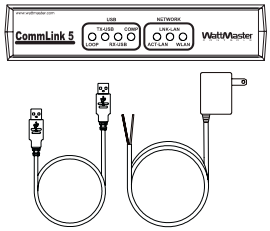


MiniLink 5
ASM01876
Used with all AZ 2 Controllers to provide network communications, zone voting, alarming, and tenant logging capabilities. A MiniLink is required on each loop of a Networked system. The MiniLink supports up to 59 devices.



CommLink 5 Communications Interface
ASM01875
The CommLink 5 connects to your computer's USB 1.1 or 2.1 port. Prism 2 computer front-end software must be installed on the direct connected or remote connected computer in order to communicate with your system. The CommLink 5 supports up to 60 MiniLink local loops.

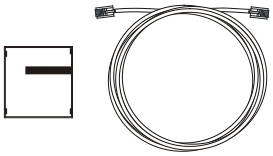
Includes: CommLink 5, 6 ft. long USB cable, and 120/24 VAC power supply. Required on all systems.



AZ 2 System Manager TS End User Interface
ASM01942
The AZ 2 System Manager TS provides a direct, graphic-enhanced, menu-driven link to enable the user to view the status and configure the setpoints of any controller on the AZ 2 control system. The AZ 2 System Manager TS is equipped with a 4.3" LCD Touch Screen Display. The System Manager TS is furnished with hardware for flush mounting into hollow drywall or surface mounting on concrete brick or plaster surfaces.

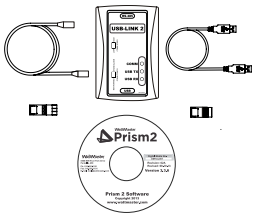
IP Module Kit - Internet/LAN Connection
ASM01902
Used for Internet or Local Area Network communications with the control system. Field installs by plugging into the CommLink 5 circuit board and provides an addressable Ethernet connection to the controls system from any computer connected to your building's LAN. It can also be configured to allow access to the control system from the Internet through your LAN if your Ethernet firewall is configured for this option.

Includes: IP Link module, 10 ft. long Ethernet cable, and installation instructions. Prism 2 computer front-end software must be installed on the remote computer in order to dial-up and communicate with the controls system.



USB-Link II Kit
ASM02244
The USB-Link II is a pocket-sized communications interface used to connect a laptop computer to your controls system for configuring and monitoring purposes, utilizing a modular cable to allow connection to the service port connector on the controllers and a USB cable to connect to a laptop computer.

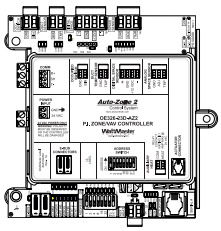
Includes: USB-Link for multiple or single loop systems, USB cable, modular connection cable, two mini-DIN to terminal adapters, and Prism 2 software.



Controllers & Related Components

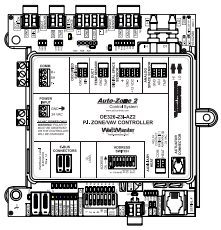
AZ 2 Zone/VAV Controller
Pressure Dependent
ASM01853

This is the the Pressure Dependent AZ 2 Zone/VAV Controller only.



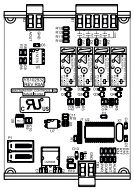
AZ 2 Zone/VAV Controller
Pressure Independent
ASM01856

This is the the Pressure Independent AZ 2 Zone/VAV Controller only.



Zone Controller Expansion Module
ASM02243

The ASM02243 Zone/VAV Controller Expansion Module is used in conjunction with the ASM01853 or ASM01856 – Zone/VAV Controllers. This allows for Fan & Heat control of terminal units, including series and parallel fan terminal units with up to 3 stages of electric heat, SCR electric heat, or modulating hot water heat. The ASM02243 Zone Controller Expansion Module provides 4 relay outputs for pilot duty switching control (1 fan, 2 heat, and 1 auxiliary), and 1 Analog output for control of a 0-10V modulating hot water valve or SCR controlled electric heating coil.

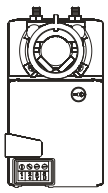


Zone Damper Actuator
ASM01846

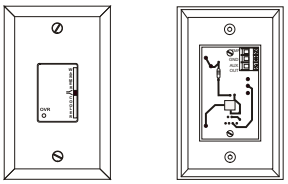
Used for zone damper applications. Accepts a floating point signal from the AZ 2 Zone/VAV Controller to position the damper.

Bypass Damper Actuator
G045890

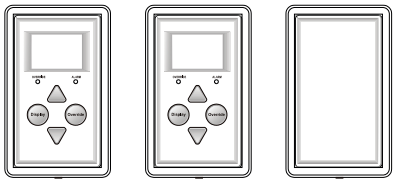
Used for bypass damper applications. Accepts a 2-10 VDC signal.
Includes: OE281-04 Modulating Damper Actuator.



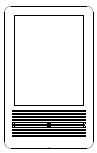
ASM02227 Standard Room Sensor - Plain
ASM01638 Standard Room Sensor w/Override,
ASM01642 Standard Room Sensor w/Slide Adjust
ASM01643 Standard Room Sensor w/Override & Slide Adjust
For wall mounting. Connects to the AZ 2 Controller or the Zone/VAV Controller Actuator Package using wiring terminals. Wires to AZ 2 Controller or Zone/VAV Controller.



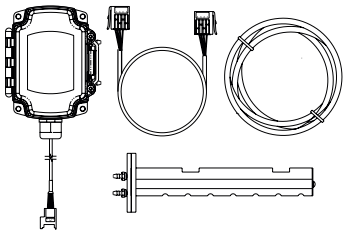
E-BUS Digital Room Sensor - Temp. Only With Display
ASM01819
E-BUS Digital Room Sensor - Temp. & Humidity W/ Display
ASM01820
E-BUS Digital Room Sensor - Temp. & Humidity W/O Display
ASM02221
The ASM01819 E-BUS Digital Room Temperature Sensor With Display & the ASM01820 E-BUS Digital Room Temperature & Humidity Sensor With Display have a Digital Touch Screen LCD Display and provide for setpoint adjustment, override and display of certain status and setpoints. The ASM02221 E-BUS Digital Room Temperature & Humidity Sensor Without Display is a combination Temperature and Humidity Sensor that does not have a display, override, status or setpoint capabilities & is used in locations where you do not want the occupants to see the Temperature & Humidity. All sensors above can use an E-BUS cable assembly for connection to the controller (sold separately) or can be wired to supplied terminals.



E-BUS CO_2 Wall-Mounted Sensor
ASM01829
Used with the AZ 2 Controller and Zone/VAV Controller Actuator Package for CO_2 sensing applications where wall mounting in the space is desired. Connects to controller using E-BUS cable or it can be wired to the supplied terminals.

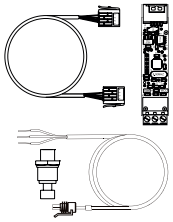


E-BUS CO_2 Duct Mounted Sensor
ASM01831
Used with the AZ 2 Zone/VAV Controller for Return Air CO_2 sensing applications. Duct Mounted E-BUS CO2 Sensor mounted in control enclosure, CO2 Pickup Tube, 10 ft. long E-BUS Cable & 10 ft. length of FRP Tubing for connection of CO2 Pickup Tube to sensor.

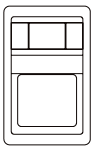


E-BUS Digital Suction Pressure Sensor
ASM01845
Used for measuring Suction Pressure on DX systems.

Includes: Suction Line Pressure Transducer with modular cable, E-BUS cable adapter & 12 Ft. long E-BUS Modular Cable for connection to the AZ 2 Controller.



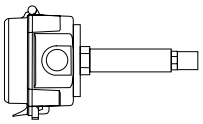
Room Mounted RH Sensor 3% - 0-5 VDC Output
ASM01646
Used for indoor air humidity sensing applications. Wires to EM1 Expansion Module.



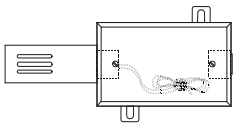
Outdoor Air Mounted RH Sensor 3% - 0-5 VDC Output
ASM01647
Used for outdoor air humidity sensing applications. Wires to EM1 Expansion Module.

Sensors & Related Components

Return Air Mounted RH Sensor 3% - 0-5 VDC Output
ASM01835
Used for return air humidity sensing applications.Wires to EM1 Expansion Module.

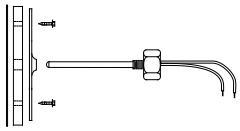


Outdoor Air Temperature Sensor
G042230
Used for temperature sensing applications. 10k Ohm Outside Air Temperature Sensor, 2 wire, mounted in a weatherproof handy box only. Wires to AZ 2 Controller.

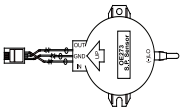


Duct Temperature Sensor - 6” Probe
R36340

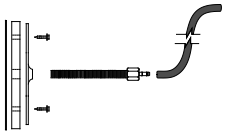
Duct Temperature Sensor - 12" Probe
P87140
Used for return or supply air temperature sensing applications. 10k Ohm Duct Temperature Sensor, 2 wire.



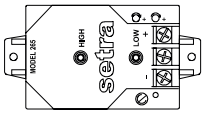
Duct Static Pressure Sensor
ASM01640
Used for duct static pressure sensing applications. 0-5″ W.C., 0-5 VDC, Static Pressure Sensor. Connects to controller using three wire integral modular cable.



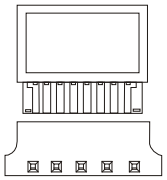
Static Pressure Pick-up Tube
ASM02242
Used with ASM02242 Static Pressure Sensor for static pressure sensing applications. Includes: Static Pressure Pick-up Tube with 1 ft. length of FRP tubing, gasketed mounting bracket, and screws. For use with the Duct Static Pressure sensor.



Building Static Pressure Sensor
ASM01832
-0.25 to +0.25″ W.C., 0-5 VDC, 24 VAC/VDC supply power Building Pressure Sensor . Used for Building Pressure Sensing Applications. Wires to the EM1 Module.



Communication Surge Protector Kit
ASM01907
Used to help isolate and prevent power surges to the communications wiring caused by lightning strikes. For use on communications wiring loops that are routed outdoors or between buildings. One is required at each point where the communications wiring leaves or enters a building.
Includes: Communication Bus Surge Protector, Base Module, and Mounting/Wiring Instructions.

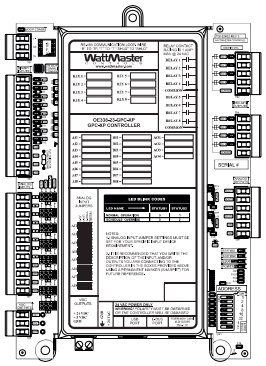


Prism 2 Front-End Computer Software
Free!
Prism 2 provides standard, easy to understand status screens for each type of AZ 2 equipment installed. Prism software has provisions for custom screens which allow floor plans, equipment photos, or user-defined summary screens to be implemented to meet their own individual needs. All controlling setpoints, trend logs, and alarm conditions are accessed in the Prism environment. Prism can be configured for direct on-site installation, remote modem connection, or TCP/IP Internet connection to several installations.

Free Download
From AZ 2 Web Site
www.az2controls.com

GPC-XP Controller
ASM01868

The ASM01868 GPC-XP Controller is used for controlling equipment or processes that cannot be controlled using a standard HVAC controller. The Prism 2 computer front end software is required to interface with the GPC-XP controller functions. The GPC-XP Controller provides the flexibility to control, schedule and/or monitor equipment such as unit heaters, exhaust fans, motorized louvers, boilers, pumps and other mechanical equipment.



- 8 configurable analog inputs
- All analog inputs accept 10 K ohm thermistor sensors, 4-20 mA, 0-5 VDC or 0-10 VDC signals and are set by means of jumpers on the controller
- Create custom formulas for analog inputs
- Highest/lowest/average of the analog inputs and can be used in the internal logic or can be broadcast to other controllers on the system
- 8 wet 24 VAC binary contacts which can be configured for N.O. or N.C. operation
- 8 configurable N.O. or N.C. relay outputs for On/Off control of equipment
- 4 analog outputs with proportional control signals. All selectable for 0-10 VDC output
- 8 separate 2 event per day time schedules which can be used for operational control or alarm recognition based on time of day
- Lead/lag start capabilities.

CV System Architecture

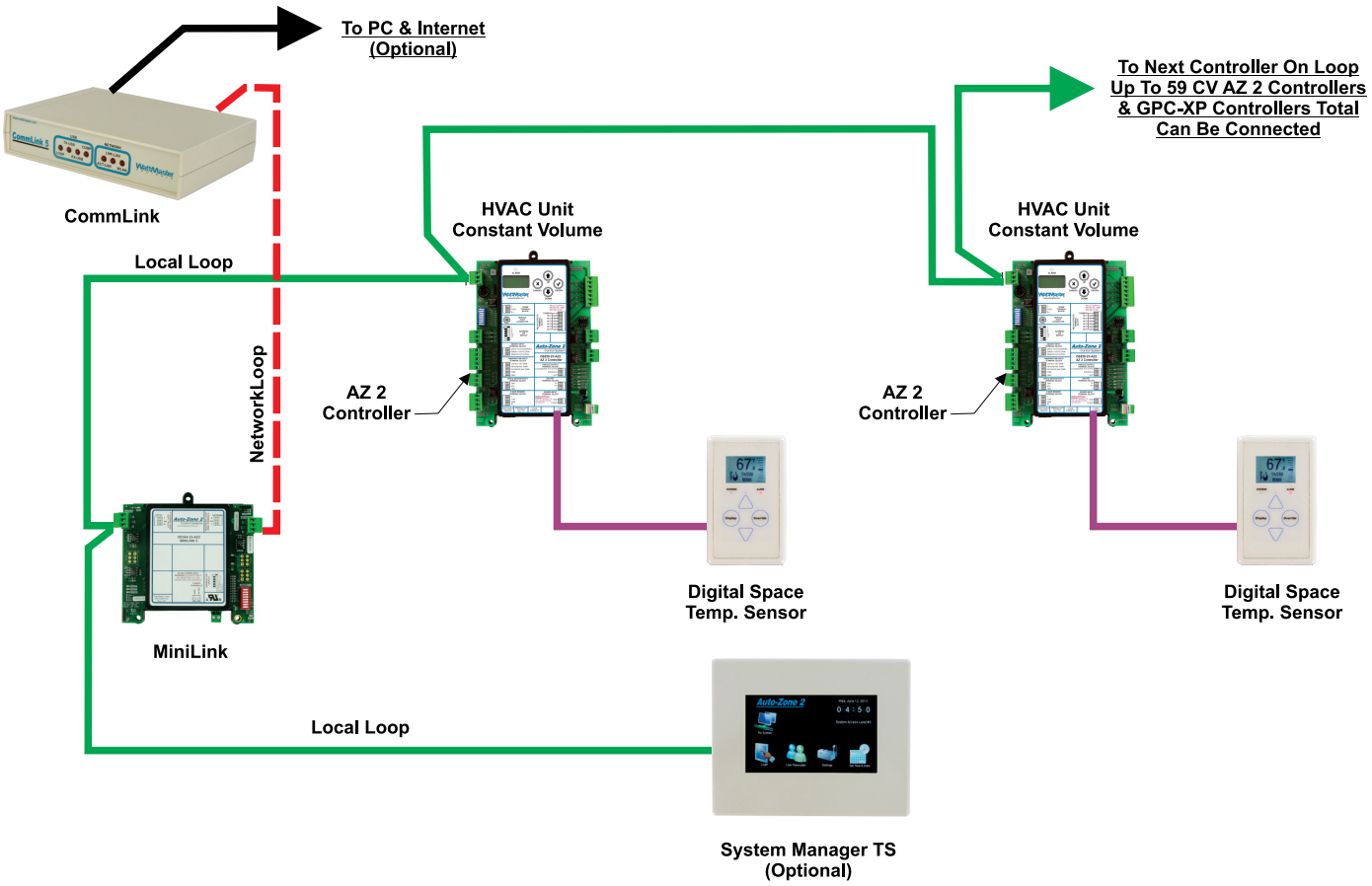


Figure 1: – Typical Single Loop CV System

Single Loop CV Controls

The most basic of the Auto-Zone 2 systems is the Single Loop CV System. It consists of one or more CV units each having their own AZ 2 Controller and associated expansion module(s).

The AZ 2 controller(s) are connected to a MiniLink communications interface which provides communications between all controllers on the local communications loop and the System Manager TS operator interface. The MiniLink provides for alarm polling of all controllers and also has the capability of broadcasting a temperature to all controllers on the loop. This can be useful for example if you want to have one Outdoor Air Temperature Sensor to be used by all the controllers.

Up to 59 AZ 2 Controllers and/or related add-on controllers such as the GPC-XP controller can be connected together on a single loop to form a controls system. Each of the controllers are connected together and to the MiniLink by means of communications cable. All communication wiring must be plenum-rated, minimum 18 gauge, 2-conductor, twisted pair with shield cable. AAON can supply communication wire that meets this specification and is color coded for the network or local loop, also, if desired, Belden #82760 or its equivalent wire may also be used.

The CommLink 5 Communication Interface allows for connection to any Windows computer with Prism 2 software installed for configuring and monitoring of the system. Prism 2 is a Windows based color graphical computer front end software package designed by AAON. An optional IP Module is also available to provide Intranet/Internet connectivity to the control system.

In addition, the System Manager TS is an end user interface that can be used for monitoring and basic configuration of the system. It has a color touch screen display and intuitive graphical user interface.

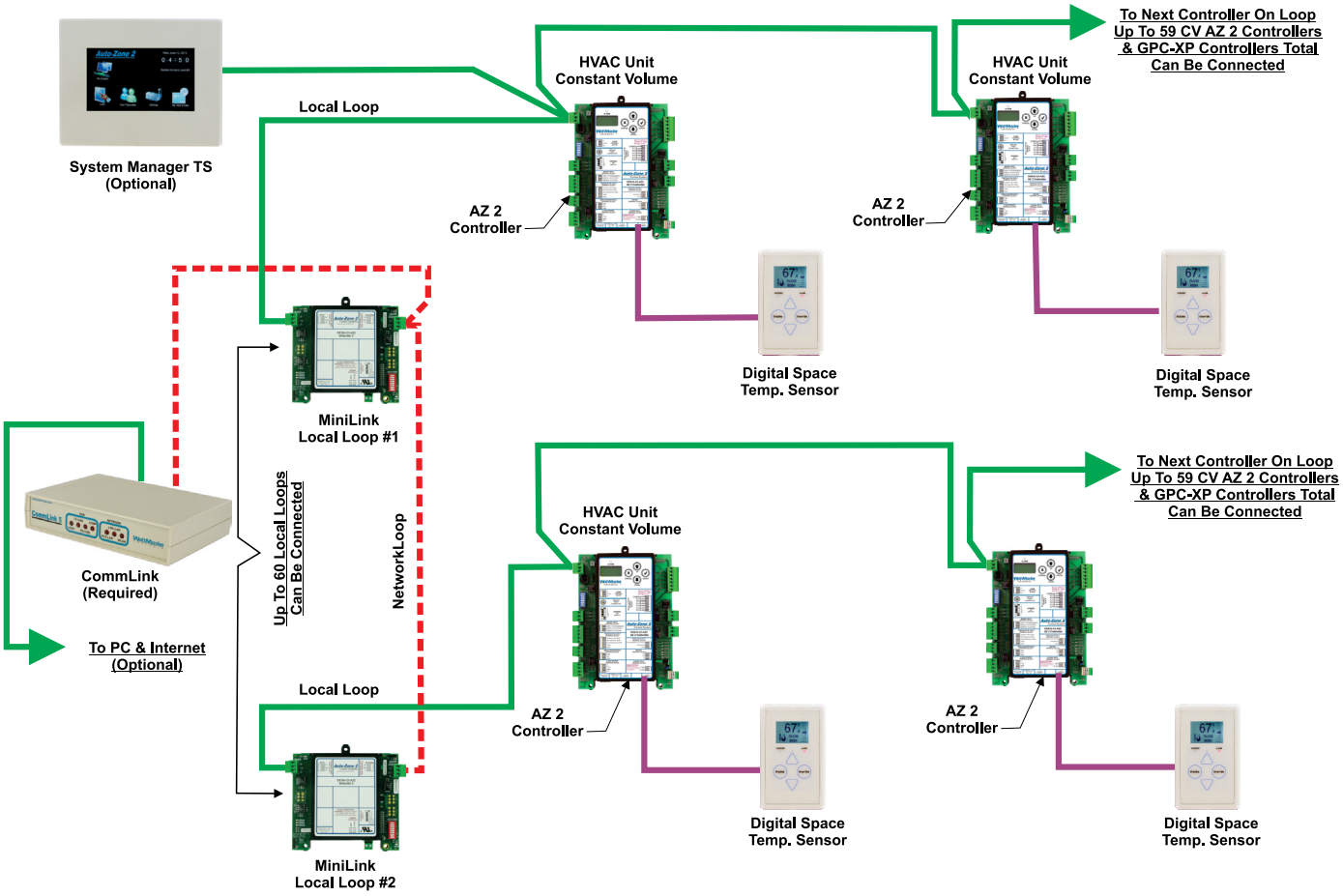


Figure 2: – Typical Multiple Loop CV System

Multiple Loop CV Controls

If you have more than 59 CV Units on your building project you will need to use a Multiple Loop CV System. It is very similar to the Single Loop CV System except it has more than one local communications loop. Each local loop is connected to a MiniLink which is connected to a CommLink 5 communications interface. The CommLink 5 communicates with each loop and can broadcast and do alarm polling across all the local loops. The CommLink 5 is always required when you have more than one local loop.

The CommLink 5 is also connected to each MiniLink by means of communications cable. This is called the Network Loop. As with the Local Loops, all communication wiring must be plenum-rated, minimum 18-gauge, 2-conductor, twisted pair with shield cable. AAON can supply communication wire that meets this specification and is color coded for the network or local loop, or if desired, Belden #82760 or its equivalent wire may also be used.

The CommLink 5 interface connects to any Windows computer with Prism 2 software installed to configure and monitor the system. An optional IP Module is also available to provide Intranet/Internet connectivity to the control system.

In addition, the System Manager TS end user interface can communicate with any controller on the entire controls system no matter which loop it is on. You simply enter its loop number and address for access. Up to 60 local loops can be connected together for large building project requirements.

Zoning/VAV System Architecture

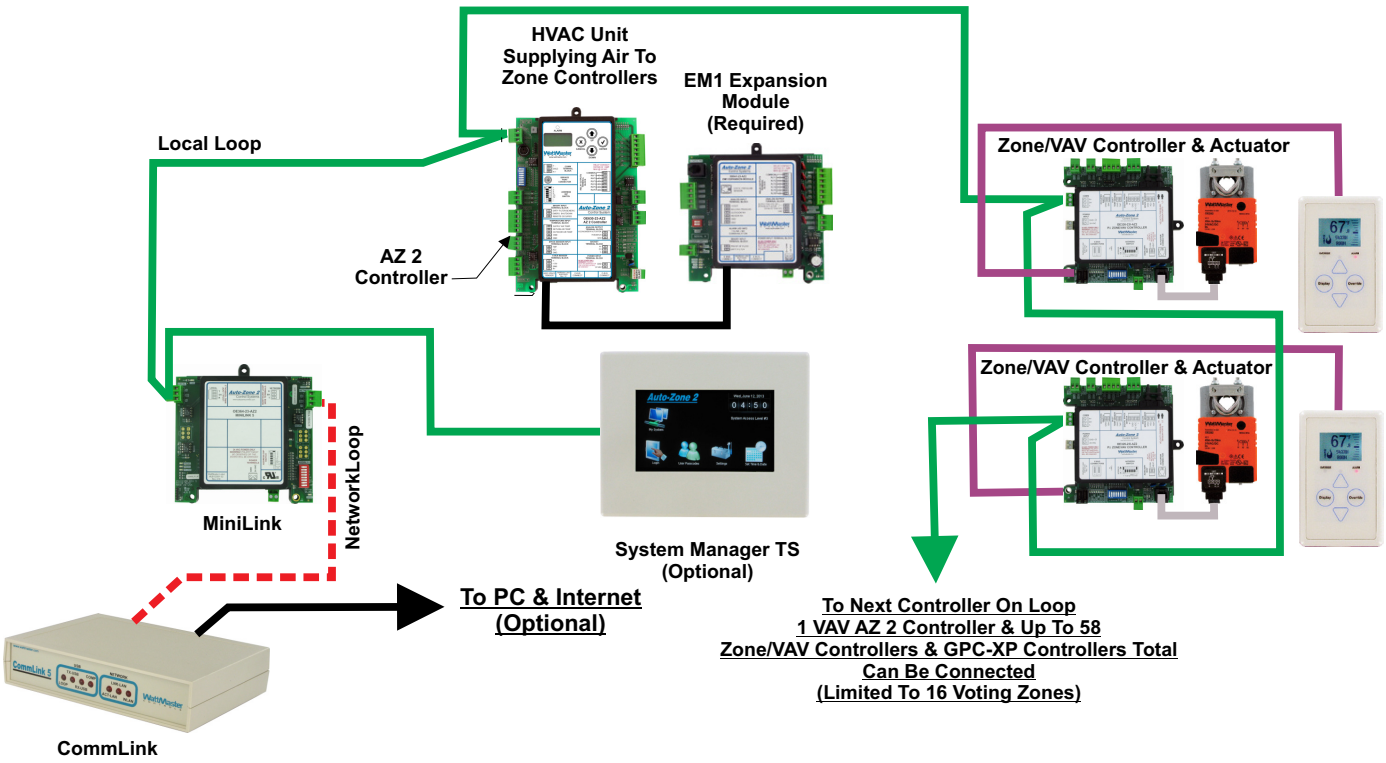


Figure 3: – Typical Single Loop Zoning/VAV System

Single Loop Zoning/VAV

If you have a single HVAC unit that will be using VAV terminal units or are using a zoning system and don't have any CV units you should select the Single Loop Zoning System. On a Variable Volume Variable Temperature Zoning System up to 16 Zone Controllers can be voting zones, and additional zone controllers can be non-voting zones. For VAV systems you can have up to 58 total VAV controllers in addition to the HVAC unit controller for the VAV boxes.

The AZ 2 Controller(s) are connected to a MiniLink communications interface which provides communication between all controllers on the local communications loop and the System Manager TS operator interface or CommLink 5 communication interface. The MiniLink provides alarm polling of all the VAV or Zone Controllers.

Each of the controllers are connected together and to the MiniLink by means of local loop communications cable. All communication wiring must be plenum-rated, minimum 18 gauge, 2-conductor, twisted pair with shield cable. AAON can supply communication wire that meets this specification and is color coded for the network or local loop or if desired, Belden #82760 or its equivalent wire may also be used.

The CommLink 5 Interface connects to any Windows computer with Prism 2 software installed for configuring and monitoring of the system. Prism 2 is a Windows based color graphical computer front end software package designed by AAON. An optional IP Module is also available to provide Intranet/Internet connectivity to the control system.

In addition, the System Manager TS is an end user interface that can be used to configure and monitor the system. It has a color touch screen display and intuitive graphical user interface.

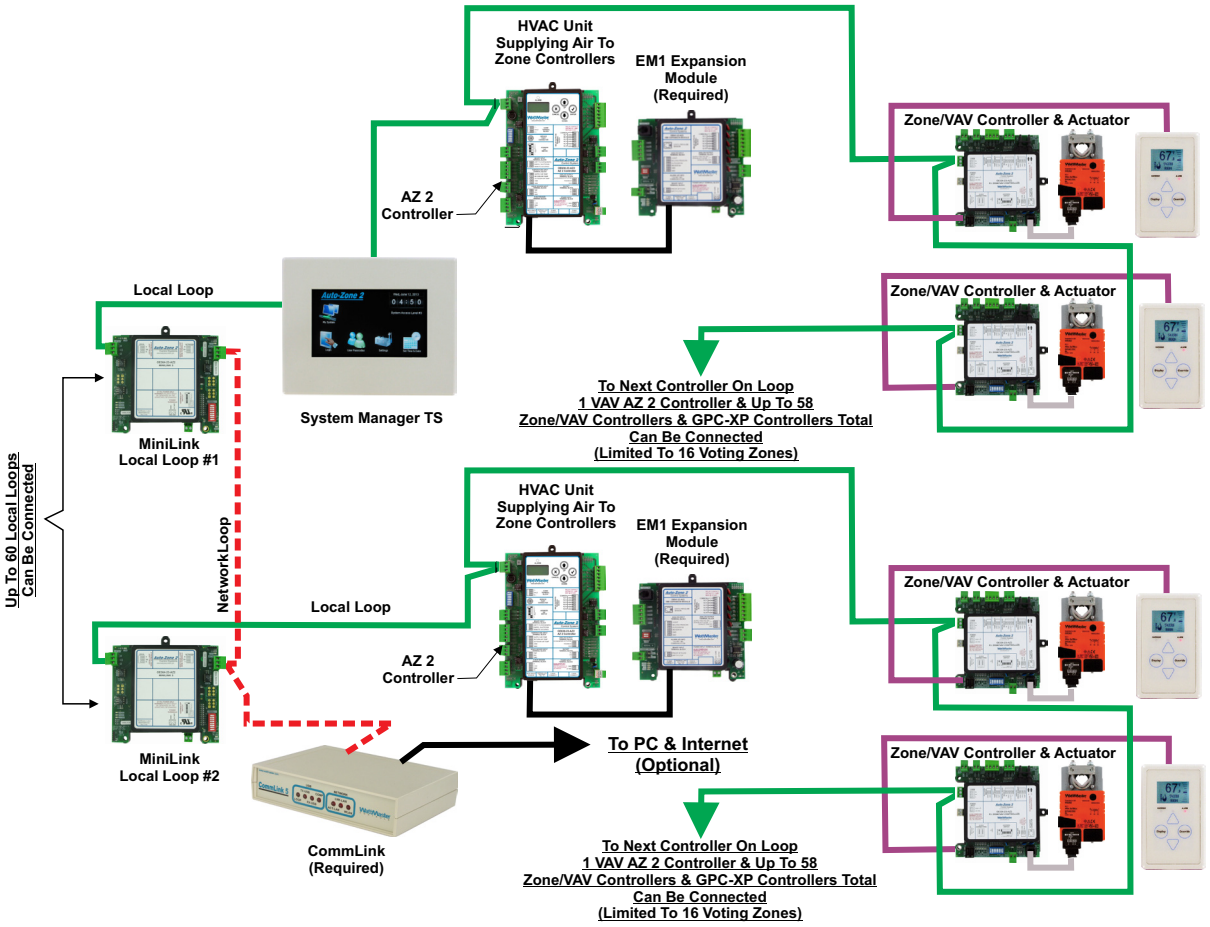


Figure 4: – Typical Multiple Loop Zoning/VAV System

Multiple Loop Zoning/VAV

If you have multiple HVAC units that will be using VAV Terminal Units or will be using a Zoning System and don't have any CV units you should select the Multiple Loop Zoning System. On a Zoning System, each local loop allows up to 16 Zone Controllers to be voting zones, and additional controllers to be non-voting zones. For VAV systems you can have up to 58 total VAV controllers in addition to the HVAC unit controller for the VAV boxes.

Each local loop is connected to its own MiniLink communications interface, which provides communication between all controllers on the local communications loop and the System Manager TS end user interface and/or the CommLink 5 communications interface. The MiniLink provides alarm polling of all the zone controllers.

On this type of system, the CommLink 5 communications interface acts as the main hub for all the local loops on the system and passes communications between and across all the local loops . The wiring between the CommLink 5 and all the MiniLink devices is called the network loop

Each of the controllers on the local loop are connected to each other and to a MiniLink by means of local loop communications cable. Each of the MiniLink devices are connected together and to the CommLink 5 on the network loop using network communications cable. All communication wiring must be plenum-rated, minimum 18 gauge, 2 conductor, twisted pair with shield cable. AAON can supply communication wire that meets this specification and is color coded for the network loop or local loop, or if desired, Belden #82760 or its equivalent wire may also be used.

The CommLink 5 communication interface is standard on this type of system and allows for connection to any Windows computer with Prism 2 software installed, for configuring and monitoring of the system. Prism 2 is a Windows based color graphical computer front end software package designed by AAON.An optional IP Module is also available to provide Intranet/Internet connectivity to the control system.

In addition, the System Manager TS is an end user interface that can be used for configuring and monitoring of the entire control system. It has a color touch screen display and intuitive graphical user interface. It can be located on any local loop on the system. Multiple System Manager TS end user interfaces can also be used if desired.

Combination Zoning/VAV & CV System Architecture

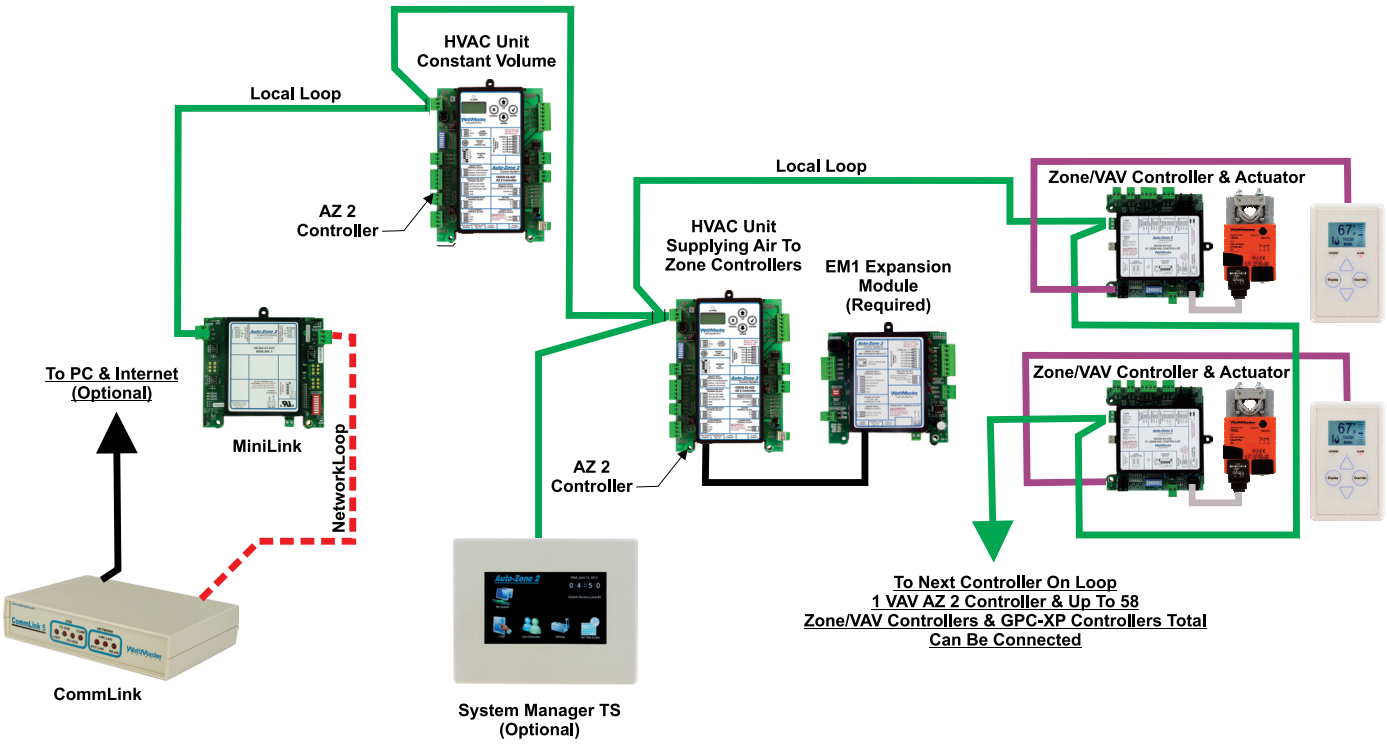


Figure 5: – Typical Single Loop Zoning/VAV & CV System

Single Loop Zoning/VAV & CV

If you have a single HVAC unit with VAV Terminal Units or a Zoning system, also have CV units and/or your total number of controllers is less than 58, you should select the Single Loop Zoning/VAV & CV System. The local loop provides for up to 58 Zone, VAV, CV and GPC-XP controllers in addition to the HVAC unit controller that is connected to the Zone/VAV Controllers. On the local loop, up to 16 Zone/VAV Controllers can be voting zones, and additional controllers can be made up of non-voting zones, CV units and GPC-XP controllers. For VAV systems you can also have up to 58 total Zone/VAV controllers, CV units and GPC-XP controllers in addition to the HVAC unit controller for the VAV boxes.

The controllers are connected to a MiniLink communications interface which provides communication between all controllers on the local communications loop and the System Manager TS end user interface or CommLink 5 communication interface. The MiniLink provides for alarm polling of all the zone controllers.

Each of the controllers are connected together and to the MiniLink by means of local loop communications cable. All communication wiring must be plenum-rated, minimum 18 gauge, 2-conductor, twisted pair with shield cable. AAON can supply communication wire that meets this specification and is color coded for the network or local loop, or if desired, Belden #82760 or its equivalent wire may also be used.

The CommLink 5 communication interface connects to any Windows computer with Prism 2 software installed to configure and monitor the system. Prism 2 is a Windows based color graphical computer front end software package designed by AAON. An optional IP Module is also available to provide Intranet/Internet connectivity to the control system.

In addition, the System Manager TS is an end user interface that can be used for configuring and monitoring of the system. It has a color touch screen display and intuitive graphical user interface.

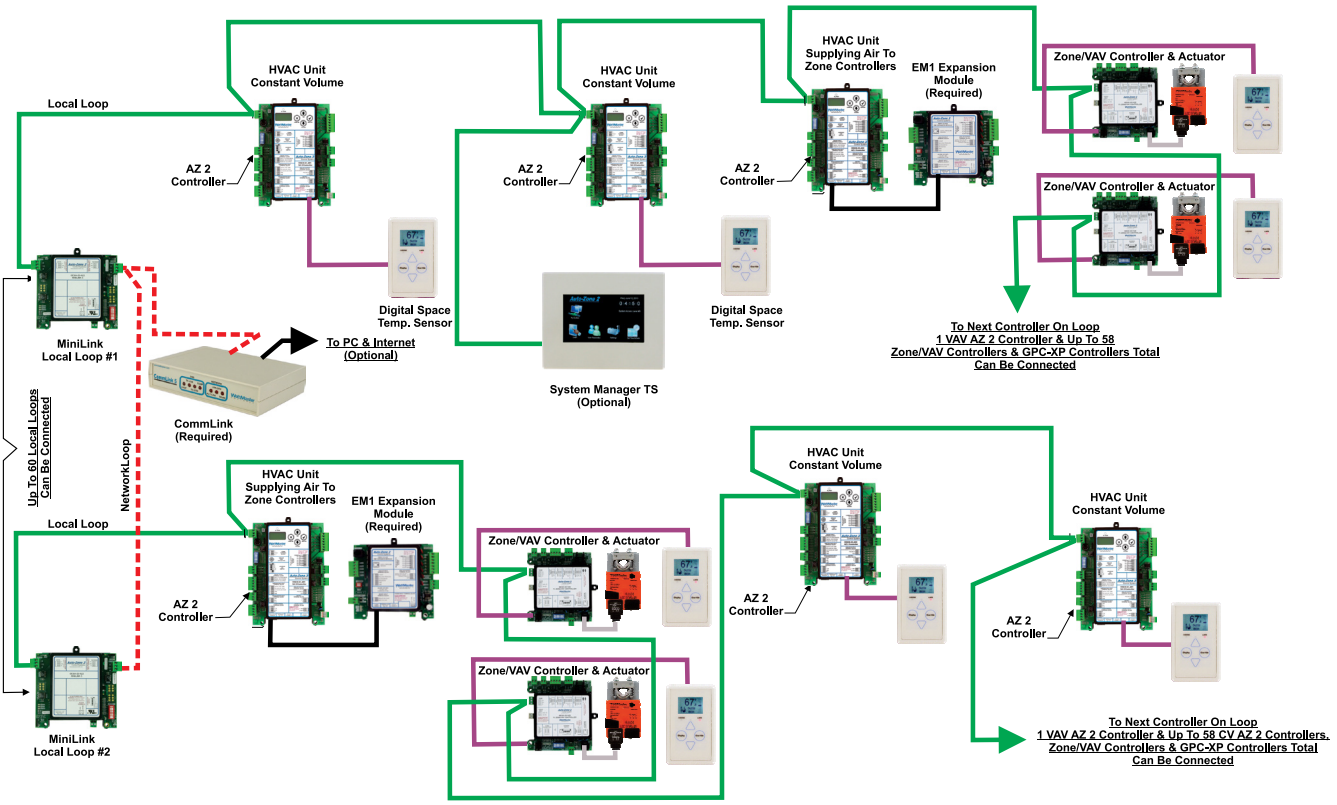


Figure 6: – Typical Multiple Loop Zoning/VAV & CV System

Multiple Loop Zoning/VAV & CV

If you have multiple HVAC units using VAV Terminal Units or a Zoning system, also have CV units and/or your total number of controllers exceeds 58 you should select the Multiple Loop Zoning/VAV & CV System. Each local loop provides for up to 58 Zone, VAV, CV and GPC-XP controllers in addition to the HVAC unit controller that is connected to the Zone/VAV Controllers. This system allows for up to 60 of these local loops to be tied together. On a zoning system local loop, up to 16 Zone/VAV Controllers can be voting zones, and additional controllers can be made up of non-voting zones, CV units and GPC-XP controllers. For VAV systems you can also have up to 58 total Zone/VAV controllers, CV units and GPC-XP controllers in addition to the HVAC unit controller for the VAV boxes.

Each local loop is connected to its own MiniLink communications interface which provides communication between all controllers on the local communications loop and the System Manager TS operator interface and/or the CommLink 5 communication interface. The MiniLink provides alarm polling of all the zone controllers.

On this type of system, the CommLink 5 communications interface acts as the main hub for all the local loops on the system and passes communication between and across all the local loops . The wiring between the CommLink 5 and all the MiniLink devices is called the network loop.

Each of the controllers on the local loops are connected together and to that loops MiniLink by means of local loop communications cable. Each of the MiniLink devices are connected together and to the CommLink 5 on the network loop using network communications cable. All communication wiring must be plenum-rated, minimum 18 gauge, 2-conductor, twisted pair with shield cable. AAON can supply communication wire that meets this specification and is color coded for the network loop or local loop, or if desired, Belden #82760 or its equivalent wire may also be used.

The CommLink 5 communication interface connects to any Windows computer with Prism 2 software installed to configure and monitor the system. Prism 2 is a Windows based color graphical computer front end software package designed by AAON. An optional IP Module is also available to provide Intranet/Internet connectivity to the control system.

In addition, the System Manager TS is an end user interface that can be used for configuring and monitoring of the system. It has a color touch screen display and intuitive graphical user interface. Multiple System Manager TS operator interfaces can also be used if desired.

Important Wiring Considerations

General

Correct wiring of the Controllers is the most important factor in the overall success of the installation process. In the unlikely event that troubleshooting of the controller is required, it is a good idea to be familiar with the system wiring.

Controller Mounting

The AZ 2 Controller is housed in a plastic enclosure. It is designed to be mounted by using the 3 mounting holes in the enclosure base. The AZ 2 Controller needs to be installed in an environment which can maintain a temperature range between -30°F and 150°F and not exceed 90% RH levels (non-condensing). It is important to mount the controller in a location that is free from extreme high or low temperatures, moisture, dust, and dirt. Be careful not to damage the electronic components when mounting the controller.

Considerations

The AZ 2 Controller, EM1, EM2, EM3 Expansion Modules, MiniLink, System Manager TS, GPC-XP and Zone Controllers must be connected to a 24 VAC power source of the proper size for the calculated VA load requirements. All transformer sizing should be based on the VA rating listed in **Table 1**.

WARNING: When using a single transformer to power more than one controller or expansion module, the correct polarity must always be maintained between the boards. Failure to observe correct polarity will result in damage to the AZ 2 Controller and Expansion Module(s).

Please carefully read and apply the following information when wiring the AZ 2 Controller or the Expansion Modules. See **Figure 7-14** for AZ 2 Controller wiring. See **Figures 15 & 16** for EM1 Expansion Module Wiring. See **Figure 17** for EM2 Expansion Module Wiring. See **Figure 18** for EM3 Expansion Module Wiring.

1. All wiring is to be in accordance with local and national electrical codes and specifications.
2. Minimum wire size for 24 VAC wiring should be 18 gauge.
3. Minimum wire size for all sensors should be 20 gauge.
4. Be sure that all wiring connections are properly tightened into the terminal blocks. Do not allow wire strands to stick out and touch adjoining terminals which could potentially cause a short circuit.
5. All communications wiring must be plenum rated minimum 18 gauge, 2 conductor twisted pair with shield wire. AAON can supply communications wire that meets this specification and is color coded for the Network or Local Loop wiring. The Local Loop wire part number is G038140. It is color coded with green candy striping and comes on a 1000 foot spool. The Network Loop wire part number is G038150. It is color coded with red candy striping and comes on a 500 foot spool. If desired, 18 gauge minimum Belden #82760 or equivalent wire may also be used for Network or Local Loop communications wiring.
6. Before applying power to any controller or module be sure to recheck all wiring connections and terminations thoroughly.

Transformer VA Required For Controllers & Modules		
Part No.	**Description**	**Min. VA**
ASM01938	AZ 2 Controller	10
ASM01939	EM1 Expansion Module	5
ASM01940	EM2 Expansion Module	5
ASM01941	EM3 Expansion Module	5
ASM01853 ASM01856	Zone/VAV Controller - P.D. Zone/VAV Controller - P.I.	6
ASM01942	System Manager TS	5
ASM01876	MiniLink 5	6
ASM01874	CommLink 5	6
ASM01868	GPC-XP	10

Table 1: VA Requirements - Controllers & Modules

24VAC Power - Transformer & Wire Sizing Considerations

Some installers like to use one large 24VAC transformer to power several devices. This is allowable as long as polarity is maintained to each device on the transformer circuit. **Warning: If polarity is not maintained, severe damage to the devices may result. WattMaster Controls recommends using a separate transformer for each device in order to eliminate the potential for damaging controllers due to incorrect polarity.** Using separate transformers also allows redundancy in case of a transformer failure. Instead of having 8 controllers inoperative because of a malfunctioning transformer you have only 1 controller off line. If the installer does decide to use a large transformer to supply power to several devices, the following transformer and wire sizing information is presented to help the installer correctly supply 24VAC power to the devices.

Following is a typical example to help the installer to correctly evaluate transformer and wiring designs.

Each AZ 2 Controller requires 10 VA @ 24VAC power. In the examples below we have a total of 8 Controllers.

8 AZ 2 Controllers @ 10 VA each..... 8 x 10 VA = 80 VA.

The above calculation determines that our transformer will need to be sized for a minimum of 80 VA if we are to use one transformer to power all the controllers.

Next we must determine the maximum length of run allowable for the wire gauge we wish to use in the installation. Each wire gauge below has a voltage drop per foot value we use to calculate total voltage drop.

18ga wire.....0.00054 = voltage drop per 1' length of wire
16ga wire.....0.00034 = voltage drop per 1' length of wire
14ga wire.....0.00021 = voltage drop per 1' length of wire

For our example we will use 18 gauge wire. WattMaster recommends 18 gauge as a minimum wire size for all power wiring.

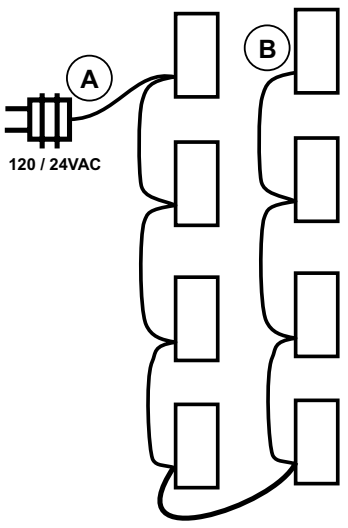
Next use the voltage drop per foot value for 18 gauge wire from the list above and multiply by the total VA load of the 8 controllers to be installed.

0.00054 (Voltage drop per foot for 18 gauge wire) x 80 VA controller load = **0.0432** Volts/Ft.

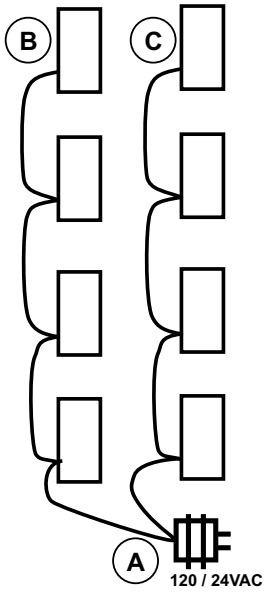
WattMaster controllers will operate efficiently with a voltage drop no greater than 2 Volts. Divide the total allowable voltage drop of 2 Volts by the number you arrived at above and you have the maximum number of feet you can run the 18 gauge wire with a 48 VA transformer with no more than a 2 Volt drop at the farthest controller from the transformer..

$$\frac{\text{2 (Volts total allowable voltage drop)}}{\text{0.0432 (Voltage drop per 1 ft. @ 80 VA load)}} = \text{46.30 feet}$$

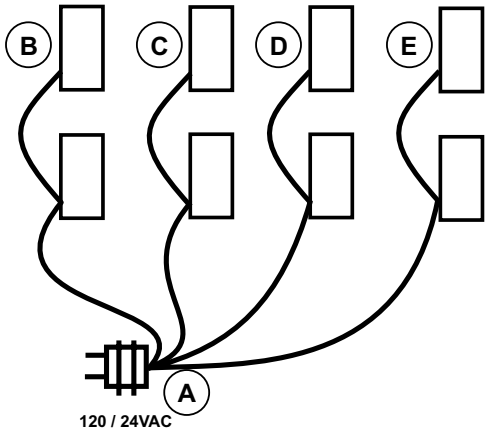
Parallel circuiting of the wiring instead of wiring all 8 controllers in series allows for longer wire runs to be used with the same size wire (as shown in our examples below). It is often necessary for the installer to calculate and weigh the cost and installation advantages and disadvantages of wire size, transformer size, multiple transformers, circuiting, etc., when laying out an installation. No matter what layout scheme is decided upon, it is mandatory that the farthest controller on the circuit is supplied with a minimum of 22 Volts.



Distance A to B cannot exceed 46.3 Ft.



Distance from A to B cannot exceed 92.6 Ft.
Distance from A to C cannot exceed 92.6 Ft.



Distance from A to B cannot exceed 185.2 Ft.
Distance from A to C cannot exceed 185.2 Ft.
Distance from A to D cannot exceed 185.2 Ft.
Distance from A to E cannot exceed 185.2 Ft.

AZ 2 Controller Wiring

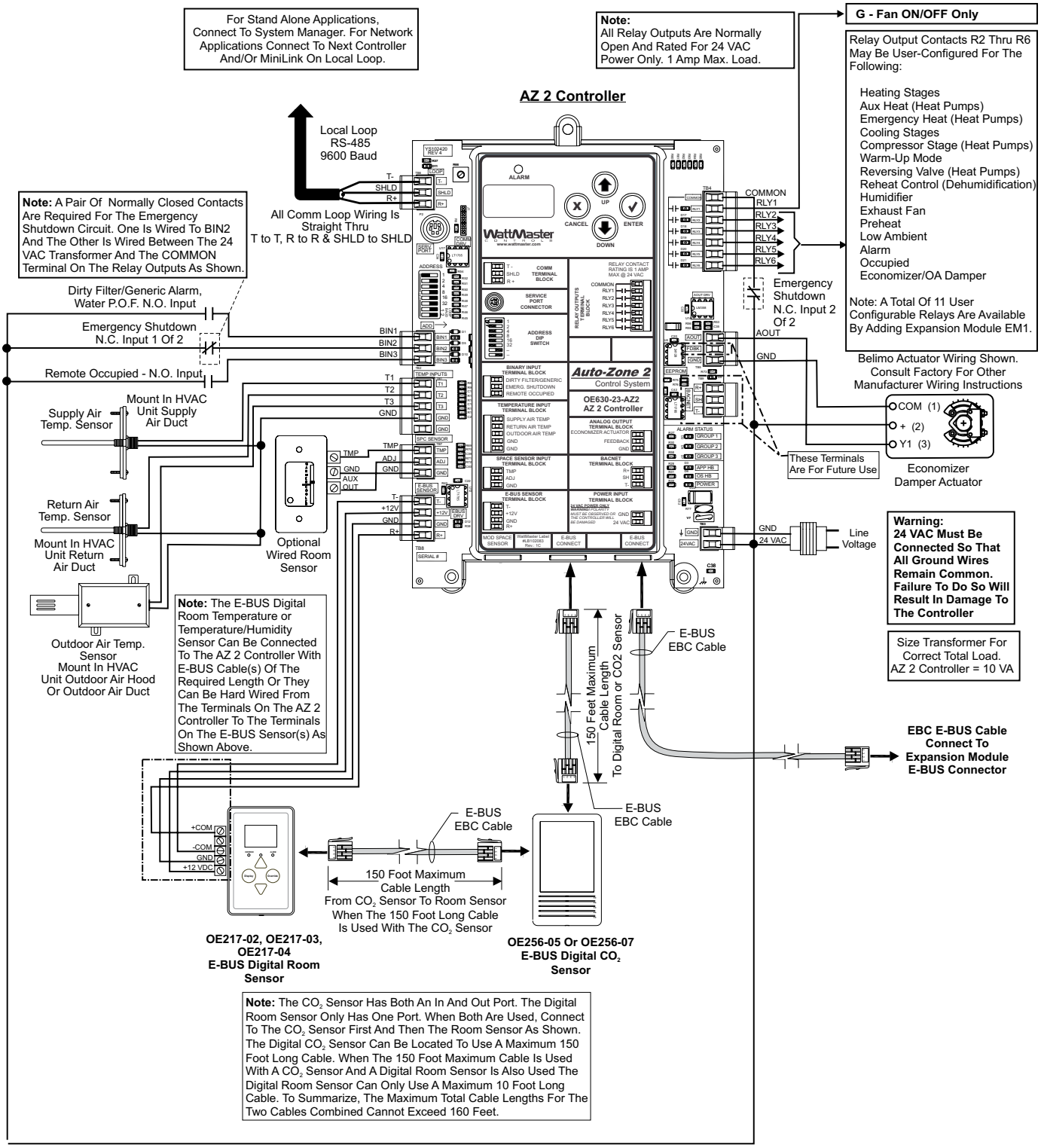


Figure 7: – AZ 2 Controller Wiring

AZ 2 Controller Inputs

Space Temperature Sensor Inputs

The Standard Room Sensor (OE210, OE211, OE212 or OE213) can be connected by wiring to the wiring terminals provided for this purpose located on the controller.

If the Space Temperature Sensor is configured as the CV Control Source, it will generate Occupied Heating and Cooling demands based on the Space Temperature. Unless this is a zone voting system, this Space Temperature sensor is the only sensor that can generate Unoccupied (Night Setback) Heating and Cooling Calls. The Standard Space Temperature Sensor can be supplied with optional Push-Button Override and/or Slide Adjust Features. The Push-Button Override will switch the unit from the Unoccupied Mode to the Occupied Mode for a user adjustable amount of time. The Slide Adjust range is user adjustable.

E-BUS Digital Space Sensor Inputs

An E-BUS Digital Space Sensor and/or an E-BUS Digital CO_2 Sensor can be connected to one of the 2 E-BUS Connection Inputs via an E-BUS Cable of the required length. As an alternative either or both sensors can be hard wired to the (4 pole) E-BUS wiring terminals provided on the controller. If the Space Temperature Sensor is configured as the CV Control Source, it will generate Occupied Heating and Cooling demands based on the Space Temperature.

T1 - Supply Air Temperature Sensor Input

The AZ 2 Controller requires the use of the Supply Air Temperature Sensor. When the unit is in Heating or Cooling Mode, it will be controlled to maintain the appropriate Heating or Cooling Supply Air Setpoint.

T2 - Return Air Temperature Sensor Input

If you want to generate occupied Heating and Cooling demands based on Return Air Temperature, select this Sensor as the CV Control Source. The Return Air Temperature Sensor is also used to initiate or cancel the Morning Warm-up Period. It also acts as a fail-safe sensor on zoning systems should communications between the zones and the AZ 2 Controller fail.

T3 - Outdoor Air Temperature Sensor Input

The Outdoor Air Temperature is used to lock out Heating or Cooling at whatever temperature you deem appropriate for each Mode of Operation to conserve energy. It is also used for Economizer Control, and if used in conjunction with an Outdoor Air Humidity Sensor, it can provide Wetbulb or Dewpoint Economizer Control.

TMP - Standard Space Sensor Temp Input

The Standard Space Sensor (with terminals) TMP output wire can be connected to this terminal.

ADJ - Standard Space Sensor Input

The Standard Space Sensor with slide adjust (with terminals) Aux output wire can be connected to this terminal.

BIN1 - Dirty Filter, Generic Alarm, W.P.O.F.

This wet contact input can be used to monitor a Dirty Filter Switch, Generic Alarm or a Water Proof Of Flow Switch (for units with water cooled condensers). It is software configurable as to what it is being used for so that the alarm is displayed correctly. If using the EM1 Expansion Module, this input can only be used for Generic Alarm or Water Proof Of Flow Switch. The Dirty Filter Switch (if used) must be wired into the BIN2 input on the EM1 Expansion Module.

BIN2 - Emergency Shutdown Input

The 24 VAC N.C. wet contact input on BIN2 is used to initiate shutdown of the HVAC unit when an N.C. Smoke Detector (by others), N.C. Firestat (by others), or other N.C. Emergency Shutdown device (by others) opens its contact. It also requires a second 24 VAC N.C. wet contact from the device to shut down the AZ 2 Controller relay outputs. As previously stated one of the N.C. contacts is wired to BIN2 and the second N.C. contact is wired between the 24 VAC transformer and the relay output COMMON terminal on the AZ 2 Controller. These contacts working together shut down the relay outputs and initiate an alarm.

WARNING: The Emergency Shutdown Input is not and should not be used as a Life Safety Device. It is not designed for this purpose.

BIN3 - Remote Forced Occupied Mode Input

This wet contact input is used to initiate Occupied Mode on the HVAC unit when a normally open contact is closed.

NOTE: The Binary Inputs require wet contacts (24 VAC only) to recognize an active input. If you provide dry contacts, the contact closure will not be recognized.

AZ 2 Controller Outputs

AOUT - Economizer Control Signal

This voltage signal (2-10 VDC) is used to control the Outdoor Air Damper & Return Air Damper during Economizer Control. It is also used to maintain the Outdoor Air Damper at its Minimum Position during the Occupied Mode when the Outdoor Air Temperature, Wetbulb Temperature, or Dewpoint is not suitable for Economizer Cooling purposes.

FDBK

This terminal is not used at this time but will be used in future applications.

BACNET

These terminals are not currently used. The controller does not have BACnet capabilities at this time but they will be available in the future.

RLY1 - Supply Fan (Enable)

This is a non-configurable output and is used to initiate the Supply Fan.

RLY2-RLY6 - User-Configurable Relays

These relays are configurable by the user. For all the available configuration options, see **Figure 7.**

By using all (5) of the available relay outputs on the AZ 2 Controller and the (6) relay outputs on the AZ 2 Expansion Module 1, you have the ability to configure up to a combined total of (11) relay outputs for Heating Stages, Cooling Stages, and options listed in **Figure 7** and **Figure 14**.

AZ 2 Controller Wiring

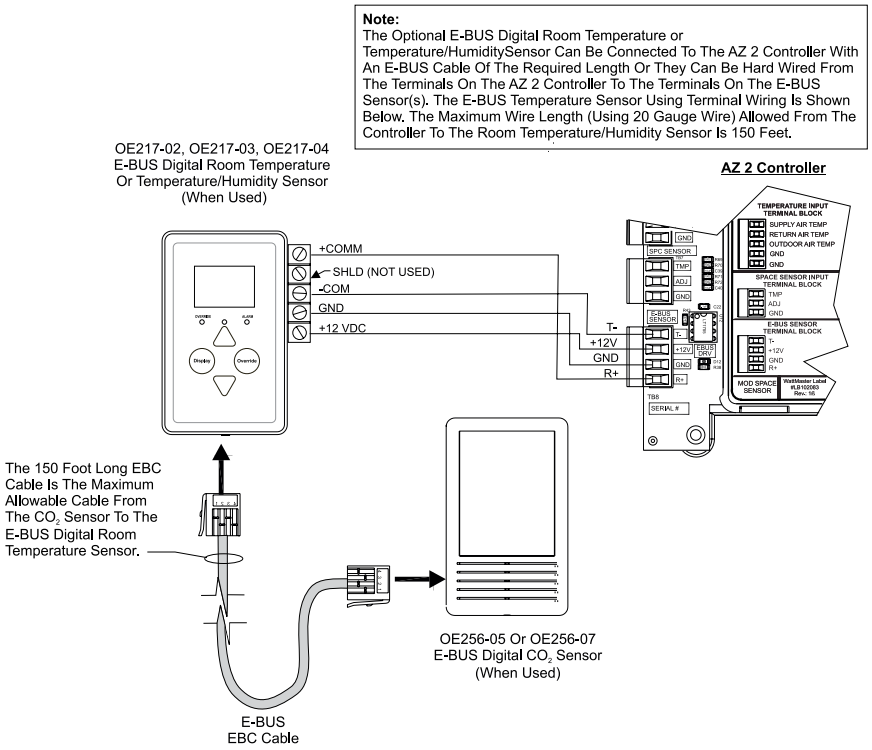


Figure 8: – E-BUS Temperature/Humidty & CO2 Sensor Wiring Using Wire Terminals

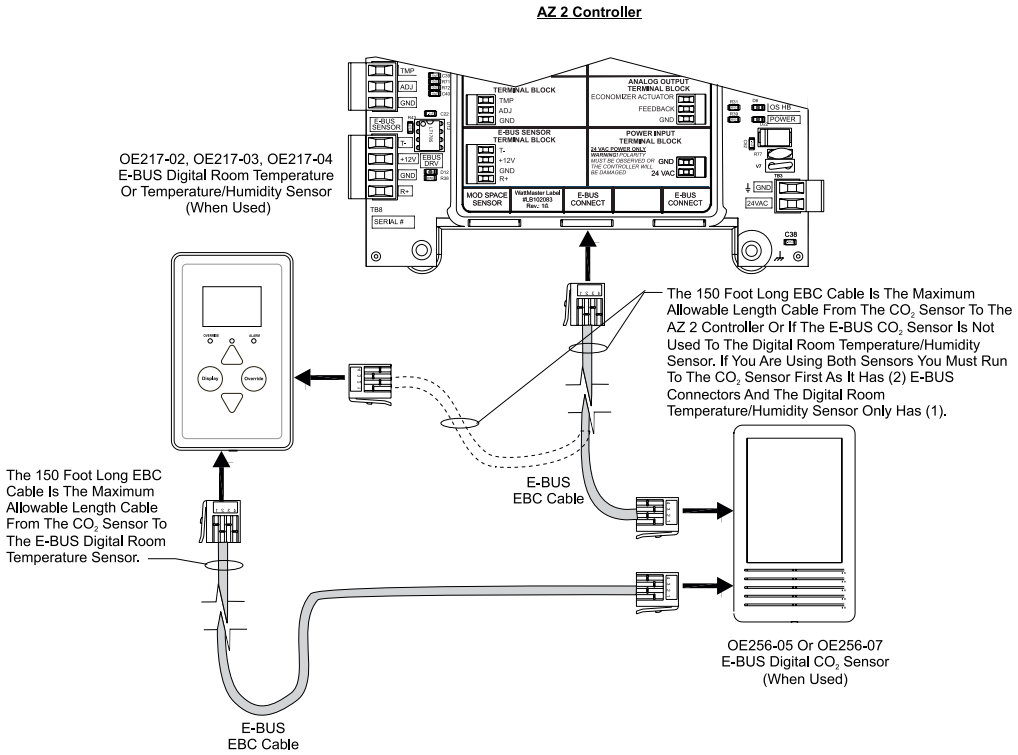


Figure 9: – E-BUS Temperature/Humidty & CO2 Sensor Wiring Using E-BUS Cables

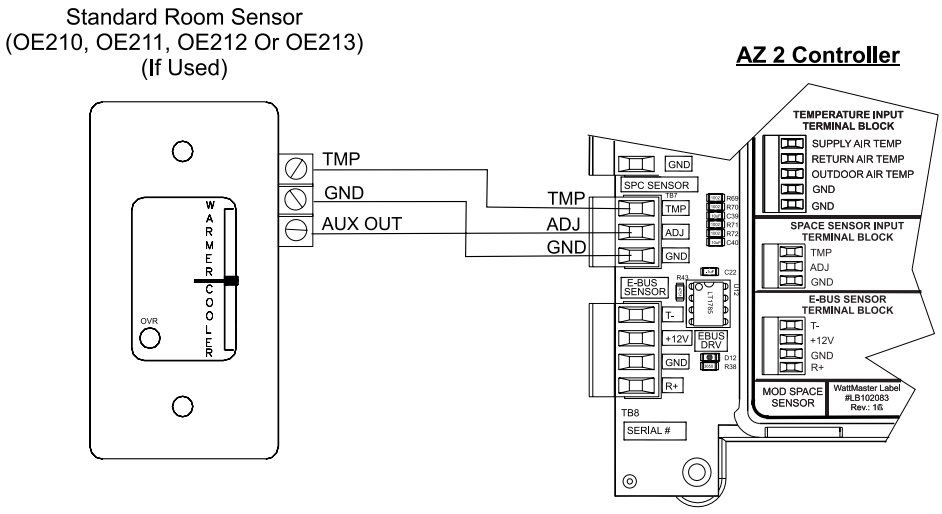


Figure 10: – Standard Room Sensor Wiring

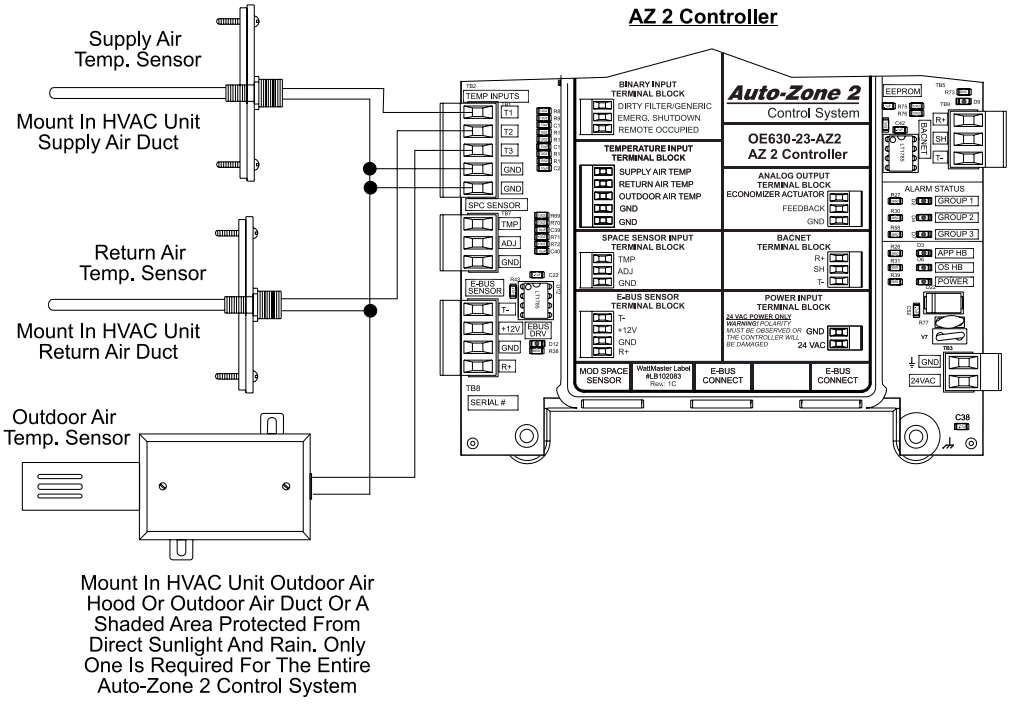


Figure 11: – SA, RA And OA Temperature Sensor Wiring

AZ 2 Controller Wiring

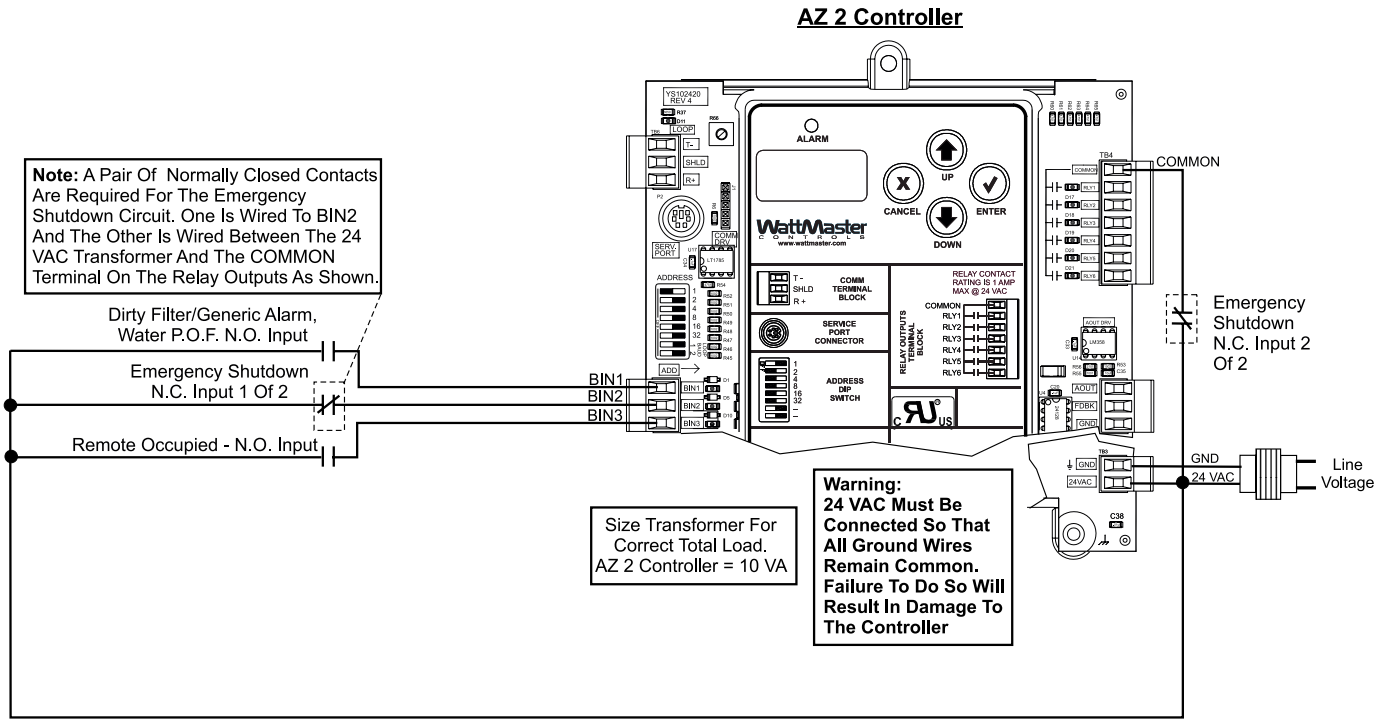


Figure 12: – Binary Input Wiring

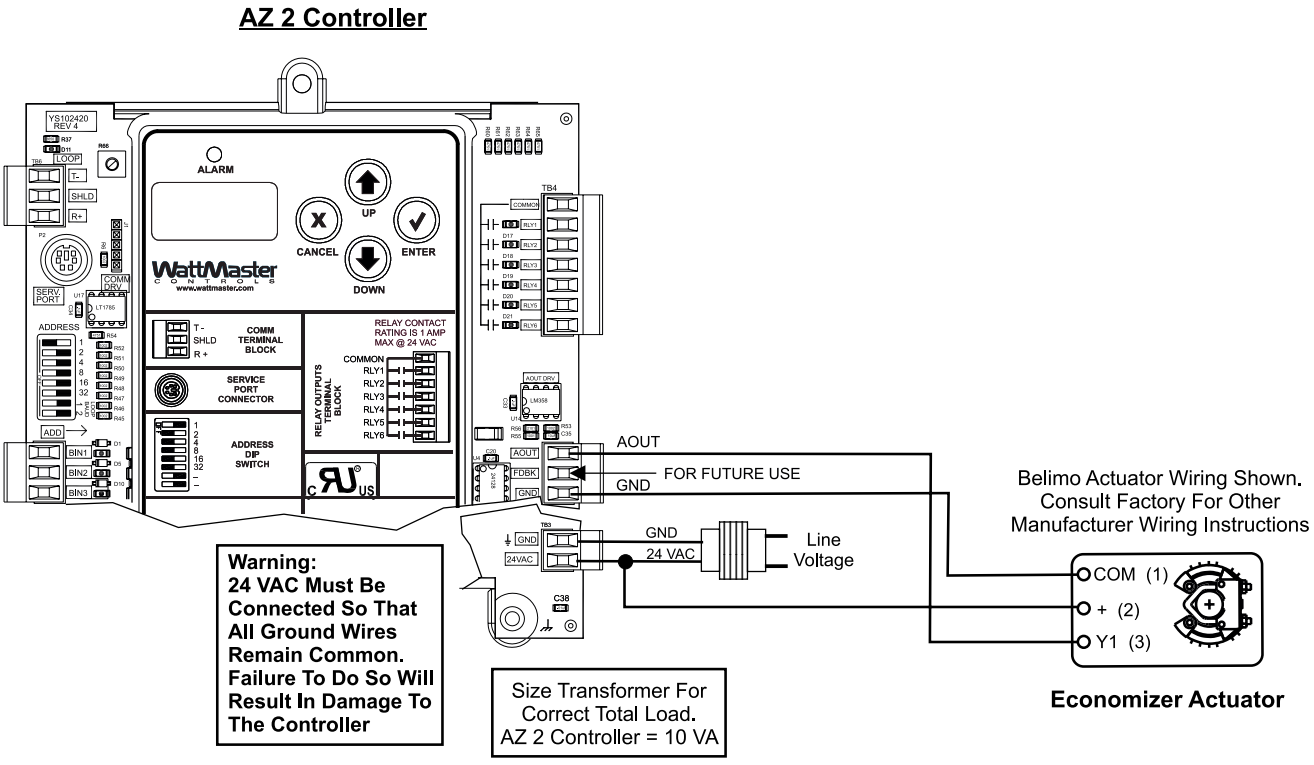


Figure 13: – Analog Output Wiring

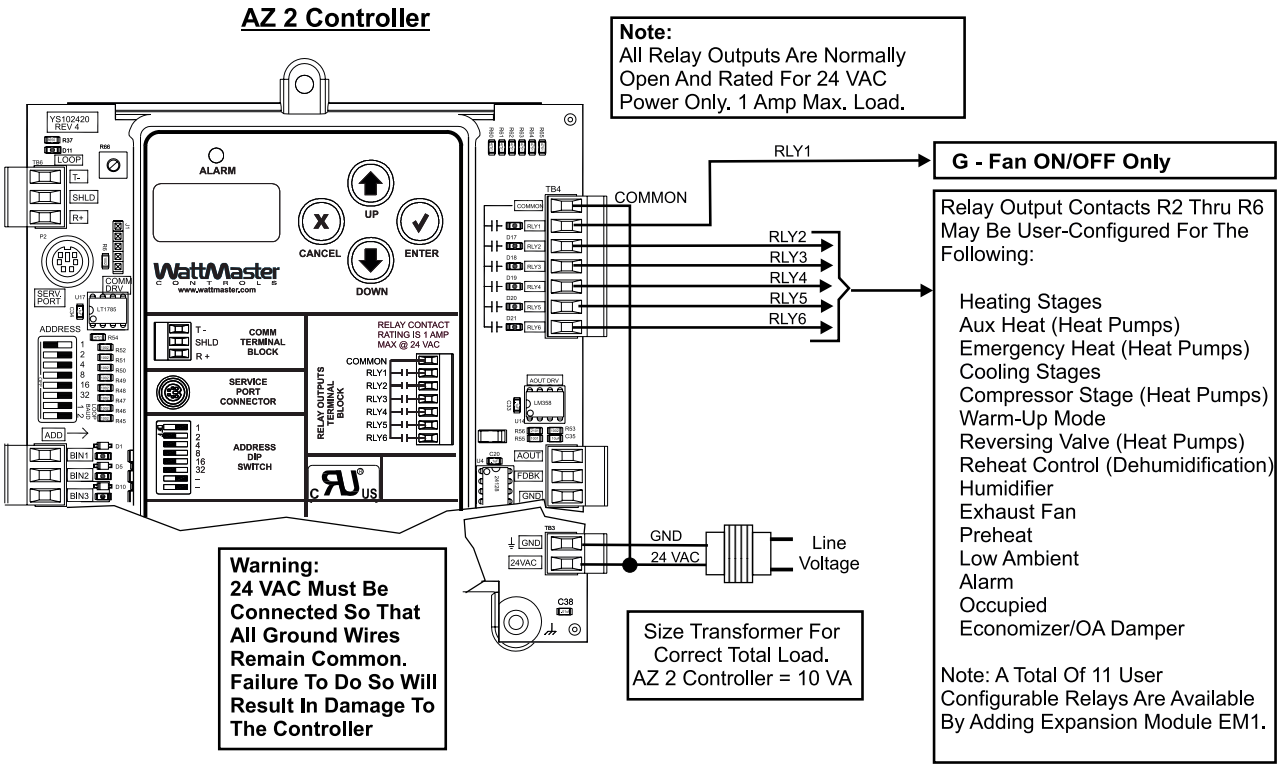


Figure 14: – Relay Output Wiring

EM1 Expansion Module Input Wiring

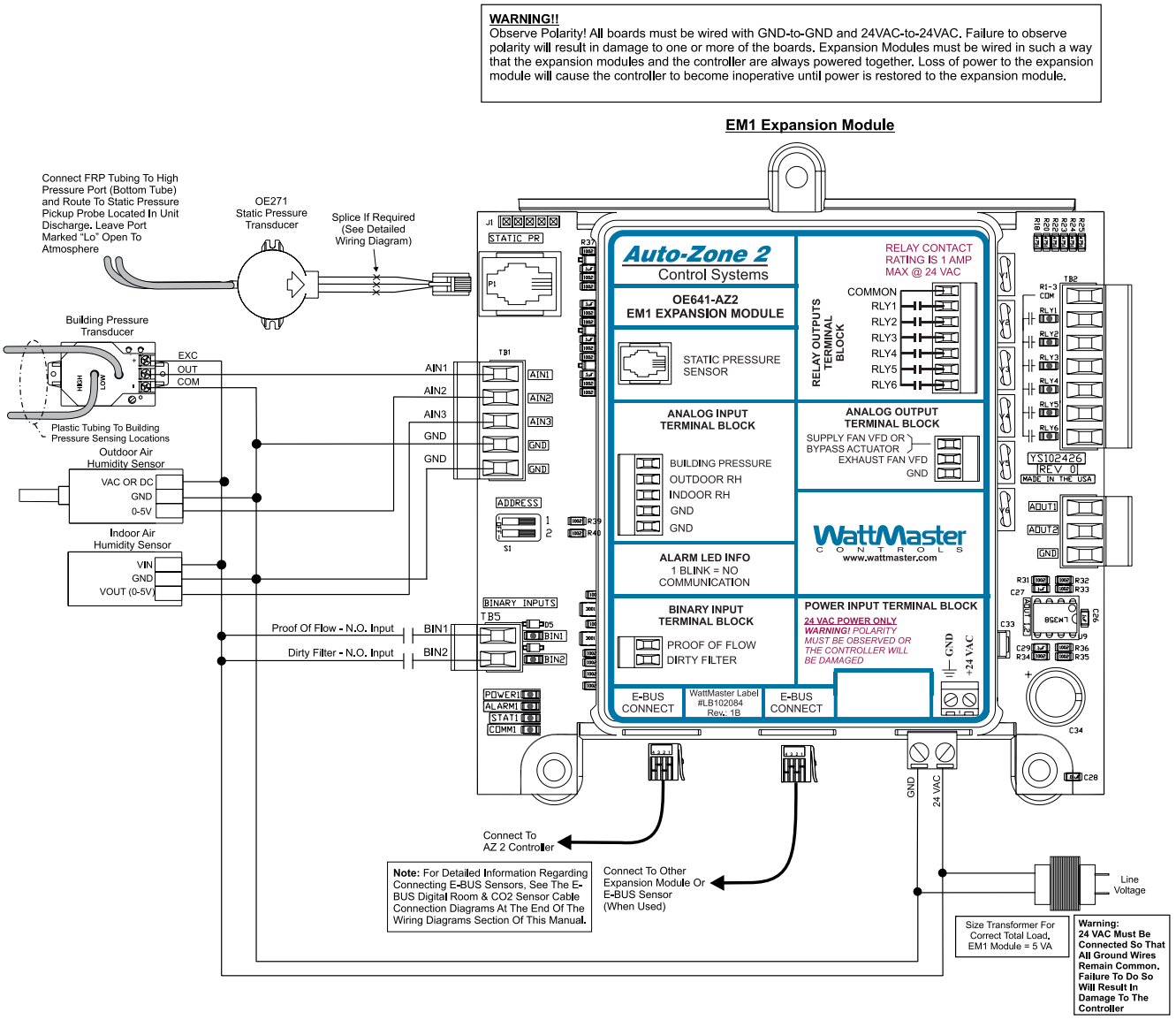


Figure 15: – EM1 Expansion Module Input Wiring

EM1 Inputs

Modular Duct Static Pressure Sensor Input

This special phone jack-style input connection accepts a Duct Static Pressure Sensor input modular cable. The Duct Static Pressure Sensor reading is used to determine current Duct Static Pressure. This Static Pressure reading is used to control the output signal supplied to the Supply Fan VFD or Zoning Bypass Damper Actuator. If you have configured the HVAC unit for Constant Volume operation, this Sensor is optional. If it is installed on a Constant Volume unit, it will not affect operation, but rather will be used as a status-only reading.

AIN1 - Building Pressure Sensor Input

This Sensor is only required if you wish to configure the AZ 2 Controller for Building Pressure Control. Building Pressure Control can be accomplished by using one of two main control methods. One control method uses the 0-10 VDC signal to control an Exhaust Fan VFD or an Exhaust Damper Actuator for Direct Acting Pressure Control applications. The other available control method is to configure one of the Output Relays as an Exhaust Fan output that will activate the Exhaust Fan any time the Building Pressure is above the Building Pressure Setpoint.

AIN2 - Outdoor Air Humidity Sensor Input

This 0-5 VDC input is used to connect an Outdoor Air Humidity Sensor that when combined with the Outdoor Air Temperature Sensor reading is used to calculate a Dewpoint and/or Wetbulb Temperature. The Wetbulb or Dewpoint Temperature is used for Economizer control.

AIN3 - Indoor Air Humidity Sensor Input

The Indoor Air Humidity Sensor is used to activate Dehumidification Mode on a VAV or CAV unit. The Sensor can be a Wall-Mounted Space Humidity Sensor or a Return Air Duct Mounted Humidity Sensor.

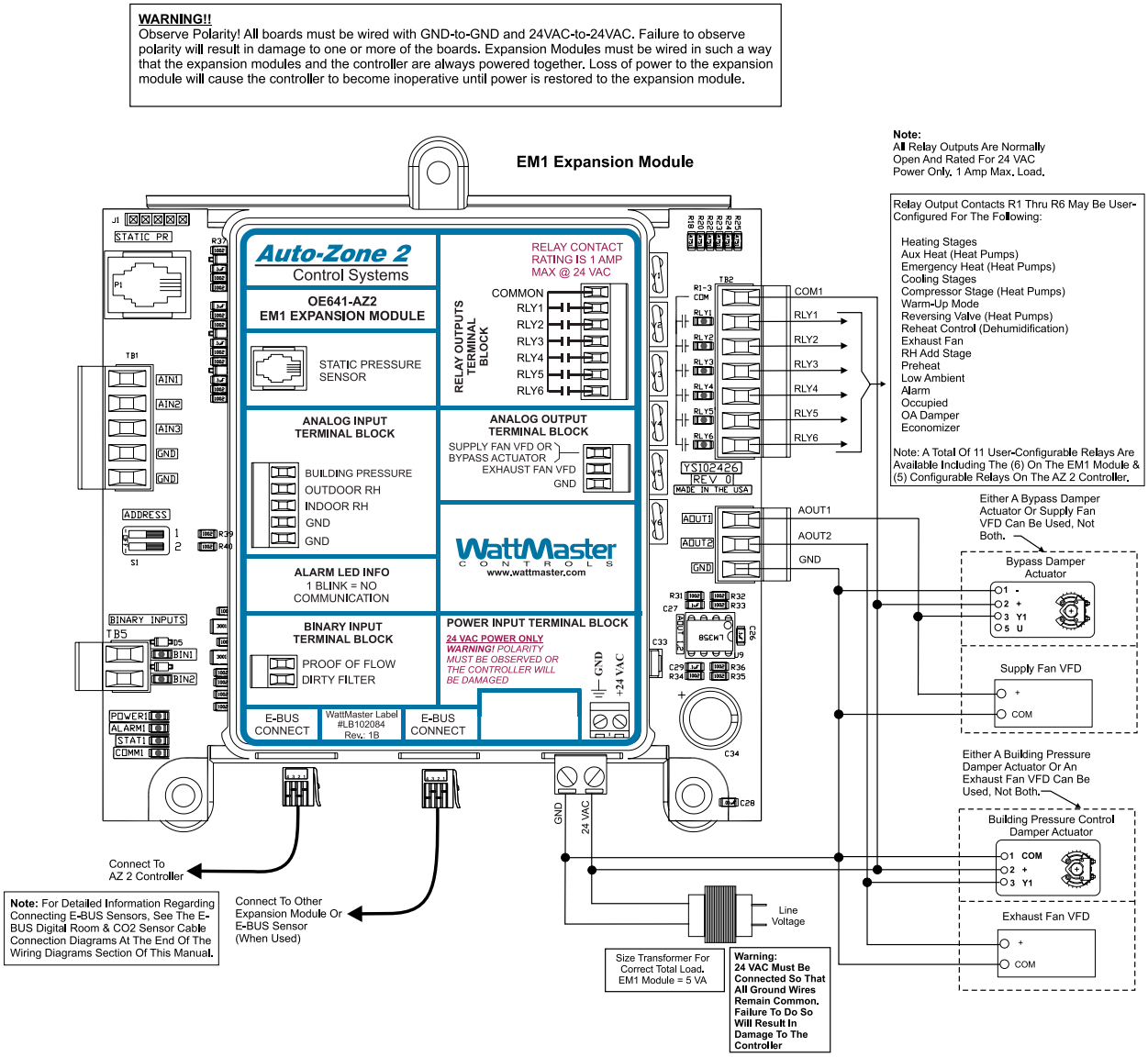


Figure 16: – EM1 Expansion Module Output Wiring

BIN1 - Proof of Flow Input

A Proof of Flow Switch that provides a wet contact closure whenever the HVAC unit Supply Fan is operating can be connected to this input. If the Proof of Flow Switch contact opens while the Supply Fan is operating, all Heating and Cooling is suspended or disabled. The Proof of Flow Switch is an optional input. This means if you want to use it you must always configure the AZ 2 Controller to recognize the input signal.

BIN2 - Dirty Filter Contact Closure Input

This wet contact input is required for Filter Status Indication and requires a Differential Pressure Switch to initiate "Dirty Filter" indication. If you are using the BIN 1 Input on the AZ 2 Controller for a Generic Alarm or Water P.O.F. Switch you must connect the Differential Pressure Switch here. Otherwise it can be located here or on the BIN1 input on the AZ 2 Controller as desired.

EM1 Outputs

AOUT1 - Supply Fan VFD/Bypass Output

This output signal has a user configurable voltage output range from 0–10 VDC. It is used to control a Supply Fan VFD or a Bypass Damper on a Zoning System.

AOUT2 - Exhaust Fan Output

This output signal has a user configurable voltage output range from 0–10 VDC. It is used to control an Exhaust Fan VFD for Building Pressure Control.

RLY1-RLY6 - User-Configurable Relay Outputs

Configure relays as indicated by the factory wiring diagram when mounted controls are used. The options are listed in **Figure 16.**

EM2 Expansion Module Wiring

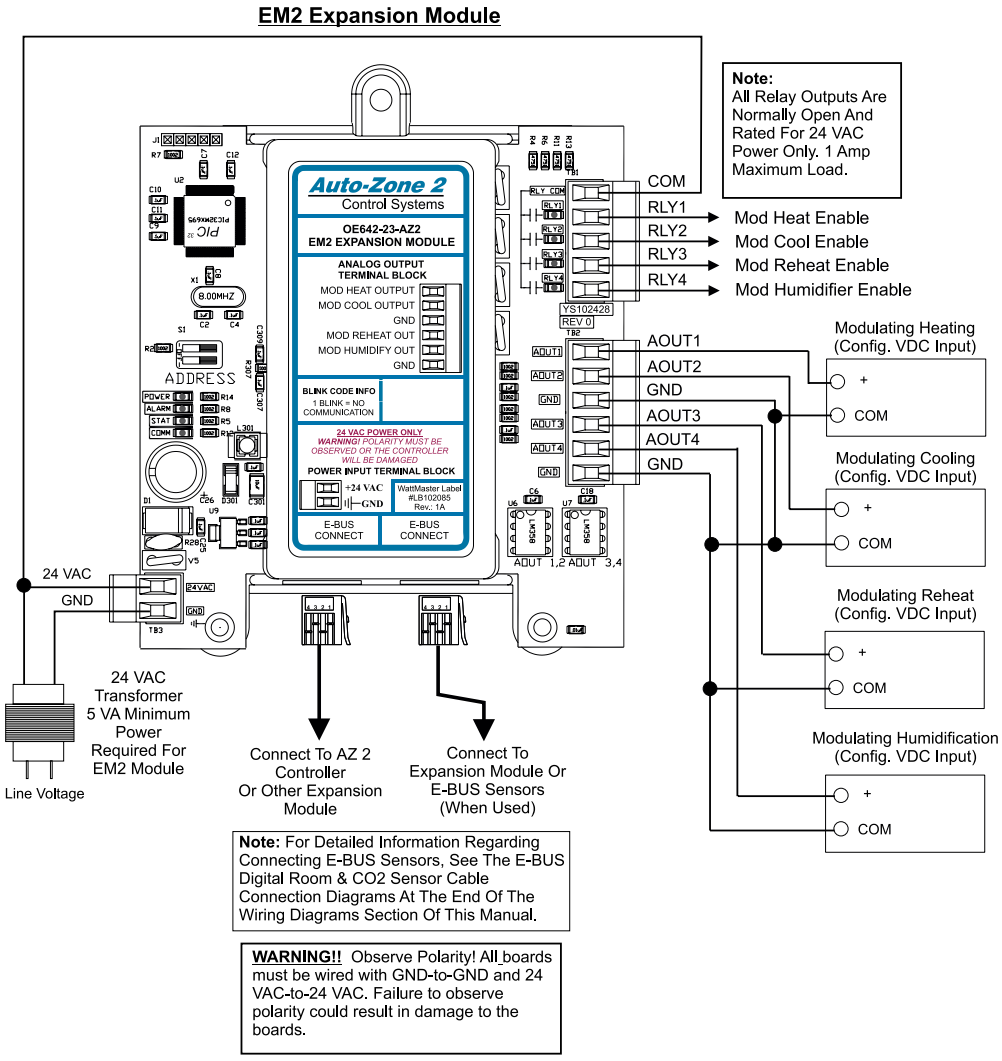


Figure 17: – EM2 Expansion Module Output Wiring

EM2 Outputs

RLY1 - Modulating Heat Enable
RLY2 - Modulating Cool Enable
RLY3 - Modulating Reheat Enable
RLY4 - Modulating Humidifier Enable

Relays 1 through 4 are used if your modulating device requires an enable signal.

AOUT1 - Modulating Heating Signal

This output signal is configurable between 0 to 10 VDC. This signal can be configured for either Direct Acting or Reverse Acting operation. This output signal is used to operate a Modulating Heating Device to maintain the Heating Supply Air Temperature Setpoint.

AOUT2 - Modulating Cooling Signal

This output signal is configurable between 0 to 10 VDC. This signal can be configured for either Direct Acting or Reverse Acting operation. This output signal is used to operate a Modulating Cooling Device to maintain the Cooling Supply Air Temperature Setpoint.

AOUT3 - Modulating Reheat Signal

This output signal is configurable between 0 to 10 VDC. This signal can be configured for either Direct Acting or Reverse Acting operation.

AOUT4 - Modulating Humidifier Signal

This output signal is configurable between 0 to 10 VDC. This signal can be configured for either Direct Acting or Reverse Acting operation.

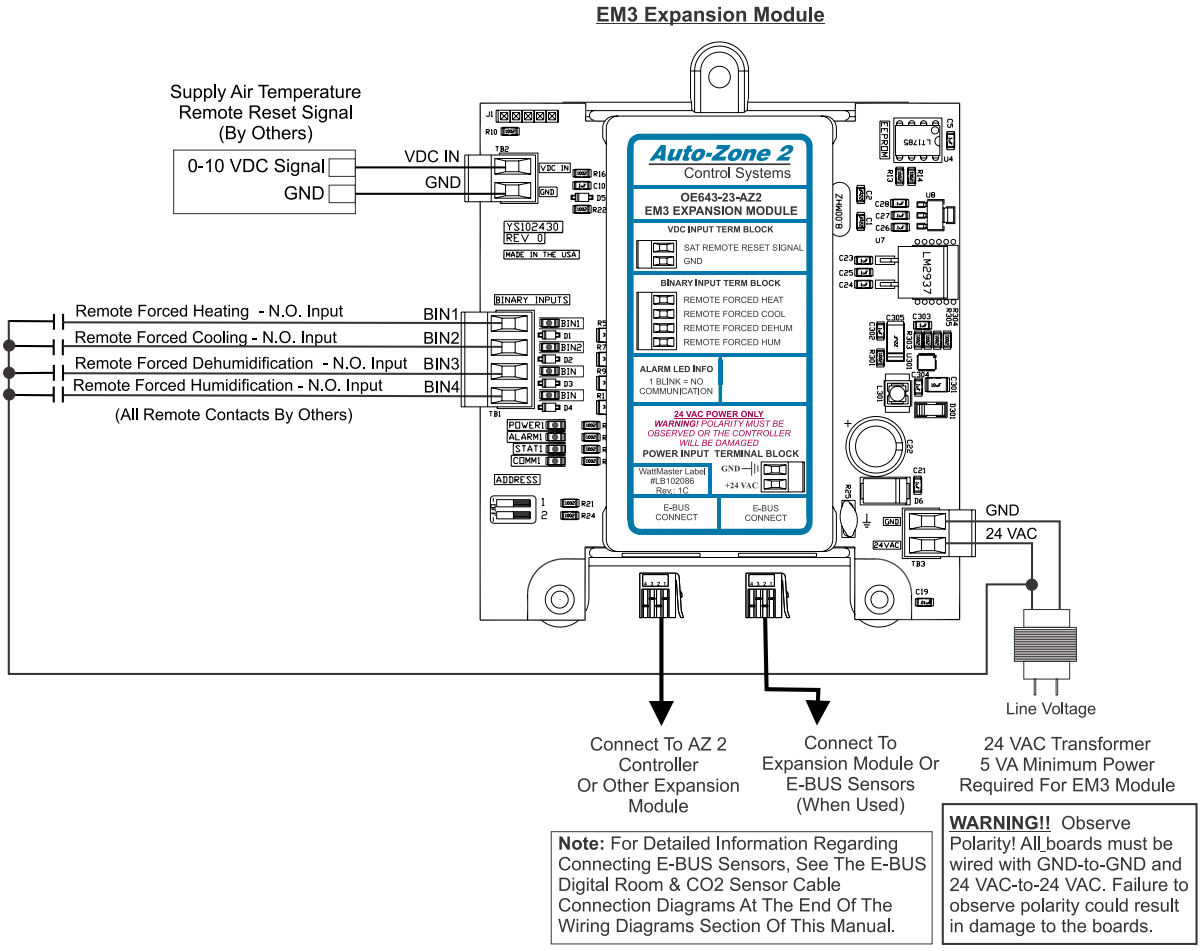


Figure 18: – EM3 Expansion Module Input Wiring

EM3 Inputs

VDC IN - SAT Remote Reset Signal

This input requires 0-10 VDC Supply Air Temperature Remote Reset Signal.

The Supply Air Temperature Remote Reset signal must be configured so that its setpoint will be at the coldest Supply Air Temperature at 0 VDC, and so that its setpoint will be at the warmest Supply Air Temperature at 10 VDC.

BIN1 - Remote Forced Heating Mode

This wet contact input is used to provide a means for another BAS or control device (by others) to force the unit into Heating Mode when it closes. See the note regarding Remote Force Mode Setting that follows.

BIN2 - Remote Forced Cooling Mode

This wet contact input is used to provide a means for another BAS or control device (by others) to force the unit into Cooling Mode when it closes. See the note regarding Remote Force Mode Setting that follows.

BIN3 - Remote Forced Dehumidification

This wet contact input is used to provide a means for another BAS or control device (by others) to force the AZ 2 Controller into Dehumidification Mode. To utilize this feature the HVAC unit must have dehumidification capability.

BIN4 - Remote Forced Humidification

This wet contact input is used to provide a means for another BAS or control device (by others) to force the AZ 2 Controller into Humidification Mode. To utilize this feature the HVAC unit must have humidification capability.

NOTE: If an external source(s) is used to force the operating mode of the HVAC unit (Heating, Cooling, Dehumidification, Humidification) then that external source(s) must be in control of forcing all modes of operation for that unit. The external source(s) must also provide the controlling sensors for each mode of operation.

Zone/VAV Controller Wiring

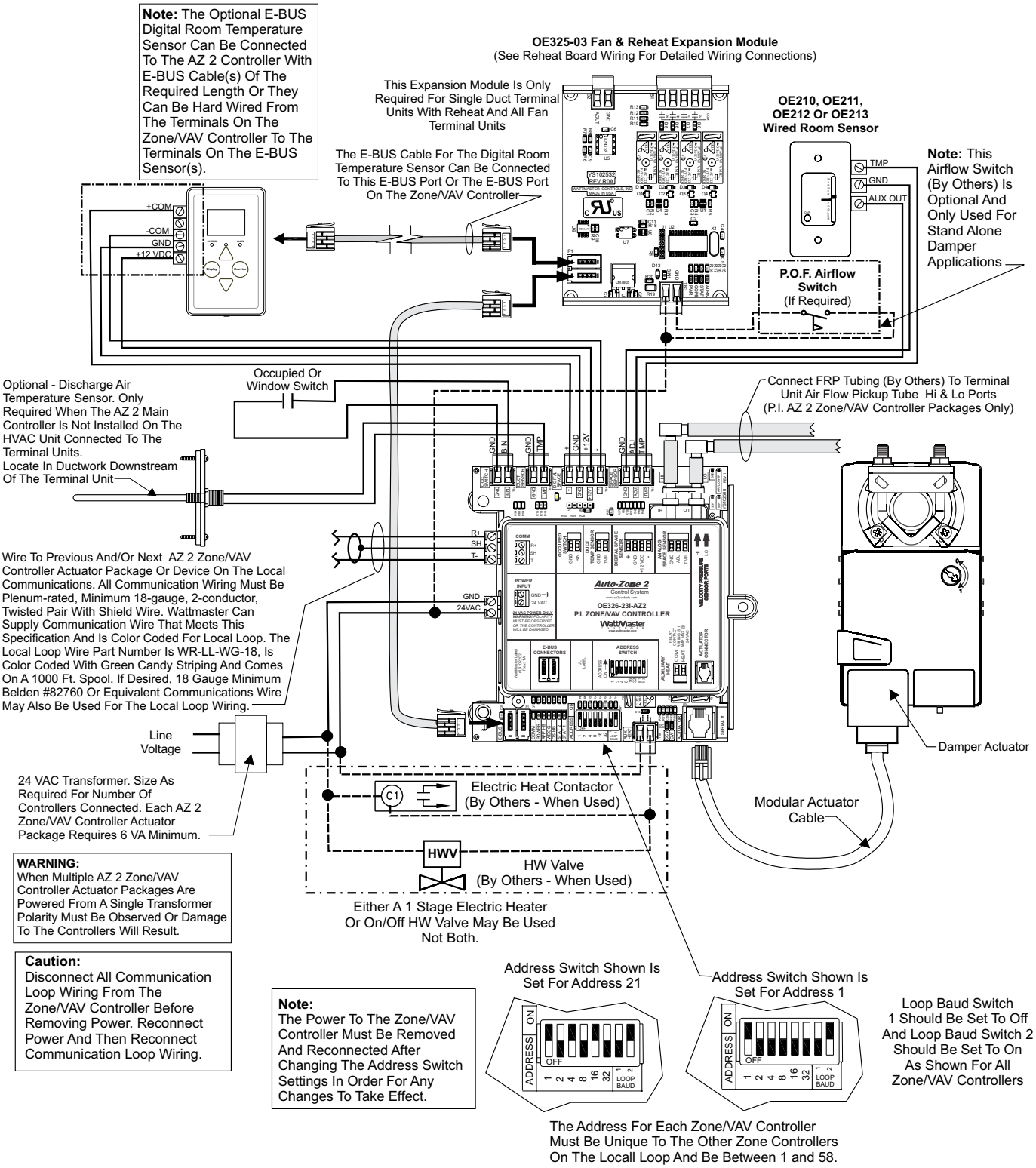


Figure 19: – Zone/VAV Controller Wiring

Zone/VAV Controller Inputs

The following inputs and outputs are available on the Zone/VAV Controller and the OE325-03 Zone Controller Expansion Module. **See Figures 19, 22, 23, 24 and 25.**

Space Temperature

A Standard Room Temperature Sensor that hard wires to the Space Sensor wiring terminals on the controller are used when an analog sensor is desired. When a Digital Room Temperature Sensor is desired it can connect to the E-BUS wire terminals on the controller or it can be connected to the E-BUS connector on the controller using an E-BUS pre-fabricated cable of the desired length.

Airflow Sensor

If the OE326-23I-AZ2 P.I. Zone/VAV Controller is being used, the terminal unit's pressure pick-up tube must be connected with FRP tubing to the barb fittings on the side of the Zone/VAV Controller. No Wiring connections are required as the pressure sensor is integral to the Zone/VAV controller. This pressure sensor input is used for CFM (airflow) calculations.

Discharge Air Temperature Sensor

This sensor can be used for monitoring the discharge air temperature of the terminal unit, round damper or rectangular damper used with the Zone/VAV controller. It is typically used when the terminal unit has reheat installed, so the true temperature of the air being supplied to the space can be monitored. It should be mounted in the discharge duct downstream of the terminal unit where the Zone/VAV Controller is installed.

Occupied or Window Switch

If an Occupied Switch input is used to determine room occupancy then it will allow for setback of the heating or cooling setpoints during occupied periods. It is a dry contact.

If a Window Switch input is used and the window is open it will cause the zone damper to be driven closed.

24 VAC Power Terminal Block

This two pole terminal block is used to wire the 24 Volt power to the Zone/VAV Controller. If desired a single transformer can be used to power multiple Zone/VAV Controllers together, or a separate transformer can be used for each controller.

WARNING: If multiple controllers are to be wired to the same transformer, polarity must be observed or damage to the controller will result.

Zone/VAV Controller Output

1 Stage Electric or On/Off HW Heat

This output is used when you only need 1 stage of electric heat or you are using an On/Off HW Valve and the controlled terminal unit is not a fan terminal unit. When you are using a fan terminal unit, have more than 1 stage of electric heat, SCR electric heat or modulating HW heat the OE325-03 Expansion Module must be used.

The Heat Relay on the Zone/VAV controller can be configured for either Aux Heat or Box Reheat. Configure the relay for Aux Heat if the heat being controlled by the controller is baseboard type heat or any other type heat that does require airflow through box. The relay will be energized whenever the space temperature drops 0.5° below the Aux Heat Setpoint and the damper will remain in the position determined by the mode of operation.

If the relay is configured for Box Reheat, then the relay will be energized whenever the space temperature drops below the Occupied Heating Setpoint and the damper will go to the Minimum Damper During Box Heating Mode setpoint. The stages of box reheat will need to be set to one.

Other Controller Connections

E-BUS Connectors

These modular connectors are used to connect the optional OE325-03 Zone Controller Expansion Module to the Zone/VAV Controller. The expansion module is only required when staged electric heat (more than 1 stage) SCR electric heat, On/Off HW heating (more than 1 stage), modulating HW heat, and/or fan terminal control is required.

The E-BUS connector can also be used to connect a Digital Space Temperature Sensor to the controller if desired .

Actuator Modular Connector

This modular connector is used to connect a modular cable from the AZ 2 Zone/VAV Controller to a damper actuator.

Communications Terminal Block

This three pole terminal block is used for connecting the communications wiring between each AZ 2 Zone/VAV Controller and/or to the MiniLink, HVAC Unit Controller or other installed controller on the local communications loop. Communications wiring should be 18 gauge minimum 2 conductor twisted pair with shield (Belden #82760 or its equivalent).

OE325-03 Zone Expansion Module

When control of a fan or if more than 1 stage of heating (1 stage of Box or Auxiliary Reheat is available through the Zone/VAV controllers onboard heat relay) heating is required, the OE325-03 Zone Controller Expansion Module is required.

Proof Of Flow Binary Input

This input is for an airflow proving switch. It is only an option for use with Stand Alone Damper applications using electric reheat. It is a wet contact (requires 24 VAC power).

Relay Output #1 - Fan Enable

The first expansion relay on the Output Expansion boards is used for energizing the fan on Series or Parallel Fan Terminal Units.

Relay Output #2 - Heating Stage 1

If you have at least one stage of heating, this is the relay used to energize the 1st stage of terminal unit heating. This heating stage can either be used with electric heat or On/Off hot water valve control.

Relay Output #3 - Heating Stage 2

If you have two stages of electric heating, this relay controls the 2nd stage of electric heat.

Relay Output #4 - Heating Stage 3

If you have three stages of electric heating, this relay controls the 3rd stage of electric heat.

Analog Output

If you are using SCR electric, modulating HW valve or modulating steam valve for heating this output can supply a 0-10 Volts DC signal for proportional control of the modulating valve or SCR electric heater.

Slaved Zone Damper Wiring

For large zones, it may be necessary to have more than one air damper controlled by a Zone/VAV Controller Actuator Package and its associated space sensor. The AZ 2 system allows for connecting up to two additional Slaved Zone Dampers to the master Zone/VAV Controller Actuator Package. *Slaving is not available for pressure independent damper applications.*

Note: Each slaved actuator is considered a modular device rated at 6 VA each. This 6 VA load must be included in the transformer sizing. See the previous section regarding transformer sizing for complete information.

Two Slave Wiring Adapters (OE267) consisting of a bypass and slave wiring interface card and modular cable are supplied with the AZ2-300-RS-XX Round Slaved Zone Damper, OE738-26-AZ2 Slaved VAV/Zone Rectangular Damper Kit, and the OE282-03 Slaved Zone/VAV Damper Kit. These are required when attaching slave actuator(s) to the master zone damper. One bypass and slave interface card should be mounted within one foot of the master Zone/VAV Controller and Actuator to facilitate connecting the modular cables from the Zone/VAV controller and Actuator to the bypass and slave interface card.. It is mounted by fastening the plastic snap-track to a suitable sheet metal mounting surface with the sheet metal screws provided. The other card should be mounted within one foot of the slaved zone actuator to facilitate connecting its modular cable from the slaved zone actuator to the second bypass slave interface card of the slaved zone damper. If you have a second slaved zone damper, mount one of its bypass & slave interface cards near the second slaved zone actuator to facilitate connection of its modular cable from the bypass and slave interface card to the slaved zone actuator. Run 24 AWG minimum wire between the slave wiring interface cards. Connect modular cables to the slave wiring interface cards and to the zone actuators as shown. See **Figure 20** for complete wiring details.

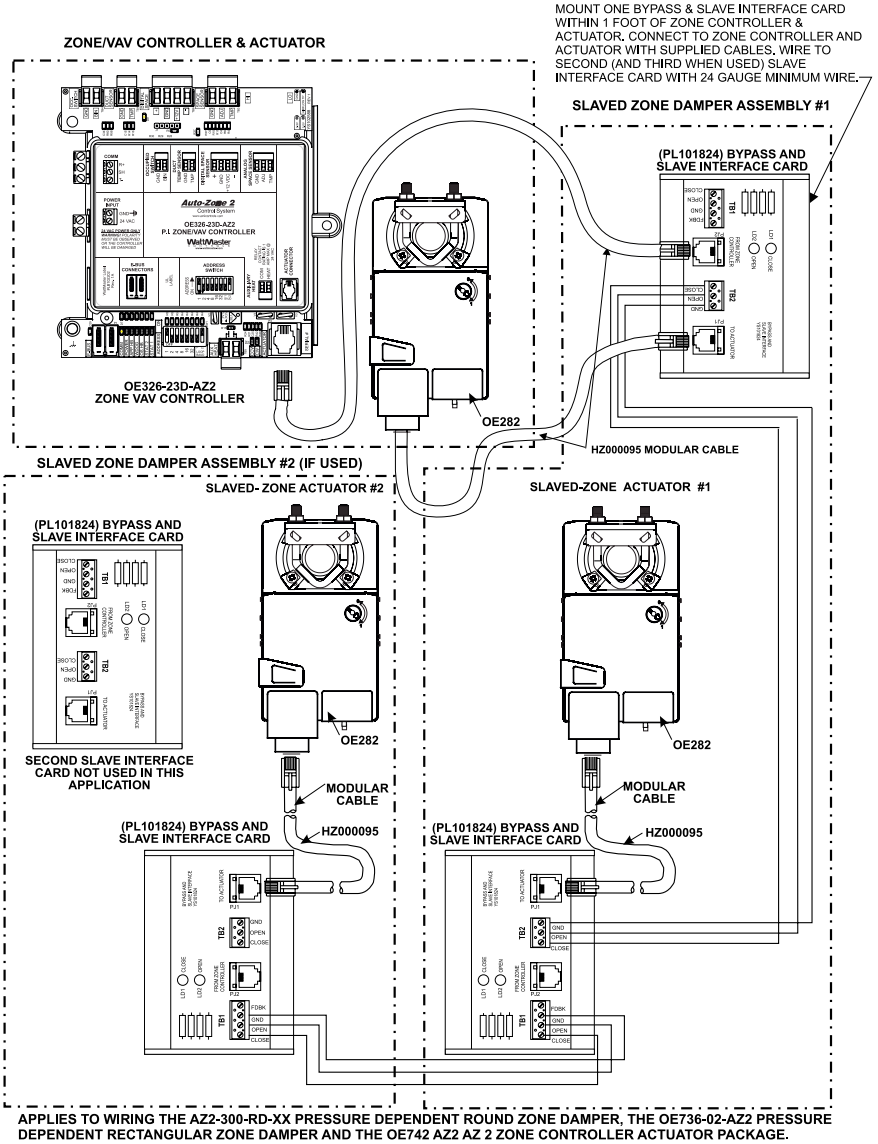


Figure 20: – Zone/VAV Slaved Zone Wiring

Slaved Bypass Damper Wiring

The Bypass Damper controls duct static pressure to insure proper system airflow and is used when the Supply air Fan is not controlled by a VFD. If your bypass requirements exceed the capacity of 3 slaved bypass dampers a VFD would be required.

The Bypass Damper is controlled by the AZ 2 HVAC Unit Controller with an EM1 Module. The EM1 Module is wired to and modulates the Bypass Damper(s) in response to the duct static pressure, based on a signal received from a static pressure sensor located in the main system ductwork.

For larger CFM units, it may be necessary to have more than one Bypass Air Damper The AZ 2 system allows for connecting up to two additional Bypass Dampers as slaves to the main Bypass Damper.

Note: Each Slaved Bypass Damper Actuator must be accounted for when sizing the transformer for the EM1 Expansion Module. The EM1 Module requires 6 VA of power which includes the load for the Master Bypass Actuator. Each Slaved Bypass actuator requires 3 VA additional load and must be included in the calculations for the transformer load when a single transformer is used to power the EM1 Module and the Slaved Bypass Damper actuators.

Refer to the Transformer & Wire Sizing information of this manual for sizing of the wire running between the EM1 Module and the Master Bypass Actuator and the Slaved Actuator(s) based on the VA load and distances between the EM1 Module and Bypass Damper Actuators. See **Figure 21** for complete wiring details.

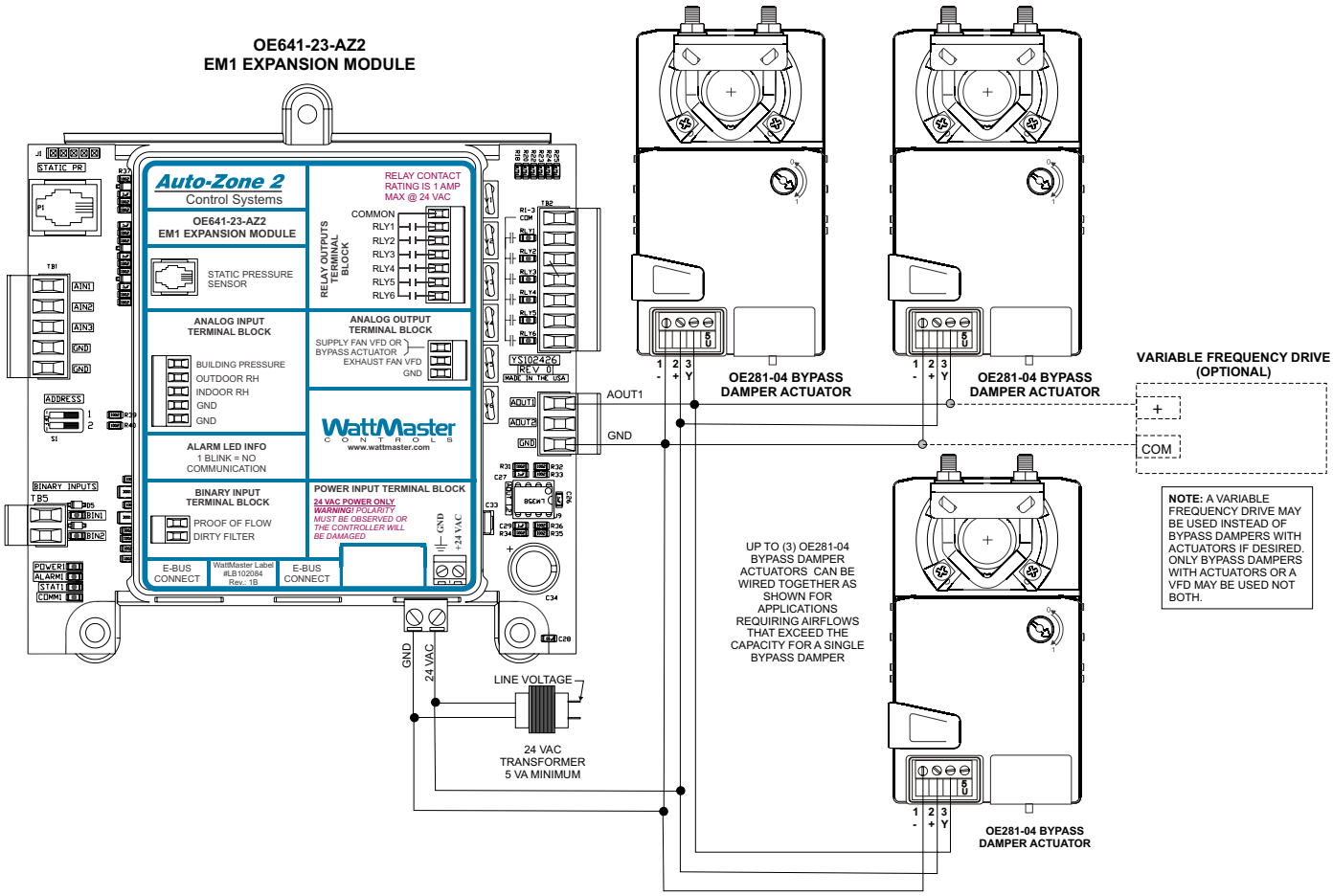


Figure 21: – Bypass Actuator Slave Wiring

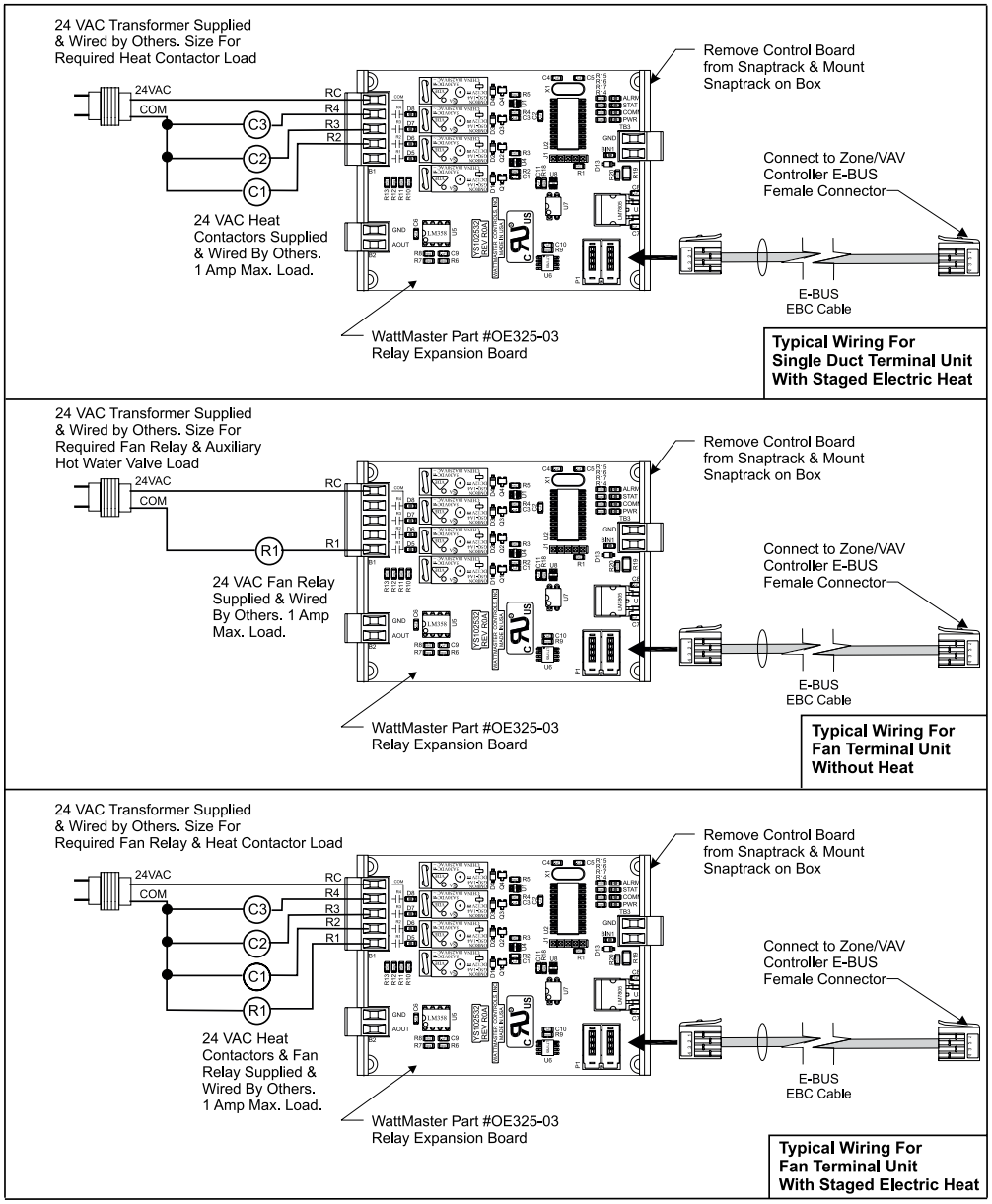


Figure 22: – Zone/VAV Controller Expansion Module Wiring - Fan Terminals And/Or Electric Staged Heat

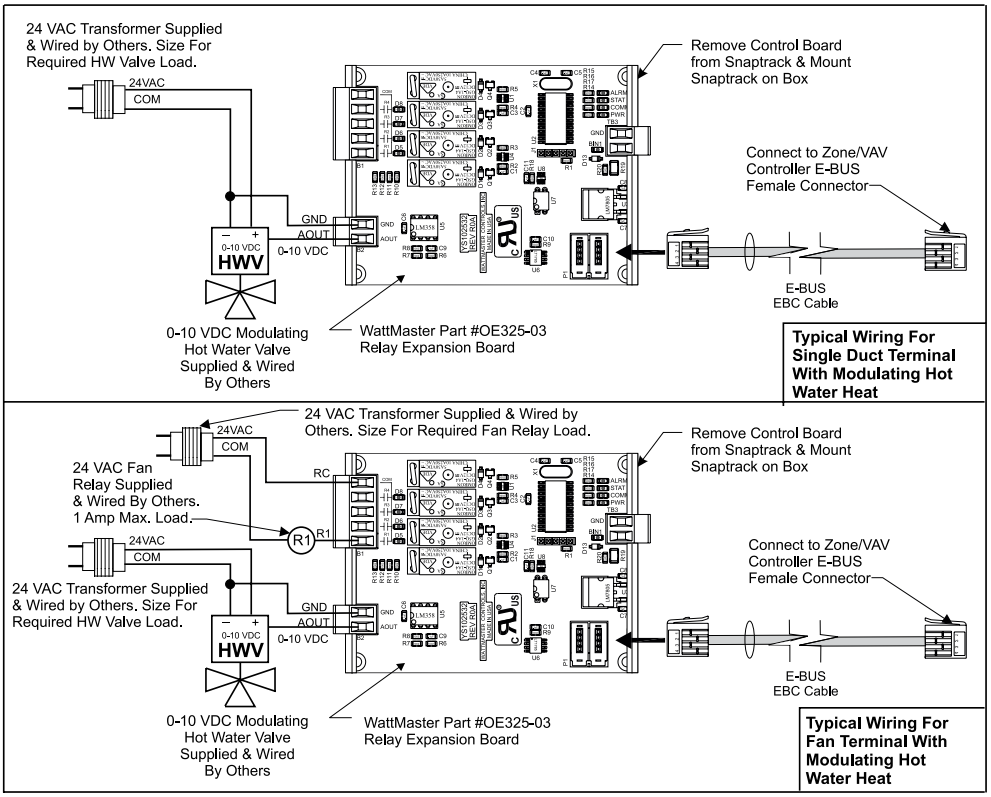


Figure 23: – Zone/VAV Controller Expansion Module Wiring - Fan Terminals And/Or Modulating HW Heat

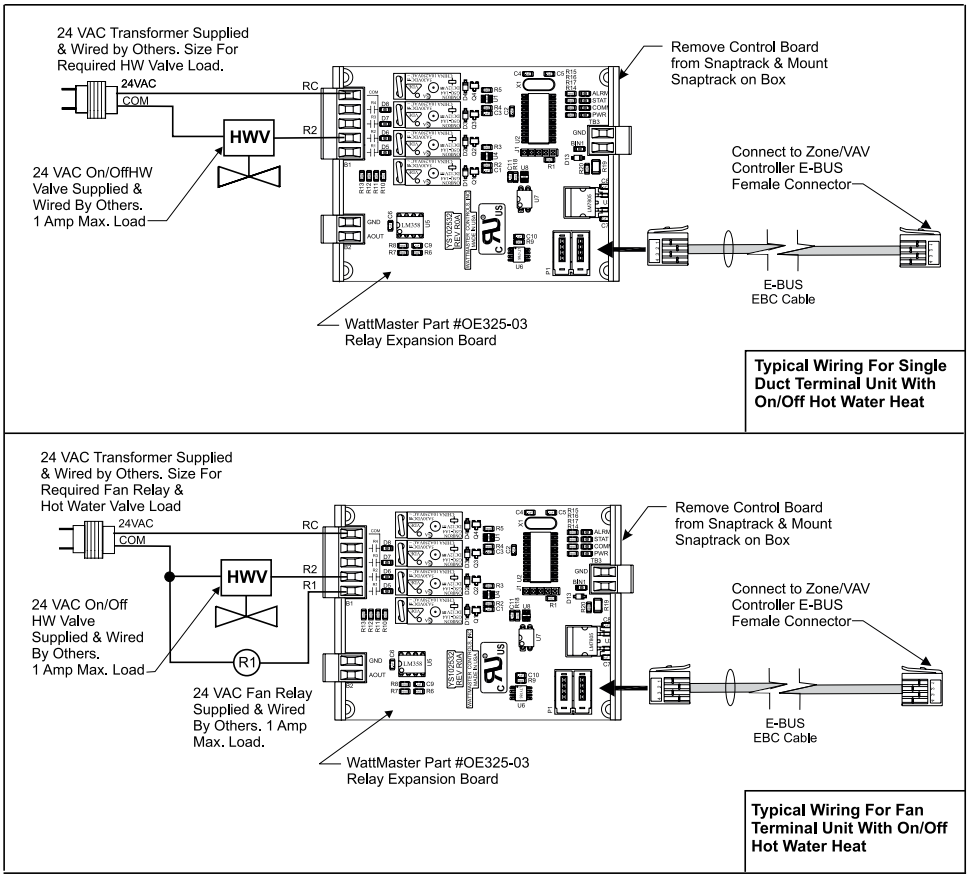


Figure 24: – Zone/VAV Controller Expansion Module Wiring - Fan Terminals And/Or On/Off HW Heat

Zone/VAV Controller Expansion Module Wiring

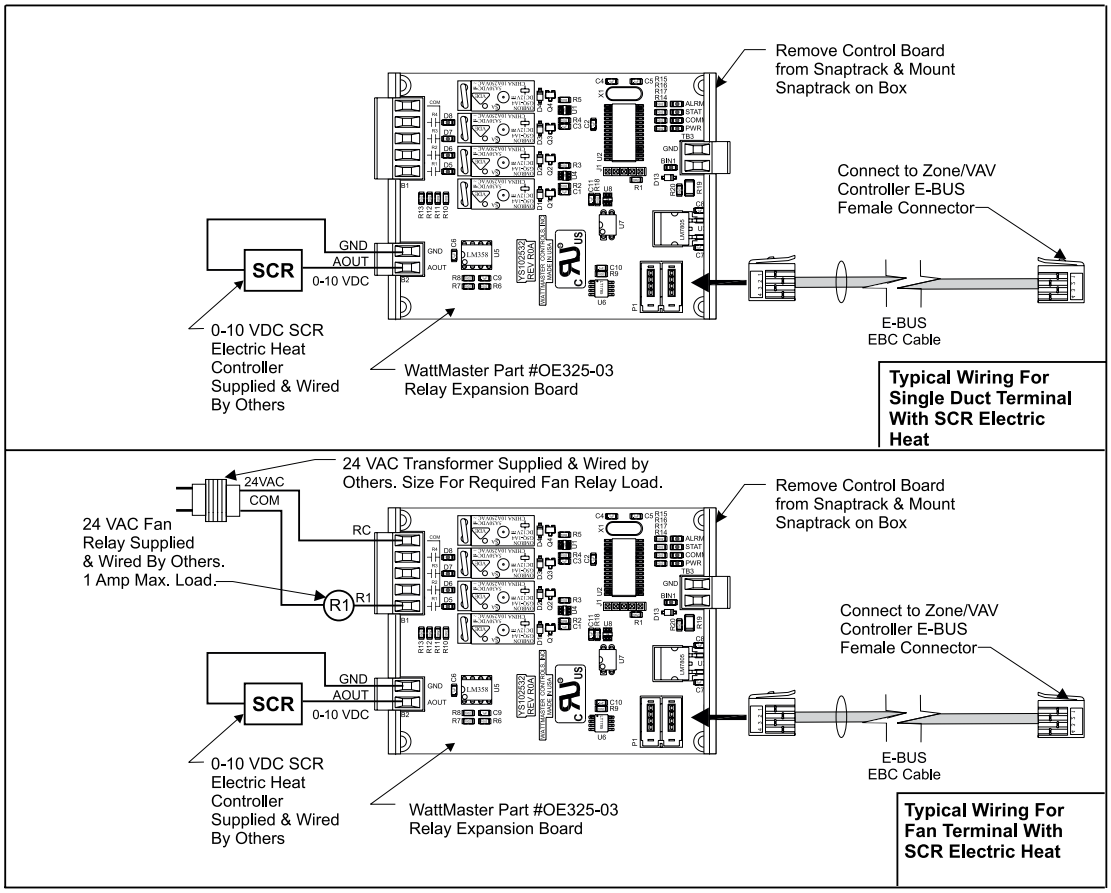


Figure 25: – Zone/VAV Controller Expansion Module Wiring - Fan Terminals And/Or SCR Electric Heat

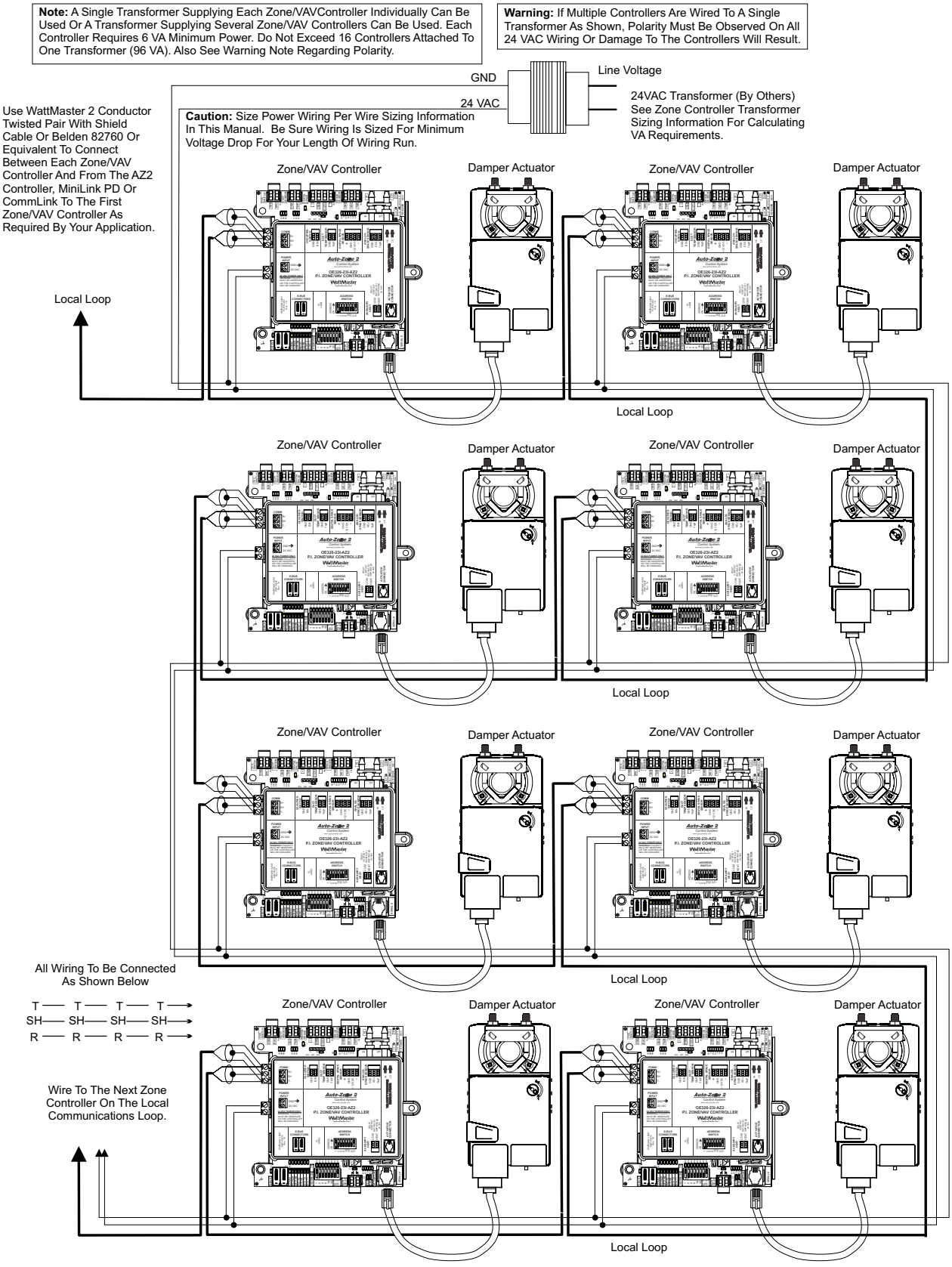
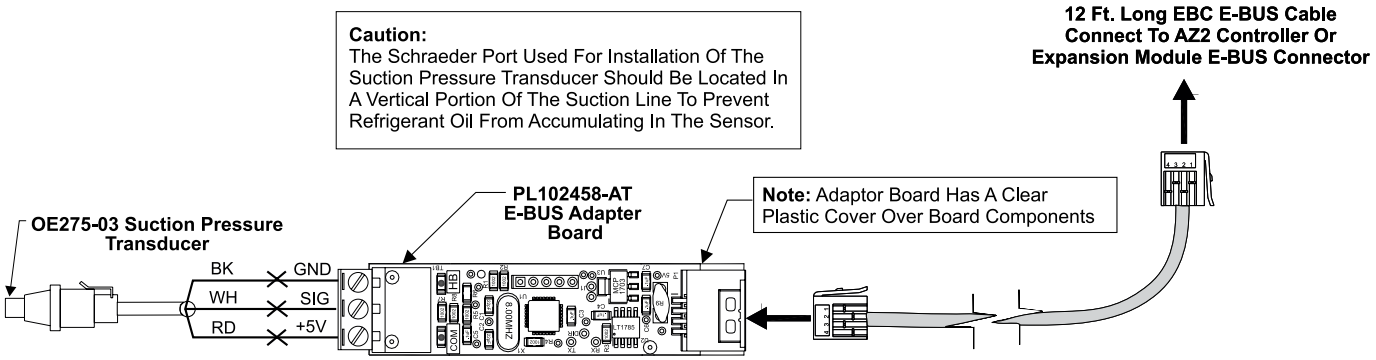


Figure 26: – Zone/VAV Controllers Communication & Power Wiring Diagram

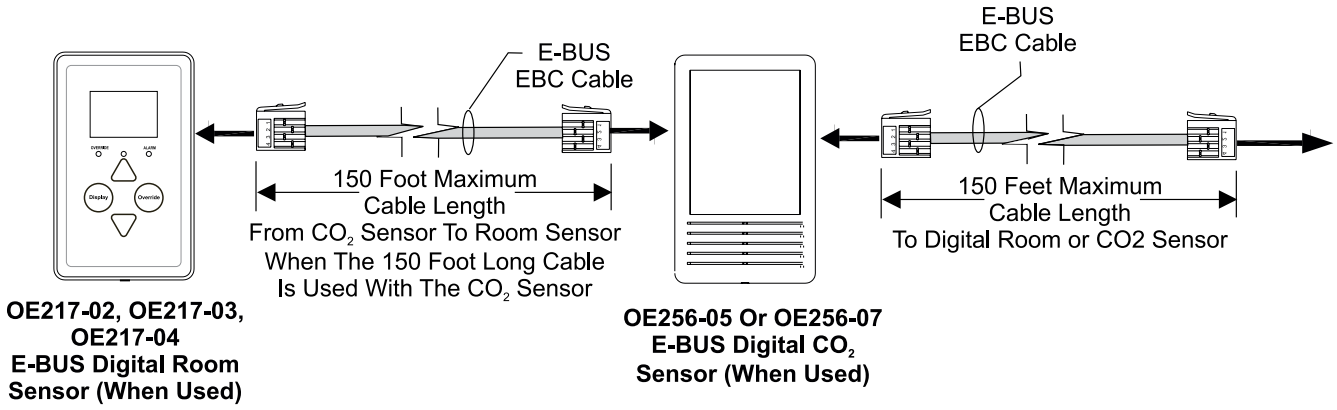
E-BUS Sensors Wiring



Note:
All Components Shown Are Supplied With The OE275-03 E-BUS Suction Pressure Transducer Kit.

The Kit Is Supplied With A 12 Ft. Long E-BUS Cable. Other Cable Lengths Are Available Up To 150 Ft. For Installations With Distances Exceeding 12 Ft. From The Controller Location To The Suction Pressure Transducer Location.

Figure 27: – E-BUS Suction Pressure Transducer Wiring



Note: The CO_2 Sensor Has Both An In And Out Port. The Digital Room Sensor Only Has One Port. When Both Are Used, Connect To The CO_2 Sensor First And Then The Room Sensor As Shown. The Digital CO_2 Sensor Can Be Located To Use A Maximum 300 Foot Long Cable. When A 150 Foot Cable Is Used With A CO_2 Sensor And A Digital Room Sensor Is Also Used The Digital Room Sensor Can Only Use A Maximum 150 Foot Long Cable. To Summarize, The Maximum Total Cable Lengths For The Two Cables Combined Cannot Exceed 300 Feet.

Figure 28: – E-BUS Digital Room Sensor And CO2 Sensor Wiring

Mounting & Wiring

It is important to mount the sensors in the appropriate location depending on the sensors intended use. Following is a list of the various sensors used with the AZ 2 controllers and expansion modules and where they should be located and mounted.

Space Temperature Sensors
These sensors should be mounted in the space served by the equipment the sensor is connected or hard wired to. All space sensors should be mounted approximately 5 feet above the floor and in an area that does not experience direct sunlight or drafts in order to get accurate readings. Cabling or wiring should be routed so the wire or cable is protected from being pinched or punctured by building fasteners or materials.

Outdoor Air Temperature Sensors
The sensor should be mounted in the upright position with the sensor tube pointing down in an area that is protected from the elements and direct sunlight. Be sure to make the wiring splices inside of the Outdoor Air Temperature Sensor weather-tight enclosure.

CAUTION: Be sure to mount the Outdoor Air Temperature Sensor in an area that is not exposed to direct sunlight. The shaded area under the HVAC unit rain hood is normally a good location. Unused conduit opening(s) must have closure plugs installed and must be coated with sealing compound to provide a rain-tight seal. Water can damage the sensor.

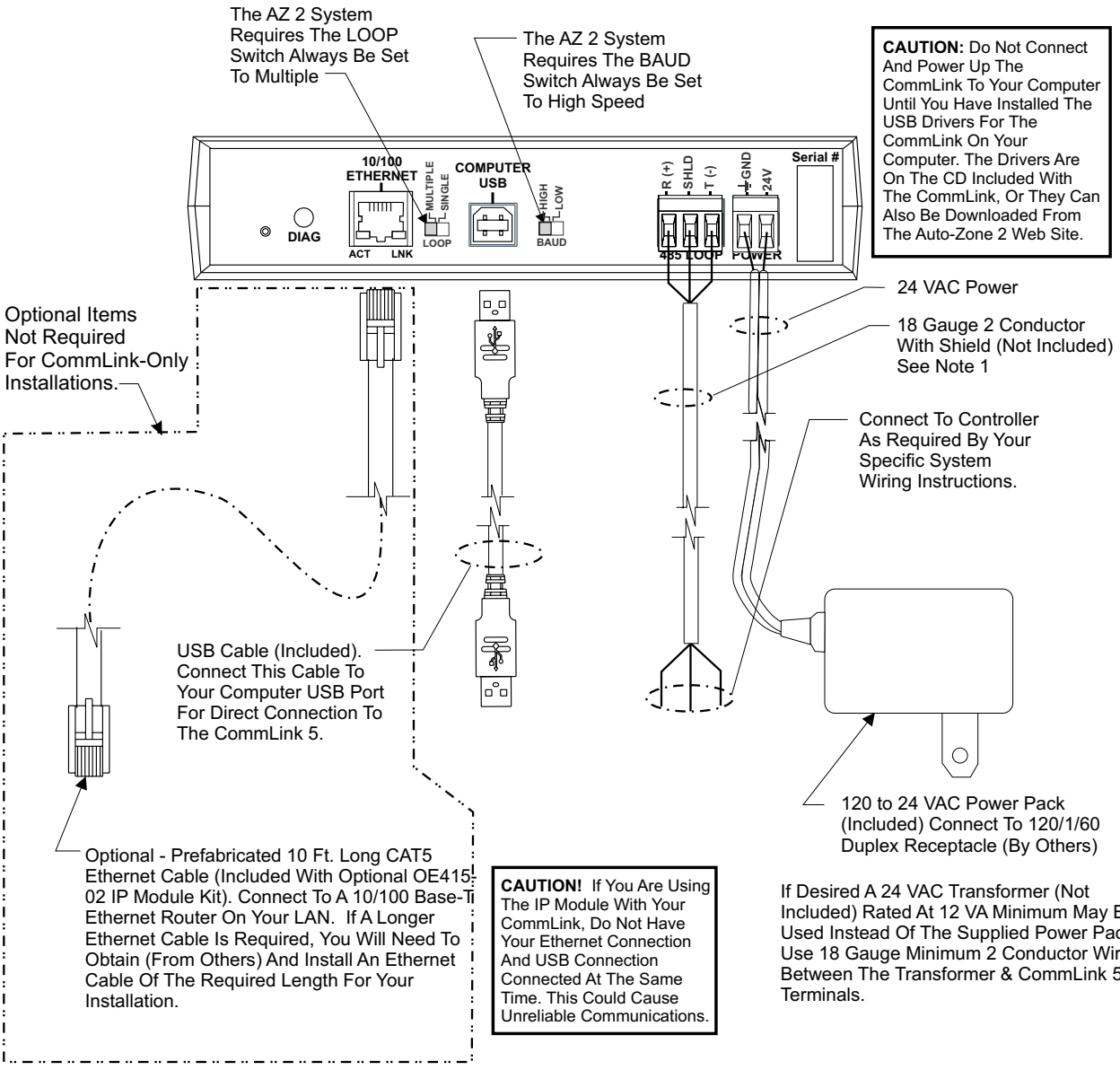
Supply Air Duct Temperature Sensors
These sensors should be mounted in the supply air duct of the equipment. The Supply Air Temperature Sensor should be mounted at least 10 Ft. away from any Heating or Cooling source and be mounted 3 duct diameters from any elbow.

Cabling or wiring should be routed so the wire or cable is protected from being pinched or punctured by building fasteners or materials.

Return Air Duct Temperature Sensors
These sensors should be mounted in the Return Air duct of the equipment the sensor is hard wired to. If the system has a Zoning Bypass Damper installed, be sure the Return Air sensor is located upstream of the bypass duct connection.

CommLink 5 Connection & Wiring

CommLink 5 Communications Interface



NOTES:

1.) All Commuications Wiring Must Be Plenum Rated Minimum 18 Gauge, 2 Conductor Twisted Pair With Shield Wire. WattMaster Can Supply Communications Wire That Meets This Specification And Is Color Coded For The Network Or Local Loop. The Local Loop Wire Part Number Is WR-LL-WG-18. It Is Color Coded With Green Candy Striping And Comes On A 1000 Foot Spool. The Network Loop Wire Part Number Is WR-NL-WR-18. It Is Color Coded With Red Candy Striping And Comes On A 500 Foot Spool. If Desired, 18 Gauge Minimum Belden #82760 Or Equivalent Wire May Also Be Used For Network Or Local Loop Communications Wiring.

2.) For Direct Connection Via USB, Your Computer Must Have An Unused USB Port Available. Drivers For Your USB Port Are Provided On A CD Supplied With The CommLink 5. It Is Also Available On The AZ 2 Controls website (www.az2controls.com). Please Follow The Directions In The CommLink 5 Technical Guide To Install And Configure The USB Drivers.

3.) The CommLink 5 Cannot Communicate With The Control System Through Its Ethernet Port And USB Port At The Same Time.

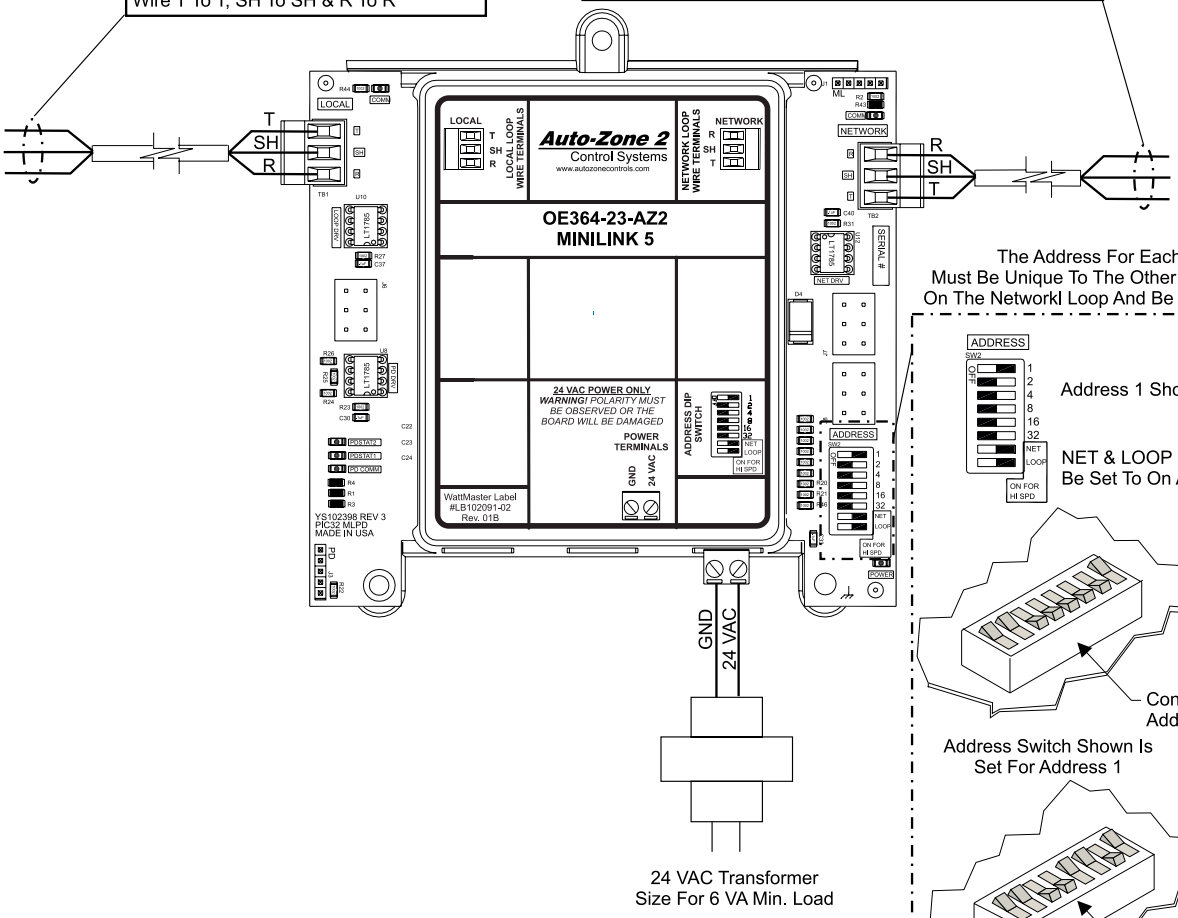
4.) All Wiring Must Conform To Applicable Federal, State & Local Electrical Wiring Codes.

Figure 29 – CommLink 5 Wiring

Note: All Communication Wiring Must Be Plenum-rated, Minimum 18-gauge, 2-conductor, Twisted Pair With Shield Wire. Wattmaster Can Supply Communication Wire That Meets This Specification And Is Color Coded For The Network Or Local Loop. The Local Loop Wire Part Number Is WR-LL-WG-18, Is Color Coded With Green Candy Striping And Comes On A 1000 Ft. Spool. The Network Loop Wire Part Number Is WR-NL-WR-18, Is Color Coded With Red Candy Striping And Comes On A 500 Ft. Spool. If Desired, 18 Gauge Minimum Belden #82760 Or Equivalent Communications Wire May Also Be Used For Network Or Local Loop Wiring.

Note: This Network Wiring Is Not Required On Single Loop Systems Without A CommLink. When CommLink Is Used On Single Loop Systems, Connect Network Loop Wire Terminals To CommLink. On Multiple Loop Systems Connect Network Loop Wire Terminals To CommLink And Daisy Chain All MiniLink Network Terminals Together. Be Sure To Wire T To T, SH To SH & R To R.

Connect Local Loop Terminals To T SH & R Local Loop Terminals On First AZ 2 Controller On Local Loop. Be Sure To Wire T To T, SH To SH & R To R



24 VAC Transformer
Size For 6 VA Min. Load

Some Installers Like To Use One Large 24 VAC Transformer To Power Several Devices. This Is Allowable As Long As Polarity Is Maintained To Each Device On The Transformer Circuit.
Warning: If Polarity Is Not Maintained, Severe Damage To The Devices May Result. Wattmaster Controls Recommends Using A Separate Transformer For Each Device In Order To Eliminate The Potential For Damaging Devices Due To Incorrect Polarity. Using Separate Transformers Also Allows Redundancy In Case Of A Transformer Failure. Instead Of Having 8 Devices Inoperative Because Of A Malfunctioning Transformer You Have Only 1Device Off Line.

The Address For Each MiniLink Must Be Unique To The Other MiniLink Devices On The Networkl Loop And Be Between 1 and 60

Note:
The Power To The MiniLink Must Be Removed And Reconnected After Changing The Address Switch Settings In Order For Any Changes To Take Effect.

Caution:
Disconnect All Communication Loop Wiring From The MiniLink Before Removing Power From The Controller. Reconnect Power And Then Reconnect Communication Loop Wiring.

Figure 30: – MiniLink Wiring

System Manager TS Wiring

Note: All Communication Wiring Must Be Plenum-rated, Minimum 18-gauge, 2-conductor, Twisted Pair With Shield Wire. Wattmaster Can Supply Communication Wire That Meets This Specification And Is Color Coded For The Network Or Local Loop. The Local Loop Wire Part Number Is WR-LL-WG-18, Is Color Coded With Green Candy Striping And Comes On A 1000 Ft. Spool. The Network Loop Wire Part Number Is WR-NL-WR-18, Is Color Coded With Red Candy Striping And Comes On A 500 Ft. Spool. If Desired, 18 Gauge Minimum Belden #82760 Or Equivalent Communications Wire May Also Be Used For Network Or Local Loop Wiring.

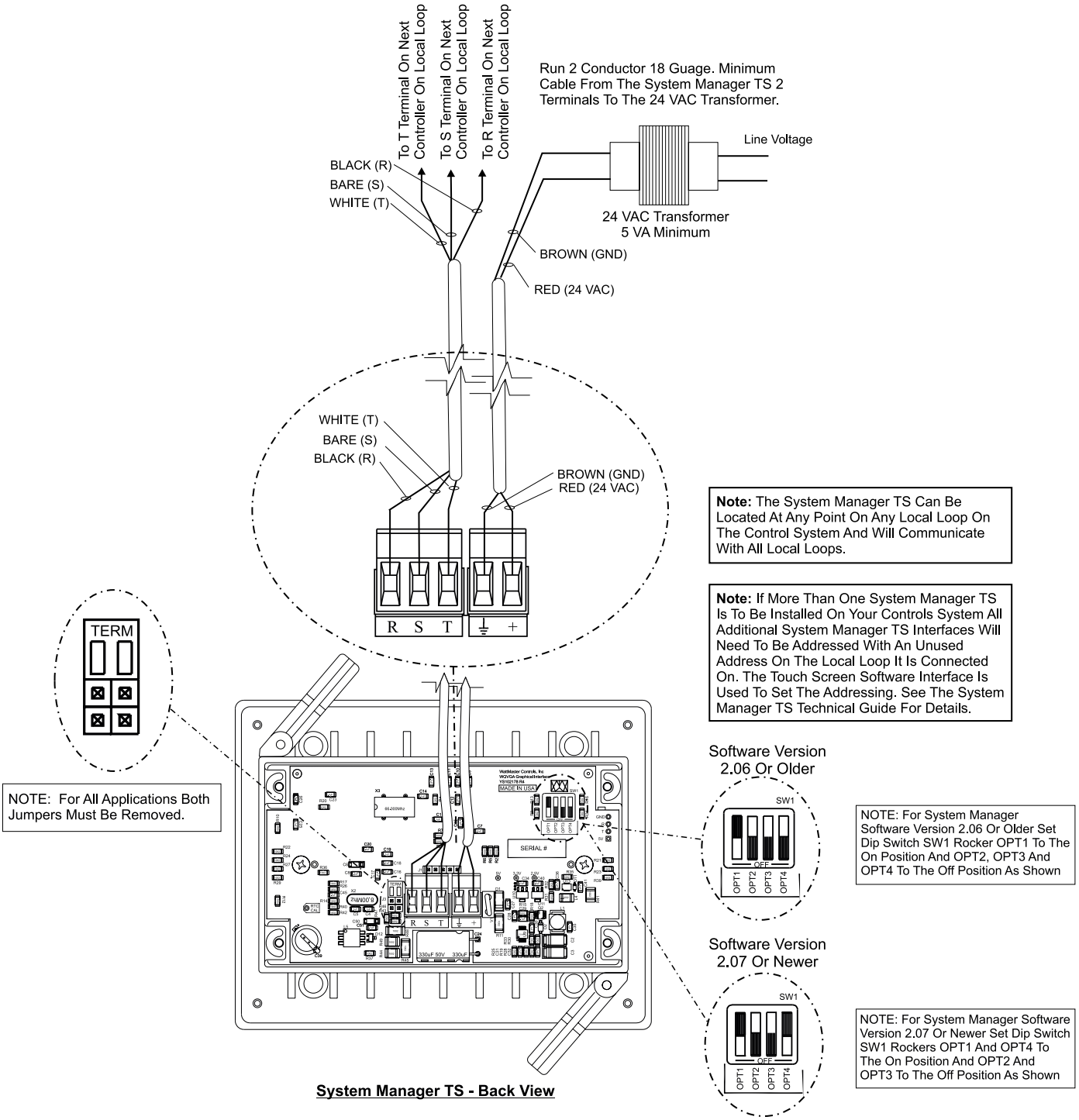


Figure 31: – System Manager TS Wiring

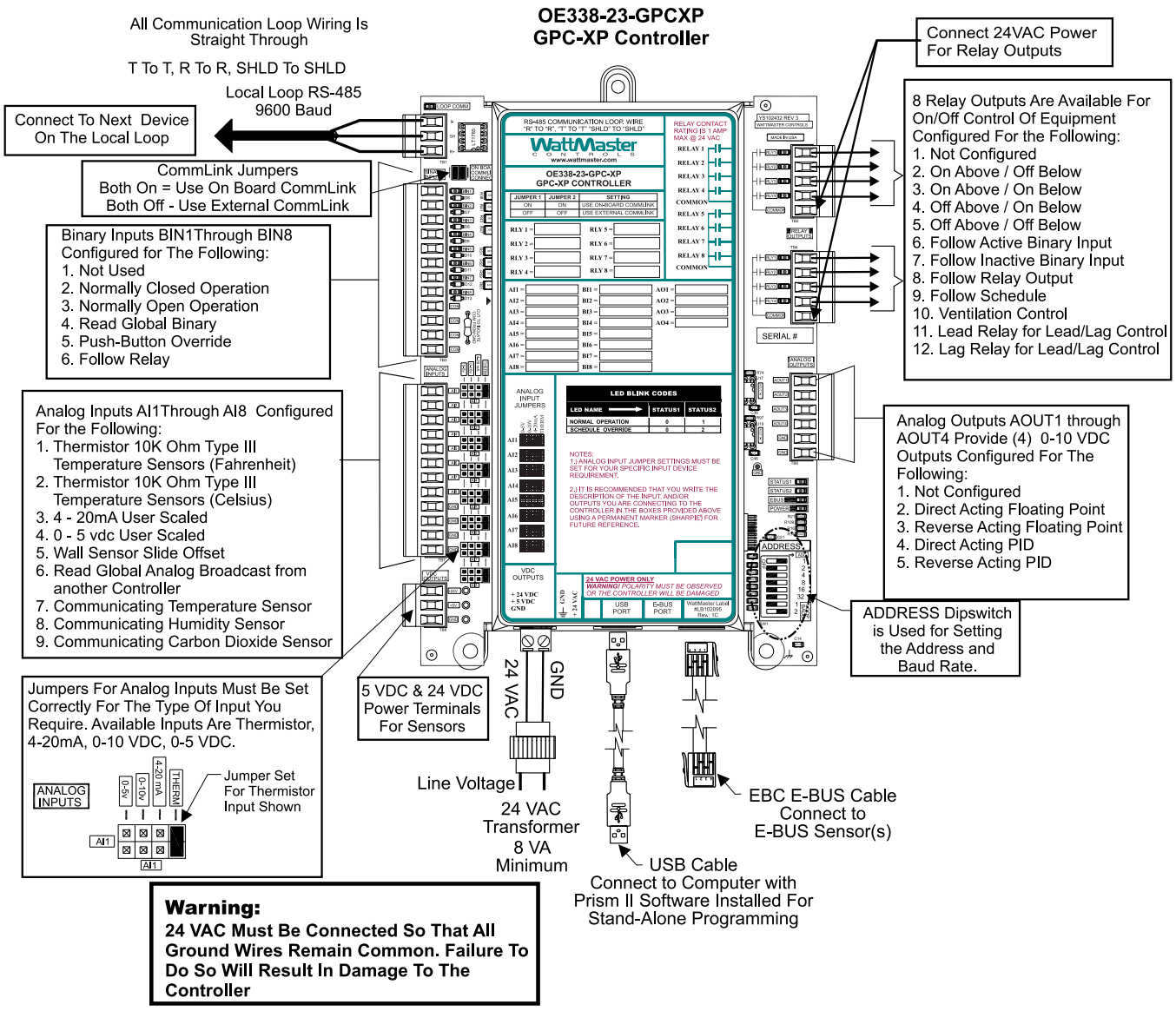


Figure 32: – GPC-XP Wiring

Features

The OE692-02-AZ2 System Manager TS (Touch Screen) provides a direct, graphic-enhanced, menu-driven link to enable you to view the status and adjust the setpoints of most controllers on the AZ 2 Controls System. See **Figure 33**.

The System Manager TS provides the following useful features:

- Provides a 4.3" LCD Graphical Touch Screen LCD display.
- Utilizes a graphical touch screen menu system with easy-to-understand menu trees and icons and non-cryptic, plain English language messages
- Makes entering data quick and easy with instructions on each configuration and setpoint screen
- Graphic configuring and status screens provide easy setup and operation without the need for specialized training
- Provides protection from unauthorized users through integral multi-level passcode authorization configuring
- Comes equipped with real-time clock backup power supply for short power losses
- Provides icon to indicate alarm conditions
- LEDs behind plastic panel indicate power, communications, and operation
- Plastic enclosure allows for easy flush wall mounting in hollow drywall or surface mounting on solid wall surface

System Requirements

- The System Manager TS only works with the following AZ 2 Controller EPROMs: All standard SS8002 version 1.00 and later
- The System Manager TS only works with the following AZ 2 Zone/VAV Controller EPROMs: All standard SS8001 version 1.00 and later
- MiniLink 5 or later.

NOTE: Alarm polling must first be set up in Prism 2. This requires a personal computer with Prism software and a USB-Link or CommLink 5. Ongoing alarm polling on the System Manager TS Main Screen requires a MiniLink to be connected to the system.

The System Manager TS is packaged and assembled for flush wall mounting. Surface mount components are also included for your convenience.

If using the surface mount version you will need to use a double duplex outlet box (by others) to use for mounting the System Manager TS.

Figure 33: AZ 2 System Manager TS

Environmental Requirements

The System Manager TS needs to be installed in an environment that maintains a temperature range between 14°F and 158°F with less than 90% RH levels (non-condensing).

Mounting

The System Manager TS is housed in a plastic enclosure designed for mounting in hollow drywall construction or a control panel cover with the flush wall mount version (see **Figure 126** in the Appendix) or on a concrete, brick, or other solid wall surface with the surface mount version (see **Figure 127** in the Appendix).

The flush wall mount version has integral wingnut paddles that are tightened after installation to grip the drywall and hold the System Manager TS in place. For mounting in a control panel cover or other thin material, (4) adhesive backed rubber pads are provided to assist in securing the System Manager TS into the cutout in the panel. These pads are applied to the wingnut paddles to provide a non-slip mounting against the panel's sheet metal surface. See **Figure 126** in the Appendix for pad placement details.

The surface mount version is designed to be installed in a double duplex outlet box (by others). Both mounting styles of the System Manager TS feature an integral, magnetically-secured face plate which can be easily removed for reset of the display when required.

The System Manager TS should be mounted at approximately eye level to allow for ease of configuring and reading of the display. The System Manager TS is typically mounted in the building manager's or superintendent's office or in an equipment room, but is also quite suitable for mounting in any location or with most decors.

Care

The AZ 2 System Manager TS should be cleaned with a soft, dust-free cloth. Do not use any liquid to clean your System Manager TS. You should *press* the **<Suspend>** button located behind the cover to temporarily freeze the touch pad before you attempt to clean your screen.

Wiring

The System Manager TS is connected to the local communications loop of the control system via 18 AWG 2-conductor, twisted pair with shield wire connected to the T, SHLD & R communication terminals on the back of the System Manager TS. The communications wire used can be either our AAON #WR-LL-WG-18 communications wire or Belden #82760 wire or its equivalent.

The System Manager TS also requires that 24 VAC (6 VA) power be supplied (by others) to its + and – wiring terminal located on the back of the System Manager TS.

See **Figure 31** for wiring details. These wiring diagrams depict wiring the System Manager TS to the AZ 2 Controller or Zone/VAV Controllers. The System Manager TS can also be wired to the local loop terminals on the MiniLink, or any other add-on controller's local loop terminals. It will still require a transformer to be wired as shown in **Figure 26**.

Technical Support

Call (866) 918-1100 to talk to a AAON Controls Technical Support Representative. Support is available Monday through Friday, 7:00 AM to 5:00 PM central standard time.

Configuring the Controller

Initialization

On system power up, a 10-second startup delay is performed where all default setpoints are initialized, LED's are initialized, and all outputs are turned off.

When power is first applied, the POWER LED will light up and stay on. The LCD window on the AZ 2 Controller will display and rotate through its various screens. See **Figure 121** (in the Appendix) for a complete list of the screens.

Operating Summary

There is a standard set of operating instructions that are continuously repeated during normal operations. They are listed below.

1. Read Analog Inputs for Temperatures, Pressures, and Binary Contact Closures.
2. Calculate Occupied/Unoccupied Mode of Operation
3. Calculate HVAC Mode of Operations
4. Set all outputs to match calculations for Heating or Cooling or Vent Mode
5. Broadcast information to other controllers if configured
6. Log all temperatures and output conditions

Configuring the Controller

The next step is configuring the controller for your specific requirements. In order to configure and monitor the AZ 2 Controller, you must use an operator interface. Two different operator interfaces are available for configuring and monitoring of the AZ 2 Controller. These are as follows:

1. System Manager TS
2. Prism 2 Software installed on a notebook or desktop computer

Either of these devices or a combination of them can be used to access the status, configuration, and setpoints of any controller on your communications loop.

If using a Notebook or Desktop computer and the Prism 2 Computer Front End Software, refer to the *Prism 2 Computer Front-End Technical Guide*.

No matter which operator interface you use, we recommend that you proceed with the configuring and setup of the AZ 2 Controller in the order that follows:

1. Configure the controller for your application
2. Configure the controller setpoints
3. Configure the controller operation schedules
4. Set the controller current time and date
5. Review controller status screens to verify system operation and correct controller configuration

Icons and Button Functions

System settings and screens are easily accessible by simply *touching* one of the six icons on the *Main Screen*. The subscreens contain yellow highlighted data entry boxes with accessible number keypads for data entry and screen maneuvering buttons such as **<Esc>**, **<Back>**, and **<OK>**.

Main Screen Icons

Icon	Main Screen Icons
	The **<My System>** icon takes you to a *Unit Selection Screen* which takes you directly to the selected controller's *Status Screen*.
 	When bright red, the **<Alarms>** icon takes you to the *Alarms Screen*. When bright green, no alarms are present. This icon is only useful when your SMTS is set for multiple managers or network mode and you have configured Alarm Polling using Prism 2 software.
	The **<Login>** icon takes you to the *Login Screen* where you enter your passcode.
	The **<User Passcodes>** icon takes you to the *System Manager Passcode Levels Screen* if you are a Level 3 user.
	The **<Settings>** icon takes you to the *System Settings Screen* where you can change the Backlight settings, set the System Manager address, and enable alarm polling. System settings are only accessible to a Level 3 user.
	The **<Set Time & Date>** icon takes you to the *Set Time and Date Screen*. Any level of user can set the time and date.

Navigation Buttons

Table 2: Main Screen Icon Functions

Button	Function
Esc	Use the **<Esc>** (Escape) key to exit from data entry without saving any new data.
Back Back	Use the small **<Back>** button located in the top right corner of a *Data Entry Screen* to return to the controller's *Status Screen*. Use the large **<Back> button located at the bottom left of other screens to return to the previous screen.**
+	Use the **<+>** key to step to the next screen.
-	Use the **<->** key to step to the previous screen.

Selection, Configuration, and Setpoint Buttons

Table 3: Navigation Button Functions

Button	Function
OK	Use the **<OK>** key to save the data you just selected or entered.
	Touch the grey radio button to make your selection. A white circle will designate that the item is selected. You can only select one radio button item per screen.
	Touch the grey square selection box to make your selection. A white square will designate that the item is selected. You can make numerous square box item selections per screen.
Setpoints	The **<Setpoints>** button, appearing on the controller's *Status Screen,* takes you directly to the controller's *Temperature Setpoint Screen*.
Overrides	The **<Overrides>** button, appearing on various controllers' *Status Screens,* takes you directly to the controller's *Force Schedules Screen*.
Schedules	The **<Schedules>** button, appearing on various controllers' *Status Screens,* takes you directly to the controller's *Schedule Screen*.
Holidays	The **<Holidays>** button, appearing on various controllers' *Status Screens,* takes you directly to the controller's *Holidays Screen*.
ALARM	The **<Alarm>** button, appearing on the controller's *Status Screen*, takes you directly to the controller's *Alarms Screen*. If red, alarm(s) are present. If black, no alarm(s) are present.

Table 4: Configuration Selection Buttons

Main Screen Icons and Button Functions

Controller Configuration & Setpoint Buttons

The AZ 2 Controller Configuration and Setpoint Buttons are located at the bottom of the *AZ 2 Controller Setpoints Screen*. See **Table 5** for a list of the Configuration and Setpoint buttons and their functions. Level 1 and Level 2 users can view these screens and change occupied heating and cooling setpoints, but only a Level 3 user can make changes to all setpoints.

Button	Function
	The **<Temps>** button, located at the bottom of the controller's *Setpoints Screen*, takes you directly to the controller's *Temperature Setpoints Screens*.
	The **<Static>** button, located at the bottom of the controller's *Setpoints Screen,* takes you directly to the controller's *Static & Air Setpoints Screens*.
	The **<Staging>** button, located at the bottom of the controller's *Setpoints Screen,* takes you directly to the controller's *Staging Delays Screens*.
	The **<Misc>** button, located at the controller's *Setpoints Screen,* takes you directly to the controller's *Miscellaneous Setpoints Screens*.
	The **<Relays>** button, located at the bottom of the controller's *Setpoints Screen*, takes you directly to the controller's *Outputs Screens*.
	The **<Config>** button, located at the controller's *Setpoints Screen*, takes you directly to the controller's *Configuration Screens*.

Table 5: AZ 2 Controller Setpoint Icons

Zone/VAV Setpoint Buttons

The Zone/VAV Setpoint Buttons are located at the bottom of the *Zone/VAV Setpoints Screen*. See **Table 6** for a list of the Setpoint buttons and their functions. Level 1 and Level 2 users can view these screens and change Occupied Heating and Cooling setpoints, but only a Level 3 user can change all setpoints.

Button	Function
	The **<Temps>** button, located at the bottom of the controller's *Setpoints Screen*, takes you directly to the controller's *Temperature Setpoints Screens*.
	The **<Damper/Airflow>** button, located at the bottom of the controller's *Setpoints Screen,* takes you directly to the controller's *Damper/Airflow Setpoints Screens*.
	The **<Alarms>** button, located at the bottom of the controller's *Setpoints Screen,* takes you directly to the controller's *Alarm Settings Screen*.
	The **<Misc>** button, located at the bottom of the controller's *Setpoints Screen,* takes you directly to the controller's *Miscellaneous Setpoints Screen*.
	The **<Calibrate>** button, located at the bottom of the controller's *Setpoints Screen*, takes you directly to the controller's *Calibration Setpoints Screen*.
	The **<Config>** button, located at the bottom of the controller's *Setpoints Screen*, takes you directly to the controller's *Configuration Setpoints Screens*.

Table 6: AZ 2 Zone/VAV Setpoint Icons

Main Screen

Once you have connected your System Manager TS to a controller and have powered it up with the proper power supply, the *Main Screen* will appear. See **Figure 34**.

The top right of the screen should display the **Current Day of the Week**, **Current Date, Year** and the **Correct Time of Day**. The bottom left of the screen displays **System Secured** or the **System Access Level**.

The middle of the screen displays the icons **My System**, **No Alarms**, **Set Time & Date**, **Login**, **User Passcodes**, and **Settings**.

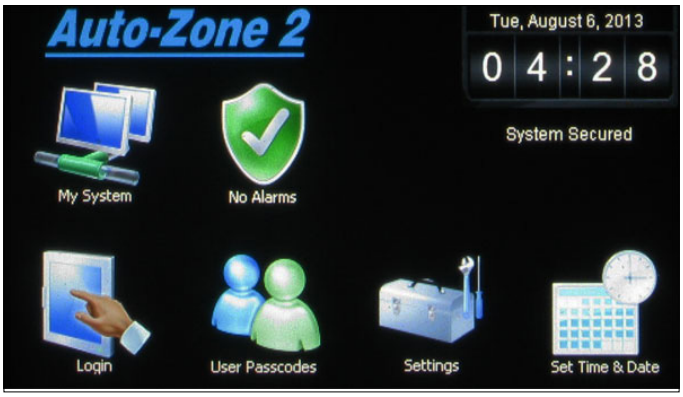


Figure 34: Main Screen

Getting Started

There are 3 steps to setting up your system with the System Manager TS.

1. Login.
2. Establish User Passcode(s)
3. Set the clock.

After you complete these simple tasks, you are ready to set your system's settings, view controller status screens, and change schedules and setpoints.

Entering Your Passcode

NOTE: There are three available passcode levels. Level 1 defaults to 1111, Level 2 defaults to 2222, and Level 3 defaults to 3333. These defaults can be changed by anyone who logs in at Level 3.

When you power-up your System Manager TS, the message **System Secured** is displayed on the bottom left corner of the *Main Screen*.

Touch the **<Login>** icon found on the bottom left of the *Main Screen* and *type* the default Level 3 passcode of "**3333**" using the number keypad to gain access to all setpoint and configuration items. See **Figure 35**.

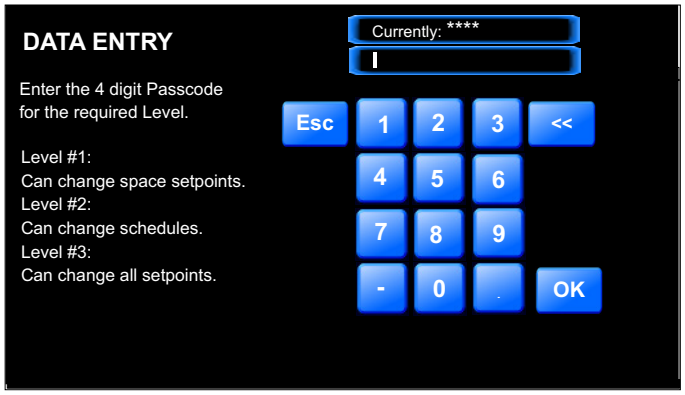


Figure 35: Login Screen

NOTE: For security reasons, the current passcode characters displayed at the top of the screen are never shown and appear as asterisks.

Touch **<OK>**. *Touch* **<Esc>** if you accessed this screen by mistake and do not wish to change the current access level. The *Login Screen* will automatically close, and the passcode will be tested against all previously defined passcodes to determine the passcode's access level. If 3333 is still the active Level 3 code, the status message **System Access Level #3** will now be displayed on the bottom left corner of the *Main Screen*.

NOTE: System Access will automatically default to **System Secured** after time set for **Backlight Timeout** in the *System Manager Settings Screen* (see **Figure 40**). If timeout is set to zero, the passcode will timeout after two minutes.

Passcode Clearance Levels

Below is a list of the passcode levels, default codes, and actions that can be performed at the various levels.

Level 0—No Passcode Needed, System Secured

Level 0 users can view temperatures and status points. They can also change the system date and time, but no changes to any controller setpoints can be made.

Level 1—Default: 1111

Level 1 users can view temperatures and change space temperature setpoints. No changes to schedules or other settings can be made.

Level 2—Default: 2222

Level 2 users can change space temperature setpoints and operating schedules but not configuration settings.

Level 3—Default: 3333

Level 3 users have complete access and can change all setpoints and configurations, including default passcodes. Level 3 users can also access force modes and clear Alarm logs. This Level is normally reserved for qualified HVAC service personnel.

WARNING: Make sure you change all passcodes as soon as possible to secure the system! The passcode for each level must be unique and not duplicated.

NOTE: Only a Level 3 user can change Level 1, 2, and 3 passcodes.

From the *Main Screen*, *touch* the **<User Passcodes>** icon. The *Passcode Levels Screen* will appear. See **Figure 36**.

To change a passcode, *touch* the blue highlighted box containing the current passcode. The keypad will appear with instructions for changing the passcode. See **Figure 37**.

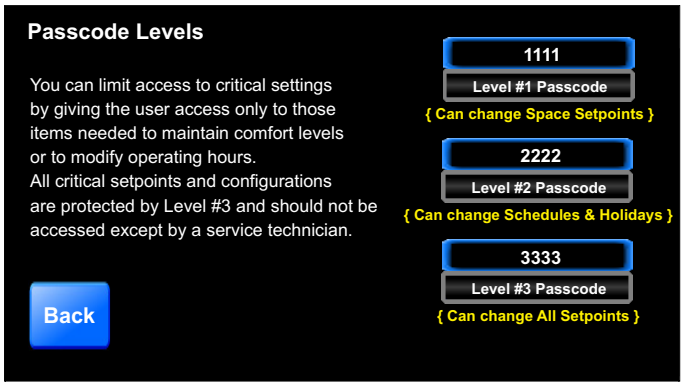


Figure 36: Passcode Levels Screen

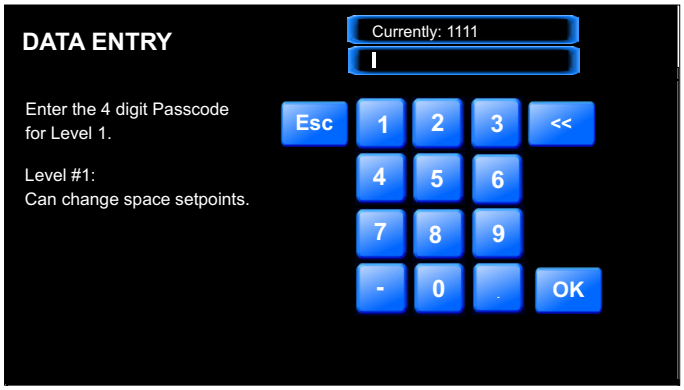


Figure 37: Change Passcode Screen

The current passcode will appear on the top menu bar. *Type* in the new four-digit passcode. You cannot use the period or minus characters in your passcode. Use the **<<<>** key if you make a mistake. *Touch* **<Esc>** to return to the previous screen without changing the passcode. When you have typed in the new passcode, *touch* **<OK>**. The *Passcode Levels Screen* should now display the passcode you entered.

NOTE: If you change the Level 3 passcode, make sure to write it down. If you should happen to forget the Level 3 passcode, contact AAON Technical Support.

Touch **<Back>** to return to the *Main Screen*.

Set Time and Date

When you first power up your AZ 2 System Manager TS, you will need to change the Time (Hour and Minute) and the Date (Month, Day and Year). You will additionally have to select the Day of the week. If your system has been turned off or has been down for a long time, you may have to do the same, although the time and date can maintain itself for several days. Any level of user can change the time and date settings.

The day of the week, the time, and the date appear at the top right on the *Main Screen*. See **Figure 34**.

From the *Main Screen*, *touch* the **<Set Time & Date>** icon. The *Set Time & Date Screen* will appear. See **Figure 38.**

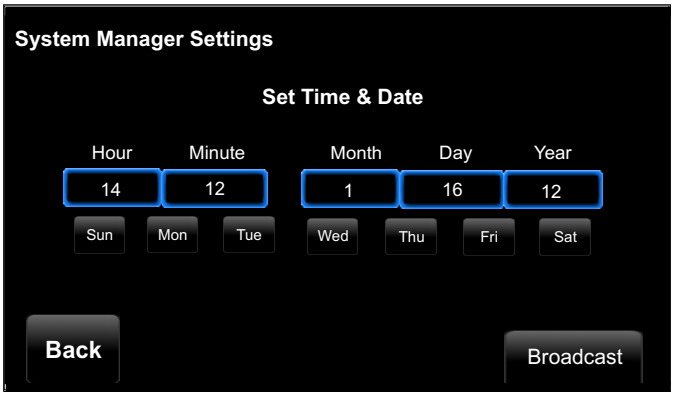


Figure 38: Set Time & Date Screen

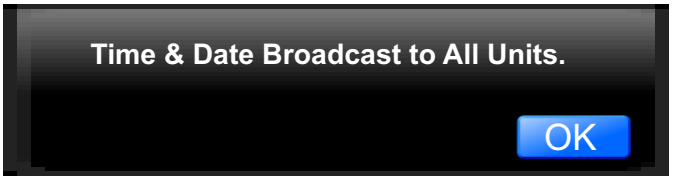
In the example above, the current time and date is 2:12 P.M., January 16th, 2012. There is no day of the week selected yet.

Set Day of the Week: Select the day of the week by simply *touching* your selection. The day of the week text will change from white to black.

Set Hour, Minute, Month, Day, and Year: *Touch* the yellow highlighted box to have each selection screen appear. See **Figures 38 & 39**

Read the instructions on each screen for entering data.

Broadcast: When you are finished setting the clock, *touch* the **<Broadcast>** button to broadcast the Time and Date to all Units. The following message will appear:



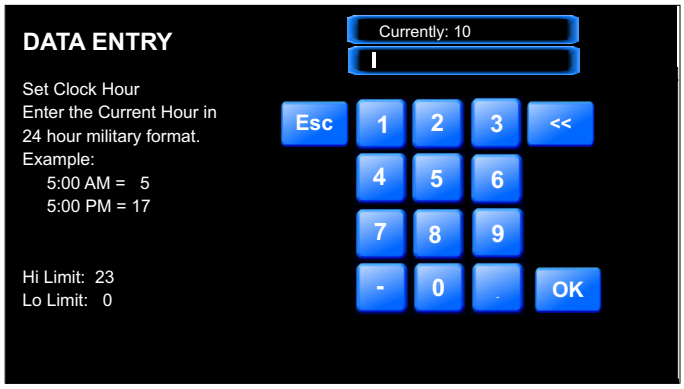


Figure 39: Set Clock Hour

Set Clock Hour: *Touch* the number buttons to enter the current hour in 24 hour military format. Valid entries are from 0-23. *Press* **<OK>**.

NOTE: See Table 7 For Military Time Conversion Data.

Set Clock Minute: *Touch* the number buttons to enter the current minutes. Valid entries are from 0-59. *Press* **<OK>**.

Set Clock Month: *Touch* the number buttons to enter the current month. Valid entries are from 1-12. *Press* **<OK>**.

Set Clock Day: *Touch* the number buttons to enter the current day of the month. Valid entries are from 1-31. *Touch* **<OK>**.

Set Clock Year: *Touch* the number buttons to enter the current year. Valid entries are from 0-99. *Touch* **<OK>**. **Note:** The year is based on the current century; therefore, 11 = 2011. If you enter more than two digits, e.g. 2011, the system will not recognize your entry.

NOTE: Even though time is set using Military Time it displays in A.M./P.M. format on the screens after it is entered.

Additional Settings

Additional system settings are available under the **<Settings>** icon. These include setting the Backlight Timeout, the Backlight Intensity Percentage, the System Manager Address, Alarm Polling, and One to One Unit Connection.

From the *Main Screen*, *touch* the **<Settings>** icon. The *System Manager Settings Screen* will appear. See **Figure 40.**

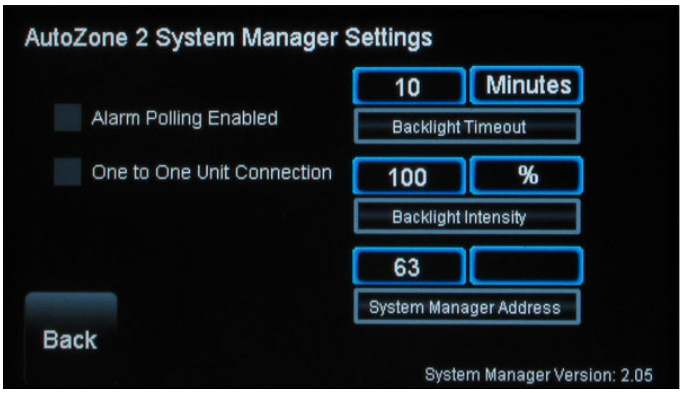


Figure 40: System Manager Settings Screen

Backlight Timeout: This setting is actually a setting for three separate functions—Backlight Timeout, *Main Screen* Timeout, and Passcode Timeout. To set the Backlight Timeout, e*nter* the amount of time you wish the screen to maintain the active intensity level after the last touch pad activity occurs. The High limit is 30 and the Low limit is 0. 0 = No Timeout. The System Manager TS will return to the *Main Screen* display at the same rate as the Backlight Timeout, except that if set to 0, the *Main Screen* will display after 2 minutes. The Passcode will timeout at the same rate as the Backlight Timeout,

Backlight Intensity Percentage: *Enter* the percentage of light level you wish to maintain whenever touch pad activity occurs. The High limit is 100% and the Low limit is 0%.

System Manager Address: *Enter* the address of the System Manager TS. 63 = Network System. 1-60 = Multiple Managers based on the following definitions:

- **Network—**If you are using this System Manager TS on a communications loop that has a MiniLink or CommLink 5 installed and you have a single System Manager TS for your entire system, you must *enter* **<63>** for **Network System**.
- **Multiple Managers—**If you are using this System Manager TS on a communications loop, have a MiniLink or CommLink 5 installed, and have more than one System Manager TS, then you need to operate in **Multiple Managers Mode**. *Enter* the address **<1-60>** at which you want this particular System Manager TS to be set. When more than one System Manager TS is used on a local loop, each must be set with a unique address different from any other device on that loop. If you want one of the System Manager TS's to be able to indicate alarms for the entire system, you must *enter* **<63>** for **Network System** for that particular System Manager TS.

Alarm Polling Enabled: If you wish for the system to poll for alarms, *touch* the yellow box to the left of this item to select it. The box will turn black and the system will immediately check all loops for alarms. *Touch* **<Cancel>** to stop the process. If you wish to have Alarm Polling Disabled, you must now *touch* the black box outlined in yellow to deselect this option. The box will return to its previously fully yellow state.

NOTE: For the System Manager TS to poll for alarms, you must also configure the unit(s) to poll for alarms on the *MiniLink Setpoints Screen* using Prism 2. See the *Prism 2 Software Technical Guide* for more information.

One to One Unit Connection: This option is not used for the AZ 2 System and should not be selected.

System Manager Version: The version number of the System Manager software appears on the bottom menu bar. This version number is important to know for troubleshooting purposes.

MiniLink Configuration (Zoning Systems Only)

NOTE: If you are using a zoning system you will need to configure the MiniLink. See the Appendix section of this manual for MiniLink configuration instructions.

Alarm Polling

In order for Alarm Polling to appear on the *Main Screen,* you must have the following items in place:

1. **Alarm Polling Enabled** must be selected in the *Systems Settings Screen* (see **Figure 40)**.
2. You must have a MiniLink connected to your system and have your System Manager TS set to Network Mode.
3. You must configure each unit to poll for alarms on the *MiniLink Setpoint Screen* using Prism 2.
   See the *Prism 2 Software Technical Guide* for more information.

The **<Alarms>** icon on the *Main Screen* allows you to check for alarms, review alarms, and clear alarms. Only a Level 3 user can clear the alarm log.

A green **<No Alarms>** icon appears on the Main Screen when no alarms are present. This icon changes to a red **<Active Alarms>** icon when alarms are present.

To check for alarms, review alarms, or clear alarms, from the *Main Screen*, *touch* the **<Active Alarms>** icon. The *System Alarm Status Screen* will appear. See **Figure 41.**

NOTE: Even if you don't set up Alarm Polling using Prism 2, a controller's first status screen will still alert you of an active alarm.

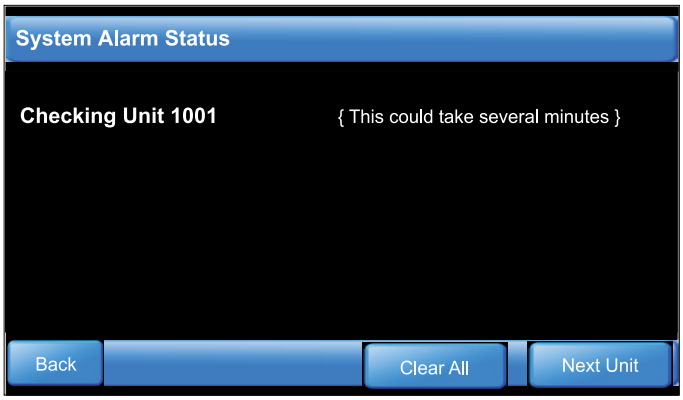
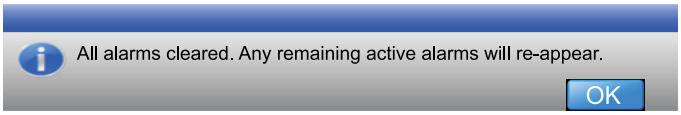


Figure 41 System Alarm Status Screen

Next Unit: *Touch* **<Next Unit>** to access the next unit's alarms.

Clear All: *Touch* **<Clear All>** to clear all alarms logs. Active alarms will remain. You must be a Level 3 user to access this option. When all alarms have cleared, the following message will appear on the screen:



NOTE: You can also view alarms while in individual controller's status screens. **See Figure 41**.

My System Unit Selection

From the *Main Screen*, *touch* the **<My System>** icon. The *Selected Unit Screen* will appear. See **Figure 42**.

Figure 42 Unit Selection Screen

In **Figure 42**, Loop 1 and Unit 1 are selected as indicated in the figure with white text. They also appear in the *Top Menu Bar* in brackets. Use the **<+>** and **<->** buttons to move up and down through the loops and units. *Enter* the desired **Loop #** and **Unit #** and then *touch* **<GO>** to access the unit's *Status Screen*.

Instructions for alarms, schedules, and setpoints are included in this guide separately for Zone/VAV Controllers and AZ 2 Controllers.

Viewing AZ 2 Controller Status

Figure 43 depicts the *AZ 2 Controller Status Screen*. Notice that the controller is identified by loop number and unit number - in this case, 0101 represents Loop 1, Unit 1. Images vary based on controller type.

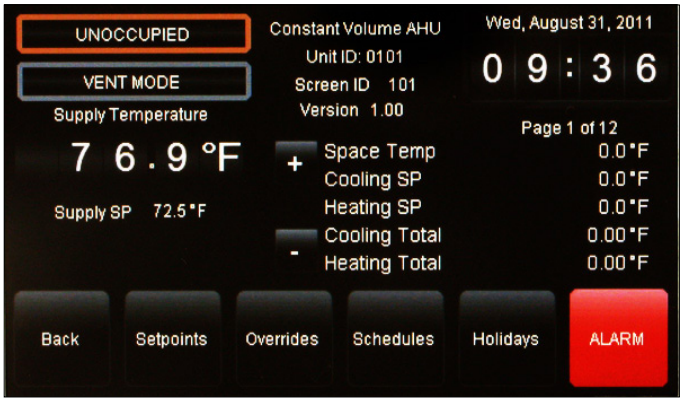


Figure 43: Controller Status Screen

Use the **<+>** and **<->** buttons in the middle of the screen to scroll through the controller's configuration and setpoint values.

Schedule Override

To Force Schedules, from the *AZ 2 Controller Status Screen*, touch the <Override> button. The *Overrides Screen will appear (***Figure 44***)*.

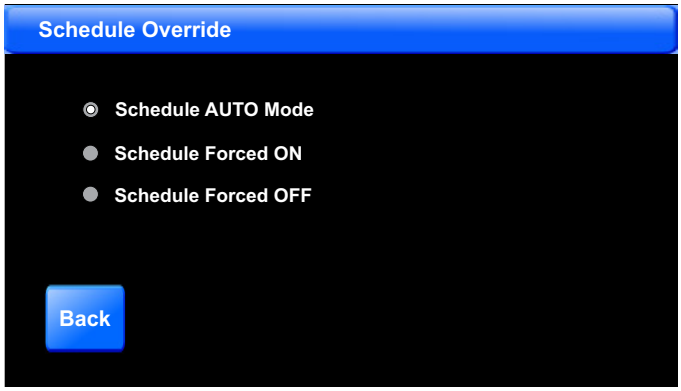


Figure 44: Schedule Overrides Screen

Touch the radio button to select the schedule option. This selection will remain in effect unless it is changed again on this screen. Schedule overrides do not automatically time out after a certain period of time. Default is Schedule AUTO Mode.

- **Schedule AUTO Mode**—Select this to restore normal schedule operations.
- **Schedule FORCED ON**—Select this to Force the unit into continuous Occupied Mode operation.
- **Schedule FORCED OFF**—Select this to Force the unit into continuous Unoccupied Mode operation.

Viewing Controller Alarm Status

To view alarm status, *touch* the **<Alarm>** or **<No Alarms>** button located at the far right bottom of the unit's *Status Screen*. See **Figure 45** The first *Alarm Status Screen* will display. See **Figure 46**.

NOTE: The **<ALARM>** button appears bright red only if the unit has an active alarm condition.

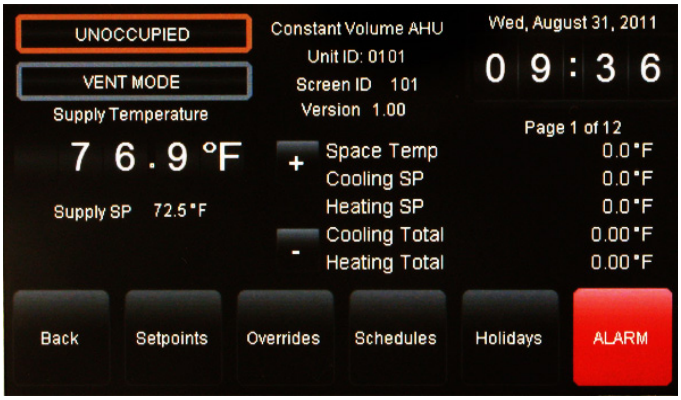


Figure 45: Controller Status Screen

NOTE: Even if you don't set up Alarm Polling using Prism 2, a controller's first status screen will still alert you of an active alarm.

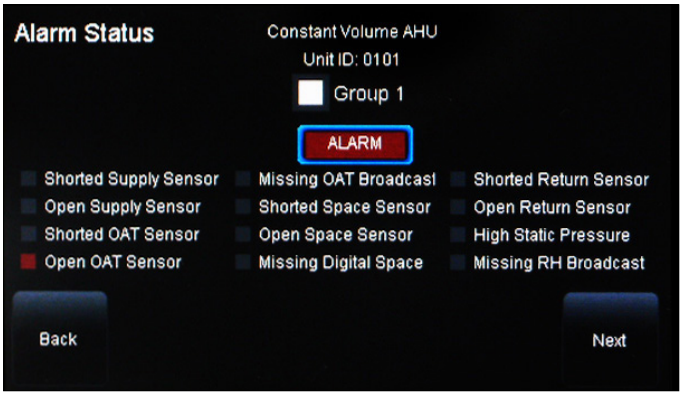


Figure 46: Controller Alarm Status Screen

In the example above (**Figure 46)**, Alarm Group 1 is enabled and there is an ALARM (designated by the word ALARM in red. There is a red box in front of Open OAT Sensor, designating the alarm. If there is no alarm condition, the word OK appears in a box below the Group Number (as shown in **Figure 47**).

Enabling/Disabling Alarms For Polling

Alarm enabling is accessed by *touching* the **<Alarm>** or **<No Alarms>** button on the lower right of the unit's *Status Screen*. See **Figure 43**. Only a Level 3 user can enable alarms.

In addition to simply viewing alarms, the *Alarm Status Screen* can also be used for enabling and disabling alarms that will be e-mailed. The e-mailing feature will only work if Prism 2 is running and has e-mailing capability.

The alarms must first be configured using Prism 2 software. *See the Prism 2 Software Technical Guide* for instructions.

Once the alarm settings have been established in Prism 2, the settings you choose in the *Alarm Status Screen* will be stored in the controller so that you will not have to re-configure the alarms for that controller in Prism 2. Once configuration is complete, Prism 2 does not have to be running in order to view alarms on individual *Alarm Status Screens in the System Manager TS*. However, as mentioned previously, Prism 2 does have to be running for e-mailing of alarms to occur.

To enable an alarm category—Sensors, Mechanical, Fail Modes—simply *touch* the white square next to Group 1, Group 2, and/or Group 3. A white box designates that the alarm category is enabled. See **Figure 46** for an example. To disable an alarm category, simply *touch* the square again. A grey box designates that the alarm category is disabled. See **Figure 47** for an example.

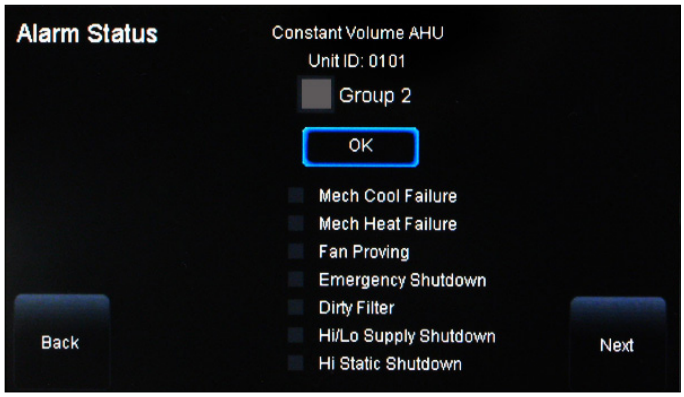


Figure 47: Controller Alarm Status Screen

Viewing and Setting Schedules and Holidays

Viewing and Setting Schedules

To view and set schedules for the AZ 2 Controller, *touch* the **<Schedules>** button found at the bottom of the *Main Status Screen* (**Figure 43**). The *Schedules Screen* will appear. See **Figure 48**. The default day will be Sunday and the default event start/stop times will be midnight.

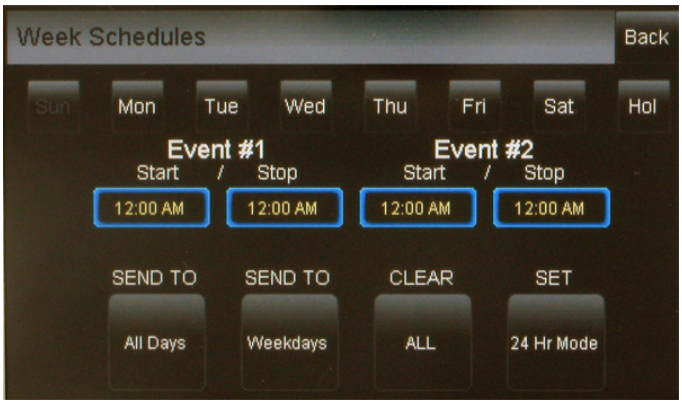


Figure 48: AZ 2 Controller Schedules Screen

A Level 2 user can set two schedules per day for individual days of the week, all weekdays, weekends, and holidays. All times are entered in military time format.

If you wish to enter a schedule for a certain day of the week, first *touch* the day of the week at the top of the screen. Otherwise, the day defaults to Sunday. *Touch* the start and stop time for each Event and enter the desired times. See **Figure 49**. All times must be entered in military time format. See the Military Time Table - **Table 7 -** at the end of the System Manager TS section of the manual.

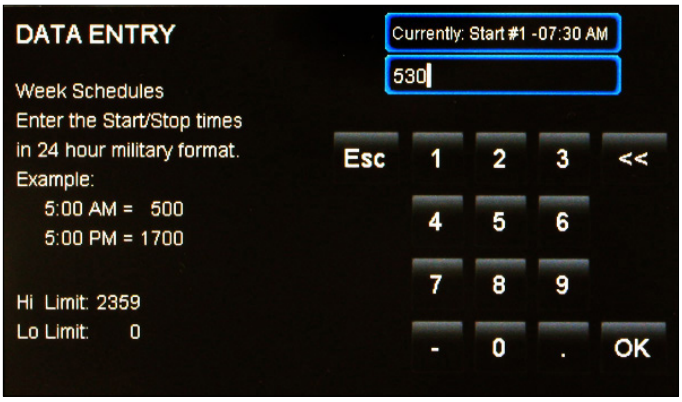


Figure 49: Schedule Times Screen

Touch **<OK>** to save the time you entered or *touch* **<Esc>** to exit the *Schedule Times Screen* without changing the time and return to the *Schedules Screen* (**Figure 48**).

To eliminate a schedule from any event, simply enter a zero for the Start and Stop time for that day. The screen will display 12:00 am for both the Start and Stop times, indicating that the equipment will not activate on that day. Once back at the *Schedules Screen*, you can continue setting schedules day by day or use following options:

SEND TO <All Days> - *Touch* this button to send the schedule appearing on the screen to all days of the week, except for holidays.

SEND TO <Weekdays> - *Touch* this button to send the schedule to weekdays only. You will need to set up a separate schedule for Saturday and Sunday when selecting this option.

CLEAR <All Schedules> - *Touch* this button to clear all schedules.

SET <24 Hr Mode> - *Touch* this button to have the system run continuously, 24 hours a day, 7 days a week including holidays. All event times will display 11:59 PM.

Viewing and Setting Holidays

To view and set holidays for an AZ 2 Controller, *touch* the **<Holidays>** button found at the bottom of the Status Screen (**Figure 43**). The *Holidays Schedule Screen* will appear. See **Figure 50**. The holidays in the screen will initially not be set. You can only set holidays for the current year. You must be a Level 2 user in order to set holidays.

Simply *touch* the day(s) of the month to select holidays. *Touch* the **<<>** button to go back one month and the **<>>** button to go forward one month.

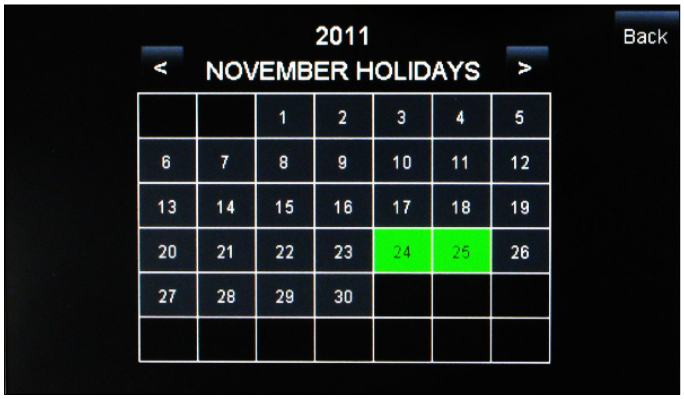


Figure 50: Holidays Schedule Screen

There are 14 holiday periods available for each year. These holiday periods can be a single day or they can span weeks or even months. For example, if you want to schedule a summer break, you need only schedule one holiday period to define a two or three month break from operating in the occupied mode.

Every defined holiday uses the Holiday operating schedule programmed in the controller's *Schedules Screen*.

Holidays can only be programmed for the current year. You cannot program holidays before the next year occurs. Holidays do not automatically adjust for the new year, so you will need to access this screen after the new year and make necessary adjustments to the days that float, such as Memorial Day.

Accessing and Entering Controller Setpoints

While in the AZ 2 Controller Status Screen (see **Figure 51**), *touch* the **<Setpoints>** button found on the bottom menu bar. The AZ 2 Controller's *Temperature Setpoints Screen* will appear. See **Figure 52**.

Level 1 and Level 2 users can change occupied space temperature setpoints, but only Level 3 users can change all setpoints.

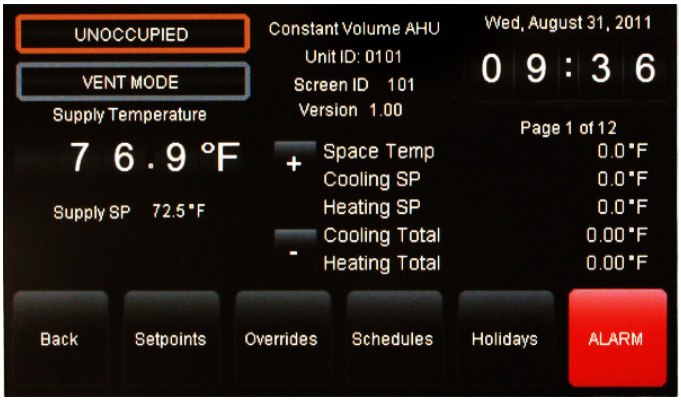


Figure 51: Controller Status Screen

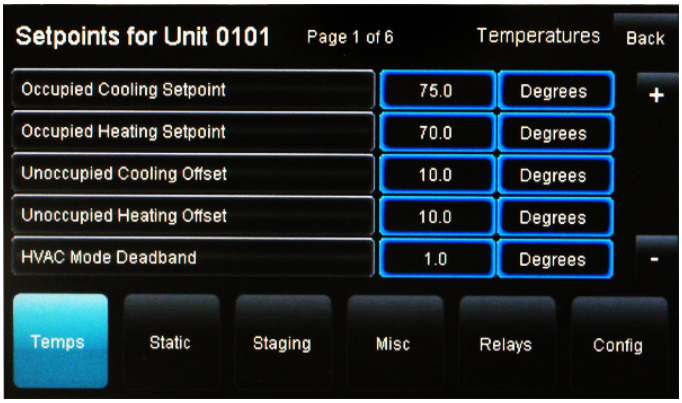


Figure 52: Controller Temperature Setpoints Screen

Individual setpoint and configuration buttons are located at the bottom of the *Setpoint Screens*. See **Figure 53**. Simply *touch* a specific button to access that category.

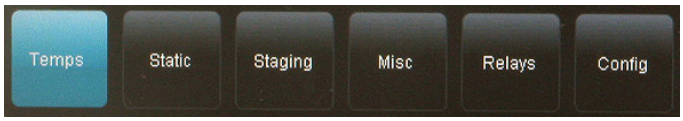


Figure 53: Setpoint Buttons

Within each Setpoint Screen, *touch* the **<Back>** button to return to the *Status Screen*. Use the **<+>** and **<->** buttons at the right of the screen to scroll through the setpoints and configurations. Simply *touch* the gray highlighted box to change the setpoint or configuration. Each setpoint data entry screen will provide a definition of the setpoint and specific instructions for entering the setpoint and will include the setpoint range as in the example below, **Figure 54**.

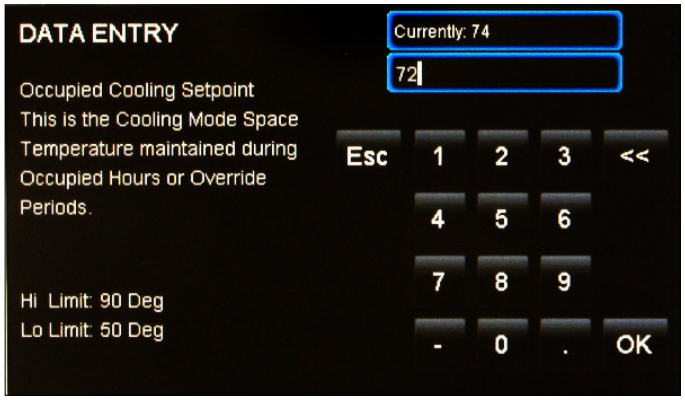


Figure 54: Cooling Mode Setpoint Data Entry Screen

Touch **<OK>** to have the system accept the new value. If you enter a setpoint that is not in the valid range, the setpoint will remain as is and will not change.

Each setpoint data entry screen is self-explanatory; however, each setpoint and configuration is explained in the next section, Configuring AZ 2 Controller Setpoints. To easily reference a particular setpoint or configuration, refer to the index.

Configuration Screens

Controller Configuration

Touch the **<Config>** button to access the *Configuration Setpoints Screens*.

For screens that contain radio buttons, *touch* the radio button next to your selection. For screens with square buttons, *touch* one or more square buttons to make your configuration selections for the unit.

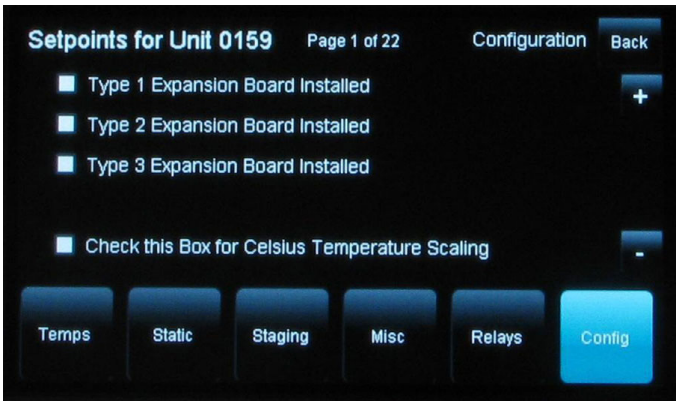


Figure 55: Configuration Screen 1 of 22

Expansion Modules Installed

Touch the square button to select the Expansion Module(s) that are installed The available selections are as follows:

- **Type 1 Expansion Board Installed**
  This is the OE641-AZ2 - EM1 Module. Select this button if it is installed.
- **Type 2 Expansion Board Installed**
  This is the OE642-AZ2 - EM2 Module. Select this button if it is installed.
- **Type 3 Expansion Board Installed**
  This is the OE643-AZ2 - EM3 Module. Select this button if it is installed.
- **Celsius Temperature Scaling**
  If you want Celsius Temperature readings.

NOTE The AZ 2 Controller will reset after setting Celsius Temperature Scaling. The VAV/Zone Controllers are automatically configured for Celsius scaling when selected on the controller screen. If this is a Zoning System the MiniLink will also need to be configured for Celsius operation. See the MiniLink Configuration page in the Appendix of this manual for information on configuring it.

Figure 56: Configuration Screen 2 of 22

Application Type

Touch the radio button to select the mode of operation that will determine the Heating, Cooling, or Vent Mode of operation. Default is Constant Volume. The available selections are as follows:

- **Constant Volume**
  Space or Return Air Temperature Controlled Single Zone CV unit (No Zones).
- **Single Zone VAV**
  Single Zone Units using space temperature to determine the mode of operation, controlling heating and cooling to maintain the heating or cooling leaving air setpoints, and modulating the supply fan VFD to maintain the space temperature setpoints. Modulating heating and cooling MUST be used for satisfactory performance.
- **VAV**
  True Cooling Only VAV with Morning Warm Up (Optional)
- **VAV Tempering**
  Future Application. Not currently available.
- **Zoning**
  Zone voting system with a maximum of 16 voting zones per HVAC unit.
- **Remote Force**
  Force a mode such as Heating, Cooling, Humidification or Dehumidification. If you want to use any one of these force modes you must wire a contact into the EM3 Expansion Module for all 4 force modes in order for them to work.

Figure 57: Configuration Screen 3 of 22

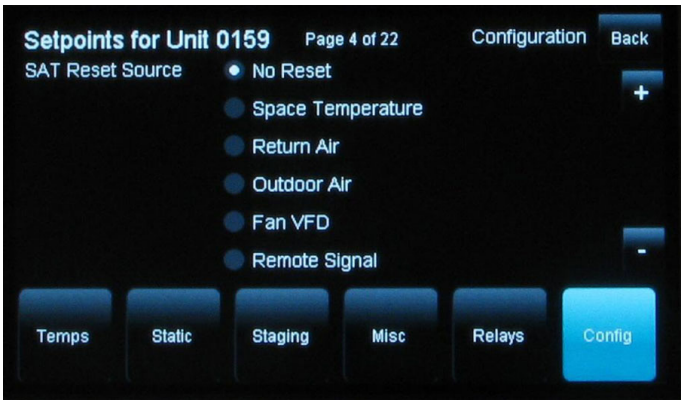


Figure 58: Configuration Screen 4 of 22

Static Pressure Control

Default is None. This configuration option is available if expansion module EM1 is installed and configured. Touch the radio button to select the type of Duct Static Pressure control this unit has. The options are:

- **None (Default)**
  This unit is not controlling Duct Static Pressure.
- **VFD**
  This unit has a Supply Fan VFD that modulates to control the Duct Static Pressure.
- **Bypass Damper**
  This unit uses a Bypass Damper to control the Duct Static Pressure.
- **VFD Filter Loading**
  This unit uses Duct Static Pressure to control the Supply Fan VFD in order to provide constant airflow as the filter is getting dirty.

SAT Reset Source

Default is No Reset. This configuration option is not available if Single Zone VAV was selected as the application type. The Supply Air Setpoint can be "automatically" adjusted based on an external condition. This screen allows you to choose this external condition or "Source". *Touch* the radio button to select the desired Reset Source for Supply Air Temperature Reset. The Single Zone VAV option should be selected in applications where the Supply Fan VFD speed is reset based on the Space Temperature. If you select No Reset, then neither the Supply Air Setpoint nor Supply Fan VFD Reset will occur. The available selections are as follows:

- **No Reset (Default)**
  No SAT Setpoint Reset will occur. The SAT Setpoints remain fixed.
- **Space Temperature**
  The SAT Setpoints will be adjusted based on the Space Temperature.
- **Return Air**
  The SAT Setpoints will be adjusted based on the Return Air Temperature.
- **Outdoor Air**
  The SAT Setpoints will be adjusted based on the Outdoor Air Temperature.
- **Fan VFD**
  The SAT Setpoints will be adjusted based on the VFD Position. This is good for Adjusting the Setpoints based on the building's load by looking at the VFD speed.
- **Remote Signal**
  The SAT Setpoints will be adjusted based on an External 0-10VDC signal.

Since the Supply Air Setpoints are not fixed during reset, they are referred to as "Active Supply Air Setpoints".

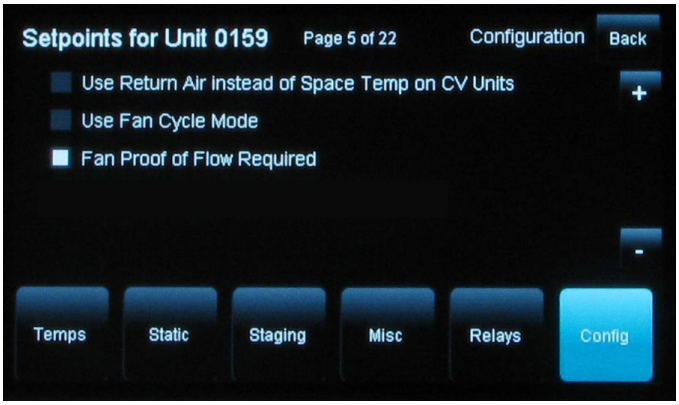


Figure 59: Configuration Screen 5 of 22

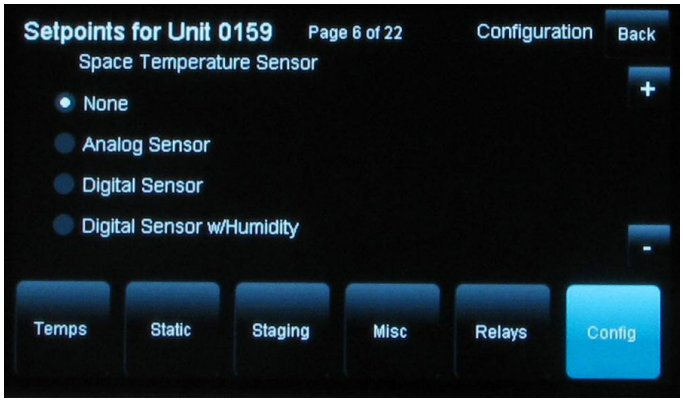


Figure 60: Configuration Screen 6 of 22

Constant Volume Controls

Touch the square button to select the Expansion Board(s) that are installed The available selections are as follows:

- **Use Return Air Instead Of Space Temp On CV Unit**
  Select this item when an Average Building Temperature (the Return Air Temperature) needs to determine Heating, Cooling, and Vent Modes of operation.

- **Use Fan Cycle Mode**
  Select this item if you want the HVAC unit's supply fan to only cycle on during Heating, Cooling, Humidification, or Dehumidification Modes. In this case there is no Vent Mode. DO NOT select this item if you want the fan to run continuously in the Occupied Mode. Continuous fan operation will give you a Vent Mode.

- **Fan Proof Of Flow Required**
  This configuration option is available if expansion module EM1 is configured and installed. *Select this item* if this unit has a Fan Proof of Flow Switch connected to the EM1 Module. The controller will turn on the fan and then wait for a 24VAC signal on the Proof Of Flow input on EM1. If it does not receive the signal, nothing else will energize for safety reasons. The source for this 24VAC signal can be from a Current Switch on the fan motor, Sail Switch in the airstream, a Differential Pressure Switch or an output from the VFD. (VFD signal may need to be conditioned with a pilot duty relay).

Space Temperature Sensor

Touch the radio button to select the type of Space Temperature Sensor that is installed on your controller or expansion module(s). The available selections are as follows:

- **None (Default)**
  Typically you would select this option if you have a VAV or Zoning system because the unit is controlled based on the Supply Air Temperature Sensor not the Space Temperature Sensor. However, you can still use a Space Temperature Sensor for monitoring of the space when using a VAV or Zoning system if desired. For all other applications you will need to select one of the other options that matches the sensor you are using.

- **Analog Sensor**
  Select this option if the sensor you are using is an OE210-02, OE211-02, OE212-02 or OE213-02 Modular Room Sensor.

- **Digital Sensor**
  Select this option if the sensor you are using is an OE217-02 Digital Room Temperature Sensor With Display.

- **Digital Sensor With Humidity**
  Select this option if the sensor you are using is an OE217-03 Digital Room Temperature & Humidity Sensor With Display or the OE217-04 Digital Room Temperature & Humidity Sensor Without Display.

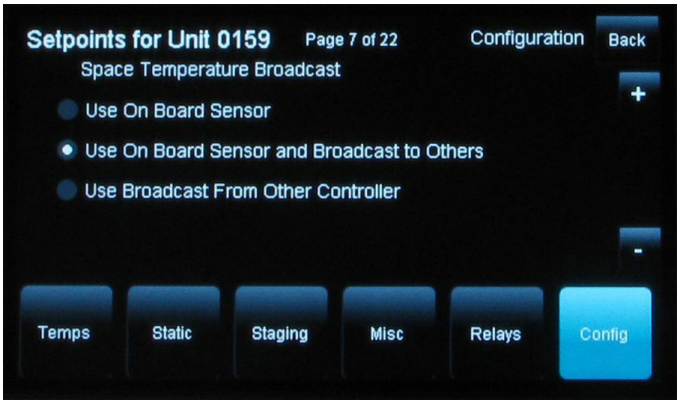


Figure 61: Configuration Screen 7 of 22

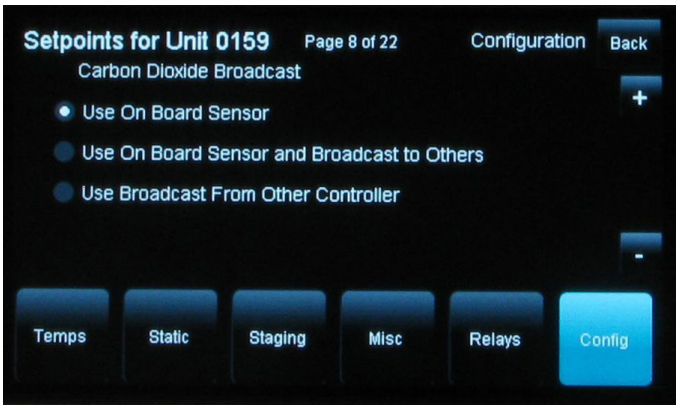


Figure 62: Configuration Screen 8 of 22

Space Temperature Broadcast

Touch the radio button to select whether you want to use the on board Space Temperature Sensor, use the on board Space Temperature Sensor and broadcast its reading to other controllers, or receive and use a Space Temperature broadcast from another controller. The available selections are as follows:

- **Use On Board Sensor (Default)**
  This is the setting you would normally use if you have a Constant Volume unit and don't want to broadcast the reading.

- **Use On Board Sensor And Broadcast To Others**
  Typically you would select this option if you had more than one unit serving a particular space and you want multiple units to see the same Space Temperature reading. You would install a Space Temperature Sensor on one of the units and broadcast to the other units on the Local Loop.

- **Use Broadcast From Other Controller**
  Select this option if you have another unit controller serving the same space as this unit that has a Space Temperature Sensor installed and you want to use its broadcast for this controller. Also if you have a GPC-XP Controller installed and want to average multiple Space Temperature Sensors with it and broadcast the average you would select this option to receive the broadcast from the GPC-XP on the Local Loop.

Carbon Dioxide Broadcast

Touch the radio button to select whether you want to use the on board CO_2 Sensor, use the on board CO_2 Sensor and broadcast its reading to other controllers, or receive and use a CO_2 broadcast from another controller. The available selections are as follows:
:

- **Use On Board Sensor (Default)**
  This is the setting you would normally use if you have a on board CO_2 Sensor and don't want to broadcast the reading.

- **Use On Board Sensor And Broadcast To Others**
  Typically you would select this option if you had more than one unit serving a particular space and you want multiple units to see the same CO_2 Sensor reading. You would install a CO_2 Sensor on one of the units and broadcast to the other units on the Local Loop.

- **Use Broadcast From Other Controller**
  Select this option if you have another unit controller serving the same space as this unit that has a CO_2 Sensor installed and you want to use its broadcast for this controller. Also if you have you have a GPC-XP Controller installed and want to average multiple CO_2 Sensors with it and broadcast the average you would select this option to receive the broadcast from the GPC-XP on the Local Loop.

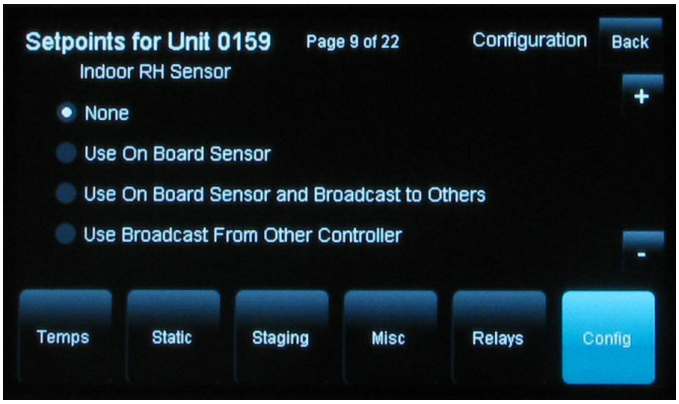


Figure 63: Configuration Screen 9 of 22

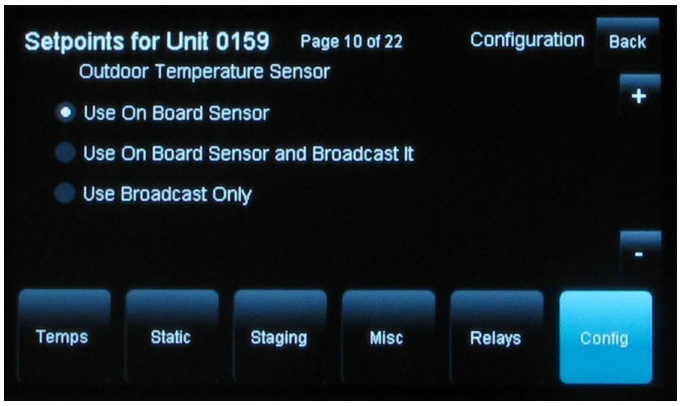


Figure 64: Configuration Screen 10 of 22

Indoor RH Sensor

Touch the radio button to select whether you want to use the On Board (E-BUS Indoor Humidity Sensor connected to the AZ 2 Controller or an Indoor Humidity Sensor Wired into the EM1 Module) and not broadcast its reading or use the On Board Indoor Humidity Sensor and broadcast its reading to other controllers or receive and use an Indoor Humidity broadcast from another controller. The available selections are as follows:

- **None (Default)**
  This is the setting you would use if you don't have an Indoor Humidity Sensor Installed and don't want to receive a broadcast from another controller.

- **Use On Board Sensor**
  This is the setting you would use if you have an Indoor Humidity Sensor and don't need to broadcast it.

- **Use On Board Sensor And Broadcast To Others**
  Typically you would select this option if you had more than one unit serving a particular space and you want both units to see the same Indoor Humidity Sensor reading. You would install an Indoor Humidity Sensor on this unit controller and broadcast the Indoor Humidity to the other unit controller. This broadcast is only to the Local Loop.

- **Use Broadcast From Other Controller**
  Select this option if you have another unit controller serving the same space as the unit which has an Indoor Humidity Sensor installed and you want to use its broadcast for this controller. Also, if you have a GPC-XP Controller installed and want to average multiple Indoor Humidity Sensors with it and broadcast the average you would select this option to receive the broadcast from the GPC-XP on the Local Loop.

Outdoor Temperature Sensor

Touch the radio button to select whether you want to use the on board Outdoor Air Temperature Sensor, use the on board Outdoor Temperature Sensor and broadcast its reading to other controllers or receive and use an Outdoor Air Temperature broadcast from another controller. The available selections are as follows:

- **Use On Board Sensor (Default)**
  This is the setting you would normally use.

- **Use On Board Sensor And Broadcast It**
  You would install an Outdoor Air Temperature Sensor on this unit controller and broadcast the Outdoor Air Temperature to unit controllers on all Local Loops.

- **Use Broadcast Only**
  Select this option if you have another unit controller that has a Outdoor Air Temperature Sensor installed and you want to use its broadcast for this controller.

NOTE: If you chose to broadcast the Outdoor Air Temperature Sensor reading from any AZ 2 Controller on your control system all the other AZ 2 Controllers on your system cannot have an Outdoor Air Temperature Sensor installed. They also must all be set to receive the Outdoor Air Temperature Broadcast. If this is not done erratic Outdoor Air Temperature readings will be experienced.

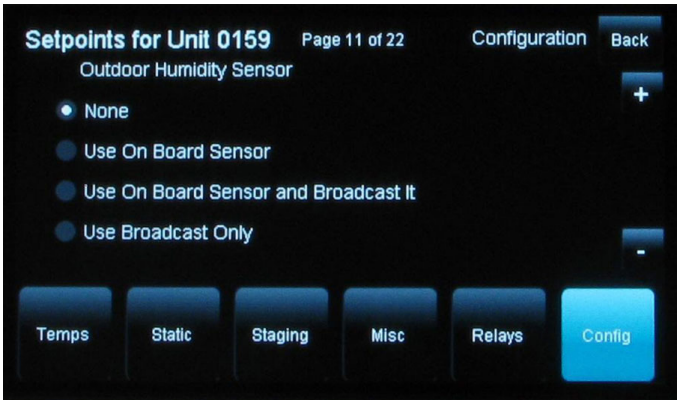


Figure 65: Configuration Screen 11 of 22

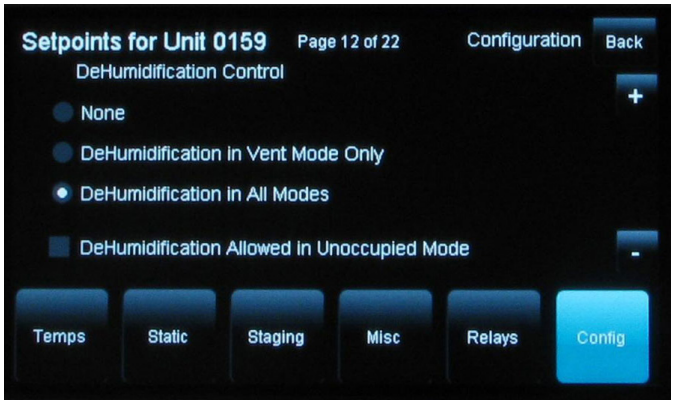


Figure 66: Configuration Screen 12 of 22

Outdoor Humidity Sensor

Touch the radio button to select whether you want to use the on board Outdoor Air Humidity Sensor, use the on board Outdoor Humidity Sensor and broadcast its reading to other controllers or receive and use a Outdoor Air Humidity broadcast from another controller. The available selections are as follows:

- **None (Default)**
  You are not using an Outdoor Humidity Sensor

  Use On Board Sensor
  This is the setting you would normally use. It requires that an EM1 Expansion Module is installed and an Outdoor Humidity Sensor is connected to it.

- **Use On Board Sensor And Broadcast It**
  You would install an Outdoor Air Humidity Sensor on the EM1 Module and broadcast the Outdoor Air Humidity to unit controllers on all Local Loops.

- **Use Broadcast Only**
  Select this option if you have another unit controller that has a Outdoor Air Humidity Sensor installed and you want to use its broadcast for this controller.

NOTE: If you chose to broadcast the Outdoor Air Humidity reading from any AZ 2 Controller on your control system all the other AZ 2 Controllers on your system cannot have an Outdoor Air Humidity Sensor installed. They also must all be set to receive the Outdoor Air Humidity Broadcast. If this is not done erratic Outdoor Air Humidity readings will be experienced.

Dehumidification Control

This configuration option is available *if expansion module EM1 is installed and configured or a E-BUS Digital Space Temp/Humidity Sensor is used on the AZ 2 Controller.* *Touch* the radio button to select the type of Dehumidification control.

- **None (Default)**
  This controller does not control dehumidification.

- **Dehumidification in Vent Mode Only**
  This controller will only go into Dehumidification mode if there is no call for Heating or Cooling.

- **Dehumidification in All Modes**
  This controller will go into Dehumidification Mode regardless of whether the unit is in Heating or Cooling Modes. It will still try to maintain the appropriate SAT Setpoint for the mode by using reheat if available.

- **Dehumidification Allowed In Unoccupied Mode**
  This controller will go into Dehumidification mode whether the unit is in Occupied Mode or Unoccupied Mode.

NOTE: The HVAC unit the AZ 2 controller is installed on must be designed for dehumidification capability by having a method of providing reheat of the air supply.

Figure 67: Configuration Screen 13 of 22

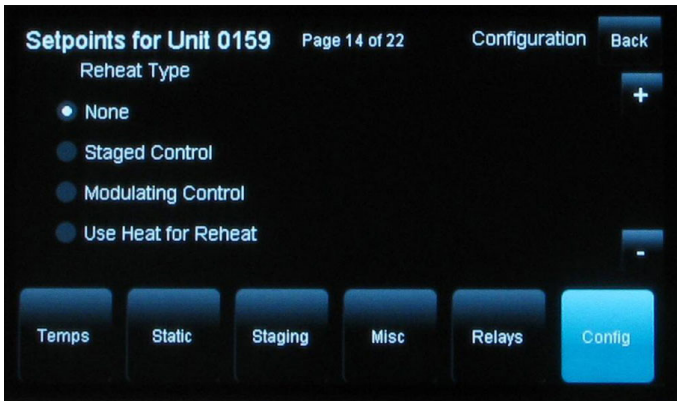


Figure 68: Configuration Screen 14 of 22

Humidifier Control

This feature allows the controller to monitor the Space Humidity and add Humidity as needed. Touch the radio button to select the type of Humidifier control.

- **None (Default)**
  No Humidity addition.
- **ON/OFF Control**
  Humidity addition using a configurable relay. May require the EM1 Expansion Module depending on the quantity of other relays configured.
- **Modulating Control**
  Proportional Humidity addition based on how far the humidity is from setpoint. An EM2 Expansion Module is required
- **Humidifier Allowed In Unoccupied**
  Select this item if your system needs Humidifier control during unoccupied hours.

Reheat Type

If Dehumidification has been configured, this screen allows you to configure what kind of reheat will be used. The output(s) will be staged or modulated to maintain the Active Supply Air Setpoint. *Touch* the radio button to select the desired Reheat Type.

- **None (Default)**
  No Reheat used.
- **Staged Control**
  Multiple stages of On/ Off Reheat, using configurable relay(s). These outputs are different than Heat Stages. It may require the EM1 Expansion Module depending on the quantity of other relays configured.
- **Modulating Control**
  Proportional modulating output. An EM2 Expansion Module is required for this option.
- **Use Heat For Reheat**
  The HVAC unit's main Heat will also be used for Reheat.

WARNING: Using the HVAC unit's internal electric heating as a reheat source requires that the electrical rating of the unit is sufficiently sized to allow for the operating electrical load of the compressor(s) and electric heater(s) at the same time.

Figure 69: Configuration Screen 15 of 22

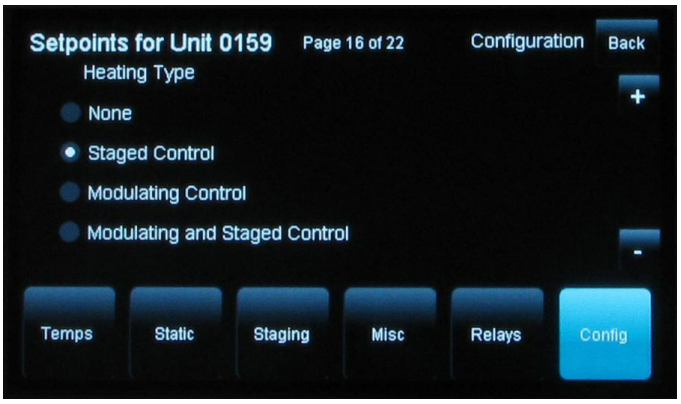


Figure 70: Configuration Screen 16 of 22

Reversing Valve

If you are using a Heat Pump, *touch* the radio button to select the desired Reversing Valve Signal depending on whether your Heat Pump unit activates its reversing valve during Cooling or Heating operation. It also allows you to configure whether this is an Air to Air or Water Source Heat Pump. When set for either WSHP Fail to Cool or WSHP Fail to Heat it ignores Outdoor Air Lockouts.

- **None (Default)**
  Not a Heat Pump and no externally controlled reversing valve.
- **Air to Air Fail to Heat**
  Air to Air Heat Pump and Reversing Valve Energizes for Cooling.
- **Air to Air Fail to Cool**
  Air to Air Heat Pump and Reversing Valve Energizes for Heating.
- **WSHP Fail to Heat**
  Water Source Heat Pump and Reversing Valve Energizes for Cooling
- **WSHP Fail to Cool**
  Water Source Heat Pump and Reversing Valve Energizes for Heating.

Heating Type

Touch the radio button to select your desired heating type. If you are using a Heat Pump, *touch* the radio button to select the option that will be used for Auxiliary Heating. Heating is always controlled to the Active Supply Air Heating Setpoint.

- **None (Default)**
  There is no heat in this unit.
- **Staged Control**
  Staged Heating using Relay Outputs.
- **Modulating Control**
  Modulating Heating using an adjustable VDC output. The EM2 Expansion Module is required for this option.
- **Modulating and Staged Control**
  The modulating heat source will be the first form of Heat used. If the modulating heat output has reached 100% for the stage up delay period, then a fixed stage of heat will be allowed to stage up while the modulating heat is allowed to modulate as needed. This will repeat for multiple fixed stages of heat. If the modulating heat source modulates down to 20% for the stage down delay, a fixed stage will stage off. This will repeat for multiple fixed stages. The EM2 Expansion Module is required for this option.

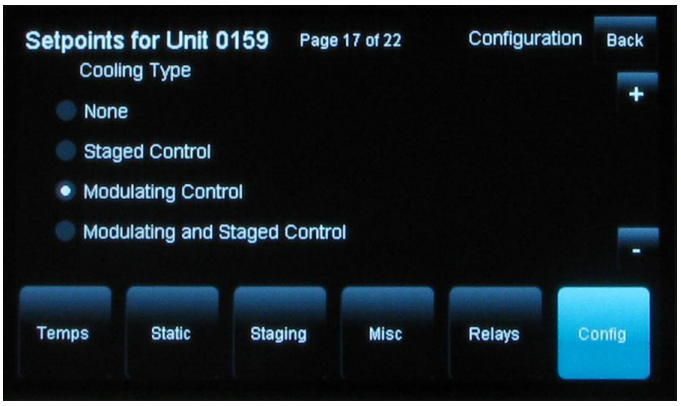


Figure 71: Configuration Screen 17 of 22

Figure 72: Configuration Screen 18 of 22

Cooling Type

If you selected None for Reversing Valve, you will see this screen. Touch the radio button to select the desired Cooling Type. Cooling is staged and/or modulated to maintain the Active Supply Air Cooling Setpoint. If your HVAC unit is equipped with a Modulating Compressor, *touch* the radio button to select Modulating Control or Modulating and Staged Control. Modulating Chilled Water is not an option on this version. *Modulating Cooling is always initiated first.*

- **None (Default)**
  No Cooling in unit.

- **Staged Control**
  Staged Cooling using Relay Outputs.

- **Modulating Control**
  Modulating Proportional Output Signal. Requires the EM2 Expansion Module.

- **Modulating and Staged Control (Future Release)**
  This option Requires the EM2 Expansion Module. The modulating cooling source will be the first form of cooling used. If the modulating cooling output has reached 100% for the stage up delay period, then a fixed stage of cooling will be allowed to stage up while the modulating cooling is allowed to modulate as needed. This will repeat for multiple fixed stages of cooling. If the modulating cooling source modulates down to 20% for the stage down delay, a fixed stage will stage off. This will repeat for multiple fixed stages.

Economizer Control

Touch the radio button to select type of Economizer Control.

- **None (Default)**
  No Economizer being controlled directly by this controller.

- **Economizer Only**
  Economizer being controlled, but no CO_2 control.

- **Economizer with CO_2 Reset**
  Economizer controlled but with the ability for CO_2 to reset the Minimum position. This option requires a RA or Space CO_2 Sensor be installed.

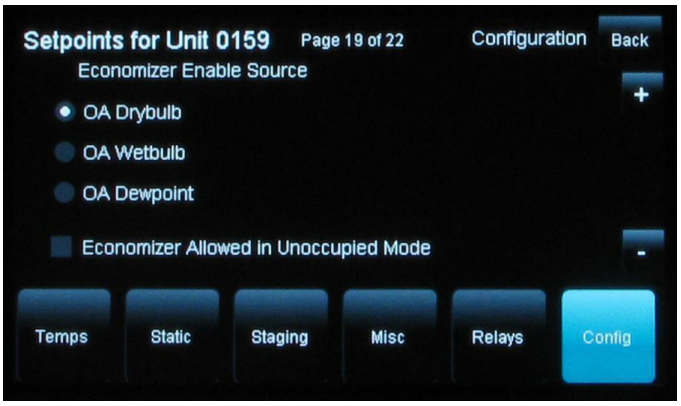


Figure 73: Configuration Screen 19 of 22

Figure 74: Configuration Screen 20 of 22

Economizer Enable Source

This configuration option is available if the unit was configured for Economizer Control. Touch the radio button from the Economizer Enable methods listed below that will allow the Economizer to be used as the first stage of cooling.

Touch the square button to allow Economizer Control in Unoccupied Mode. Default is No Economizer Allowed in Unoccupied Mode.

- **OA Drybulb (Default)**
  If the Outdoor Air Drybulb temperature is below the enable setpoint, the Economizer can be used as the first stage of cooling. This is the default setting.

- **OA Wetbulb**
  If the Outside Air Wetbulb temperature is below the enable setpoint, the Economizer can be used as the first stage of cooling. An OA Humidity Sensor and EM1 Expansion Module is required for this option.

- **OA Dewpoint**
  If the Outdoor Air Dewpoint temperature is below the enable setpoint, the Economizer can be used as the first stage of cooling. An OA Humidity Sensor and EM1 Expansion Module is required for this option.

- **Economizer Allowed in Unoccupied Mode**
  If you want to use the Economizer as necessary during Unoccupied Night Setback cooling calls. It will be utilized just as it would be in the Occupied mode with the same outdoor enable temperature. If there is a call for Cooling while in Unoccupied Mode the Economizer will go to its Minimum Position and modulate as needed.

Building Pressure Control

This configuration option is available if the EM1 Expansion Module has been installed and configured and a Building Pressure Sensor has been installed and configured. *Touch* the radio button to select type of Building Pressure Control.

- **None (Default)**
  No Building Pressure Control by this controller.

- **On/Off Control**
  If the Building Pressure rises above setpoint, a relay configured as Exhaust Fan will energize in order to turn on an On/Off exhaust fan. You must configure one of the output relays as Exhaust Fan.

- **Modulating Control**
  If the building pressure rises above setpoint, a modulating signal will be used to control an exhaust fan VFD or a modulating damper. A relay configured as Exhaust Fan can be used to enable this device so that the modulating signal can control it.

- **No Pressure Broadcast Required**
  No broadcast of Building Pressure. Building Pressure Control is only for this unit.

- **Broadcast Pressure to Single Loop**
  Only broadcasts to the Local Loop that this board is connected to.

- **Broadcast Pressure to All Loops**
  Broadcasts to all Local Loops on the entire system.

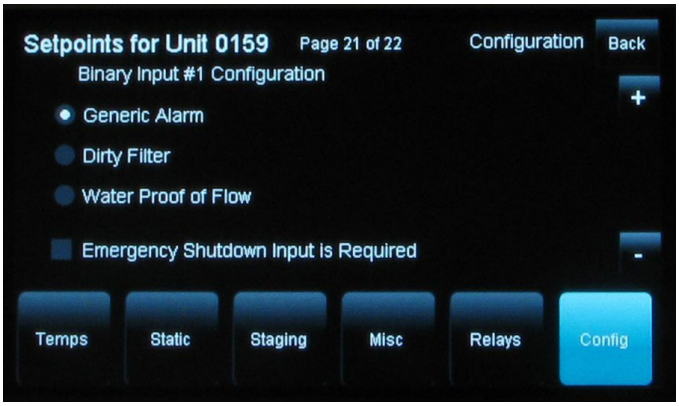


Figure 75: Configuration Screen 21 of 22

Figure 76: Configuration Screen 22 of 22

Binary Input #1 Configuration

Touch the radio button to select the input for BIN1 on the AZ 2 Controller.

- **Generic Alarm**
  Select this item if an alarm device (by others) is connected to the BIN1 binary input. If the alarm device input is active, an alarm will be generated.

- **Dirty Filter**
  Select this item if a Dirty Filter switch is connected to the BIN1 binary input. If the Dirty Filter input is active, an alarm will be generated.

- **Water Proof Of Flow**
  If your HVAC unit is configured as a WSHP unit this will monitor the unit water flow and will not allow the compressor(s) to start unless water flow is proven.

Binary Input #2 Configuration

Touch the square button if Emergency Shutdown Input is required

- **Emergency Shutdown Input is Required**
  The 24 VAC N.C. wet contact input on BIN2 of the AZ 2 Controller is used to initiate shutdown of the HVAC unit when an N.C. Smoke Detector (by others), N.C. Firestat (by others), or other N.C. Emergency Shutdown device (by others) opens its contact. It also requires a second 24 VAC N.C. wet contact from the device to shut down the AZ 2 Controller relay outputs. As previously stated one of the N.C. contacts is wired to BIN2 and the second N.C. contact is wired between the 24 VAC transformer and the relay output COMMON terminal on the AZ 2 Controller. These contacts working together shut down the relay outputs and initiate an alarm.

WARNING: The Emergency Shutdown Input is not and should not be used as a Life Safety Device. It is not designed for this purpose.

Broadcast To Boxes

Select this item to have the HVAC unit broadcast the following items to all Zone/VAV Controllers on its Local Loop:

- **Broadcast Commands To Boxes**
  This broadcast sends the AZ 2 Controller's Mode, Supply Air Temperature, Real Time clock, Schedule and Fan Status to all Zone/VAV controllers on the controllers local loop. This configuration option is available if this unit has been configured for VAV or Zoning applications.

Morning Warmup

Select this item to have the HVAC unit use Morning Warmup.

- **Use Morning Warmup**
  If selected, a Morning Warmup sequence will use the HVAC units Heat Source to Warm up the Building to a Return Air Target temperature

Morning Warmup Broadcast

Select From one of the 3 options below:

- **No Broadcast (Default)**
  A Morning Warmup Command will not be sent to the Zone/VAV Controllers

- **Fixed Position**
  This is a setpoint that resides in each Zone/VAV controller. The damper will be driven to this setpoint during any Force Mode operation. The unit will tell all boxes to go to this position.

- **Force Boxes To Max Position**
  This is a setpoint that resides in each Zone/VAV controller. This is the maximum position the damper can go to in any mode. The unit will tell all boxes to go to this position.

Temperature Setpoints

Temps

Touch the **<Temps>** button to access the *Temperature Setpoint Screens*. The following describes each setpoint in detail.

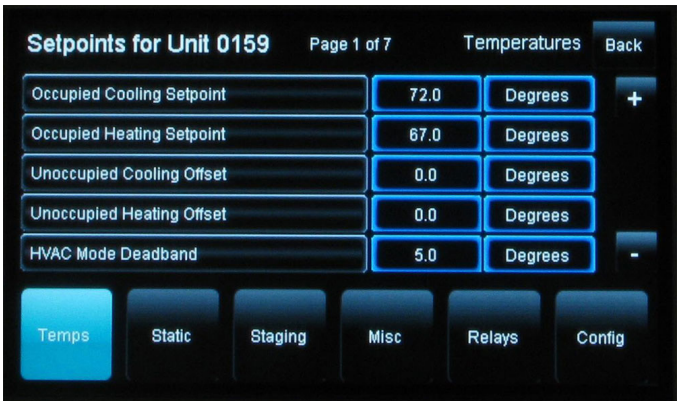


Figure 77: Temperature Setpoint Screen 1 of 7

Temp. Setpoints Screen 1 of 7

*Select and adjust the setpoints of these item*s per the requirements of your system and controller.

- **Occupied Cooling Setpoint**
  This setpoint is used to determine the Cooling Mode of operation. Above this temperature plus the deadband, the unit will switch to Cooling Mode.

  If configured as a CV controller, these are the Space or Return Air Temperature Setpoints (based on the unit configuration) that will initiate Cooling.

  If configured for Zoning and communication is lost from the Zones, the controller will automatically use the Return Air Temperature and these setpoints to control the unit. High limit = 90ºF ; Low limit = 30ºF. Default = 75ºF.

- **Occupied Heating Setpoint**
  This setpoint is used to determine the Heating Mode of operation. Below this temperature minus the deadband, the unit will switch to Heating Mode.

  If configured as a CV controller, these are the Space or Return Air Temperature Setpoints (based on the unit configuration) that will initiate Heating.

  If configured for Zoning and the communication is lost from the Zones, the controller will automatically use the Return Air Temperature and these setpoints to control the unit. High limit = 90ºF ; Low limit = 50ºF. Default = 70ºF.

- **Unoccupied Cooling Offset**
  These setpoints are added to the Space/RAT Setpoints when the unit is Unoccupied. The unit will always use the Space Temperature Sensor for this operation, so you MUST have a Space Temperature Sensor connected to use this feature even if you have configured the Return Air Temperature Sensor as the controlling sensor for the Occupied Mode. High limit = 30ºF (no offset); Low limit = 0ºF. Default =10°F.

- **Unoccupied Heating Offset**
  These setpoints are subtracted from the Space/RAT Setpoints when the unit is Unoccupied.

  The unit will always use the Space Temperature Sensor for this operation, so you MUST have a Space Temperature Sensor connected to use this feature even if you have configured the Return Air Temperature Sensor as the controlling sensor for the Occupied Mode. High limit = 30ºF (no offset); Low limit = 0ºF ; Default = 10°F .

- **HVAC Mode Deadband**
  This is the deadband above and below the Cooling and Heating Setpoints. This setting prevents cycling between Cooling/Vent/Heating modes. High limit = 10ºF (no offset); Low limit = 0.5ºF ; Default = 1ºF .

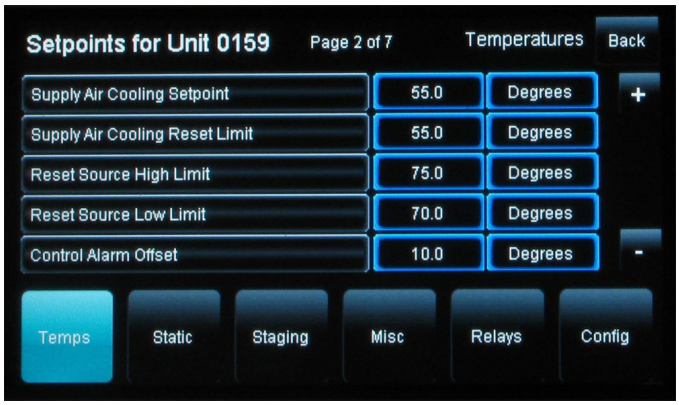


Figure 78: Temperature Setpoint Screen 2 of 7

Temp. Setpoints Screen 2 of 7

*Select and adjust the setpoints of these item*s per the requirements of your system and controller.

- **Supply Air Cooling Setpoint**
  If no Supply Air Reset has been configured, this is the Supply Air Setpoint (SAT) the unit will control to in the Cooling Mode.

  If SAT Reset has been configured, this is the LOWEST Supply Air Setpoint the controller can be reset to in the Cooling Mode. High limit = 90ºF ; Low limit = 35ºF ; Default = 55ºF.

- **Supply Air Cooling Reset Limit**
  This setpoint only applies if Supply Air Reset has been configured. This is the HIGHEST value the Supply Air Setpoint can reset up to in the Cooling Mode. High limit = 90ºF / 32.2ºC; Low limit = 35ºF ; Default = 55ºF .

- **Cooling Reset Source High Limit**
  If a SAT Reset Source has been configured, then the Cooling Mode Supply Air Setpoint is reset to its minimum limit as the reset source rises to this level. High limit = 90ºF; Low limit = 30ºF . Default = 75ºF.

- **Cooling Reset Source Low Limit**
  If a SAT Reset Source has been configured, then the Cooling Mode Supply Air Setpoint is reset to its maximum limit as the reset source drops to this level. High limit = 90ºF; Low limit = 30ºF . Default = 70ºF.

- **Control Alarm Offset**
  The AZ 2 Controller can be set up to generate an alarm anytime the controller goes into the Occupied Mode and the Space Temperature exceeds the user-defined alarm limits for a user-defined period of time. A High Temperature Alarm Setpoint is created by adding the Cooling Setpoint Alarm Offset to the current Cooling Setpoint. If the Space Temperature exceeds this limit or a period defined by the Alarm Delay Period Setpoint, the controller can generate an alarm callout if the optional CommLink 5 and IP Module are installed. High limit = 50ºF ; Low limit = 0ºF / ; Default = 10ºF.

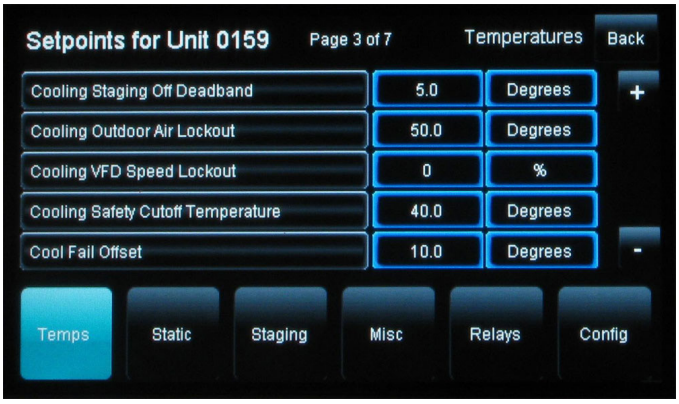


Figure 79: Temperature Setpoint Screen 3 of 7

Temp. Setpoints Screen 3 of 7

*Select and adjust the setpoints of these item*s per the requirements of your system and controller.

- **Cooling Staging Off Deadband**
  This setpoint is used to prevent excessive cycling of the cooling stage. Remember, all staging delays must be met! When the AZ 2 Controller in Cooling Mode, if the Supply Air Temperature drops below the Active Supply Air Temperature Setpoint minus the Cooling Stage Off Deadband value, a Cooling Stage will be deactivated after its Minimum Run Time and Stage Down Delays have been met. High limit = 30ºF (no offset); Low limit = 1ºF ; Default = 5ºF.

- **Cooling Outdoor Air Lockout**
  If the Outdoor Air Temperature is below the Outdoor Air Cooling Lockout Setpoint, mechanical cooling will be locked out. This lockout also applies to compressors being used for heating in a heat pump application. High limit = 120ºF; Low limit = 0ºF ; Default = 50ºF.

- **Cooling VFD Speed Lockout**
  This setpoint only applies if expansion module EM1 is installed. If the Main Fan VFD Signal is below this level, the Mechanical Cooling will be disabled. High limit = 100%; Low limit = 0%; Default = 30%.

- **Cooling Safety Cutoff Temperature**
  If the Supply Air Temperature drops below the Low SAT Setpoint, the unit will completely shut down and the Economizer will close to prevent freeze up issues. High limit = 100ºF; Low limit = 0ºF ; Default = 40ºF.

- **Cool Fail Offset**
  If the Unit is in Cooling Mode and the Supply Air Temperature (SAT) does not fall within the Cool Fail Offset from the SAT Setpoint, it will wait the Mechanical Heat/Cool Alarm Timer period and then generate an alarm. High limit = 100ºF ; Low limit = 0ºF ; Default = 10ºF. (0 = Disable this function).

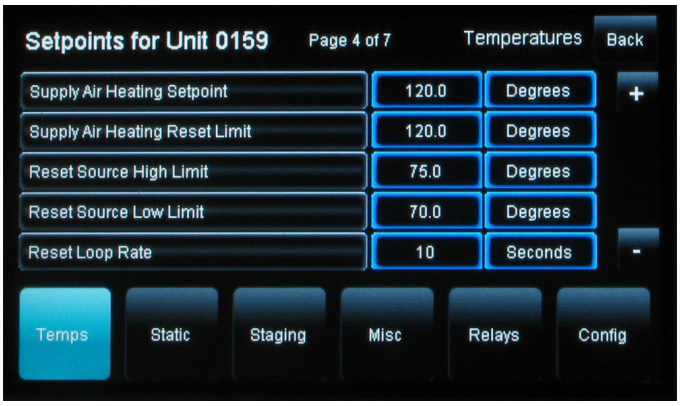


Figure 80: Temperature Setpoint Screen 4 of 7

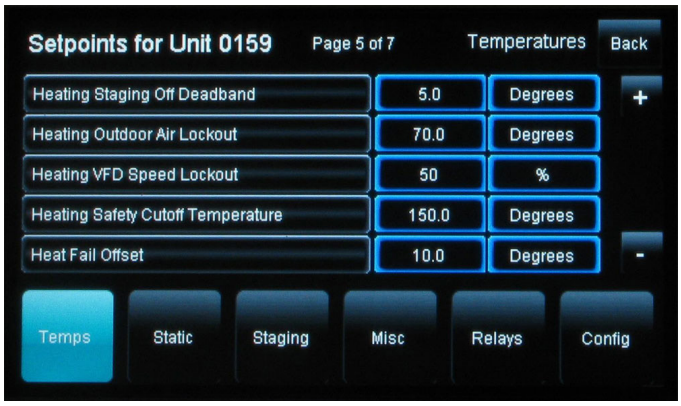


Figure 81: Temperature Setpoint Screen 5 of 7

Temp. Setpoints Screen 4 of 7

*Select and adjust the setpoints of these item*s per the requirements of your system and controller.

- **Supply Air Heating Setpoint**
  If No Reset has been configured for the SAT Reset Source, then this setpoint will be the Heating Mode Supply Air Setpoint. If a Reset Source has been configured, then this setpoint will be the lowest temperature the Supply Air Setpoint can be reset to. High limit = 150ºF; Low limit = 35ºF; Default = 120ºF.

- **Supply Air Heating Reset Limit**
  If a SAT Reset Source has been configured, then this is the maximum that the Heating Mode Supply Air Setpoint can be reset up to. High limit = 150ºF; Low limit = 35ºF; Default = 120ºF.

- **Heating Reset Source High Limit**
  If a SAT Reset Source has been configured, then the Heating Mode Supply Air Setpoint will be reset to its minimum limit as the reset source rises to this level. High limit = 150ºF ; Low limit = 1ºF ; Default = 75ºF.

- **Heating Reset Source Low Limit**
  If a SAT Reset Source has been configured, then the Heating Mode Supply Air Setpoint will be reset to its maximum limit as the reset source drops to this level. High limit = 150ºF ; Low limit = 0ºF ; Default = 70ºF.

- **Reset Loop Rate**
  If you selected a SAT Reset Source, *enter* a value in seconds between 1-255. This value determines how fast the Supply Air Temperature Setpoint is adjusted as the Reset Source changes. High limit = 255 seconds; Low limit = 1 second; Default = 10 seconds.

Temp. Setpoints Screen 5 of 7

*Select and adjust the setpoints of these item*s per the requirements of your system and controller.

- **Heating Staging Off Deadband**
  These setpoints are used to prevent excessive cycling of the heating stage. Remember, all staging delays must be met!

  When the AZ 2 Controller is in Heating Mode, if the Supply Air Temperature rises above the Active Supply Air Temperature Setpoint plus the Heating Stage Off Deadband value, a Heating stage will be deactivated after its Minimum Run Time and Stage Down Delays have been met. High limit = 30ºF (no offset); Low limit = 1ºF ; Default = 5ºF .

- **Heating Outdoor Air Lockout**
  If the Outdoor Air Temperature is above the Outdoor Air Heating Lockout setpoint, the mechanical heating will be locked out. High limit = 120ºF ; Low limit = 0ºF ; Default = 70ºF .

- **Heating VFD Speed Lockout**
  This setpoint only applies if expansion module EM1 is installed. If the Main Fan VFD Signal is below this level, the Mechanical Heating will be disabled. High limit = 100%; Low limit = 0%; Default = 30%.

- **Heating Safety Cutoff Temperature**
  If the Supply Air Temperature rises above the High SAT Setpoint, all Heat will turn off and the main fan will remain on to cool the unit off before mechanical damage occurs. High limit = 170ºF ; Low limit = 0ºF ; Default = 150ºF.

- **Heat Fail Offset**
  If the Unit is in Heating Mode and the Supply Air Temperature (SAT) does not rise within the Heat Fail Offset from the SAT Setpoint, it will wait the Mechanical Heat/Cool Alarm Timer period and then generate an alarm. High limit = 100ºF; Low limit = 0ºF ; Default = 10ºF. (0 = Disable this function).

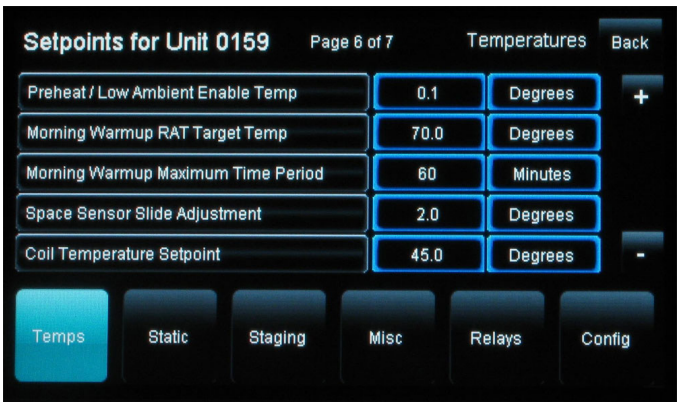


Figure 82: Temperature Setpoint Screen 6 of 7

Temp. Setpoints Screen 6 of 7

*Select and adjust the setpoints of these item*s per the requirements of your system and controller.

- **Preheat/Low Ambient Enable Temp.**
  This setpoint can be used for two different purposes, both based on the Outdoor Air Temperature (OAT) falling below this Preheat Setpoint. In the first case as the OAT falls below this setpoint in the Occupied Mode, a relay configured as a **Preheat Relay** will energize to enable a preheater or it can be used to enable something else (such as a boiler).

  One of the AZ 2 Controller Relay Outputs must be configured for the Preheat/Low Ambient control. Whenever the Outdoor Air Temperature falls below the Preheat/ Low Ambient Setpoint, the **Low Ambient Relay** will energize. This operation occurs in both the Occupied and Unoccupied Modes of Operation. High limit = 90ºF ; Low limit = 0ºF ; Default = 30ºF.

- **Morning Warm-up RAT Target Temp.**
  Anytime the HVAC unit enters the Occupied Mode and the RAT falls below the Morning Warmup Target Setpoint the unit will enter Morning Warmup. This can happen only one time per Occupied period. High limit = 90ºF; Low limit = 50ºF; Default = 70ºF.

- **Morning Warm-up Maximum Time Period**
  If the equipment has entered the Morning Warm-up Mode, it will remain in that mode until the Return Air Temperature rises above the Morning Warm-up Setpoint or until this Warm-up Timeout expires. The Warm-up Timeout must be greater than zero for Morning Warm-up to occur. High limit = 240 minutes; Low limit = 0 minutes; Default = 60 minutes.

During Morning Warm-up Mode the AZ 2 Controller sends a signal to make the outdoor air dampers on the HVAC unit close, the heat in the HVAC unit turn on and maintain the HVAC unit's Heating Supply Air Setpoint. The AZ 2 controller also broadcasts a signal to all of the HVAC units Zone/VAV controllers to force them to one of two user selectable airflow positions. The two user selectable positions are either Maximum Position or Fixed Position. The Maximum Position and Fixed Position setpoints are also user adjustable on each Zone/VAV controller.

- **Space Sensor Slide Adjustment**
  If the AZ 2 Controller has a Space Temperature Sensor with the Slide Adjust option installed, the HVAC Mode Enable Heating and Cooling Setpoints can be offset by the HVAC Mode Sensor Slide Offset Setpoint value. When the Slide Adjust bar is in the middle, no offset will occur. If the Slide Adjust bar is moved all the way to the top of the Sensor, the Heating and Cooling Setpoints will be raised by the Setpoint value you have entered. If the Slide Adjust bar is moved all the way down to the bottom of the Sensor, the Heating and Cooling Setpoints will be lowered by the Setpoint value you have entered. High limit = 10ºF; Low limit = 0ºF; Default = 0ºF. If you are not using the Slide Adjust be sure to set this value to its default of 0.

- **Coil Temperature Setpoint**
  If the AZ 2 Controller has a Suction Pressure Sensor installed the controller will convert the suction pressure readings to a suction temperature value. This setpoint is used to control the compressors during dehumidification mode. High limit = 85ºF; Low limit = 35ºF; Default =45ºF.

Figure 83: Temperature Setpoint Screen 7 of 7

Temp. Setpoints Screen 7 of 7

*Select and adjust the setpoints of these item*s per the requirements of your system and controller.

- **Cooling Proportional Window**
  The Modulating Cooling Proportional Window is used to determine the signal to the Modulating Cooling Source. The Modulating Cooling signal is calculated based on the differential between the Supply Air Temperature and the Supply Air Setpoint. The larger the Cooling Proportional Window the smaller the signal adjustment will be per Time Period. The Maximum Signal Adjustment per Time Period is 10% and is not user adjustable. The Minimum Signal Adjustment per Time Period is based on the Cooling Proportional Window. The larger the Proportional Window, the smaller the signal adjustment will be per Time Period. The Time Period is the delay between another increase or decrease in the Modulating Cooling Source Signal and is user-adjustable. For example, if the Cooling Proportional Window is 5°F, the signal would adjust 2% per °F each Time Period above or below the Active Supply Air Temperature Setpoint. When the Supply Air Temperature is above or below the Active Supply Air Temperature Setpoint by 5°F or more, the signal would adjust 10% each Time Period. Default = 5ºF

- **Heating Proportional Window**
  The Modulating Heating Proportional Window is used to determine the signal to the Modulating Heating Source. The Modulating Heating signal is calculated based on the differential between the Supply Air Temperature and the Supply Air Setpoint. The larger the Heating Proportional Window the smaller the signal adjustment will be per Time Period. The Maximum Signal Adjustment per Time Period is 10% and is not user adjustable. The Minimum Signal Adjustment per Time Period is based on the Heating Proportional Window. The larger the Proportional Window, the smaller the signal adjustment will be per Time Period. The Time Period is the delay between another increase or decrease in the Modulating Heating Source Signal and is user-adjustable. For example, if the Heating Proportional Window is 5°F, the signal would adjust 2% per °F each Time Period above or below the Active Supply Air Temperature Setpoint. When the Supply Air Temperature is above or below the Active Supply Air Temperature Setpoint by 5°F or more, the signal would adjust 10% each Time Period. Default = 5ºF

- **Reheat Proportional Window**
  The Reheat Proportional Window is used to determine the signal to the Modulating Reheat Source. The Modulating Reheat signal is calculated based on the differential between the Supply Air Temperature and the Supply Air Setpoint. The larger the Reheat Proportional Window the smaller the signal adjustment will be per Time Period. The Maximum Signal Adjustment per Time Period is 10% and is not user adjustable. The Minimum Signal Adjustment per Time Period is based on the Reheat Proportional Window. The larger the Proportional Window, the smaller the signal adjustment will be per Time Period. The Time Period is the delay between another increase or decrease in the Modulating Reheat Source Signal and is user-adjustable. For example, if the Reheat Proportional Window is 5°F, the signal would adjust 2% per °F each Time Period above or below the Active Supply Air Temperature Setpoint. When the Supply Air Temperature is above or below the Active Supply Air Temperature Setpoint by 5°F or more, the signal would adjust 10% each Time Period. Default = 5ºF

- **SZVAV Cooling Reset Range**
  During Single Zone VAV operation, this value, added to the Space Cooling Setpoint, creates the reset range over which the supply fan VFD will be proportionally reset from its minimum configured speed in Cooling Mode to the maximum configured fan speed. Default = 2ºF

- **SZVAV Heating Reset Range**
  During Single Zone VAV operation, this value, subtracted from the Space Heating Setpoint, creates the reset range over which the supply fan VFD will be proportionally reset from its minimum configured speed in Heating Mode to the maximum configured fan speed. Default = 2ºF

Static & Air Setpoints

Touch the **<Static>** button to access the *Static & Air Setpoint Screens*. The following describes each setpoint in detail.

Figure 84: Static Setpoint Screen 1 of 4

Static Setpoints Screen 1 of 4

*Select and adjust the setpoints of these item*s per the requirements of your system and controller.

- **Main Fan Maximum VFD Speed (Bypass Position)**
  This setpoint only applies if expansion module EM1 is installed and configured. **See Figure 84** .This is the maximum the Main Fan can modulate up to in any mode.

  This is also the minimum Bypass Damper position allowed during normal operation. High limit = 100%; Minimum Signal Low limit = 0%; Default = 0%.

- **Main Fan VFD Speed Dirty Filter Alarm Speed**
  This setpoint only applies if expansion module EM1 is installed and configured and if VFD with Filter Loading has been configured.

  If you are doing filter loading, the controller will notify the user that the filter needs to be changed if the VFD signal rises above this setpoint. If the VFD rises above this filter loading limit, you will receive a Dirty Filter Alarm. High limit = 100%; Low limit = 0%; Default = 0%.

- **Economizer Minimum Position/Lo CO_2**
  This is the normal Economizer minimum position if CO_2 levels are below the threshold levels set in the CO_2 screens. This is the same as the Minimum Economizer Setpoint. **See Figure 84.**

  Economizer (Outdoor Air Damper) Min Position Setpoint is maintained during the Occupied Mode even if the Economizer is disabled due to the Outdoor Air Temperature or Wetbulb Temperature being above the Economizer Enable Setpoint. Anytime the Econo mizer is not modulating for a cooling demand, it will remain at this Minimum Ventilation Position during Occupied hours. High limit = 100%; Low limit = 0%; Default = 10%.

- **Economizer Minimum Position/Hi CO_2**
  This setpoint only applies if Economizer Control is configured with CO_2 and when doing CO_2 override of the economizer.

  This is the highest minimum position the Economizer Damper can be reset to if the CO_2 levels reach the highest value set in the CO_2 screens. The Minimum Damper Position will be reset from its Min at Lo CO_2 to its Min at Hi CO_2 as the CO_2 levels rise to a maximum level.

  The Economizer Minimum Position/Hi CO2 Setpoint is used to limit the amount of Outdoor Air that will be introduced to the HVAC unit in order to ensure the unit is operating within its Heating and Cooling design limitations. The Minimum setting for this Setpoint is the value previously set for the Economizer Minimum Position/ Lo CO_2 Setpoint. High limit =100%; Low limit = 0%; Default = 80%.

- **Economizer Maximum in SAT Tempering**
  This feature is not currently available but will be in future releases. During VAV Supply Air Tempering Mode, this is the maximum position the Outdoor Air Dampers can open to drop the Supply Air Temperature down to the setpoint. High limit =100%; Low limit = 0%; Default = 100%.

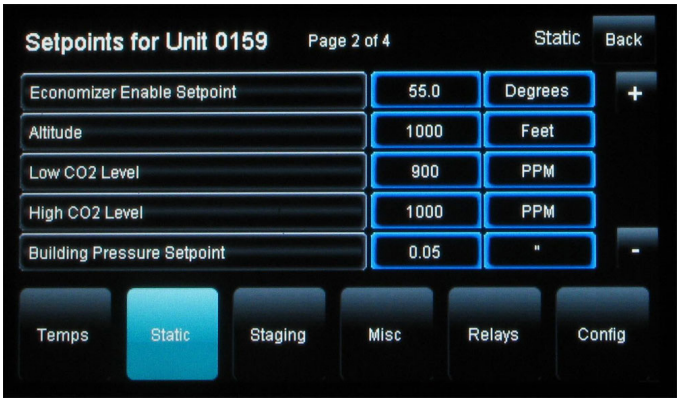


Figure 85: Static Setpoint Screen 2 of 4

Figure 86: Static Setpoint Screen 3 of 4

Static Setpoints Screen 2 of 4

*Select and adjust the setpoints of these item*s per the requirements of your system and controller.

- **Economizer Enable Setpoint**
  If the Drybulb/Dewpoint/Wetbulb is below this level, the Economizer is enabled for operation during Cooling Mode. High limit = 90ºF ; Low limit = 30ºF ; Default = 55ºF .

- **Altitude**
  Enter the elevation above sea level for the city or location the building is at. This generates more accurate CO_2 readings due to the change in barometric pressure. Altitude correction is required for valid readings if you are above 500 feet. High limit = 10,000 feet; Low limit = 0 feet; Default = 1000.

- **Low CO_2 Level**
  This CO_2 level is used to set the lowest CO_2 level used to reset the minimum Economizer Position. High limit = 1000 PPM; Low limit 0 PPM. ; Default = 900 PPM.

- **High CO_2 Level**
  This CO_2 level is used to set the highest CO_2 level used to reset the minimum Economizer Position. High limit = 1000 PPM; Low limit 0 PPM. ; Default = 1000 PPM.

- **Building Pressure Setpoint**
  The Building Pressure is maintained at this setpoint while the Main Fan is running. High limit = 0.20”WG; Low limit = -0.20”WG; Default = 0.10”WG.

Static Setpoints Screen 3 of 4

*Select and adjust the setpoints of these item*s per the requirements of your system and controller.

- **Static Pressure Setpoint**
  This setpoint only applies if expansion module EM1 is installed and configured and if Static Pressure Control has been configured.

  This is the Highest (normal) Static Pressure Setpoint that the VFD Fan or Bypass Damper will maintain. High limit = 3.00”WG; Low limit = 0.10”WG; Default = 0.50”WG.

- **Static Pressure High Alarm Limit**
  This setpoint only applies if expansion module EM1 is installed and configured. If the Static Pressure rises to this setpoint an alarm will be initiated. High limit = 3.00”WG; Low limit = 0.10”WG; Default = 3.00”WG.

WARNING: A duct mounted static over-pressure switch (by others) should be installed & used to prevent duct static from exceeding its design pressure limits. The High Pressure Alarm Limit above is only an alarm limit. An alarm initiates, but no other action occurs.

Figure 87: Static Setpoint Screen 4 of 4

Static Setpoints Screen 4 of 4

*Select and adjust the setpoints of these item*s per the requirements of your system and controller.

- **VFD Vent Mode Minimum Speed**
  This setpoint sets the main fans minimum speed during Vent Mode on Single Zone VAV configured units. High limit = 100%; Low limit = 0%; Default = 30%.

- **VFD Heat Mode Minimum Speed**
  This setpoint sets the main fans minimum speed during Heat Mode on Single Zone VAV configured units. High limit = 100%; Low limit = 0%; Default = 50%.

- **VFD Cool Mode Minimum Speed**
  This setpoint sets the main fans minimum speed during Cool Mode on Single Zone VAV configured units. High limit = 100%; Low limit = 0%; Default = 50%.

- **VFD High CO_2 Minimum Speed**
  This setpoint sets the main fans minimum speed during IAQ Mode on Single Zone VAV configured units. High limit = 100%; Low limit = 0%; Default = 100%.

Staging Delays Setpoints

Touch the **<Staging>** button to access the *Staging Delays Setpoint Screens*. The following describes each setpoint in detail.

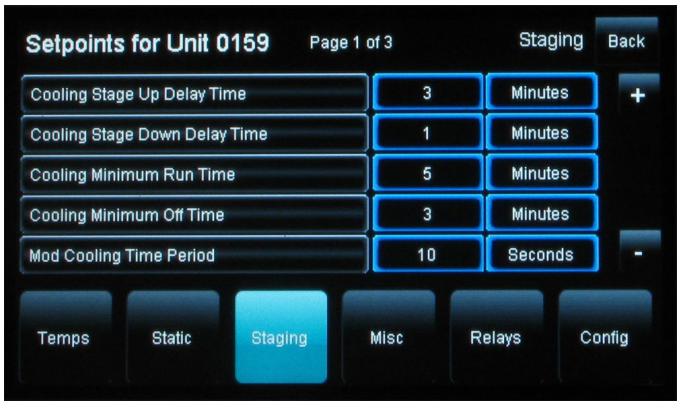


Figure 88: Staging Setpoint Screen 1 of 3

Staging Setpoints Screen 1 of 3

*Select and adjust the setpoints of these item*s per the requirements of your system and controller.

- **Cooling Stage Up Delay Time**
  If a stage of Cooling is energized (or has reached 100%), the controller will wait this long in minutes before another stage is brought on. High limit =15 minutes; Low limit = 3 minutes; Default = 3 minutes.

- **Cooling Stage Down Delay Time**
  If a Stage of Cooling is energized and needs to be turned off (at 0%), the controller will have to wait this long in minutes before it is de-energized. High limit =15 minutes; Low limit = 1 minute; Default = 1 minutes.

- **Cooling Minimum Run Time**
  If a stage of Cooling is on, it must remain on for this long in minutes before it can turn off. High limit =15 minutes; Low limit = 5 minutes; Default = 5 minutes.

- **Cooling Minimum Off Time**
  If a stage of Cooling is off, it must remain off for this long in minutes before it can turn back on. High limit =15 minutes; Low limit = 3 minutes; Default = 3 minutes.

- **Mod Cooling Time Period**
  Set how often a change in the output signal is calculated and then made. High limit = 30 seconds; Low limit = 0 seconds. Default = 10 seconds.

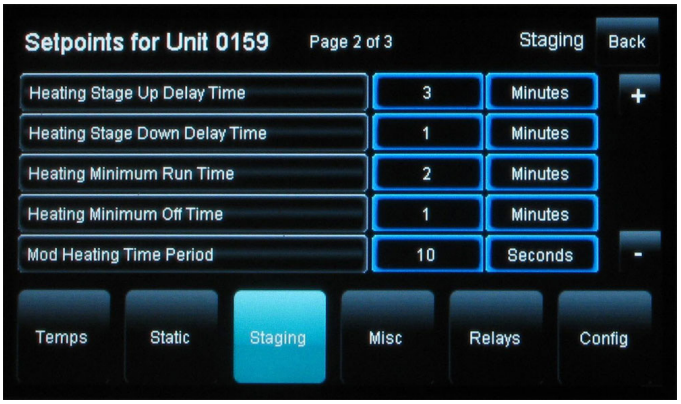


Figure 89: Staging Setpoint Screen 2 of 3

Figure 90: Staging Setpoint Screen 3 of 3

Staging Setpoints Screen 2 of 3

*Select and adjust the setpoints of these item*s per the requirements of your system and controller.

- **Heating Stage Up Delay Time**
  If a stage of Heat is energized (or has reached 100%), the controller will wait this long in minutes before another stage is brought on. High limit =15 minutes; Low limit = 3 minutes; Default = 3 minutes.

- **Heating Stage Down Delay Time**
  If a stage of Heat is energized and needs to be turned off (at 0%), the controller will wait this long in minutes before it is de-energized. High limit =15 minutes; Low limit = 1 minute; Default = 1 minute.

- **Heating Minimum Run Time**
  If a stage of Heat is on, it must remain on for this long in minutes before it can turn off. High limit =15 minutes; Low limit = 2 minutes; Default = 2 minutes.

- **Heating Minimum Off Time**
  If a stage of Heat is off, it must remain off for this long in minutes before it can turn back on. High limit =15 minutes; Low limit = 1 minute; Default = 1 minute.

- **Mod Heating Time Period**
  Configures how often a change in the output signal is calculated and then output. This setting allows you to vary the time period for different applications such as a Steam Valve as opposed to a Hot Water Valve. High limit = 30 seconds; Low limit = 0 seconds; Default = 10 seconds.

Staging Setpoints Screen 3 of 3

*Select and adjust the setpoints of these item*s per the requirements of your system and controller.

- **Mechanical Heat/Cool Alarm Timer**
  If the Supply Air Temperature does not reach a user configured range from the Supply Air Temperature Setpoint in this time period, an alarm will be generated. This alarm will not affect the operation of the unit, it simply notifies there is a problem. High limit =255 minutes; Low limit = 0 minutes; Default = 15 minutes.

- **Heat Pump Aux Heat Delay**
  This configuration option is available if the AZ 2 Controller has been configured as a Heat Pump. If the compressors are being used for heat and the Supply Air is not reaching the Setpoint, the Aux Heat can be used. However, this additional amount of time will be added to the Stage Up Timer to give the compressors adequate time to raise the temperature. A relay output must be configured as an Aux Heat Stage. High limit = 60 minutes; Low limit = 0 minutes; Default = 3 minutes.

- **Control Alarm Delay Period**
  If the temperature at the Controlling Sensor exceeds the Controlling Temperature Setpoint plus, or minus the Control Alarm Offset for this time period, an alarm is generated. High limit = 120 minutes; Low limit = 0 minutes.

- **Modulating Reheat Time Period**
  This is the rate at which control movements are made to the Reheat output signal. High limit = 30 seconds; Low limit = 1 second; Default = 10 seconds

Controller Miscellaneous Setpoints

Miscellaneous Setpoints

Misc

Touch the **<Misc>** button to access the *Miscellaneous Setpoint Screens*. The following describes each setpoint in detail.

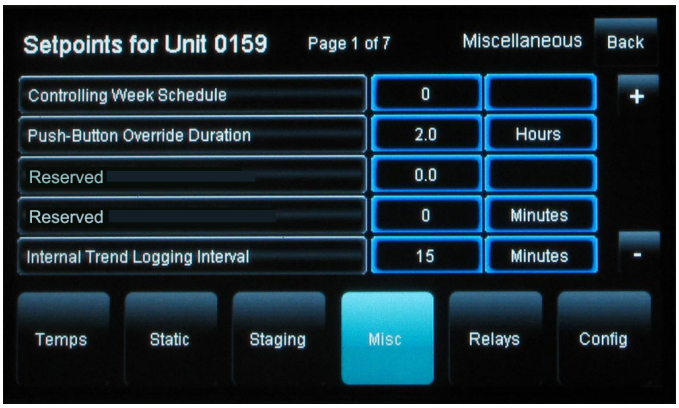


Figure 91: Miscellaneous Setpoint Screen 1 of 7

Misc. Setpoints Screen 1 of 7

*Select and adjust the setpoints of these item*s per the requirements of your system and controller.

- **Controlling Week Schedule**
  If the AZ 2 Controller is not using its own internal week schedule, enter the external schedule number that will control this unit. This requires the GPC-XP for the broadcast of schedules. High limit = 8; Low limit = 0; Default = 0. The default setting of "0" means you will use the AZ 2 Controllers on board schedule.

- **Push-Button Override Duration**
  If the unit is Unoccupied Mode and the Pushbutton on the Space Sensor is momentarily pressed, the unit will go into the Push Button Override mode of operation (which puts it back into the Occupied Mode) for the duration of this setpoint. At the end of that time period, the unit will return to the Unoccupied Mode of operation.

  See the AZ 2 Controller Sequence portion of this manual for additional details regarding push button override with the various available room sensors.

- **Internal Trend Logging Interval**
  An internal Trend Log is updated at a rate equal to this value. This is how often the Trend Logs are stored. Each Controller can store up to 120 Trend Logs. High limit =120 minutes; Low limit = 1 minute; Default = 15 minutes.

NOTE: Trend Logs can only be viewed using Prism 2 software installed on a computer and connected to the system.

Figure 92: Miscellaneous Setpoint Screen 2 of 7

Misc. Setpoints Screen 2 of 7

*Select and adjust the setpoints of these item*s per the requirements of your system and controller.

- **Fan Starting Delay**
  When the unit goes from Unoccupied Mode to the Occupied Mode or if restarts after a power failure, the unit must wait this amount of time before turning on the Supply Fan. This can be useful in preventing several units from starting at the same time.

  By setting this setpoint to "-1", the address of the board will automatically be multiplied by 5 seconds to determine the actual fan starting delay in order to provide a staggered start for multiple units.

  For example:
  Address 1 = 5 seconds
  Address 2 = 10 seconds
  Address 3 = 15 seconds

  Otherwise, a time delay value of up to 300 seconds can be entered in this field. High limit = 300 seconds; Low limit = 0 seconds; Default = 0 seconds.

- **Space Dehumidification Setpoint**
- **Space Dehumidification Setpoint Deadband**
  This setpoint only applies if expansion module EM1 and an Indoor Humidity Sensor has been installed,or an E-BUS Digital Space/Humidity Sensor is installed, and if the controller has been configured for Dehumidification. When the space humidity rises above this setpoint plus the Deadband, the unit will enter the Dehumidification Mode. When the space humidity falls below this setpoint minus the Deadband, the unit will leave the Dehumidification Mode.

- **Space Humidity Setpoint**

- **Space Humidity Setpoint Deadband**
  This setpoint will only apply if Humidification has been configured and an indoor humidity sensor is installed. When the Space Humidity falls below this setpoint minus the Deadband, the unit will enter the Humidification Mode. When the space humidity rises above this setpoint plus the Deadband, the unit will leave the Humidification Mode. Space RH Setpoint: High limit = 100%; Low limit = 0%; Default - 50%.Deadband: High limit = 30%; Low limit = 3%; Default - 5%.

Figure 93: Miscellaneous Setpoint Screen 3 of 7

Misc. Setpoints Screen 3 of 7

*Select and adjust the setpoints of these item*s per the requirements of your system and controller.

- **Daylight Savings Start Date**
  This is the date used in the Spring to tell the controller to adjust its clock. On this date, the controller will "Spring Forward" 1 hour at 2 am. If Daylight Savings is not used in your area, *enter* **<0>**. High limit = 1231; Low limit = 0; Default = 0.

NOTE: The U.S. government has the authority to determine the switch-over dates each year. Currently, the time changes the first Sunday in April and then switches back the last Sunday in October.

- **Daylight Savings Stop Date**
  This is the date used in the Fall to tell the controller to adjust its clock. On this date, the controller will "Fall Back" 1 hour at 2 am. If Daylight Savings is not used in your area, *enter* **<0>**. High limit = 1231; Low limit = 0; Default = 0.

- **Mod Heat Signal Low Volts**

- **Mod Heat Signal High Volts**
  Defaults are Low - 0 VDC; High - 10 VDC. This configuration option is available if expansion module EM2 has been installed and configured and if Modulating Heat has been configured. These settings will set the output voltage range for the modulating heat. The Output modulates between these two points:

  Low Volts
  Voltage at which the Heat is at 0%.
  High limit = 10 VDC; Low limit = 0 VDC;
  Default = 0 VDC.

  High Volts
  Voltage at which the Heat is at 100%.
  High limit = 10 VDC; Low limit = 0 VDC;
  Default = 10 VDC.

Controller Miscellaneous Setpoints

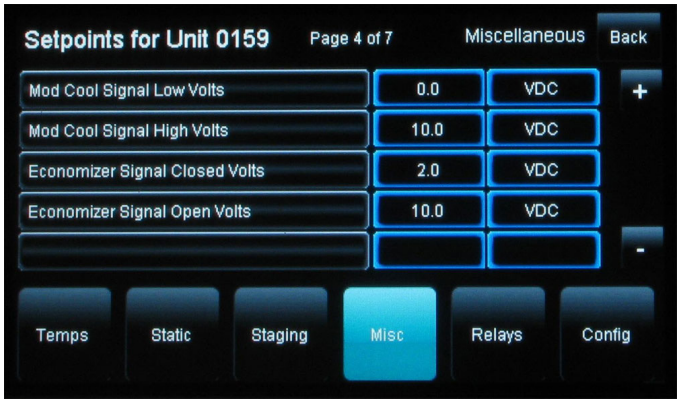


Figure 94: Miscellaneous Setpoint Screen 4 of 7

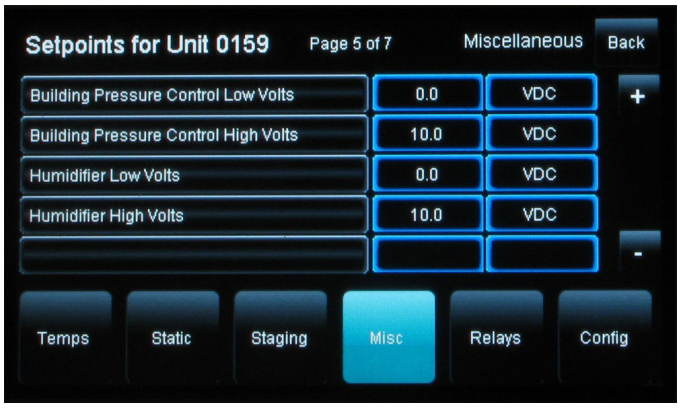


Figure 95: Miscellaneous Setpoint Screen 5 of 7

Misc. Setpoints Screen 4 of 7

*Select and adjust the setpoints of these item*s per the requirements of your system and controller.

- **Mod Cool Signal Low Volts**
- **Mod Cool Signal High Volts**
  Defaults are 0 VDC No Cool and 10 VDC Full Cool. This configuration option is available if expansion module EM2 has been installed and configured and if Modulating Cooling has been configured. These settings will set the output voltage range for the modulating cooling. The output modulates between these two points.

  Low Volts
  Voltage at which the Cooling is at 0%.
  High limit = 10 VDC; Low limit = 0 VDC; Default = 0 VDC.

  High Volts
  Voltage at which the Cooling is at 100%.
  High limit = 10 VDC; Low limit = 0 VDC; Default = 10 VDC.

- **Economizer Signal Closed Volts**
- **Economizer Signal Open Volts**
  Defaults are 2 VDC Closed and 10 VDC Open. This configuration option is available if Economizer Control is configured. The following settings will set the output voltage range for the Economizer operation:

  Min Volts
  Voltage at which the Economizer is fully closed. High limit = 10 VDC; Low limit = 0 VDC; Default = 0 VDC.

  Max Volts
  Voltage at which the Economizer is fully open. High limit = 10 VDC; Low limit = 0 VDC; Default = 10 VDC.

Misc. Setpoints Screen 5 of 7

*Select and adjust the setpoints of these item*s per the requirements of your system and controller.

- **Building Pressure Control Low Volts (0%)**
  This configuration option is available if expansion module EM1 has been installed and configured and if Modulating Building Pressure Control was configured on a previous screen. The following settings will set the output voltage range for the Building Pressure Control operation. Voltage at which the exhaust fan or damper is at 0%. High limit = 10 VDC; Low limit = 0 VDC; Default = 0 VDC.

- **Building Pressure Control High Volts (100%)**
  This configuration option is available if expansion module EM1 has been installed and configured and if Modulating Building Pressure Control was configured on a previous screen. The following settings will set the output voltage range for the Building Pressure Control operation. Voltage at which the exhaust fan or damper is at 100%. High limit = 10 VDC; Low limit = 0 VDC; Default = 10 VDC

- **Humidifier Low Volts (0%)**
  This configuration option is available if the EM2 Expansion Module was installed and Modulating Humidification Control was configured on a previous screen. These settings will set the output voltage range to the modulating humidifier. Voltage at which Humidity addition is at 0%. High limit = 10 VDC; Low limit = 0 VDC; Default = 0 VDC.

- **Humidifier High Volts (100%)**
  This configuration option is available if Modulating Humidification Control was configured on a previous screen. These settings will set the output voltage range to the modulating humidifier. Voltage at which Humidity addition is at 100%. High limit = 10 VDC; Low limit = 0 VDC; Default = 10 VDC.

Figure 96: Miscellaneous Setpoint Screen 6 of 7

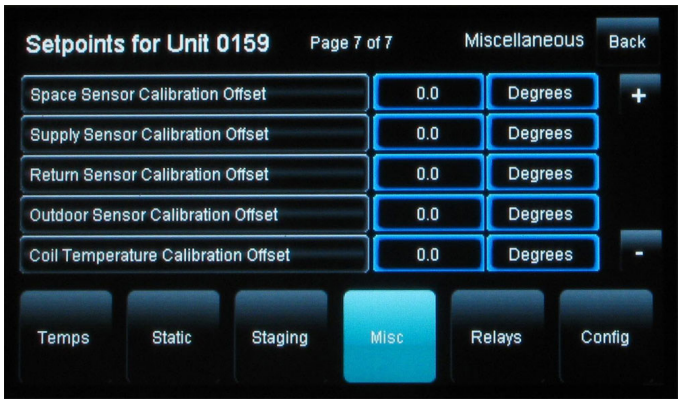


Figure 97: Miscellaneous Setpoint Screen 7 of 7

Misc. Setpoints Screen 6 of 7

*Select and adjust the setpoints of these item*s per the requirements of your system and controller.

- **Mod Reheat Low Volts (0%)**
  This configuration option is available if a Modulating

  Reheat option was configured on the previous screen and if expansion module EM2 is installed and configured. These settings will set the output voltage range for the modulating reheat. Voltage at which the Reheat is at 0%. High limit = 10 VDC; Low limit = 0 VDC; Default = 0 VDC.

- **Mod Reheat High Volts (100%)**
  This configuration option is available if a Modulating Reheat option was configured on the previous screen and if expansion module EM2 is installed and configured. These settings will set the output voltage range for the modulating reheat. Voltage at which the Reheat is at 100%. High limit = 10 VDC; Low limit = 0 VDC; Default = 10 VDC.

Misc. Setpoints Screen 7 of 7

*Select and adjust the setpoints of these item*s per the requirements of your system and controller.

- **Space Sensor Calibration Offset**
  This configuration option provides for offsetting the Space Temperature Sensor readings to match a known accurate temperature sensing device. Enter a positive Sensor Calibration value to raise the Space Air Temperature and/or Space Air Temperature Sensor reading and a negative value to lower the Sensor reading.

- **Supply Sensor Calibration Offset**
  This configuration option provides for offsetting the Supply Air Temperature Sensor readings to match a known accurate Temperature sensing device. Enter a positive Sensor Calibration value to raise the Supply Air Temperature and/or Supply Air Temperature Sensor reading and a negative value to lower the Sensor reading.

- **Return Sensor Calibration Offset**
  This configuration option provides for offsetting the Return Air Temperature Sensor readings to match a known accurate Temperature sensing device. Enter a positive Sensor Calibration value to raise the Return Air Temperature and/or Return Air Temperature Sensor reading and a negative value to lower the Sensor reading.

- **Outdoor Sensor Calibration Offset**
  This configuration option provides for offsetting the Outdoor Air Temperature Sensor readings to match a known accurate Temperature sensing device. Enter a positive Sen sor Calibration value to raise the Outdoor Air Temperature and/or Outdoor Air Temperature Sensor reading and a negative value to lower the Sensor reading.

- **Coil Temperature Calibration Offset**
  This configuration option provides for offsetting the Internal Coil Temperature readings (converted from the internal coil suction pressure) to match a known accurate Temperature. If the Coil Temperature reading is too high, enter a negative calibration offset to decrease the reading. If it is too low, enter a positive value to increase the reading.

Controller Relay Configuration

Relay Configuration

Relays

Touch the **<Relays>** *button to access the Relay Configuration Screens. Touch* the radio button next to the desired relay selection. Choose one relay output from each screen for Relays 2 through 12. Default is "Not Used.".

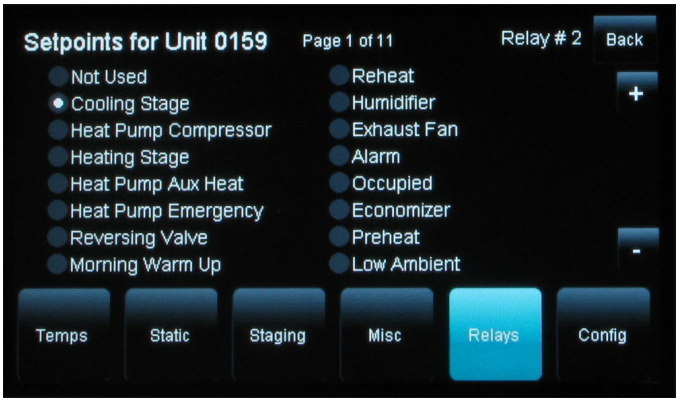


Figure 98: Relay Configuration Screen 1 of 11

Relay Setpoint Screen 1 of 11

*Select and configure these item*s per the requirements of your system and controller.

NOTE: Relay #1 is not configurable as it is reserved for the Supply Air Fan.

- **Not Used**
  If Relay is not needed, configure as Not Used.
- **Cooling Stage**
  For DX Cooling.
- **Heat Pump Compressor**
  For DX Cooling.
- **Heating Stage**
  For Heat Stage.
- **Heat Pump Aux Heat**
  For Heat Stage.
- **Heat Pump Emergency**
  For Emergency Heat.
- **Reversing Valve**
  Controls a Reversing Valve on a Heat Pump application.
- **Morning Warm Up**
  Morning Warm Up Relay for telling 3rd party VAV boxes that the controller is in Morning Warm Up Mode.
- **Reheat**
  Controls a stage of On/Off Reheat.
- **Humidifier**
  Controls a stage of Humidity Addition.
- **Exhaust Fan**
  Controls Exhaust Fan On/Off output.
- **Alarm**
  Any time an Alarm occurs on the AHU, this relay will energize.
- **Occupied**
  Whenever the unit goes into Occupied Mode this relay will energize.
- **Economizer**
  Whenever the Outdoor Air Damper Actuator opens to 5% (not adjustable) this relay will energize. This is typically used to initiate an exhaust fan once this relay energizes
- **Preheat**
  Anytime the Outdoor Air Temperature drops below the Preheat/Low Ambient Setpoint in Occupied Mode this relay will energize.
- **Low Ambient**
  Anytime the Outdoor Air Temperature drops below the Preheat /Low Ambient Enable Temp. Setpoint in Occupied Mode or Unoccupied this relay will energize.

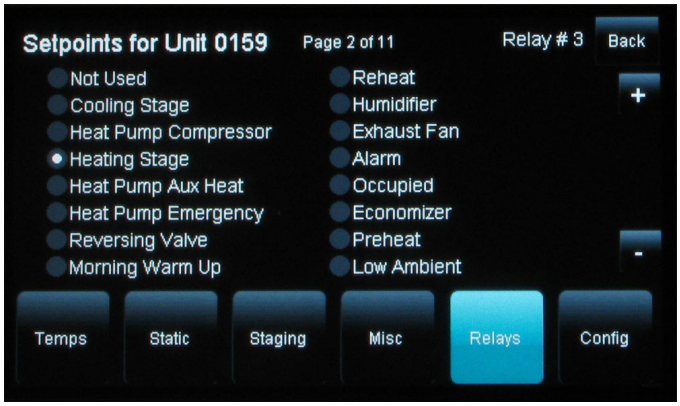


Figure 99: Relay Configuration Screen 2 of 11

Relay Config. Screen 2 Through 11

*Select and configure these item*s per the requirements of your system and controller.

NOTE: There are 11 screens that allow you to configure up to 5 relays that are available on the AZ 2 Controller itself and the additional 6 relays which are available on the EM1 Expansion Module (if used). All Relay configuration screens are identical for all configurable relays 2 through 12.

Zone/VAV Viewing Status Screens and Enabling Alarms

Viewing Status Screens

Figure 100 depicts an *AZ 2 Zone/VAV Controller Status Screen*. Notice that the controller is identified by loop number and unit number - in this case, 0102 represents Loop 1, Unit 2. Use the **<+>** and **<->** buttons in the middle of the screen to scroll through the controller's configuration and setpoint values.

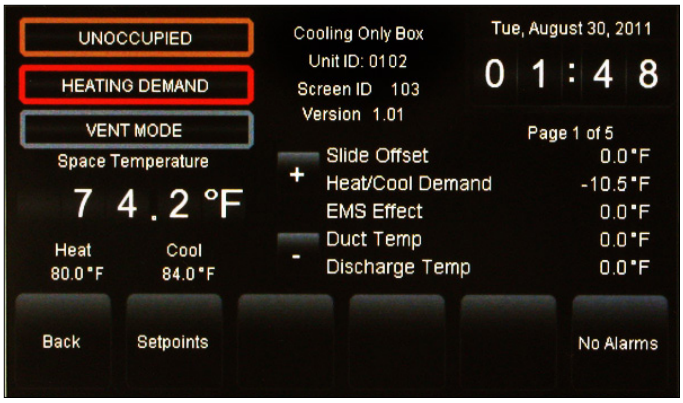


Figure 100: AZ2 Zone/VAV Controller Status Screen

Viewing Alarm Status

To view alarm status, *touch* the **<Alarm>** or **<No Alarms>** button *located at the bottom right* of the unit's *Status Screen*. See **Figure 100**. The first *Alarm Status Screen* will display. See **Figure 101**.

NOTE: The word ALARM in bright red designates an active alarm condition. The word OK designates no alarm condition.

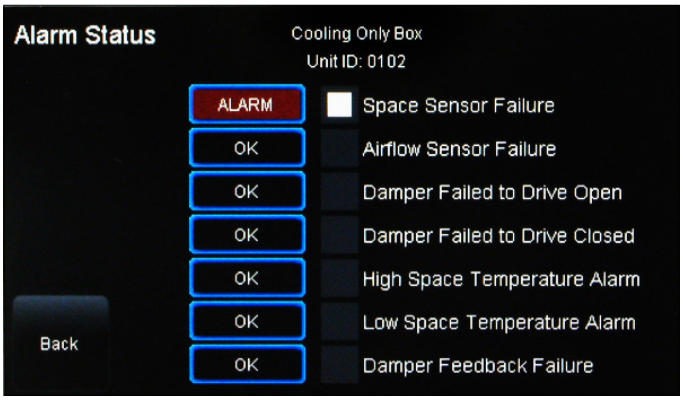


Figure 101: Controller Alarm Status Screen

Enabling/Disabling Alarm Polling

Alarm configuration is accessed by *touching* the **<Alarm>** or **<No Alarms>** button located at the bottom right of the *Status Screen*. See **Figure 101**. Only a Level 3 user can configure alarms.

In addition to simply viewing alarms, the *Alarm Status Screen* can also be used for enabling and disabling alarms that can be e-mailed. The e-mailing feature will only work if Prism 2 is running and the computer has e-mailing capability.

The alarms must first be configured using Prism 2 software. See the Prism 2 Technical Guide for instructions.

Once the alarm settings have been established in Prism 2, the settings you choose in the *Alarm Status Screen* will be stored in the controller so that you will not have to reconfigure the alarms for that controller in Prism 2. Once configuration is complete, Prism 2 does not have to be running in order to view alarms on individual *Alarm Status Screens in the System Manager TS*. However, as mentioned previously, Prism 2 does have to be running for e-mailing of alarms to occur.

To enable an alarm, simply *touch* the square to the left of each alarm condition. A white box designates that the alarm is enabled. See **Figure 101** for example. To disable the alarm, simply *touch* the square again. A grey box designates a disabled alarm.

Accessing and Entering Zone/VAV Setpoints

Accessing & Entering Zone/VAV Setpoints

While in the AZ 2 *Zone/VAV Status Screen* (see **Figure 102**), *touch* the **<Setpoints>** button found on the bottom menu bar.

NOTE: Level 1 and Level 2 users can change Occupied Space Temperature Setpoints, but only Level 3 users can change all setpoints.

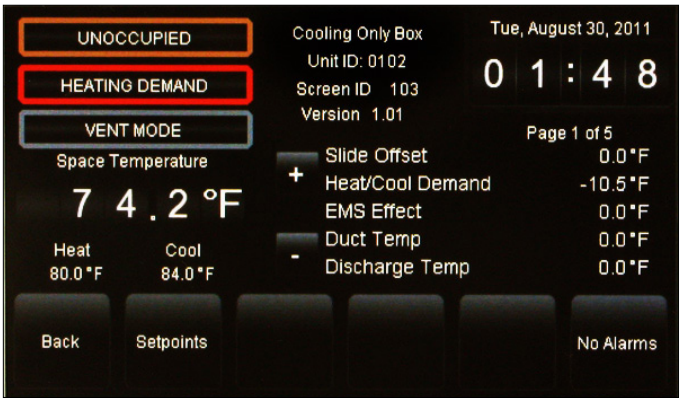


Figure 102: AZ 2 Zone/VAV Controller Status Screen

The *Setpoint screen* that first appears will always be the T*emperature Setpoint Screen.* **Figure 103** depicts a *Zone/VAV Controller Temperature Setpoint Screen*.

Use the up and down arrow keys to the right of the screen to move through the setpoints. *Touch* the **<Status>** button to return to the controller's status screen. *Touch* the various buttons on the bottom of the screen to access other setpoint screens. *Touch* the **<Home>** icon to go back to the *Main Screen*.

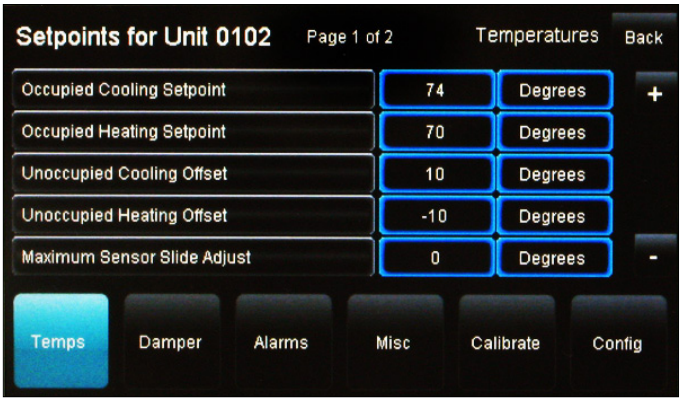


Figure 103: AZ 2 Zone/VAV Controller Temperature Setpoint Screen

Individual setpoint buttons are located at the bottom of the *Setpoint Screens*. See **Figure 104**. Simply *touch* one of the setpoint buttons to access its setpoints.

Within each *Setpoint Screen*, *touch* the **<Back>** button to return to the *Status Screen,* or *touch* **<Home>** to return to the *Main Screen*.

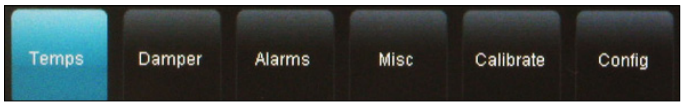


Figure 104: AZ 2 Zone/VAV Setpoint Buttons

Use the **<+>** and **<->** buttons at the right of the screen to scroll through the setpoints. Simply *touch* the yellow highlighted box to change the setpoint. Each setpoint data entry screen will provide a definition of the setpoint and specific instructions for entering the setpoint and will include the setpoint range as in the example below, **Figure 105.**

.

Touch **<OK>** to have the system accept the new value. If you enter a setpoint that is not in the valid range, the setpoint will remain as is and will not change.

Each setpoint data entry screen is self-explanatory; however, each setpoint is explained in the next section, Configuring VAV/Box Setpoints. To easily reference a particular setpoint, refer to the index.

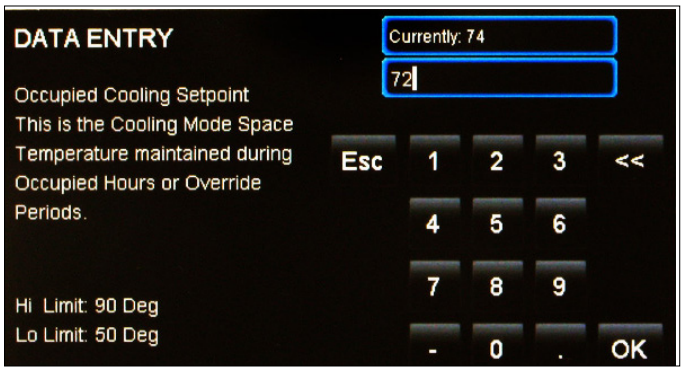


Figure 105: Occupied Cooling Setpoint Data Entry

Zone/VAV Configuration

Config

Touch the **<Config>** button to access the *Configuration Setpoints Screens*. The following describes each setpoint in detail.

Figure 106: Box Configuration Screen 1 of 3

Box Configuration Screen 1 of 3

Touch the radio button to select the option(s) needed for your Zone or VAV controller.

- **Single Duct Cooling Only**
- **Heating/Cooling Changeover**
- **Series Fan Powered Box**
- **Parallel Fan Powered Box**

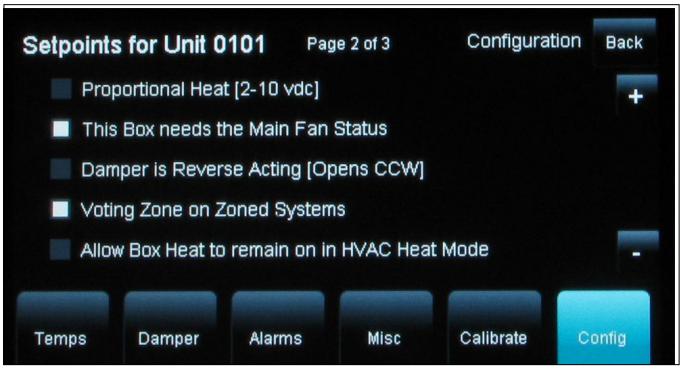


Figure 107: Box Configuration Screen 2 of 3

Box Configuration Screen 2 of 3

Proportional Heat {2-10 VDC}

Touch the square button if this unit has 2-10 VDC proportional heat. Leave un-selected for 0-10 VDC operation.

This Box Needs the Main Fan Status

Touch the square if this unit needs Main Fan status. This setting only applies to the unoccupied mode of operation. Choose this setting to activate the heating stages only when the main fan is operating on non-fan terminal units.

For Series Fan Terminal units, if this setting is selected, the series box fan will only run when the main HVAC unit fan is running or when a space heating demand is made. If this setting is NOT selected, the series box fan will only run when a space heating demand is made. This setting has no effect on the parallel flow fan terminal unit.

Damper is Reverse Acting {Opens CCW}

Touch the square if this unit's damper is reverse acting (opens counter-clockwise).

Voting Zone on Zoned Systems

Touch the square if this unit is a Voting Zone.

Allow Box Heat to remain on in HVAC Heat Mode

Touch the square to have box heat remain on in HVAC heat mode. This will allow the Heating Relay's Controlling Box Heat to remain on even when the AHU is in Supply Air Heating Mode. This is used as a method to provide supplemental heat if for some reason the AHU heat cannot satisfy the heating demand.

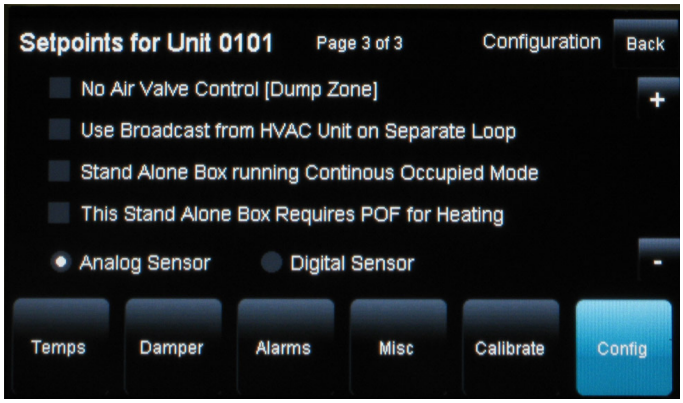


Figure 108: Box Configuration Screen 3 of 3

Box Configuration Screen 3 of 3

No Air Valve Control {Dump Zone}

A Dump Zone is used when you want to control a duct heater or baseboard heater independently. A Zone/VAV Controller with a Relay Expansion Module is used for this purpose. No damper or actuator is used. *Touch* the square if this unit has no air valve control (Dump Zone). If you need to control an auxiliary heater, do not select this option.

Use Broadcast from HVAC Unit on Separate Loop

Touch the square if this unit is installed on a system with one HVAC unit having multiple VAV loops.

Stand Alone Box Running Continuous Occupied Mode

Touch the square if this unit is a Stand Alone Box that operates independently without requiring communication with the HVAC unit controller.

This Stand Alone Box Requires POF for Heating

Touch the square if this unit requires a proof of flow switch for heating.

Analog or Digital Sensor

Touch the appropriate round button depending on whether you are using an analog or digital sensor. with your box.

Zone/VAV Configuration Setpoints

Stand Alone Mode Occupied Options

Using The System Manager or Prism Software

If the Zone/VAV controllers are not configured to communicate with the HVAC unit controller (HVAC unit is being controlled by others) then the VAV boxes can be configured for "Stand Alone" operation as shown in the previous screen (Box Configuration Screen 3 of 3). See **Figure 108.**

There are a couple of ways this can be set up. If you select "This Box is Stand Alone with Continuous Occupied Operation", the Zone/VAV controller will be occupied continously and no night setback is available. If this mode is selected, you can also select "This Stand Alone Box Requires Proof of Flow Contact for Heat Enable" and a proof of flow switch can be connected between the BIN1and GND terminals on the Zone Controller Expansion Module. If there is no air flow in the duct, (proof of flow switch is not closed) then the heat will be locked out.

Using The Prism Software

Another option for Stand Alone operation is to select "Enables Occupied Mode" under the "Binary Input Configuration" for the Zone/VAV controller configuration by using a computer and our Prism software. This uses the BIN1 contact on the Zone/VAV controller to put the controller in occupied mode. When the BIN1 contact is shorted to the GND terminal, the Zone/VAV controller goes into occupied mode and when the contact opens, it goes into unoccupied mode. When this feature is selected, "This Box is Stand Alone with Continuous Occupied Operation" should not be selected.

Stand Alone mode can be used on any VAV box except Series Fan Terminals. You can use pressure dependent or pressure independent boxes, and reheat can also be used with this configuration.

Temperature Setpoints

Temps

Touch the **<Temps>** button to access the *Temperature Setpoint Screens*. The following describes each setpoint in detail.

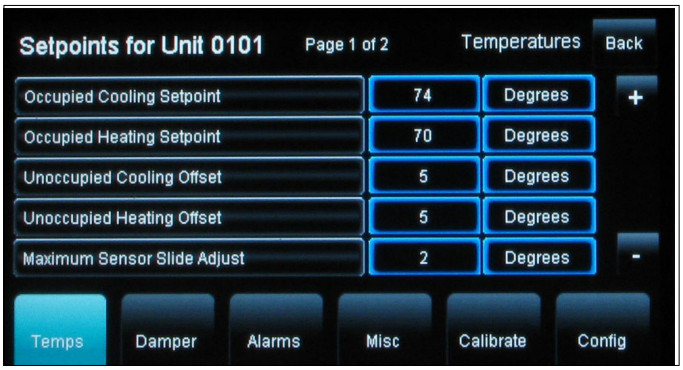


Figure 109: Box Temperature Setpoint Screen 1 of 2

Box Temp. Setpoint Screen 1 of 2

*Select and adjust the setpoints of these item*s per the requirements of your system and controller.

Occupied Cooling Setpoint

This is the Cooling Mode Space Temperature maintained during Occupied hours Override periods. Enter the Occupied Cooling Setpoint as the maximum temperature you would like the zone to reach before modulating the damper open to bring in more cold air to cool the space. High limit = 90ºF; Low limit = 50ºF; Default = 74ºF.

Occupied Heating Setpoint

This is the Heating Mode Space Temperature maintained during Occupied hours or Override periods. Enter the Occupied Heating Setpoint as the minimum temperature you would like the zone to reach before activating the Reheat Stages on the optional Expansion Relay board or if configured for Box Reheat using the onboard relay on the Zone/VAV controller when configured without an expansion board. If this is a Cooling Only box that doesn't contain reheat, this setpoint will be ignored. If this is a Zoning System and the HVAC unit is in Heating Mode the damper will modulate as required to maintain this setpoint. High limit = 90ºF; Low limit = 50ºF; Default = 70ºF.

Unoccupied Cooling Offset

During Unoccupied hours, the Cooling Setpoint is adjusted up by this amount. High limit = 30ºF; Low limit = 0ºF; Default = 10ºF.

Unoccupied Heating Offset

During Unoccupied hours, the Heating Setpoint is adjusted down by this amount. High limit = 0ºF; Low limit = 30ºF; Default = 10ºF.

Maximum Sensor Slide Adjust

If the Optional Slide Offset is available on the wall sensor, this is the maximum amount that the Heat/Cool Setpoints can be adjusted up or down as the slide is moved from the center position to its full up or down position. High limit = 5ºF; Low limit = 0ºF; Default = 0ºF.

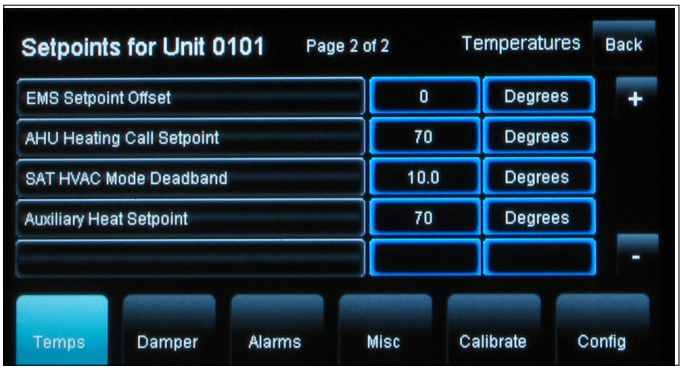


Figure 110: Box Temperature Setpoint Screen 2 of 2

Box Temp. Setpoint Screen 2 of 2

*Select and adjust the setpoints of these item*s per the requirements of your system and controller.

EMS Setpoint Offset

To use this option additional hardware is required. Please contact AAON Controls if you want more information about using this option. If the Energy Management Mode (EMS) is activated, the heat and cool setpoints can be spread apart by this amount. High limit = 10ºF; Low limit = 0ºF; Default = 0ºF.

AHU Heating Call Setpoint

If the Space Temperature drops below this setpoint by 0.5 degrees, a call for heat to the HVAC unit is broadcast from the Zone/VAV box. This only occurs in the Unoccupied Mode. High limit = 90ºF; Low limit = 50ºF; Default = 70ºF.

SAT HVAC Mode Deadband

If the Supply Air Temperature is above the Space Temperature by this amount, the Zone/VAV controller enters the Supply Air Heating Mode. It will remain in the Supply Air Heating Mode until the supply air drops to 2º above the space temperature. At that point the unit enters the Supply Air Vent Mode and remains there until the Supply Air drops this deadband below the Space Temperature. At that point the Zone/VAV Controller enters the Supply Air Cooling Mode and will remain there until the Supply Air Temperature rises to 2º below the Space Temperature. High limit = 20ºF; Low limit = 2ºF; Default = 10ºF.

Auxiliary Heat Setpoint

The Heat Relay on the Zone/VAV controller can be configured for single stage Aux. Heat or Box Reheat and does not require an additional expansion board. If it is configured for Auxiliary Heat the following applies.

When this setpoint is used with Baseboard Heat or other Heating Source that is separate from Box Heat and does not require airflow, when the Space Temperature drops below this setpoint by 0.5 degrees, the Aux Heat Relay activates. The Aux Heat Setpoint de-activates at 0.5 degrees above this setpoint. High limit = 90ºF; Low limit = 50ºF; Default = 70ºF.

Zone/VAV Damper/Airflow Setpoints

Damper/Airflow Setpoints

Damper

Touch the **<Damper>** button to access the *Damper/Airflow Setpoint Screens*. The following describes each setpoint in detail.

Figure 111: Box Damper/Airflow Screen 1 of 2

Box Damper/Airflow Spt. Screen 1 of 2

*Select and adjust the setpoints of these item*s per the requirements of your system and controller.

Air Valve Sizing {Pr Indep Only}

For a Pressure Independent Box, enter the manufacturer's airflow constant (flow coefficient) at 1" W.G. for the duct diameter this box is mounted on. This is also referred to as the "K" factor.

If you are using an AZ 2 Zone/VAV Round Damper you can find the "K" factor chart on page 108 of this manual. High limit = 9999 CFM; Low limit = 0 CFM; Default = 1200 CFM.

Max Position {All Modes}

The Zone/VAV controller will not allow the damper or airflow calculation to exceed this Maximum Setpoint while it is allowing the damper to modulate. Enter the maximum damper or airflow setting used by all modes of operation. Pressure Independent = CFM. Pressure Dependent = %. High limit = 9999 CFM / 100%; Low limit = 0 CFM / 0%; Default = 1000 CFM.

Min Position in Vent Mode

During Vent Mode when there is no heating or cooling demand, the damper or airflow will maintain the Vent Minimum amount of airflow into the zone for ventilation. Enter the minimum damper or airflow setting used during Supply Air Vent Mode of operation. Pressure Independent = CFM. Pressure Dependent = %. High limit = 9999 CFM / 100%; Low limit = 0 CFM / 0%; Default = 250 CFM.

Min Position in Cooling Mode

During Supply Air Cooling Mode, if the space being served by this damper is satisfied and has no cooling demand, the damper will close to this Cool Minimum setting. This provides a minimum amount of airflow into the space for ventilation, even if the space does not require additional cooling. Enter the minimum damper or airflow setting used during Supply Air Cooling Mode of operation. Pressure Independent = CFM. Pressure Dependent = %. High limit = 9999 CFM / 100%; Low limit = 0 CFM / 0%; Default = 100 CFM.

Min Position in Heating Mode

During Supply Air Heating Mode, if the space being served by this damper is satisfied and has no heating demand, the damper will close to this Heat Min setting. This provides a minimum amount of airflow into the space for ventilation, even if the space does not require additional heating. Enter the minimum damper or airflow setting used during supply air heating mode of operation. Pressure Independent = CFM. Pressure Dependent = %. High limit = 9999 CFM / 100%; Low limit = 0 CFM / 0%.; Default = 100 CFM.

Figure 112: Box Damper/Airflow Screen 2 of 2

Box Damper/Airflow Spt. Screen 2 of 2

*Select and adjust the setpoints of these item*s per the requirements of your system and controller.

Min Position in Reheat Mode

Enter the minimum damper or airflow setting used during the Space Reheat Mode of operation. Pressure Independent = CFM. Pressure Dependent = %. High limit = 9999 CFM / 100%; Low limit = 0 CFM / 0%; Default = 50 CFM.

Min Position during Night Mode

Enter the minimum damper or airflow setting used during unoccupied hours. The Night Min is the position the damper will move to when the system is in Override Mode and this particular damper is not part of the override group. This Night Min position only affects non-fan powered boxes. Pressure Independent = CFM. Pressure Dependent = %. High limit = 9999 CFM / 100%; Low limit = 0 CFM / 0%; Default = 0 CFM.

Fixed Position in Force Mode

Many times while troubleshooting a system, it is useful to have the zone damper set to a specific damper position or airflow setting. This setpoint can be used to determine where the damper/airflow will remain when the Zone/VAV Controller receives a *Force to Fixed Position* command. Enter the fixed damper or airflow setting used by the fixed position force mode during the morning warm-up. Pressure Independent = CFM. Pressure Dependent = %. High limit = 9999 CFM / 100%; Low limit = 0 CFM / 0%; Default = 0 CFM.

Min Position for Parallel Fan

Enter the minimum damper or airflow setting used to activate the parallel fan if installed. Pressure Independent = CFM. Pressure Dependent = %. High limit = 9999 CFM / 100%; Low limit = 0 CFM / 0%.; Default = 250 CFM.

Alarm Settings

Alarms

Touch the **<Alarms>** button to access the *Box Alarm Setpoints Screen*. The following describes each setpoint in detail.

Figure 113: Box Alarm Setpoints Screen 1 of 1

Box Alarm Setpoints Screen 1 of 1

Select and adjust the setpoints of these items per the requirements of your system and controller.

Cooling Setpoint Alarm Offset

The Zone/VAV controller can be set up to generate an alarm anytime the box goes into the Occupied Mode and the Space Temperature exceeds the user-defined alarm limits for a user-defined period of time. A High Temperature Alarm Setpoint is created by adding the Cooling Setpoint Alarm Offset to the current Cooling Setpoint. If the Space Temperature exceeds this limit for a period defined by the Alarm Delay Period Setpoint, the controller can generate an alarm callout if all the optional hardware components required for this to occur are installed. High limit = 50ºF; Low limit = 1ºF; Default = 30ºF.

Heating Setpoint Alarm Offset

The Zone/VAV controller can be set up to generate an alarm anytime the box goes into the Occupied Mode and the Space Temperature exceeds the user-defined alarm limits for a user-defined period of time. A Low Temperature Alarm Setpoint is created by adding the Heating Setpoint Alarm Offset to the current Heating Setpoint. If the Space Temperature exceeds this limit for a period defined by the Alarm Delay Period Setpoint, the controller can generate an alarm callout if all the optional hardware components required for this to occur are installed. High limit = 1ºF; Low limit = 50ºF; Default = 30ºF

Alarm Delay Period

As mentioned above, if you configure the controller to generate Space Temperature alarms, this is the amount of time after the box goes into the Occupied Mode that the temperature must be outside the alarm limits before an alarm is generated. A Space Temperature Alarm is generated when the Space Temperature is out of the specified range for this amount of time. High limit = 300 minutes; Low limit = 1 minute; Default = 30 minutes.

Miscellaneous Setpoints

Misc

Touch the **<Misc>** button to access the *Miscellaneous Setpoints Screen*. The following describes each setpoint in detail.

Figure 114: Box Misc. Setpoints Screen 1 of 2

Box Misc. Setpoints Screen 1 of 2

Select and adjust the setpoints of these items per the requirements of your system and controller.

Damper Integral Constant {Kp}

The Zone/VAV controller normally opens its damper based on a proportional error from setpoint. That means if the zone temperature is 4°F from setpoint, the damper would be 100% open, or it would be modulating to provide the Maximum CFM on Pressure Independent boxes. If the error is less than 4°F, the damper may stagnate at that position and never satisfy the zone. If you add Integral into the damper calculation process, this will cause the damper or airflow calculations to continue to increase as long as the zone temperature is still above the setpoint. That means it can provide 100% or Maximum CFM before the 4°F error is achieved, bringing the zone under control faster than it normally would. Start with a small (5 or 10) value, if you use this, and monitor the effect it has. If you enter too large a value, you can create "hunting" situations that can cause the damper actuator to prematurely wear out. High limit = 100; Low limit = 0; Default = 0.

Override Group ID#

Use this to group zones that need to activate together during Push-Button Override conditions. Enter 0 to ignore other box overrides. High limit = 16; Low limit = 0; Default = 1.

Push-Button Override Duration

If the Flush Mount Wall Sensor has the optional Push-Button Override, or you have a Digital Room Sensor, this is the amount of time the Zone/VAV controller will return to Occupied Mode using its Occupied Setpoints during Unoccupied Mode. This will generate a call for the HVAC unit to start its fan and provide heating or cooling, depending on how you configure the HVAC unit controller. High limit = 8.0 hours; Low limit = 0 hours; Default = 0.

Controlling Week Schedule

Use this to operate on a different schedule than the HVAC unit associated with this zone. Enter 0 to operate on the HVAC unit's schedule. Enter 1 through 8 to use an external schedule. A GPC-XP Controller is required for schedules 1 through 8. Max Value = 8; Low Value = 0; Default = 30ºF

Stages of Box Heat
Enter the number of Box Heat/Re-Heat Stages to be controlled on the expansion board. High limit = 3; Low limit = 0; Default = 0.

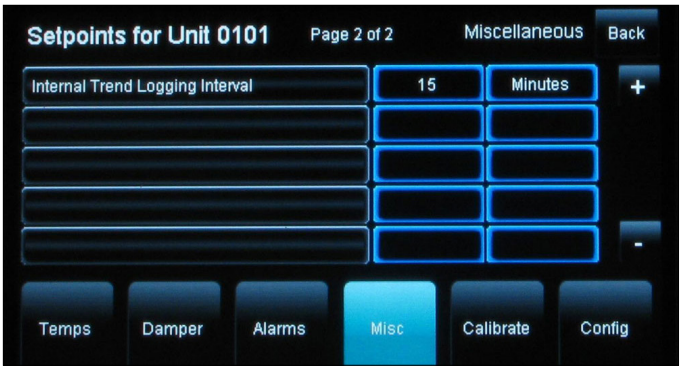


Figure 115: Box Misc. Setpoints Screen 2 of 2

Box Misc. Setpoints Screen 2 of 2

*Select and adjust the setpoints of these item*s per the requirements of your system and controller.

Internal Trend Log Interval
An internal Trend Log is constantly updated at a rate equal to this value. High limit = 60 minutes; Low limit = 1 minute, Default = 15 minutes. The controller can store up to 120 trend logs.

Calibration Setpoints

Touch the **<Calibration>** button to access the *Calibration Setpoints Screen*. The following describes each setpoint in detail.

Figure 116: Box Calibrate Setpoints Screen 1 of 1

Box Calibrate Setpoints Screen 1 of 1

*Select and adjust the setpoints of these item*s per the requirements of your system and controller.

Space Sensor Offset
Enter a positive value to raise the reading and a negative value to lower the reading. High limit = +100 ºF; Low limit = -100 ºF; Default = 0 ºF.

Discharge Sensor Offset
Enter a positive value to raise the reading and a negative value to lower the reading. High limit = +100 ºF; Low limit = -100 ºF; Default = 0 ºF.

NOTE: The Discharge Sensor Offset setting only operates on the reading when the Zone/VAV controller has its own Supply Air Temperature Sensor installed on the AUX2 input. If the Supply Temperature is received from a global broadcast, you will need to go to the AZ 2 Controller to calibrate the temperature reading.

System Manager TS LEDs and Buttons

LEDs and system function buttons are located behind the cover of your System Manager TS. The cover is held in place with (4) magnets and can be removed with a firm pull. See **Figure 118** for locations of LEDs, buttons and magnets.

Power LED
This LED will light up and stay on as long as power is supplied to your System Manager TS.

Operation LED
This LED will blink once a second to indicate that the system is operating.

Screen Refresh LED
This LED will turn on the System Manager TS when the screen refreshes. The screen should return to the Main Screen within 2 minutes.

Communications LED
This LED will light up and blink when there is a connection with the MiniLink and/or Network.

Reset Button
Press this button to reset the screen. The screen should refresh itself to the *Main Screen* within 2 minutes.

Touch Screen Suspend Button
Press this button to temporarily freeze the touch screen function of your System Manager TS for ten seconds in order to clean the screen. Always use a dry, dust -free cloth to clean the screen.

Figure 117: System Manager TS LEDs and Buttons

Military Time Conversion

The main difference between regular and military time is how hours are expressed. Regular time uses numbers 1 to 12 and A.M. and P.M. to identify each of the 24 hours in a day. In military time, the hours are numbered from 0000 to 2300.

Military time is based on a 24-hour day. Hours are numbered 0000 through 2300 and are recorded first. The last two digits indicate the minute after the hour. Military time does not exceed 2359 hours. For example, midnight is recorded as 0000; one minute past midnight is 0001; 1 a.m. is 0100, 1 p.m. is 1300, and so on.

Regular and military time express minutes and seconds in exactly the same way. When converting from regular to military time and vice versa, the minutes and seconds do not change.

Regular time requires the use of A.M. and P.M. to clearly identify the time of day. Since military time uses a unique two-digit number to identify each of the 24 hours in a day, A.M. and P.M. are unnecessary.

Table 7 in the column to the right summarizes the relationship between regular and military time.

NOTE: Even though time is set using Military Time it displays in A.M./P.M. format on the screens after it is entered.

Regular Time	Military Time	Regular Time	Military Time
12:00 A.M.	0000	12:00 P.M.	1200
12:30 A.M.	0030	12:30 P.M.	1230
1:00 A.M.	0100	1:00 P.M.	1300
1:30 A.M.	0130	1:30 P.M.	1330
2:00 A.M.	0200	2:00 P.M.	1400
2:30 A.M..	0230	2:30 P.M.	1430
3:00 A.M..	0300	3:00 P.M.	1500
3:30 A.M..	0330	3:30 P.M.	1530
4:00 A.M.	0400	4:00 P.M.	1600
4:30 A.M..	0430	4:30 P.M.	1630
5:00 A.M..	0500	5:00 P.M.	1700
5:30 A.M.	0530	5:30 P.M.	1730
6:00 A.M.	0600	6:00 P.M.	1800
6:30 A.M.	0630	6:30 p.m.	1830
7:00 A.M..	0700	7:00 P.M.	1900
7:30 A.M..	0730	7:30 P.M.	1930
8:00 A.M.	0800	8:00 P.M.	2000
8:30 A.M.	0830	8:30 P.M.	2030
9:00 A.M.	0900	9:00 P.M.	2100
9:30 A.M.	0930	9:30 P.M.	2130
10:00 A.M.	1000	10:00 P.M.	2200
10:30 A.M.	1030	10:30 P.M.	2230
11:00 A.M.	1100	11:00 P.M.	2300
11:30 A.M.	1130	11:30 P.M.	2330

Table 7: Military Time Conversion

Before Applying Power

In order to have a trouble free start-up, it is important to follow a few simple procedures. Before applying power for the first time, it is very important to correctly address the controller and run through a few simple checks.

Controller Addressing

All AZ 2 Controllers are equipped with address switches. If the AZ 2 Controller is to operate as a stand-alone system (not connected to any other HVAC unit or Zone/VAV Controllers), the controller address switch should be set for address 1. When using the System Manager TS to monitor and configure the AZ 2 Controller, you would enter this address to communicate with the controller. When the system is to be connected to other HVAC unit controllers on a communication loop, each controller's address switch must be set with a unique address between 1 and 59. When the AZ 2 Controller is used with Zone/VAV Controllers, the AZ 2 Controller's address switch must be set as address 59, no exceptions. See **Figure 118** for address switch setting information.

Power Wiring

One of the most important checks to make before powering up the system for the first time is to confirm proper voltage and transformer sizing for each controller. Each AZ 2 Controller requires 10 VA of power delivered to it at 24 VAC and the AZ 2 Expansion Module requires 5 VA at 24 VAC. **See Table 1** in this manual for VA listings for all AZ 2 related controllers and devices. You may use separate transformers for each device (preferred) or power several devices from a common transformer. If several devices are to be powered from a single transformer, correct polarity must be followed.

WARNING: Observe Polarity! All boards must be wired with GND-to-GND and 24 VAC-to-24 VAC. Failure to observe polarity will result in damage to one or more of the boards. Expansion modules must be wired in such a way that the Expansion modules and the AZ 2 Controller are always powered together. Loss of power to the Expansion module will cause it to become inoperative until power is restored to the Expansion module.

Check all wiring leads at the terminal block for tightness. Be sure that wire strands do not stick out and touch adjacent terminals. Confirm that all sensors required for your system are mounted in the appropriate location and wired into the correct terminals on the AZ 2 Controller. Be sure any expansion modules connected to the AZ 2 Controller are also correctly wired just as you did for the AZ 2 Controller.

After all the above wiring checks are complete, apply power to the AZ 2 Controller and all expansion modules connected to it.

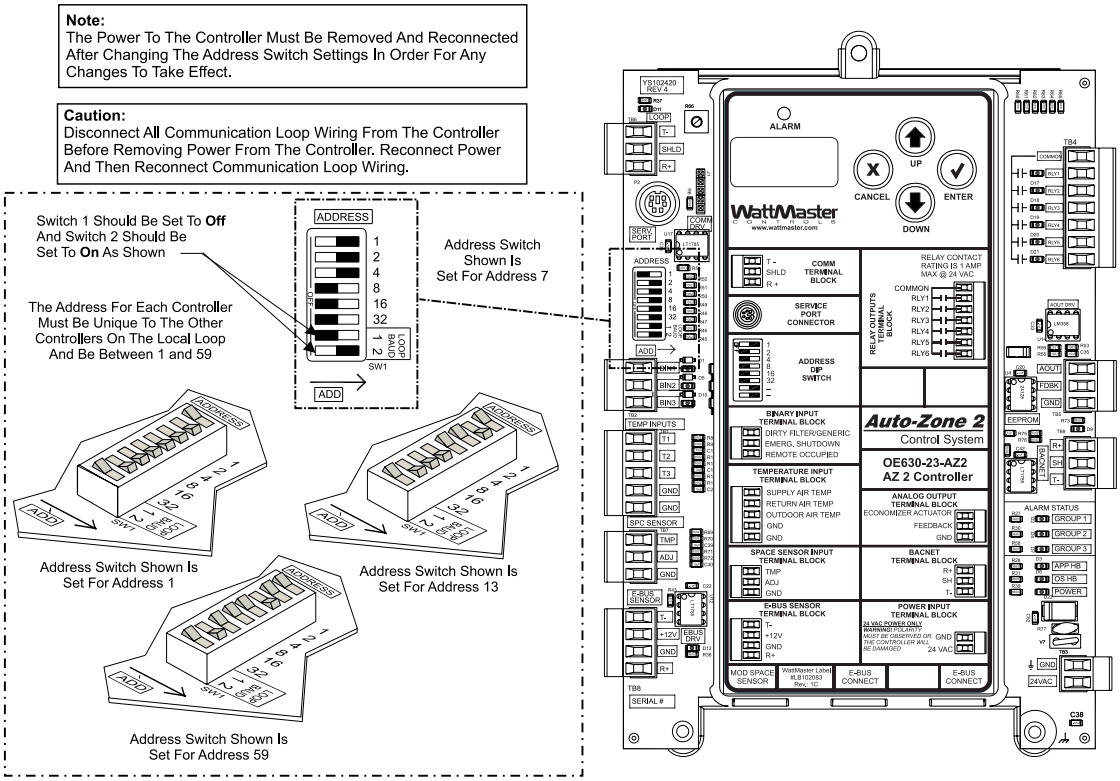


Figure 118: AZ 2 Controller Address Switch Setting

AZ 2 Controller Display

The AZ 2 Controller has an LCD display that is helpful to access the parameters and conditions for many controller functions and setpoints. See **Figure 119** for a detail of the screen and the keypad.

It is also very useful in troubleshooting the controller and is easier to use than the LED displays to diagnose any problems that could occur. The display screens tell you what is happening with the controller in plain English descriptions.

See **Figure 120** for a flow chart of how the screens are arranged. When the power is applied to the controller (after a brief delay) it will move to the "General Info" screen and begin to scroll through its display screens.

The "Power Up Delay" screen and "Press X To Cancel" screens only display for a brief time when you first power the controller. The length of time these screens display depends on the unit configurations you have selected. If you wish to cancel these two screens from being displayed you can hit the "Cancel" (X) key on the controller keypad.

By pressing either the "Up" or "Down" arrow keys you can scroll through the main category display screens. Once you stop scrolling up or down, the item screens for the category you stopped on, will display and scroll continuously.

The main display categories are:

1. General Info
2. Alarms
3. Overall Status
4. Sensor Status
5. Output Status

General Info Display Screens

These screens, as the name implies, scroll through the general information screens about the controller. This includes the AZ 2 Controller Software used, the Software version installed and the controller address.

Alarm Display Screens

If the unit detects an alarm(s) condition at any time the red "Alarm" LED above the display screen will light up and the display screen will move to the alarm category and display the alarm(s) currently active. It will scroll through all current alarms until the condition(s) causing the alarm(s).

Once the alarm(s) have all been remedied the controller screen will move back to the "General Info" main category screens and will scroll through these continuously until another alarm condition occurs or you select a different main category screen using the "Up" or "Down" arrow keys on the controller.

Overall Status Display Screens

These screens depict the current operating status of the controller. They include the current date and time the controller is programmed for, what schedule it is using, what mode it is currently operating in, and the current cooling, heating and economizer status.

Sensor Status Display Screens

These screens depict the current temperatures, relative humidity, dewpoint and wetbulb temperatures being sensed by the installed sensors. It also displays the current Supply Air Setpoint that has been configured.

Output Status Display Screens

These screens depict the current outputs and their status. These include the Fan Status (Off/On), Fan Speed (% of signal), number of Cooling Stages operating, the Cooling Signal (% of signal) when using Modulating Cooling, Economizer % open, the number of current Heating Stages in operation, and the Heating Signal (% of signal) when using Modulating Heating,

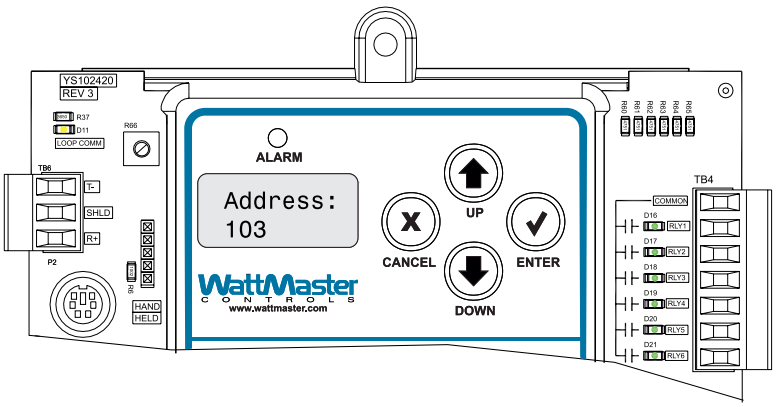


Figure 119: AZ 2 Controller Keypad & Screen

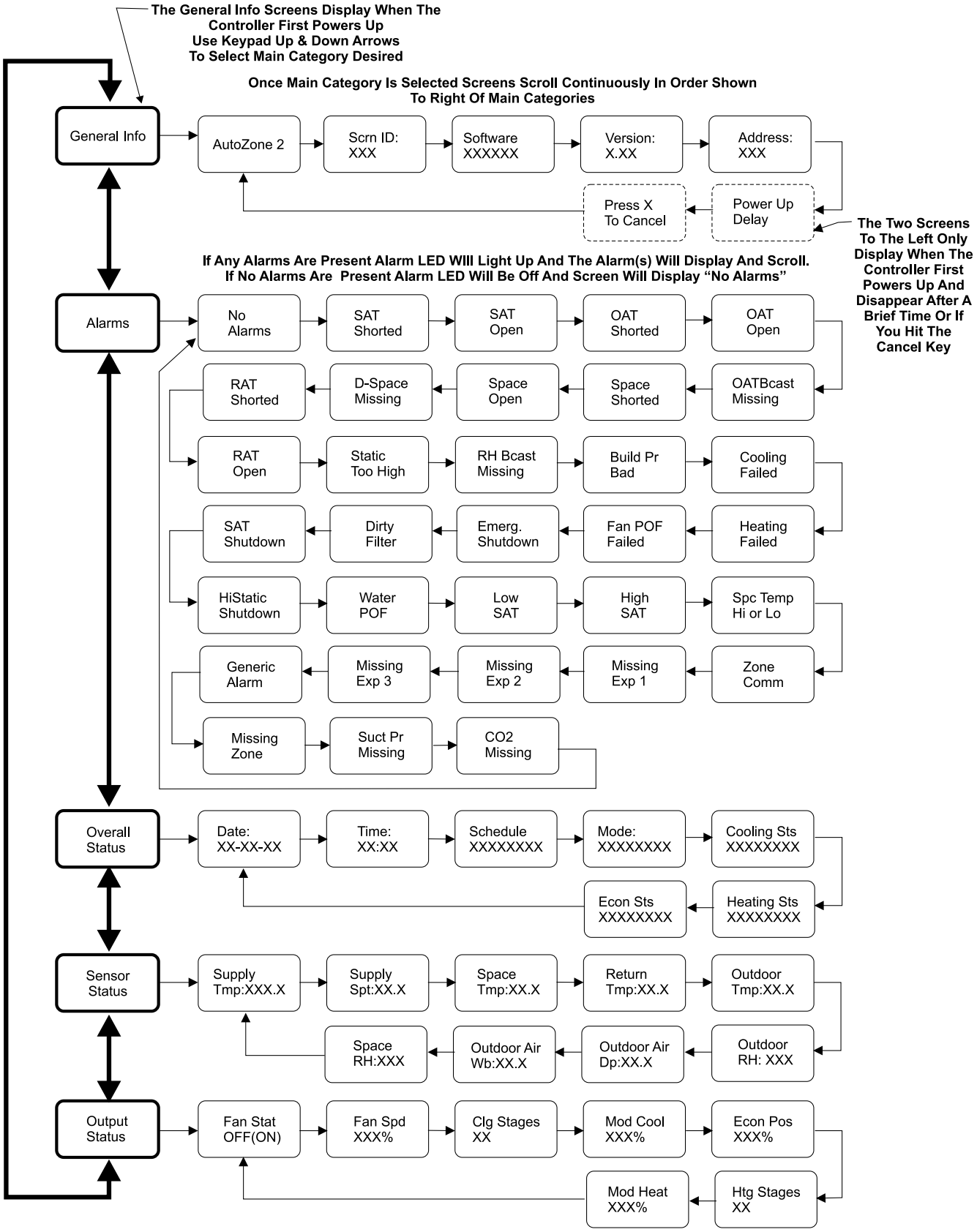


Figure 120: AZ 2 Controller Screen Matrix

Operation Modes

Occupied/Unoccupied Mode

The AZ 2 Controller can utilize several methods for determining the Occupied Mode of Operation. These are as follows:

- Forced Schedule
- Remote Forced Occupied Signal
- Internal Week Schedule
- Push-Button Override Signal

Forced Schedule

The AZ 2 Controller can be forced into the Occupied Mode by inputting a Forced Schedule from any operator interface.

Remote Forced Occupied Signal

The EM3 Expansion Module is required to use this feature. When this wet contact input closes, it will force the AZ 2 Controller into the Occupied Mode. When the Remote Forced Occupied Signal is removed, the controller will revert to the Unoccupied Mode of operation if no Internal or External Schedule has been configured or is in effect when this occurs.

NOTE: When using Remote Forced Occupied Mode, set all the Internal Week Schedule Times to '0' so that the Internal Schedule always commands the Unoccupied Mode.

Internal Week Schedule

An Internal Week Schedule, which supports up to two start/stop events per day, is available for determining Occupied and Unoccupied Schedules.

Fan Delay

When you have several units on your system this option will allow you to have a staggered start so that they don't all start at once when the occupied schedule occurs. It can be found under the "Setpoints" "Misc" tab. The default is -1 which means the controller will use a staggered start. If this option is set to -1 it will take the unit address of each controller on your system and multiply it by 5 seconds. If it is set to -1 when the unit with address 2 starts, it would be 10 seconds after the unit with address 1 starts, and so on for all the controllers on the AZ 2 System. It an also be set for a specific duration on each unit controller, if desired, or turned off completely, allowing no delay by entering 0 for the Fan Delay.

Push-Button Override Signal

During Unoccupied hours, you can force the AZ 2 Controller back to Occupied operation by pressing the Override Button on the OE211 or the OE213 Space Temperature Sensor for a period of less than 3 seconds. This initiates the Override or resets the Override Timer back to zero during Unoccupied hours of operation.

During Override operations, you can cancel the Override by pressing the Override Button for a period of time between 3 seconds and 10 seconds. This restores the AZ 2 Controller to Normal Unoccupied Operation.

If the Override Button is held for more than 10 seconds, it causes a Space Sensor Failure Alarm. This is due to the fact that the Override Button actually shorts the Space Temperature Sensor input to ground. If this input is shorted to ground or left floating with no Space Temperature Sensor detected for more than 10 seconds, it is considered a Space Temperature Sensor failure.

When using the OE217-02 or OE217-03 E-BUS Digital Room Temperature Sensors you can use the **<Override>** button to initiate the override sequence. The Override LED is inoperable when in Occupied Mode. In Unoccupied Mode, if you *touch* the **<Override>** button, the Override LED will blink, indicating an override request. The Controller will respond by sending the unit into override. The Override LED will then stay on for the duration of the Override. Any time the Unit is in Override, you can request to cancel the override by *touching* the **<Override>** button, and the Override LED will blink. The Unit will then cancel the override. The Override LED will then turn off.

HVAC Modes of Operation

There are 6 possible HVAC Modes of Operation. They are as follows:

- Vent Mode
- Cooling Mode
- Dehumidification Mode
  - * Available in Vent, Cooling & Heating Modes
- Heating Mode
- Warm-Up Mode
- Off Mode

Vent Mode Operation

This Mode only applies to the Occupied Mode of Operation. The Vent Mode is defined as the Supply Fan running with no Heating, Cooling, or Dehumidification demand.

Vent Mode can occur during the Occupied Mode if the Application Type has been configured for Constant Volume, Single Zone VAV, or Zoning. When configured for Constant Volume, Vent mode will occur anytime the controlling sensor (Space or Return) is reading between the Mode Enable Setpoints. If the controller is configured for Single Zone VAV, Vent Mode will occur anytime the Space Temperature is between the Mode enable setpoints. Vent Mode will occur in a Zoning system anytime there is no demand from the Zones.

Vent Mode can also occur if the Application Type has been configured for Remote Force and the unit follows an Occupied Schedule or if the Schedule has been forced to Fan Only Mode. See the Remote Control of HVAC Mode Section for complete details.

NOTE: During Vent Mode, all Cooling and Heating Stages are deactivated and the Economizer Damper is maintained at a Minimum Position to provide fresh air into the building. The Static Pressure is still maintained by the Supply Fan VFD or Zoning Bypass Damper Signal since the Supply Fan is still operating in this Mode.

Cooling Mode Operation

For Constant Volume units with the Space or Return Air Sensor configured as the controlling sensor, or on units configured for Single Zone VAV operation, Occupied Cooling Mode occurs whenever the HVAC Mode Enable Temperature rises one deadband above the HVAC Cooling Setpoint. The unit will leave the Cooling Mode whenever the HVAC Mode Enable Temperature falls one deadband below the HVAC Cooling Setpoint. Unoccupied Cooling Mode only occurs if a Space Temperature Sensor is connected to the AZ 2 Controller and the Space Temperature rises above the HVAC Cooling Setpoint plus the Unoccupied Cooling Offset. A Space Temperature value can also be broadcast from a GPC-XP Controller or other AZ 2 Controller to this AZ 2 Controller instead of having a Space Sensor connected to the controller.

For a unit configured for VAV operation, after an optional Morning Warm-Up period, the unit is in the Cooling Mode whenever it is in the Occupied Mode. Unoccupied Cooling Mode will occur if a Space Sensor is connected to the AZ 2 Controller and the Space Temperature rises above the Cooling Setpoint plus the Unoccupied Cooling Offset, or if there is a Night Setback Cooling call (based on the same conditions) from an AZ 2 Zone/VAV Controller.

For a unit configured for Zoning, the Occupied Cooling Mode is generated whenever at least one voting zone has a Cooling demand of more than 1˚. If the unit is in the Heating Mode when a request for Cooling is generated, the unit will change over to Cooling once the Heating has satisfied the zone demands or once the Heating has satisfied a timer identified as "Max HVAC Period with Opposing Demands". Unoccupied Cooling Mode will occur if there is a Night Setback Cooling call from an AZ 2 Zone/VAV Controller based on the Space Temperature rising above the Space Cooling Setpoint plus the Unoccupied Cooling Offset.

The Mechanical Cooling will be disabled if the Outdoor Air Temperature is below the Cooling Lockout Setpoint by 1°F. This gives a 2°F hysteresis around the Cooling Lockout Setpoint to prevent unwanted cycling in and out of Mechanical Cooling Mode. If the Outdoor Air Temperature disables the Mechanical Cooling while it is currently operating, the Mechanical Cooling will stage off if all staging and run times are satisfied.

If the Economizer has been enabled for operation, it is used as the first stage of Cooling, and the Mechanical Cooling will be activated if necessary. See the Economizer Operation section for a more detailed operating sequence.

No matter which Sensor is configured for the HVAC Mode Enable or if the Remote BAS sets the Mode through Remote Forced Cooling, the Supply Air Temperature is always regulated to the Active Supply Air Temperature Setpoint while in the Cooling Mode.

Staged - Cooling

In the Cooling Mode, as the Supply Air Temperature rises above the Supply Air Temperature Cooling Setpoint, the Cooling Stages will begin to stage on based on the Cooling Stage Up Delay setting. The Cooling Stages will continue to run until the Supply Air Temperature drops below the Supply Air Temperature Cooling Setpoint minus the Cooling Staging Off Deadband. The Cooling Staging Off Deadband Setpoint determines when the compressors start to stage down. For example, if the Supply Air Temperature Setpoint is 55° and the Cooling Staging Off Deadband is 5°, as the Supply Air Temperature drops below 50°, the Cooling Stages will begin to stage off based on the Cooling Staging Down Delay Setpoint.

Cooling Staging Delay

Minimum Off Time

A Cooling Stage cannot be activated unless it has been off for this amount of time.

Minimum Run Time

After a Cooling Stage has been activated, it must remain on for this amount of time.

Staging Up Delay

After the first Cooling Stage has been activated, this delay prevents additional stages from activating too quickly before they are needed to achieve the Active Supply Air Temperature Setpoint.

Staging Down Delay

After a Cooling Stage has met its Minimum Run Time and is not needed, this delay prevents additional stages from deactivating too quickly in case they are needed to maintain the Active Supply Air Temperature Setpoint Temperature.

Modulating Cooling

The Modulating Cooling Proportional Window is used to determine the signal to the Modulating Cooling Source and is user-adjustable. The Modulating Cooling signal is calculated based on the differential between the Supply Air Temperature and the Supply Air Temperature Cooling Setpoint based on the Modulating Cooling Proportional Window.

The Maximum Signal Adjustment per Time Period is 10% and is not user-adjustable. The Minimum Signal Adjustment per Time Period is based on the Modulating Cooling Proportional Window. The larger the Modulating Cooling Proportional Window, the smaller the signal adjustment will be per Time Period. The Time Period is the delay between another increase or decrease in the Modulating Cooling Source Signal and is user-adjustable. For example, if the Modulating Cooling Proportional Window is 5°F, the signal would adjust 2% per °F each Time Period above or below the Supply Air Temperature Cooling Setpoint. When the Supply Air Temperature is above or below the Supply Air Temperature Cooling Setpoint by 5°F or more, the signal would adjust 10% each Time Period.

The AZ 2 Controller with an EM2 Module can control a Chilled Water Valve. The AZ 2 Controller will control the Chilled Water Valve to maintain the Active Supply Air Temperature Setpoint.

If the Supply Air Temperature rises above the Supply Air Temperature Cooling Setpoint, the Modulating Cooling Signal will modulate the Chilled Water Valve as needed up to 100%.

If the Supply Air Temperature falls below the Supply Air Temperature Cooling Setpoint, the Modulating Cooling Signal will modulate the Chilled Water Valve as needed down to 0%.

Dehumidification Mode

Economizer Operation

The information that follows assumes you have configured your HVAC unit to control the Outdoor Air Dampers in an Economizer Mode of operation.

The Economizer is used as the first stage of Cooling if the enabling temperature is below the Economizer Enable Setpoint by 1ºF. The AZ 2 Controller can be configured to enable the Economizer based on Wetbulb, Dewpoint, or Drybulb temperature.

NOTE: For Wetbulb or Dewpoint control of the Economizer, an Outdoor Air Humidity sensor must be installed or setup to be received via a broadcast.

During Economizer operation, the Economizer starts at the configured minimum position. As the Supply Air Temperature moves above the Supply Air Cooling Setpoint, the Economizer begins to make short incremental movements until the Supply Air Temp has met the Setpoint. If the Economizer reaches 100% Open and the Supply Air Temperature is still above the Supply Air Cooling Setpoint, mechanical cooling will be initiated, if not disabled based on Mechanical Lockouts, to provide additional stages of cooling. Once a mechanical cooling stage has been activated, the Economizer will remain full open until the mechanical cooling stages deactivate or until the enabling temperature causes the Economizer to be disabled.

If the Economizer is not configured to provide Cooling during the Occupied Mode, it will still maintain the configured Minimum Position Setpoint to provide minimum fresh air into the building. During the Unoccupied Mode, the Economizer will be closed, unless Unoccupied Economizer Mode has been selected.

Dehumidification Mode

The Indoor Air Humidity initiates Dehumidification when the Indoor Air Humidity rises by the Adjustable Deadband above the Indoor Air Humidity Setpoint during the Occupied Mode of operation. Dehumidification is disabled when the Indoor Air Humidity drops below the Indoor Humidity Setpoint by the Adjustable Deadband during the Occupied Mode of operation.

During the Dehumidification Mode, the AZ 2 Controller activates Cooling to extract moisture from the Supply Air and utilizes either Modulating Reheat, On/Off Reheat, or Heating to warm the Supply Air before entering the building.

When using Staged DX Cooling Control, the AZ 2 Controller activates the Cooling Stages based on the actual Evaporator Coil Suction Temperature compared to the Coil Temperature Setpoint. The Evaporator Coil Temperature is calculated by using the Suction Pressure Sensor and converting the pressure to temperature.

For Modulating Chilled Water units, the AZ 2 Controller opens the Chilled Water Valve to a fixed 100% position to provide full moisture removal capabilities. Using On/Off Chilled Water valves for dehumidification is not supported.

If you configured your AZ 2 Controller for Dehumidification control, you need to install an E-BUS Temperature/Humidity Sensor to the AZ 2 Controller or a 0-5 VDC Indoor Humidity Sensor to the EM1 Expansion Module.

If the unit is equipped with On/Off Reheat, then the AZ 2 Controller needs to be configured for Staged Reheat and an available relay needs to be configured as “Reheat”. The Reheat Relay will remain on during the Dehumidification Mode until the Supply Air Temperature rises above the Supply Air Temperature Setpoint.

The controller can also be configured for Modulating Reheat in which case a Modulating Reheat Enable Relay on the EM2 Expansion Module can be used (if necessary) to enable reheat device while the Modulating Reheat Signal output from the module controls the reheat. The output signal low and high voltage limits are user configurable. Reheat is initiated as described in the preceding paragraph.

A third Reheat configuration option is to “Use Heat For Reheat” as the Reheat source. In this case, whatever heat is used as the standard Heat source (using the normal Heat outputs) will also be used as the Reheat source. Reheat is initiated as described above.

The Dehumidification Mode can be configured to have Dehumidification in all modes. If configured for “All Modes” the AZ 2 Controller will enter the Dehumidification Mode when the Humidity is above the Setpoint regardless of the current Heating or Cooling demands. The Reheat is always controlled by the Active Supply Air Temperature Setpoint. The Active Supply Air Temperature Setpoint will change during Heating, Cooling, or Vent Modes. During the Vent Mode, the Supply Air Temperature Setpoint will be a Calculated Setpoint that is halfway between the Heating and Cooling Supply Air Setpoints.

If Dehumidification in “All Modes” has not been configured, the AZ 2 Controller will only enter the Dehumidification Mode and use Reheat during the Vent Mode. The Reheat will be controlled to a Calculated Supply Air Temperature Setpoint that is halfway between the Space or Return Air Temperature Heating and Cooling Setpoints.

Unoccupied Dehumidification can also be configured and is only activated when the Indoor Air Humidity is above the Indoor Air Humidity Setpoint plus the Deadband during the Unoccupied Mode.

WARNING: Using the HVAC unit’s internal electric heating as a reheat source requires that the electrical rating of the unit is sufficiently sized to allow for the operating electrical load of the compressor(s) and electric heater(s) at the same time.

Coil Temperature Offset for Split Systems

On split systems that have the condensing unit mounted a considerable distance from the air handling unit, the actual Evaporator Coil Temperature can be quite a bit different than the Calculated Coil Temperature based on the Suction Pressure Transducer reading in the condensing unit. You can put in a temperature offset to the Calculated Coil Temperature reading so that it will more closely match the actual Evaporator Coil Temperature. For example, the Suction Pressure Transducer in the condensing unit may give you a Calculated Coil Temperature reading of 30ºF, but the actual temperature of the Evaporator Coil in the air handler may be 45ºF. To compensate, you can put in a 15ºF offset so that the Calculated Coil Temperature reading will read 45ºF. The maximum amount of offset allowed is ± 30ºF.

Heating Mode Operation

For Constant Volume units with the Space or Return Air Sensor configured as the controlling sensor, or on units configured for Single Zone VAV operation, Occupied Heating Mode occurs whenever the HVAC Mode Enable Temperature falls one deadband below the HVAC Heating Setpoint. The unit will leave the Heating Mode whenever the HVAC Mode Enable Temperature rises one deadband above the HVAC Heating Setpoint. Unoccupied Heating Mode only occurs if a Space Temperature Sensor is connected to the AZ 2 Controller and the Space Temperature falls below the HVAC Heating Setpoint minus the Unoccupied Heating Offset. A Space Temperature value can also be broadcast from a GPC Controller to the AZ 2 Controller instead of having a Space Sensor connected to the controller.

For a unit configured for Zoning, the Occupied Heating Mode is generated whenever at least one voting zone has a Heating demand of more than 1°F. If the unit is in the Cooling Mode when a request for Heating is generated, the unit will change over to Heating once the Cooling has satisfied the zone demands or once the Cooling has satisfied a timer identified as "Max HVAC Period with Opposing Demands". Unoccupied Heating Mode will occur if there is a Night Setback Heating call from an AZ 2 Zone/VAV Controller based on the Space Temperature falling below the Space Heating Setpoint minus the Unoccupied Heating Offset.

The Mechanical Heating will be disabled if the Outdoor Air Temperature is above the Heating Lockout Setpoint by 1°F. This gives a 2°F hysteresis around the Heating Lockout Setpoint to prevent unwanted cycling in and out of Mechanical Heating Mode. If the Outdoor Air Temperature disables the Mechanical Heating while it is currently operating, the Mechanical Heating will stage off if all staging and run times are satisfied.

In the Heating Mode the Supply Air Temperature is always controlled to the Active Supply Air Temperature Setpoint.

Staged - Heating

When in Heating Mode as long as the Supply Air Temperature is below the Active Supply Air Heating Setpoint, the Heating Stages will begin to stage up based on the configured Heating Stage Up Delay. If the Supply Air Temperature rises above the Active Supply Air Temperature Heating Setpoint plus the Heating Staging Off Deadband the Heating stages will be staged down. The Heating Staging Off Deadband Setpoint determines when the heat source starts to stage down and is adjustable. For example, if the Supply Air Temperature Heating Setpoint is 120°F and the Heating Staging Off Deadband is 5°F, as the Supply Air Temperature rises above 125°F, the Heating Stages will begin to stage off based on the configured Heating Stage Down Delay.

For a Zoning System the Heating Mode will be enabled anytime any zone is more than 1°F below its configured Heating Setpoint.

Heating Staging Delay

Minimum Off Time

A Heating Stage cannot be activated unless it has been off for this amount of time.

Minimum Run Time

After a Heating Stage has been activated, it must remain on for this amount of time.

Staging Up Delay

After the first Heating Stage has been activated, this delay prevents additional stages from activating too quickly before they are needed to achieve the Active Supply Air Temperature Setpoint.

Staging Down Delay

After a Heating Stage has met its Minimum Run Time and is not needed, this delay prevents additional stages from deactivating too quickly in case they are needed to maintain the Active Supply Air Temperature Setpoint.

Modulating Heating

The AZ 2 Controller supports various forms of Modulating Heat such as SCR Electric Heat, Modulating Hot Water Heat, and Modulating Steam Heat. Whichever form of Modulating Heating is used, the Controller will modulate the Heat Source to achieve the Supply Air Temperature Heating Setpoint.

The Modulating Heat Proportional Window is used to determine the signal to the Modulating Heating Source and is user-adjustable. The Modulating Heating Signal is calculated by the differential between the Supply Air Temperature and the Supply Air Temperature Heating Setpoint. The maximum signal adjustment per Time Period is 10% and is not user- adjustable. The minimum signal adjustment per Time Period is based on the Modulating Heat Proportional Window. The larger the Modulating Heat Proportional Window, the smaller the signal adjustment will be per Time Period. The Time Period is the delay between another increase or decrease in the Modulating Heating source signal and is user-adjustable. For example, if the Modulating Heat Proportional Window is 5°F, the signal will be adjusted 2% per °F each Time Period above or below the Active Supply Air Temperature Setpoint. When the Supply Air Temperature is above or below the Supply Air Temperature Heating Setpoint by 5°F or more, the signal will adjust 10% each Time Period.

Primary Modulating Heat and Secondary Heat with Staged Gas or Electric Heat

The Modulating Heating Proportional Window is used to determine the signal to the Primary Heat Source and is user-adjustable. The Heating Stage Control Window is used to determine stage up and stage down of the Secondary Heat Source. In the Heating Mode, the Primary Heat Source will modulate to achieve the Active Supply Air Temperature Setpoint. When the Primary Heat Source reaches 100%, the Heating Stage Up Delay begins. If the Primary Heat Source is still at 100% after the Heating Stage Up Delay expires, the Secondary Heat Source will activate. The Primary Heat Source will then modulate to achieve the Active Supply Air Temperature Setpoint. If the Secondary Heat Source is activated and the Primary Heat Source has modulated to 0%, the Heating Stage Down Delay will begin. If the Primary Heat Source is still at 0% after the Heating Stage Down Delay expires, the Secondary Heat Source will deactivate. If the Supply Air Temperature rises above the Active Supply Air Temperature Setpoint plus the Heating Stage Control Window, the Primary Heat Source will modulate to 0% to allow the Supply Air Temperature to cool off.

The AZ 2 Controller can activate two forms of Heating that are classified as Primary and Secondary Heat Sources. The Primary Heat Source used can be SCR Electric Heat, Modulating Hot Water Heat, Modulating Steam Heat or Modulating Gas. The Secondary Heat Source used can be Staged Gas Heat, or Staged Electric Heat.

Heat Pump Operation

The AZ 2 Controller can be configured to control a Heat Pump. Heat Pump operation can be set for Air to Air or Water Source Heat Pump and the Reversing Valve can be set to fail to Heat Mode or Cool Mode.

Auxiliary Heating Stages are configured as HP Auxiliary Heat and are used to supplement the Compressor Heating Stages.

The Cooling and Dehumidification Modes operate in the same manner as described under the Cooling and Dehumidification titled sections in this manual. In the Heating Mode, the AZ 2 Controller activates the Reversing Valve (if required) and stages compressors to provide Heating if the Outdoor Air Temperature is above the OAT Cooling Lockout Setpoint and the controller is configured for Air to Air Heat Pump operation. The compressor heating stages are activated as needed to achieve the Active Supply Air Setpoint. Auxiliary Heat can be activated to supplement Compressor Heating in order to achieve the Active Supply Air Setpoint if the Outdoor Air Temperature is below the OAT Heating Lockout Setpoint. If the Outdoor Air Temperature is below the OAT Cooling Lockout Setpoint, only Auxiliary Heating will occur. If the Outdoor Air Temperature is above the OAT Heating Lockout, only Compressor Heating will occur.

Emergency Heat stages can also be configured. If the Outdoor Air Temperature is above the Compressor Lockout Temperature, Emergency Heating is disabled. If the Outdoor Air Temperature is below the Compressor Lockout Temperature, Emergency Heating is enabled and can stage-up after Auxiliary Heat.

If the controller is configured as a Water Source Heat Pump the Outdoor Air Lockouts are ignored by the controller & Emergency Heat will not operate.

Water Source Heat Pumps Binary Input #1 can be configured for Water Proof of Flow. If flow is not proved the compressor(s) will be disabled.

NOTE: Single Zone VAV Applications cannot be configured as a Heat Pump.

Morning Warm-Up Mode

When the AZ 2 Controller is configured for Morning Warm-Up Mode and switches to the Occupied Mode of Operation (not Pushbutton Override Mode), the unit compares the Return Air Temperature to a Morning Warm-Up Target Temperature. If the Return Air Temperature is below this Setpoint, the Warm-Up Mode is initiated. This Mode remains in effect until the Return Air Temperature rises above the Target Temperature or a user-adjustable Time Period expires. Warm-Up Mode is not initiated by Push-Button Overrides or Unoccupied Heating demands. The Outdoor Air Damper remains closed during Warm-Up Mode.

Once the Warm-Up Mode has been terminated, it cannot resume until the unit has been through a subsequent Unoccupied Mode. Only one Warm-Up Mode is allowed per Occupied cycle.

If you have third party VAV boxes not using the AZ 2 Zone/VAV Controllers that need to be forced wide open during the Warm-Up Mode, you can configure one of the relay outputs to be used during this Mode. If the Warm-Up Mode is active, the relay is activated. This relay then becomes the Force Open Command for all VAV boxes to which it is wired.

Humidification Mode

If an indoor humidity sensor is installed, the Indoor Air Humidity can be used to initiate Humidification when the humidity level falls by the adjustable Humidify Deadband below the Space Humidify Setpoint. Humidification is disabled when the humidity level rises by the Deadband above the Space Humidify Setpoint. Humidification can also be configured to operate in the Unoccupied Mode and will utilize the same setpoints.

If On/Off Humidification is configured on the AZ 2 Controller a relay must be configured as “Humidifier Enable”. This relay will enable the humidifier when the humidity falls below setpoint.

If Modulating Humidification is configured on the AZ 2 Controller, a Modulating Humidifier Enable Relay on the EM2 Expansion Module can be used to enable the humidifier, and the Modulating Humidifier Signal output on this module will control the humidifier. The output signal low and high voltage limits are user configurable.

For Humidification control you need to connect an E-BUS Indoor Temperature/Humidity Sensor to the AZ 2 Controller or a 0-5 VDC Indoor Humidity Sensor to the EM1 Expansion Module.

Off Mode

If the unit is in Unoccupied Mode and no Heating, Cooling, or Dehumidification demands exist, the AZ 2 Controller enters the Off Mode.

If the unit is in Occupied Mode and the unit is configured for Fan Cycling and no Heating, Cooling, or Dehumidification demands exists it will also go into the Off Mode.

During the Off Mode, the Supply Fan is off and the Outdoor Air Dampers are closed.

Remote Force Modes

NOTE: If an external source(s) is used to force the operating mode of the HVAC unit (Heating, Cooling, Dehumidification, Humidification) then that external source(s) must be in control of forcing all modes of operation for that unit. The external source(s) must also provide the controlling sensors for each mode of operation.

Remote Forced Heating and Cooling

The Heating Mode, Cooling Mode, and Vent Mode can be determined by an external source. The AZ 2 Controller will check the EM3 Expansion Module for a 24 VAC input signal on BIN1 and BIN2. BIN1 is used for Remote Forced Heating Mode and BIN2 is used for Remote Forced Cooling Mode. If a 24 VAC signal is present on both BIN1 and BIN2, the AZ 2 Controller will be in Remote Forced Venting Mode. Remote Forced Venting Mode is considered to be Occupied Fan-Only operation. Once the Remote Forced Mode has been set, normal Heating, Cooling, or Venting Modes of operations will occur. All other user-adjustable setpoints, such as the Heating and Cooling Supply Air Temperature Setpoints, are used in the actual control of the equipment.

Remote Forced Dehumidification

Dehumidification Mode is normally controlled by using an Indoor Humidity Sensor. If desired, Dehumidification Mode can also be initiated by an external source connected to the EM3 Expansion Module input BIN3 . The AZ 2 Controller will check the BI3 input on the EM3 Expansion Module for a 24 VAC signal. If the signal is present, it will force the AZ 2 Controller into Dehumidification Mode regardless of the mode it is currently operating in if Dehumidification "All Modes" has been configured. If Dehumidification "All Modes" has not been configured, the unit will only be forced into Dehumidification Mode if it is operating in the Vent Mode during the time the remote signal is being supplied to input BIN3.

During Dehumidification, if a Reset Source is not configured, the Supply Air Temperature Setpoint will be halfway between the Heating and Cooling Setpoints.

Remote Forced Humidification

Humidification Mode is normally controlled using an Indoor Humidity Sensor. If desired, Humidification Mode can be initiated by an external source connected to BIN4 on the EM3 Expansion Module. If 24 VAC is supplied to BIN4, the controller will initiate Humidification. See the Humidification section for more information.

Supply Air Temperature Setpoint Reset

The AZ 2 Controller can utilize an automatic Supply Air Temperature Reset function based on a selected Reset Source. The available Reset Source options are:

- Space Temperature
- Return Air Temperature
- Outdoor Air Temperature
- Supply Fan VFD Signal
- Remote Reset Signal.

For whatever option is selected, a High and a Low Reset Source Setpoint must be configured that will correspond to configured Low and High SAT Setpoints. This must be done separately for the Cooling Mode setpoints and for the Heating Mode setpoints.

When the Reset Source is at its highest configured setpoint the SAT Setpoint will be reset to its lowest configured setpoint. When the Reset Source is at its lowest configured setpoint the SAT Setpoint will be reset to its highest configured setpoint.

The only exception to the above rule would be if doing reset based on the Supply Fan VFD Signal Percentage during the heating mode. In that case at the High Reset Source Setpoint the supply air setpoint would be reset to the configured High SAT Setpoint, etc.

In all cases as the Reset Source value moves within its range established by the configured High and Low Reset Setpoints, the Supply Air Setpoint will be proportionally reset within its range established by the configured Low and High SAT Setpoints.

If Dehumidification Priority has been configured and the unit is in Cooling Dehumidification or the Heating Dehumidification Mode, the SAT reset will occur as described above.

In the Vent Mode or the Vent Dehumidification Mode, the SAT Setpoint will be calculated to be halfway between the HVAC Mode Enable Setpoints.

Example:
Resetting the supply air temperature based on the return air temperature.

Supply Air Cooling Setpoints:

- Cooling Setpoint = 55°
- Cooling Reset Limit = 65°
- Reset Source Hi Limit = 75°
- Reset Source Lo Limit = 65°

When the return air temperature rises to 65°, the supply air temperature setpoint will be 55° and when the return air temperature drops to 55°, the supply air temperature setpoint will increase to 65°.

When the temperature at the Reset Source is at the Reset Source High Setpoint, the Supply Air Temperature Setpoint would be reset to the Supply Air Low Setpoint. When the temperature at the Reset Source is in between its Low and High Setpoints, the Supply Air Setpoint will be proportionally reset between its High and Low Setpoints. When the unit is in the Vent Mode or Vent Dehumidification Mode, the Supply Air Temperature Setpoint will be calculated to be halfway between the Heating and Cooling Setpoints. If Dehumidification All Modes has been configured and the unit is in Heating Dehumidification or Cooling Dehumidification Mode, the Supply Air Temperature Setpoint is proportionally reset in the same way as in the Heating and Cooling Modes described previously in this paragraph.

If the Supply Fan VFD Signal is configured as the Reset Source, then separately, for the heating mode and the cooling mode, you will need to enter a Low and High VFD Signal Setpoint and a Low and a High Supply Air Setpoint. This creates a range of VFD Signal Setpoints and a range of Supply Air Temperature Setpoints. As the VFD Signal varies within its range, it will proportionally reset the Supply Air Temperature Setpoint within its range. For example, in the Cooling Mode, when the Supply Fan VFD Signal is at its low setpoint, the Supply Air Cooling Setpoint will be reset to its high setpoint; when the Supply Fan VFD signal is at its high setpoint, the Supply Air Cooling Setpoint will be reset to its low setpoint. In the heating mode, the Supply Air Heating Setpoint reset would react in the opposite fashion with the VFD signal at its highest setpoint the Supply Air Heating Setpoint is reset to its highest setpoint, and with the VFD signal at its lowest setpoint the Supply Air Heating Setpoint is reset to its lowest setpoint. In either mode, if the VFD signal is halfway (for instance) between the Low Signal Setpoint and the High Signal Setpoint, the Supply Air Setpoint would be reset to halfway between its High and Low Setpoint. If Dehumidification All Modes has been configured and the unit is in Heating Dehumidification or Cooling Dehumidification Mode, the Supply Air Temperature Setpoint is proportionally reset in the same way as in the Heating and

Duct Static Pressure Control

Cooling Modes described above in this paragraph. When the unit is in the Vent Mode or Vent Dehumidification Mode, the Supply Air Temperature Setpoint will be calculated to be halfway between the Heating and Cooling Setpoints.

If a Remote Reset Signal is configured as the Reset Source, a 0-5 or 0-10 VDC signal can be used to reset the Supply Air Temperature Setpoint. For the Heating Mode and the Cooling Mode you will need to separately enter a Low and a High Supply Air Setpoint.

As an example when using a 0-5 VDC signal, when the Reset Signal is at 0 VDC, the Supply Air Setpoint will be at its lowest setpoint for both Heating and Cooling. When the Reset Signal is at 5 VDC, the Supply Air Setpoint will be at its highest setpoint for both Heating and Cooling. As the voltage signal changes between 0 VDC and 5 VDC, the Supply Air Setpoint will be proportionally reset between the Low and High Supply Air Temperature Setpoint for both Heating and Cooling.

Fan Only Operation

This is a user selected mode that allows the fan to run in the Vent Mode without any Heating or Cooling. The Economizer Damper will be set to its minimum position.

Supply Fan Control

Any time the Supply Fan is requested to start, a timer is checked to make sure the Supply Fan has been off for at least 1 minute. This 1-minute delay is a protection against rapid cycling of the Supply Fan. Once the 1-minute delay has been satisfied, the Supply Fan relay is activated and all other outputs are verified to be in the off condition for a period of 1 to 2 minutes. This short period of Supply Fan-Only Operation serves to purge the stagnant air from the duct before any Heating or Cooling occurs.

Normally, the Supply Fan runs continuously during the Occupied Mode of operation. If the fan is only required to run in the Occupied Mode during Heating, Cooling, or Dehumidification Modes, the AZ 2 Controller can be configured for Fan Cycle Mode.

Duct Static Pressure Control

The AZ 2 Controller reads and controls Static Pressure in the duct system if the Supply Fan has been configured for Duct Static Pressure Control. Any time the Supply Fan is operating, the AZ 2 Controller is controlling Duct Static Pressure. The Duct Static Pressure Setpoint is user-adjustable.

The Duct Static Pressure Control Output Signal is determined by whether you select a Supply Fan VFD (0-10 VDC) or Bypass Damper (2-10 VDC). This Output Signal can be used to directly connect to a Supply Fan VFD. The Output Signal increases (increases VFD Speed) if the Duct Static Pressure is below the Duct Static Pressure Setpoint by the Deadband amount, and the Output Signal decreases (decreases VFD Speed) if the Static Pressure is above the Setpoint by the Deadband amount.

When using a Zoning Bypass Damper the Output Signal decreases (closes Zoning Bypass Damper) if the Duct Static Pressure is below the Duct Static Pressure Setpoint by the Deadband amount, and the Output Signal increases (opens Zoning Bypass Damper) if the Static Pressure is above the configurable Setpoint by the Deadband amount.

WARNING: AAON does not assume responsibility for protecting the equipment from over-pressurization! You should always install mechanical high static protection cutoffs to protect your system!

Any time the Supply Fan is off, the Duct Static Pressure Control Output Signal will remain at zero volts unless it is configured for Bypass Damper Control in which case it will be at ten volts. If the duct static pressure exceeds the Duct Static Pressure Alarm Setpoint the unit will shut down. until one of the following things occur:

1. The Duct Static Pressure Alarm is reset by selecting the reset button located in the alarms area of the System Manager TS screens or the Prism 2 software screens.
2. The AZ 2 Controller's power is cycled.

Duct Static Pressure Control for Filter Loading

In order to maintain a constant CFM through the supply air ducts on a mixed air CAV unit, the AZ 2 Controller can utilize a Duct Static Pressure Sensor (used to monitor the discharge pressure) in conjunction with a Supply Fan VFD. If the filters are getting dirty, the AZ 2 Controller will ramp up the VFD to compensate for the decrease in airflow. To utilize this feature, the unit must be configured to use VFD Filter Loading. This feature cannot be used if this is a VAV or Zoning application with typical Duct Static Pressure Control.

Building Pressure Control

The AZ 2 Controller can maintain Building Static Pressure any time the Supply Fan is operating by activating a Constant Volume Exhaust Fan, a VFD Exhaust Fan, or a Modulating Exhaust Damper. A Building Pressure Transducer must be connected to the EM1 Expansion Module. For Constant Volume Exhaust Fan applications, only an Exhaust Fan Relay and on/off operation of the Exhaust Fan must be configured. If using an Exhaust Fan with VFD, Modulating control must be configured in order for this feature to operate. An Exhaust Fan Relay can also be configured along with Modulating Building Pressure control for an Exhaust Fan Enable output.

Modulating Control

If configured, a VFD Exhaust Fan or Modulating Exhaust Damper will be controlled by varying a user adjustable control signal (variable between 0 to 10 VDC). If an enable output is required, an Exhaust Fan Relay can also be configured. The Exhaust Fan Relay and the Modulating Signal will activate when the Building Static Pressure rises above the Building Static Pressure Setpoint and will modulate based on a 0.05" WC proportional window. The Exhaust Fan Relay will remain active until the Building Static Pressure falls below the Building Static Pressure Setpoint and the Modulating Signal falls to 0%.

On/Off Control

If you do not require a Modulating Control Signal, you can also configure one of the Relay Outputs as an Exhaust Fan Relay to activate whenever the Building Static Pressure is above the Building Static Pressure Setpoint. The Exhaust Fan Relay will deactivate when the Building Static Pressure falls below the Building Static Pressure Setpoint. Only one Relay Output should be configured for this operation. There is no staging of additional Exhaust Fan Relays.

IAQ (CO_2) Operation

If you have configured the AZ 2 Controller to monitor and control CO_2 levels, the Economizer operation will be modified as follows:

1. The Maximum Reset Position the Economizer can open to is determined by a user-adjustable setpoint called the Economizer Minimum Position at High CO_2.
2. The Minimum Position the Economizer can close down to is reset higher as the level of CO_2 increases above the configured Low CO_2 Level Setpoint. As the CO_2 level increases above the adjustable High CO_2 Level Setpoint, the Outdoor Air Damper will start opening beyond its Minimum Position. At the High CO_2 Setpoint, the Economizer will be held to its Maximum Reset Position and not allowed to open any further unless in Economizer Mode.

Pre-Heater Operation

In climates where freezing temperatures are experienced, it is desirable to preheat the Outdoor Air being drawn into the HVAC unit before it reaches the Water Coils to prevent freezing. The Pre-Heater control option is available by setting a Preheat/Low Ambient Setpoint and by configuring one of the relay outputs as a Pre-Heater. Only one relay can be configured for this option, and therefore, staging of Pre-heater relays is not available. The Pre-Heater operation will only operate in the Occupied Mode.

The Pre-Heater sequence operates so that any time during the Occupied mode, if the Outdoor Air Temperature is below the Pre-heat/Low Ambient Enable Setpoint and the Supply Fan is running, the Pre-heater Relay will activate. It will remain on until the Outdoor Air Temperature rises 1°F above the Setpoint or until the Supply Fan shuts down. If the Proof of Flow option is installed and configured, its signal must also be active for the Pre-Heater Relay to activate.

Low Ambient Operation

A Preheat/Low Ambient Relay can be configured. Whenever the Outdoor Air Temperature falls below the Preheat/Low Ambient Setpoint, the Low Ambient Relay will energize. This operation occurs in both the Occupied and Unoccupied Modes of Operation.

Single Zone VAV Mode

In this application, the AZ 2 Controller will modulate the Supply Fan VFD to maintain the Space Cooling or Heating Setpoint while the unit's cooling or heating source is modulating to maintain the appropriate Supply Air Setpoint. This sequence will operate optimally when the HVAC unit has modulating heating and cooling. Staged heating and cooling should not be used and will not provide satisfactory performance.

When the Space Temperature rises one deadband (user adjustable) above the Space Cooling Setpoint, the cooling mode is initiated. The Supply Fan will energize and begin operating at a user adjustable speed. Cooling will modulate to maintain the Active Supply Air Cooling Setpoint. The Supply Fan will then proportionally modulate as needed within a user adjustable reset range. The Cooling Mode is disabled when the space temperature falls one deadband below the Space Cooling Setpoint.

When the Space Temperature falls one deadband below the Space Heating Setpoint, the Heating Mode is initiated. The Supply Fan will energize and begin operating at a user adjustable speed. Heating will modulate to maintain the Active Supply Air Heating Setpoint. The Supply Fan will then proportionally modulate as needed between 0% and 100% (user adjustable) as the Space Temperature falls within the Space Reset Range. The heating mode is disabled when the space temperature rises one deadband above the Space Heating Setpoint.

When the Space Temperature is satisfied and the unit is in the Vent Mode of operation, the fan will operate at a user adjustable speed. During Dehumidification, the fan will operate as described above, depending on if the Space Temperature is calling for Heating, Cooling, or Vent Mode operation.

Whenever the unit is in CO_2 override operation of the Outdoor Air Damper, the minimum VFD fan speed is forced to user adjustable position and can modulate up from there.

In order for the AZ 2 Controller to operate in Single Zone VAV mode, the unit must be configured as follows:

Application Type = Single Zone VAV
Reset Source = No Reset
Duct Static Pressure Control = No

Configure the Cooling Reset Source High Limit and Low Limit Setpoints and the Heating Reset Source High Limit and Low Limit Setpoints to establish the Space Temperature Cooling and Heating range over which the VFD will modulate in those modes.

Outdoor Air Lockouts

The Outdoor Air Cooling and Heating Lockouts Setpoints are designed to prevent unwanted Mechanical Heating or Cooling operation during certain Outdoor Ambient Temperature conditions.

When the Outdoor Air Temperature is below the Cooling Lockout Setpoint, no Mechanical Cooling can operate. However, if the unit is equipped with an Economizer and the AZ 2 Controller is configured to use the Economizer, it can be used to provide free Cooling when the Mechanical Cooling is locked out. For Heat Pumps, the Cooling Lockout also applies to Compressor Heating, which means it usually will be a

lower setting than on Cooling units that are not Heat Pumps. On WSHP units the controller ignores the Outdoor Air Temperature Lockout.

The Outdoor Air Heating Lockout operates so that when the Outdoor Air Temperature is above the Outdoor Air Heating Lockout Setpoints, no Mechanical Heating can operate. This applies to any type of Heating except Compressor Heating as used on Heat Pumps. The lockout for Compressor Heating is explained in the previous paragraph regarding Cooling Lockout Setpoints.

Supply Air Cutoffs

The Supply Air Temperature Cutoffs are designed to prevent extreme hot or cold air from entering the building and for protection of the HVAC equipment.

High Supply Air Temperature Cutoff

High Supply Air Temperature Cutoff is initiated when the Supply Air Temperature rises above the HI SAT Cutoff Setpoint. When this occurs, Heating stages will be deactivated until the Supply Air Temperature falls 10°F below the HI SAT Cutoff Setpoint. Also, the Outside Air Damper will move to its Minimum Economizer Position.

Low Supply Air Temperature Cutoff

Low Supply Air Temperature Cutoff is initiated when the Supply Air Temperature falls below the LO SAT Cutoff Setpoint. If the Supply Air Temperature falls below the LO SAT Cutoff Setpoint for 5 minutes, it is assumed a Mechanical Failure has occurred and all Heating & Cooling will be deactivated, the Supply Air Fan will shut off, and the Outdoor Air Dampers will close. To restore normal operation, one of the following two things must occur:

1. The Supply Air Temperature rises above the LO SAT Cutoff Setpoint by 10°F.
2. The AZ 2 Controller's power is cycled.

If either the High or Low SAT Cutoff occurs 3 times in a 2 hour period the Heating & Cooling will be deactivated, the Supply Air Fan will shut off, and the Outdoor Air Dampers will close and will not come back on until one of the following things occur:

1. The High or Low SAT Cutoff is reset by selecting the reset button located in the alarms screen of the System Manager TS, or the Prism 2 software alarms screen.
2. The AZ 2 Controller's power is cycled.

Scheduling

The AZ 2 Controller has an internal backup for the Real Time Clock (RTC) that allows the controller to keep the time and accurately control scheduling. It can also broadcast the time to the Zone/VAV Controllers if that option is configured.

The AZ 2 Controller has an internal 7-day Schedule with 2 Start/Stop Events per day. You can also have 1 Holiday Schedule with up to 2 Start/Stop Events per day that will apply to 14 different Holiday periods. Periods can be of any length of consecutive days.

You can change the time on the AZ 2 Controller through the System Manager TS. You can also broadcast the time and date to all AZ 2 Controllers from a Windows Computer using the Prism 2 Computer Front-End Software.

Internal Trend Logging

In order to retrieve and utilize the Internal Trend logs you must have a computer with Prism 2 Software installed and connected to the system communications loop. The AZ 2 Controller continuously maintains an Internal Trend Log, which records a fixed set of values at a user-programmed interval.

There are 120 log positions available. Once the last (120th) log position has been recorded, the oldest log value is replaced by each new value. This means you will need to retrieve the logs at an interval that is shorter than the duration of the last 120 logs. The minimum time interval for each log is 1 minute and the maximum is 60 minutes.

For instance a 15 minute log interval and 120 log positions (15 minutes x 120 logs) would give you a duration of 1800 minutes which equals 30 hours before a 15 minute log interval would start over.
Shown below are some log intervals and the duration of 120 logs.

- 1 minute interval = 2 hours
- 12 minute interval = 24 hours
- 15 minute interval = 30 hours
- 30 minute interval = 60 hours
- 60 minute interval = 120 hours

The fixed items are listed in **Table 9**. These items and values are explained in greater detail in the *Prism Computer Front-End Software Technical Guide*.

Terminal Unit Controller Compatibility

The AZ 2 Controller is designed to communicate with AZ 2 Zone/VAV Controllers. The AZ 2 Controller can be configured to broadcast its Internal Schedule, Time and Date, Fan and Heat Status, and Supply Air Temperature. The AZ 2 Controller can also broadcast Force to Max or Force to Fixed Position during Morning Warm-up. The AZ 2 Zone/VAV Controllers broadcast Push-Button Overrides from Unoccupied to Occupied. The controllers can also generate Unoccupied Heating and Cooling calls to the AZ 2 Controller based on Setbacks.

If you are using another manufacturer's VAV Terminal Unit Controllers, the AZ 2 Controller can activate a relay to inform the VAV Terminal Unit Controllers that the AZ 2 Controller is operating in Warm-up Mode. No other information can be passed between the AZ 2 Controller and the other manufacturer's VAV Terminal Unit Controllers. This means that Overrides or Unoccupied Heating and Cooling calls cannot activate the AZ 2 Controller. If you need any of these capabilities, you must use only AZ 2 Zone/VAV Controllers for controlling all of your VAV Terminal Units.

VAV System

When the AZ 2 Controller goes into the Occupied Mode, it initiates Morning Warm-up if the Return Air Temperature is below the Morning Warm-up Target Temperature Setpoint. During Morning Warm Up the AZ 2 Controller can be configured to broadcast a command for the Zone/VAV Controller to move to a Maximum or Fixed Air Flow position.

Once Morning Warm-up has been satisfied, the AZ 2 Controller enters the Cooling Mode and the Zone/VAV Controllers will modulate to satisfy their Space Temperature Setpoints. If the Space Temperature falls below the Heating Setpoint, staged or modulating Reheat can be activated to warm the space.

Communications between the AZ 2 Controller and the Zone/VAV Controllers are handled by the MiniLink. Alarm Polling is also monitored by the MiniLink. A computer running Prism Front-End Software is required to retrieve all data acquired by the MiniLink.

AZ 2 Controller Log Items		
Date	Modulating Cooling (%)	CO2 High Level Setpoint
Time	Heating Stages Active	Building Pressure
Mode of Operation (See Codes)	Modulating Heating (%)	Building Pressure Setpoint
HVAC Mode (See Codes)	Outdoor Air Temperature	Exhaust Fan Speed (%)
Space Temperature	Outdoor Relative Humidity	All Relay Status
Cooling Enable Setpoint	Outdoor Wetbulb	Return Air Temperature
Heating Enable Setpoint	Outdoor Dewpoint	Slide Offset
Mavericks	Duct Static Pressure	Indoor Relative Humidity
Cooling Status (See Codes)	Duct Static Setpoint	Indoor Relative Humidity Setpoint
Heating Status (See Codes)	Supply Fan Speed (%)	Reheat Stages Active
Economizer Status (See Codes)	Economizer Position (%)	Modulating Reheat (%)
Supply Air Temperature	Economizer Minimum Setpoint	Humidifier Output (%)
Supply Air Setpoint	CO2 Level	Humidifier Setpoint
Cooling Stages Active	CO2 Low Level Setpoint	

AZ 2 Controller Log Item Codes		
Mode of Operation 0 = Unoccupied 1 = Occupied 2 = Forced Unoccupied 3 = Forced Occupied 4 = Remote Occupied 5 = Override 6 = Zone Override 7 = Holiday Occupied 8 = Holiday Unoccupied 9 = Optimal Start 10 = Power Up Delay	**HVAC Mode** 0 = Off Mode 1 = Cool Mode 2 = Heat Mode 3 = Vent Mode 4 = Dehumidification Cool Mode 5 = Dehumidification Heat Mode 6 = Dehumidification Vent Mode 7 = Morning Warm Up 8 = Not Used 9 = Outputs Forced 10 = Failure Mode 11 = Fan Starting Delay	**Cooling Status** 0 = Cooling Enable 1 = Locked Out by OAT 2 = Locked Out by VFD 3 = Locked Out by Proof Of Flow 4 = Lo SAT Cutoff 5 = Emergency Shutdown
Heating Status: 0 = Heating Enable 1 = Locked Out by OAT 2 = Locked Out by VFD 3 = Locked Out by Proof Of Flow 4 = Hi SAT Cutoff 5 = Emergency Shutdown	**Economizer Status** 0 = Disabled by Schedule 1 = Enabled 2 = Disabled by OAT 3 = Enabled Reset by CO2 4 = Disabled Reset by CO2 5 = Emergency Shutdown	

Table 8: Internal Trend Log Information

Zoning System

The AZ 2 Controller is configured for Voting Control by choosing "Zoning" under the Application Type. The actual unit control is performed based on the voting demand of the Zone/VAV Controllers. The MiniLink totals the Heating and Cooling demands and determines which HVAC Mode the AZ 2 Controller should be in. A demand of more than 1 degree from any one zone is required to initiate heating or cooling operation.

Once the AZ 2 Controller receives the broadcast to set the HVAC Mode (Heating, Cooling, or Vent), it operates as previously described in the AZ 2 Controller Sequence of Operation.

When the AZ 2 Controller is configured for Voting the Return Air Sensor is automatically selected as the Control Source. In the event that communications are lost to all of the Zone/VAV Controllers, the AZ 2 Controller will begin to control the HVAC unit based on Return Air in order to maintain an acceptable level of comfort until communications with the zones can be restored.

A total of 16 zones can be configured as voting zones. Additional zones would be allowed but would be non-voting zones and not included in the voting process.

Zone/VAV Configuration & Setup

General

Configuration can be accomplished by using either the System Manager TS or a personal computer with Prism software installed. Several options are available to configure the AZ 2 Zone/VAV Controller for the appropriate equipment it is installed on. All of these options can be set from the "Configuration" menu with the exception of "AHU Heating Call Setpoint" which is set from the "Setpoints" menu. **See Figure 111**.

Box Control Method

Set this configuration item for the type of box the AZ 2 Zone/VAV Controller is used on. All options below are available with and without reheat. The options are:

- Cooling Only Box (VAV)
- Heating/Cooling Changeover Box (Zoning)
- Series Fan Powered Box (VAV & Zoning)
- Parallel Fan Powered Box (VAV & Zoning)

Damper Operating Mode

This option sets the direction of rotation the damper moves when driving towards its full open position. The options available are:

- Direct Acting (Clockwise-to-Open Damper)
- Reverse Acting (Counterclockwise-to-Open Damper)

NOTE: Direct Acting is the Default. When the operating mode is changed the damper will re-calibrate.

Voting Zone

When the AZ 2 Zone/VAV Controller is being used on a "Zoning" system as opposed to a true VAV system, this option must be set to allow the MiniLink to determine if this controller should be included in the zoning system voting process. If this is set to "Yes", this controller will be included in the voting process. If this is a zoning system and it is set to "No", this controller will not vote in the zoning system voting process. If this is a true "VAV" system, the option should be set to "No". A Maximum of 16 voting zones can be configured. The options available are:

- Yes
- No

Pressure Independent Boxes-Airflow @ 1" W.C.

If this is a pressure independent box, this option allows you to calibrate the box CFM correctly using the box manufacturer's "K" factor. Enter the correct "K" (CFM) factor for the inlet diameter of the box you are configuring. See the "K" factor table that follows if you are using the AZ 2 Round Zone/VAV Dampers.

Airflow @ 1" W.C. Across Airflow Pickup On AZ 2 Round Damper		
Damper Size	**K-Factor (CFM)**	**Velocity (FPM)**
6" Nominal Dia.	448	2282
8" Nominal Dia.	904	2590
10" Nominal Dia.	1436	2633
12" Nominal Dia.	1891	2408
14" Nominal Dia.	3015	2820
16" Nominal Dia.	3889	2749

K-Factor in the table is corrected to 70 °F @ 1000 ft. elevation. For other elevations add 2% for each additional 1000 ft. of elevation.

Add 1% for each additional 10 degrees of temperature increase.

Expansion Relays - Steps of Reheat

If the box has reheat supplied by an electric coil, this option must be set for the number of electric heating stages on the box. If the box has hot water heat with a 2 position hot water valve, set the number of stages to "1". For hot water heat with a proportional hot water valve, this must be set for "0". Options available are:

- No Staging
- 1 Stage of Reheat
- 2 Stages of Reheat
- 3 Stages of Reheat (**See Figure 19** for more information)

Proportional Heating Signal

If the box has hot water reheat using a proportional hot water valve, set this option to match the voltage signal required by the hot water valve you are using. Options available are:

- 0-10 VDC Voltage Signal
- 2-10 VDC Voltage Signal

Allow Box Heat With AHU Heat

If the box you are using has reheat or auxiliary heat, configuring this setting to 1=Yes will allow the box heat to operate at the same time as the HVAC unit heat. Options available are:

- No
- Yes

Main Fan Status

If the AZ 2 Zone/VAV Controller is installed on a non-fan powered box that has reheat, set this option to "Yes" in order to enable box reheat only when the HVAC unit fan is running. A full description of how this setting affects the various box types in the occupied and unoccupied modes is contained under the "Occupied Mode Sequences" and "Unoccupied Mode Sequences" heading that follow later in this manual. Options available are:

- No - Heat can operate without fan
- Yes - Heat cannot operate without fan

Zone/VAV Controller Configuration & Setup

Push-Button Override Group ID#

During Unoccupied Mode, all AZ 2 Zone/VAV Controllers with a corresponding **Group ID#** will resume Occupied operation whenever any of the AZ 2 Zone/VAV Controllers with the same **Group ID #** has its push-button depressed to initiate an override condition. This allows you to group zones in various areas of the building. For example, individual tenants with several offices could restore occupied mode for just their zones and not affect other zones in the building.

The default group ID number for all AZ 2 Zone/VAV Controllers is set at the factory as 1. If you don't want a specific zone(s) to be part of that group you must give each one a distinct group number between 2 and 16.

NOTE: AAON recommends that your groups consist of at least 3 zones to ensure minimum airflow across the HVAC unit coil.

Dump Zone

The dump zone is a controller without an actuator that is used to control a duct heater or auxiliary heat. If this AZ 2 Zone/VAV Controller is to be used as a "Dump Zone", set this configuration to 1=Yes. Options available are:

- No
- Yes

AHU Heating Call

This setting is located under the "Setpoints" menu and is used only for the Unoccupied mode. For Non-Fan Powered Terminal units, this temperature setpoint is used to allow a heating device such as baseboard heaters to be energized in an attempt to satisfy the heating demand prior to initiating the HVAC unit Supply Air Heating mode. For Fan Powered Terminal Units, this setpoint can be used to operate the Series or Parallel box to satisfy the heating demand by using plenum air and reheat prior to initiating the HVAC Supply Air Heating Mode.

During unoccupied mode, when the temperature in the space drops below the AHU Heat Call setpoint, the AZ 2 Zone/VAV Controller sends a signal to the AZ 2 Unit Controller to initiate the HVAC unit Supply Air Heating Mode. This setpoint temperature can be set higher or lower than the Space Heating Setpoint.

NOTE: This setpoint follows the Unoccupied Heating Setpoint Setback.

Auxiliary Heat

The Auxiliary Heat option allows for a separate setpoint that is different from the other heating setpoints. The Auxiliary Heat Relay energizes at 0.5ºF below the Auxiliary Heat Setpoint and de-energizes 0.5ºF above the Auxiliary Heat Setpoint. The Auxiliary Heat will continue to function regardless of the HVAC Mode the AZ 2 controller is in or at any airflow condition. This is typically used to control baseboard or other perimeter heat sources. See **Table 9** for a complete layout of the various fan and heat relay staging points.

Expansion Relays – Steps of Reheat

If only one stage of heat is required use the "Auxiliary Heat" relay on the Zone/VAV board and select "Used for BOX Re-heating" in the Configuration. Also in "Stages of Box Re-Heat" configure for 1 stage. If the box requires more than one stage of reheat, the OE325-03 Relay Expansion Board must be used and select 2 or 3 stages of heat. If a Fan Terminal Unit is used, use the OE325-03 Relay Expansion Board for all stages of heat.

Box Reheat

The relay will be energized whenever the space temperature drops below the Occupied Heating Setpoint and the damper will go to the Minimum Damper During Box Heating Mode setpoint. The stages of box reheat will need to be set to one.

Binary Input Configuration

Window Open Detection

If the "Window Open" button is checked, and the contacts on terminals BIN & GND are open, the controller will control to the Cooling and Heating Setpoints. When the BIN & GND contacts are shorted, The Zone/VAV controller will drive the damper to the full closed position. If the "Reverse Contact Polarity" button is checked, the Zone/VAV controller will drive the damper closed when the contacts are open.

Motion Sensor Occupancy Detection

If the "Motion Sensor Occupancy Detection" button is checked, then the "Occupancy Detection Time" and "Occupancy Duration Setpoints" will be used to determine the Cooling and Heating Setpoints of the Zone/VAV controller. When the Motion Sensor contacts on terminals BIN and GND are shorted (closed) indicating Occupancy and they remain shorted for the "Occupancy Duration Time Period", the Zone/VAV controller will control to the "Occupied Cooling and Heating Setpoints", the user interface will display "Occupied Mode". If no motion is detected for a period longer that the Occupancy Duration Time Period the contacts will open and the Zone/VAV controller will control to the Occupancy Cooling and Heating Setback temperatures and the user interface will show "Occupied Room Empty" until motion is detected again.

If the "Reverse Contact Polarity" button is checked, then the Zone/VAV controller will control opposite of the previously discussed sequence. In this case, when the Motion Sensor contacts on terminals BIN and GND are shorted (closed), the user interface will show "Occupied Room Empty" and they will control to the "Occupancy Cooling and Heating Setback" Temperatures. When motion is detected again (contacts open) for the Occupancy Detection Time Period" the user interface will display "Occupied Mode" and control to the Occupied Heating and Cooling Setpoints.

Scheduling

Occupied/Unoccupied Mode

The AZ 2 Zone/VAV Controller monitors the communications loop for its Occupied and Unoccupied mode of operation command. Either the AZ 2 Controller or the GPC-XP can transmit the Occupied command to the AZ 2 Zone/VAV Controller. This requires the AZ 2 Zone/VAV Controller Actuator Packages to all be connected to the system communication loop through their RS-485 connector and to be properly addressed for the command to be received.

Push-button Override Operation

During unoccupied hours, you can force the AZ 2 Zone/VAV Controller and AZ 2 Controller back to occupied operation by pressing the override button on the Standard Room Sensor or Digital Room Sensor. The operation for the push-button override sequence is different depending on which sensor you are using.

Standard Room Sensor

Pushing the override button for less than 3 seconds initiates the override which will continue for a configurable duration of time (0-8 hours). If during the override period the button is pressed a second time for less than 3 seconds, an additional configurable duration of time (0-8 hours) will be added to the remaining override duration that is left at the time of pushing the button.

Digital Room Sensor

Pushing the override button momentarily initiates the override which will continue for a configurable duration of time (0-8 hours). If during the override period the button is pressed a second time, it will cancel the override.

Multiple Daily Setpoints/Schedules

By clicking on the "Use Schedule Space Setpoints" box, in the Prism Setpoints/Configuration screen, you can set up to 5 temperature setpoint periods in a 24 hour period. You select a Cooling and Heating setpoint for the period from Midnight to first event, then different setpoints from first event to second event, then second event to third event, then third event to fourth event and finally from the fourth event to midnight. Each of the event times and temperatures are configurable.

Protection Mode

This mode occurs and will appear on the main status screen when the Auto-Zone 2 HVAC unit controller is connected with Zone/VAV controllers for zoning or VAV box control and the "Broadcast Commands to Boxes" (configuration screen 22 of 22) has not been checked. See **Figure 76** under the "Controller Configuration" heading and its associated text for complete details

HVAC Modes of Operation

There are 7 possible modes of operation for the HVAC Unit and the AZ 2 Zone/VAV Controller. These modes are determined by the Supply Air Temperature (SAT) and/or space demand conditions. They are:

- **Supply Air Vent Mode**
  (Based on HVAC Unit SAT)
  This mode occurs when the Supply Air Temperature is within 2°F of the Space Temperature and stays in this mode until the Supply Air Temperature is above or be low the Space Temperature plus or minus the Supply Air HVAC Mode Deadband.

- **Space Vent Mode**
  (Based on AZ 2 Zone/VAV Controller Space Temp.)
  This mode occurs when the Space Temperature is below the Cooling Setpoint and 1.0 °F above the Heating Setpoint.

- **Supply Air Cooling Mode**
  (Based on HVAC Unit SAT)
  This mode occurs when the Supply Air Temperature falls to less than the Space Temperature minus the Supply Air HVAC Deadband. To cancel the supply air cooling mode, the supply air temperature must rise to within 2 °F of the space temperature.

- **Space Cooling Mode**
  (Based on AZ 2 Zone/VAV Controller Space Temp.)
  This mode occurs when the Space Temperature rises above the Space Cooling Setpoint.

- **Supply Air Heating Mode**
  (Based on HVAC Unit SAT)
  This mode occurs when the Supply Air Temperature rises to a temperature that is greater than the Space Temperature plus the Supply Air HVAC Deadband. To cancel the supply air heating mode, the supply air temperature must fall to within 2 °F of the space temperature.

- **Space Heating Mode**
  (Based on AZ 2 Zone/VAV Controller Space Temp.)
  This mode occurs when the Space Temperature falls to 1.0 °F below the Space Heating Setpoint.

- **Off Mode** - (Not displayed.)
  During unoccupied mode, the mode is considered 'OFF' if the space temperature does not generate a heating mode or cooling mode based on the unoccupied heating & cooling setpoints.

Zone/VAV Occupied Mode Sequences

Damper Positions

The actual values for the minimum damper positions that are described in the following paragraphs can be configured by changing the values in the setpoint screens for the AZ 2 Zone/VAV Controller. These minimums are expressed in damper open percentages for pressure dependent terminal units or in CFM for pressure independent terminal units.

Cooling Minimum

When the HVAC unit is in the Supply Air Cooling mode but the space does not require cooling, the Zone/VAV damper will move to the Cooling Minimum position.

Heating Minimum

When the HVAC unit is in the Supply Air Heating mode but the space does not require Heating, the Zone/VAV damper will move to the Heating Minimum position.

Vent Minimum

This is the position the Zone/VAV damper will move to when the HVAC unit is in the Supply Air Vent mode.

Night Minimum

This is the position that the damper moves to during the Unoccupied mode. When using non-fan powered terminal units, the Zone/VAV damper will position itself in the Night Minimum position. In order for fan powered terminal units to position the damper to the Night Minimum position, the check for main fan status must be selected, and the HVAC unit fan must be operating.

Box Heating Minimum

This is the position that the damper moves to when Reheat is initiated. If the AZ 2 Zone/VAV Controller is used on a terminal unit that has reheat, the Zone/VAV damper will move to the Reheat position whenever a Space Heating demand occurs and the HVAC unit is in Supply Air Cooling or Vent mode. When the HVAC unit is in Supply Air Heating mode, the Zone/VAV damper will modulate as required to maintain the Space Heating Setpoint.

Occupied Mode Sequences

Space Vent Mode

This mode only applies to the Occupied Mode of operation. If the equipment is in the Unoccupied Mode, then a lack of heating or cooling demand would generate the Off Mode.

If the HVAC unit is in Supply Air Vent Mode, you can adjust the damper position on pressure dependent terminal units and the airflow on pressure independent terminal units to provide a fixed amount of ventilation air into the space when there are no heating or cooling demands. During this time, the damper does not modulate on pressure dependent terminal units. On pressure independent terminal units, it only modulates to the extent required to maintain the Vent Minimum Airflow setting.

If the AZ 2 Zone/VAV Controller detects that the HVAC unit is in Supply Air Heating Mode, indicating that the air handler has activated its heat, the Heating Airflow Minimum will be substituted for theVent Minimum.

If the AZ 2 Zone/VAV Controller detects that the HVAC unit is in Supply Air Cooling Mode, indicating that the air handler has activated its cooling, the Cooling Airflow Minimum will be substituted for the Vent Minimum.

NOTE: A Zone Expansion Module is required for each Zone/VAV Controller used when you are using a Fan Terminal even if you do not have any heat requirements. All Single Duct Terminal Units with heat also require a Zone Controller Expansion Module.

Space Cooling Mode

Occupied Space Cooling mode is initiated by the temperature in the space rising to within 0.5ºF of the Occupied Cooling Setpoint.

If the HVAC unit is in the Supply Air Heating Mode and another Zone/VAV Controller has a cooling demand, the Damper Position/Airflow for the Zone/VAV Controller requiring cooling will position itself to provide the Heating Minimum Damper Position/Airflow Setpoint amount of air into the space. No modulation open will occur because the space does not want the warm air currently being supplied by the air handler.

When the HVAC unit is in the Supply Air Cooling Mode, the damper is normally held at the Minimum Cooling Position until the Space Temperature begins to rise above the Occupied Cooling Setpoint. As the Space Temperature rises to within 0.5ºF of the Occupied Cooling Setpoint, the Damper/Airflow calculation causes the air valve to open proportionally until the Maximum Setpoint is achieved at 1.5ºF above the setpoint. This is a 2ºF Proportional Window starting 0.5ºF below the Occupied Cooling Setpoint to 1.5ºF above the Occupied Cooling Setpoint.

The Damper Position/Airflow is never allowed to modulate outside the user-adjustable Minimum and Maximum setpoints. The Maximum Damper/ Position/Airflow Setpoint applies to Heating and Cooling modes of operation only. All of the modes have their own individual minimum setting.

Series Flow Fan Terminals

If the AZ 2 Zone/VAV Controller has been configured as a Series Fan Powered terminal unit, the series fan relay will activate and run the series box fan continuously anytime the HVAC unit fan is running.

In all cases, before the series box fan can be activated, the air damper is driven fully closed and held that way for 30 seconds to make sure the series box fan hasn't inadvertently started to spin backwards. Once the series box fan starts, it waits an additional 10 seconds to allow the fan to spin up before it starts to open the damper and introduce airflow from the HVAC unit fan.

Parallel Flow Fan Terminals

During normal cooling or vent mode and adequate air supply, the parallel fan will be off. During the occupied cooling mode, the fan will only activate if the damper/airflow is below a user-defined low limit setting. This causes it to be used as a supplemental air source. When the damper/airflow rises 15% above the low limit setpoint, the fan will be deactivated.

NOTE: A Zone Expansion Module is required for each Zone/VAV Controller used when you are using a Fan Terminal even if you do not have any heat requirements. All Single Duct Terminal Units with heat also require a Zone Controller Expansion Module.

Space Heating Mode

Occupied Space Heating mode is initiated by the temperature in the space falling to within 0.5ºF of the Occupied Heating Setpoint.

If the HVAC unit is in the Supply Air Cooling mode and another AZ 2 Zone/VAV Controller has a heating demand, the damper/airflow for the Zone/VAV Controller requiring heating will position itself to provide the Cooling Minimum amount of air into the space. No modulation open will occur because the space does not want the cold air currently being supplied by the air handler.

When the HVAC unit is in the Occupied Supply Air Heating mode, the damper will be held at the Heating Minimum position until the space temperature falls to within 0.5ºF of the Occupied Heating Setpoint. As the space temperature falls below the heating setpoint, the damper/airflow calculation causes the air valve to open proportionally until the maximum setpoint is achieved at 1.5ºF below the setpoint. This is a 2 ºF proportional window starting 0.5ºF above the heating setpoint to 1.5ºF below the heating setpoint.

Two different configurations are available for the Occupied Space Heating mode. If the box is configured to allow reheat during Supply Air Heating mode, the reheat relays can be activated even when the HVAC unit is in the Supply Air Heating mode. If the box is configured not to allow reheat when the HVAC unit is in Supply Air Heating mode, the box heat relays will be de-energized when the HVAC unit is in Supply Air Heating mode. In either configuration, when the HVAC unit is in the Supply Air Heating mode, the damper will modulate open proportionally to the space demand. The proportional window for the space temperature is to 1.5ºF below the heating setpoint. This allows the space to take advantage of the warm supply air in the duct.

The AZ 2 Zone/VAV Controller can activate auxiliary heating relays if the Expansion Module has been connected and the correct number of heating stages (1, 2 or 3) has been configured. During demands for heat, the first stage will activate whenever the space temperature drops below the heating setpoint. The second stage will activate if the space temperature falls 1.0ºF below the heating setpoint. The third stage will activate if the space temperature falls 2.0ºF below the heating setpoint. There is a two-minute delay between staging. This prevents stages from activating at the same time. Once a heating stage has been activated, it must remain on for at least one minute. Once it has been deactivated, it must remain off for at least two minutes. The third stage relay will deactivate when the space temperature rises to within 1.0ºF of the heating setpoint. The second stage relay will deactivate when the space temperature rises to the heating setpoint. The first stage relay will deactivate when the space temperature rises above the heating setpoint by 1.0ºF. See **Table 9** for a complete layout of the various fan & heat relay staging points.

Modulating (Proportional) Heat

The AZ 2 Zone/VAV Controller Actuator Package with a Zone Controller Expansion Module provides an analog output for control of a modulating hot water valve or SCR electric heater. It provides a 0-10 VDC signal to control the heating device. When the space temperature drops to 0.5ºF above the Heating Setpoint the output starts at 0 VDC and ramps up to 10 VDC at 1.5 below the Heating Setpoint.

Auxiliary Heat

The Auxiliary Heat option allows for a separate setpoint that is different from the other heating setpoints. The Auxiliary Heat Relay energizes at 0.5ºF below the Auxiliary Heat Setpoint and de-energizes 0.5ºF above the Auxiliary Heat Setpoint. The Auxiliary Heat will continue to function regardless of the HVAC Mode the AZ 2 controller is in or at any airflow condition. This is typically used to control baseboard heat or an external duct heater. See **Table 9** for a complete layout of the various fan and heat relay staging points.

Fan & Reheat Relay Staging

Relays Stage On At	Series Fan	Parallel Fan	Heat Stage 1	Heat Stage 2	Heat Stage 3	Aux. Heat
0.5ºF Above Box Heat Setpoint	ON With HVAC Fan *See Note 1	X				
At Box Heat Setpoint			X			
1.0ºF Below Box Heat Setpoint				X		
2.0ºF Below Box Heat Setpoint					X	
0.5ºF Below Aux. Heat Setpoint						X
Relays Stage Off At	**Series Fan**	**Parallel Fan**	**Heat Stage 1**	**Heat Stage 2**	**Heat Stage 3**	**Aux. Heat**
1.0ºF Above Box Heat Setpoint	OFF With HVAC Fan See Note 1	X See Note 2				
1.0ºF Above Box Heat Setpoint			X			
At Box Heat Setpoint				X		
1.0ºF Below Box Heat Setpoint					X	
0.5ºF Above Aux. Heat Setpoint						X

Note:
1.) If check for main fan status is selected when configuring the controller, the series fan will energize anytime the HVAC unit's fan is operating, even in the unoccupied mode.
2.) The parallel fan will continue to run for 2 minutes following the relay staging off.

Table 9: Fan & Reheat Relay Staging

Zone/VAV Unoccupied Mode Sequences

Series Flow Fan Terminals

If the AZ 2 Zone/VAV Controller has been configured as a Series Fan Powered terminal unit, the series fan relay will activate and run the series box fan continuously anytime the HVAC unit fan is running.

In all cases, before the series box fan can be activated, the air damper is driven fully closed and held that way for 30 seconds to make sure the series box fan hasn't inadvertently started to spin backwards. Once the series box fan starts, it waits an additional 10 seconds to allow the fan to spin up before it starts to open the damper and introduce airflow from the HVAC unit fan.

Parallel Flow Fan Terminals

On parallel fan powered terminal units, the fan will run whenever Space Heating mode is active. At all other times, the fan will only activate if the damper/airflow is below a user defined low limit setting. This causes it to be used as a supplemental air source. When the damper/airflow rises 15% above the low limit setpoint, the fan will be deactivated if there are no heating stages active, and no space demand exists.

The check for main fan status setting has no effect on the Parallel Fan box when in the occupied mode. The Parallel Fan will only be energized when in the Space Heating mode.

Unoccupied Mode Sequences

Space Vent Mode

This mode only applies to the Occupied Mode of operation. If the equipment is in the Unoccupied Mode, then a lack of heating or cooling demand would generate "No Space Demand" on the AZ 2 Controller display.

Space Cooling Mode

During unoccupied mode, the HVAC unit is normally off. Unoccupied Space Cooling mode is initiated by the temperature in the space rising to within 0.5ºF of the Unoccupied Cooling Setpoint.

If the HVAC unit is in the Unoccupied Supply Air Heating mode because one or more of the AZ 2 Zone/VAV Controllers has a heating demand and another Zone/VAV Controller has a cooling demand, the damper/airflow for the Zone/VAV Controller requiring cooling will position itself to provide the heating minimum setpoint amount of air into the space. No modulation open will occur because the space does not want the warm air currently being supplied by the air handler.

When the HVAC unit is in the Unoccupied Supply Air Cooling mode, the damper will be held at the Night Minimum Position until the space temperature begins to rise above the cooling setpoint. As the space temperature rises to within 0.5ºF of the Unoccupied Cooling Setpoint, the damper/airflow calculation causes the air valve to open proportionally until the maximum setpoint is achieved at 1.5ºF above the setpoint. This is a 2ºF proportional window starting 0.5ºF below the cooling setpoint to 1.5ºF above the cooling setpoint.

The damper/airflow is never allowed to modulate outside the user-adjusted minimum and the maximum setpoints. The maximum damper/airflow setpoint applies to heating and cooling modes of operation only. All of the modes have their own individual minimum setting.

Series Flow Fan Terminals

If the Zone/VAV Controller has been configured as a Series Fan Powered terminal unit and check for main status has been selected, the series fan relay will activate and run the series box fan continuously anytime the HVAC unit fan is running. The damper will be held at the Night Minimum Position until the space temperature begins to rise above the cooling setpoint. If check for main fan status has not been selected, the series fan relay will activate and run the series box fan when in the Space Cooling mode. The damper will be in the fully closed position until the space temperature begins to rise above the cooling setpoint.

In all cases, before the series box fan can be activated, the air damper is driven fully closed and held that way for 30 seconds to make sure the series box fan hasn't inadvertently started to spin backwards. Once the series box fan starts, it waits an additional 10 seconds to allow the fan to spin up before it starts to open the damper and introduce airflow from the HVAC unit fan.

Parallel Flow Fan Terminals

In the Unoccupied Cooling Mode, the parallel fan will be off whether "Check for Main Status" has been selected or not. If "Check for Main Status" has been selected, and the main AHU fan is on the damper will be held at the Night Minimum Position, if the main AHU fan is off, the damper will he held fully closed, until the Space Temperature begins to rise above the Cooling Setpoint. If "Check for Main Status" has not been selected, the damper will be held in the fully closed position until the Space Temperature begins to rise above the Cooling Setpoint.

Space Heating Mode

During unoccupied mode, the HVAC unit is normally off. Unoccupied Space Heating mode is initiated by the temperature in the space falling to within 0.5ºF of the Unoccupied Space Heating Setpoint.

If the HVAC unit is in the Unoccupied Supply Air Cooling mode because one or more of the Zone/VAV Controllers has a cooling demand and another Zone/VAV Controller has a heating demand, the damper/airflow for the Zone/VAV Controller requiring heating will position itself to provide the Night Minimum Position setpoint amount of air into the space. No modulation open will occur because the space does not want the cold air currently being supplied by the air handler.

When the HVAC unit is in the Unoccupied Supply Air Heating mode, the damper will be held at the Night Minimum Position until the space temperature begins to fall below the Unoccupied Heating Setpoint. As the space temperature falls to 0.5ºF below the Unoccupied Heating Setpoint, the damper/airflow calculation causes the air valve to open proportionally until the maximum setpoint is achieved at 1.5ºF below the setpoint. This is a 2ºF proportional window starting 0.5ºF above the heating setpoint to 1.5ºF below the heating setpoint.

As with the Occupied Mode of operation, two different configurations are available for the Unoccupied Space Heating mode. If the box is configured to allow reheat during Supply Air Heating mode, the reheat relays can be activated even when the HVAC unit is in the Supply Air Heating mode. If the box is configured not to allow reheat when the HVAC unit is in Supply Air Heating mode, the box heat relays will be de-energized when the HVAC unit is in Supply Air Heating mode. In either configuration, when the HVAC unit is in the Supply Air Heating mode, the damper will modulate open proportionally to the space demand. The proportional window for the space temperature is 0.5ºF above to 1.5ºF below the heating setpoint. This allows the space to take advantage of the warm supply air in the duct.

If check for main fan status is not selected and the Zone/VAV terminal unit has auxiliary heat (baseboard heat etc.) that does not require the HVAC unit fan to operate, reheat can be used without the HVAC unit fan operating. If check for main fan status is selected, the reheat will only operate when the HVAC unit fan is operating.

The Zone/VAV Controller can activate auxiliary heating relays if the Expansion Module has been connected and the correct number of heating stages (1, 2 or 3) has been configured. During demands for heat, the first stage will activate whenever the space temperature drops below the heating setpoint. The second stage will activate if the space temperature falls 1.0ºF below the heating setpoint. The third stage will activate if the space temperature falls 2.0ºF below the heating setpoint. There is a two-minute delay between staging. This prevents stages from activating at the same time. Once a heating stage has been activated, it must remain on for at least one minute. Once it has been deactivated, it must remain off for at least two minutes. The third stage relay will deactivate when the space temperature rises to within 1.0ºF of the heating setpoint. The second stage relay will deactivate when the space temperature rises to the heating setpoint. The first stage relay will deactivate when the space temperature rises above the heating setpoint by 1.0ºF. See **Table 10: Fan & Reheat Relay Staging** for a complete layout of the various fan & heat relay staging points.

Modulating (Proportional) Heat

The Zone/VAV Controller Actuator Package also provides an analog output for control of a modulating hot water valve or SCR electric heater. It provides a 0-10 VDC signal to control the heating device. When the space temperature drops to 0.5ºF above the Heating Setpoint, the output starts at 0 VDC and ramps up to 10 VDC at 1.5 below the Heating Setpoint.

Auxiliary Heat

The Auxiliary Heat option allows for a separate setpoint that is different from the other heating setpoints. The Auxiliary Heat Relay energizes at 0.5ºF below the Auxiliary Heat Setpoint and de-energizes 0.5ºF above the Auxiliary Heat Setpoint. The Auxiliary Heat will continue to function regardless of the HVAC Mode the AZ 2 Controller is in, or at any airflow condition. This is typically used to control baseboard heat or an external duct heater.

Series Flow Fan Terminals

If the AZ 2 Zone/VAV Controller has been configured as a Series Fan Powered terminal unit, the series fan will run continuously when the Zone/VAV Controller is in the Space Heating mode, no matter whether check for main fan status has been selected or not. If the HVAC unit is in Supply Air Heating mode, the damper will modulate to maintain the Space Heating Setpoint.

Any series fan terminal unit that has check for main fan status selected will also operate its series box fan anytime the HVAC unit controller is broadcasting that the HVAC unit fan is operating, regardless of whether it is calling for heat or not. The damper will be held at the closed position until the main fan status broadcast is received. Once the broadcast is received, the damper will then move to its Reheat Minimum position. If check for main fan status has not been selected, the series box fan will only activate and run when it is in Space Heating mode. When in Space Heating mode, the damper will move to its Reheat Minimum position. When in Supply Air Heating mode, the damper will modulate to maintain the Unoccupied Heating Setpoint.

In all cases, before the series box fan can be activated, the air damper is driven fully closed and held that way for 30 seconds to make sure the series box fan hasn't inadvertently started to spin backwards. Once the series box fan starts, it waits an additional 10 seconds to allow the fan to spin up before it starts to open the damper and introduce airflow from the HVAC unit fan.

Parallel Flow Fan Terminals

If the Zone/VAV Controller has been configured as a Parallel Fan Powered terminal unit, the Parallel fan will run continuously when the Zone/VAV Controller is in the Space Heating mode no matter whether check for main fan status has been selected or not. At all other times, the fan will be off.

If check for main fan status is selected, the damper will remain in the closed position until the HVAC unit controller is broadcasting that the HVAC unit fan is operating, regardless of whether it is calling for heat or not. The damper will be held at the closed position until the main fan status broadcast is received. Once the broadcast is received, the damper will then move to its Night Minimum position. If check for main fan status has not been selected, the damper will stay in the closed position until Space Heating mode is initiated. When in Space Heating mode the damper will move to its Reheat Minimum position. When in Supply Air Heating mode the damper will modulate to maintain the Unoccupied Heating setpoint.

Damper Control

The damper position is calculated by the demand from the space. This calculation can also include an optional Integral function. This prevents the damper/airflow from stagnating at a position somewhere above the setpoint because the supply air temperature or duct pressure isn't quite enough to satisfy the space at the currently calculated proportional position. The Integral causes the calculation to keep adding a small amount of the proportional error back into the damper/airflow position each time a new position is calculated. The amount the Integral adds back in is user adjustable. This value is presented as a number between 0.0 and 10.0. That means that if the integral is less than 1.0, you are adding a percentage from 0 to 100% of the error back into the calculation. If you increase the Integral above 1.0, you are adding more than 100% back in.

With just proportional control, a 1ºF error would cause a 50% increase in damper/airflow if the Integral is not included. (1 °F is half of the 2ºF Proportional Window).

If you had set the Integral to 1.0, the calculation would add 2% to the current damper/airflow calculation each time. The calculation occurs once every 10 seconds, so it would take a little over 4 minutes to reach the programmed 100% maximum.

Example:

1. 50% Remaining / 2% Integral = 25 Moves to get to a 100% Maximum
2. 25 Moves times 10 seconds = 250 seconds or a little over 4 minutes to reach the 100% maximum damper/airflow position.

Of course, different space temperature errors and different Integral values cause this calculation to operate slower or faster. It is up to the user to determine the optimum setting that provides the tightest temperature control without causing the damper to continue to hunt or modulate, causing premature wear of the actuator gears and motor.

On pressure dependent terminal units, the damper position is maintained to within ± 3% of the calculated position. No attempt is made to position the damper exactly on the calculated position. This reduces wear and tear on the actuator gears and motors and the amount of airflow involved is not affected by that small amount of damper error.

On pressure independent terminal units, the airflow is maintained to within roughly 3% of the terminal unit size constant, but no tighter than 16 CFM on the smallest terminal units. The actual control window is based on the formula:

Window = Terminal unit size X Square Root (1 / 750)

Where Terminal unit size refers to the total rated CFM of the terminal unit.

This sliding window allows the control to be much tighter on the smaller terminal units than can be achieved on the larger terminal units as far as CFM readings. On a large terminal unit, 25 CFM may not be noticeable, but on a small terminal unit, 25 CFM may be more than the minimum airflow setting for the space.

If the pressure sensor is disconnected or fails on a pressure independent terminal unit, the controller automatically reverts to pressure dependent operation and generates an alarm to alert the user that a failure has occurred.

On either type of terminal unit, a space sensor failure will force the damper to position itself to the 50% of the maximum damper position setpoint, and it will not change until the sensor is repaired or replaced.

NOTE: For additional Damper Control information **see Figure 107** and related paragraphs.

Zoning

Description

The AZ 2 Control System can be configured to operate as a true zoning system with the addition of a MiniLink. The MiniLink acts as a loop manager receiving information from the AZ 2 Zone/VAV Controller Actuator Packages, interpreting this information, and then sending a heat, cool, or vent signal to the AZ 2 Controller.

Zone Polling

The MiniLink must be configured for zoning operation from the AZ 2 System Manager TS or Prism 2 computer software. During the setup and configuring, the user is required to enter the last Zone address on the loop. Once configured, the MiniLink begins polling each AZ 2 Zone/VAV Controller for its temperature and setpoint information. A zone poll cycles through all configured zones in one pass without interruption.

The following is a list of status information required by the MiniLink to correctly perform its HVAC Mode calculations.

- Zone Temperature
- Current Cooling Setpoint
- Current Heating Setpoint
- Current Zone Operating Mode Status & Alarm Conditions

A zone is considered **MISSING** if it fails to respond to 5 consecutive polling requests. A Missing Zone alarm can be generated in less than 2 minutes. This alarm can generate an alarm call out to maintenance or a supervisor if the system has been properly setup. See the "Alarm Detection And Reporting" section for more information.

Zone Voting

If a zone has been configured for the **VOTING** mode, the MiniLink will perform the following tests based on the data received during the zone polling operation. These tests insure that only properly operating zones can have an effect on the HVAC Mode calculation.

- The zone has not been reported as MISSING
- The zone is not currently undergoing Damper Calibration
- The zone damper has not failed driving Open or Closed and has passed Calibration
- The zone temperature readings are between 40 °F and 105ºF
- The Zone Cooling Setpoint is between 55 °F and 105ºF
- The Zone Heating Setpoint is between 48 °F and 99 °F
- The zone has not been declared Maverick by the MiniLink
- The zone has been configured as a VOTING zone

If *all* the above tests are passed, the zone temperature and setpoints are then included in the HVAC Mode decision; otherwise, this zone is ignored.

Testing for Maverick Zones

During the HVAC Mode decision process, a zone cannot be included in the Voting if it has been declared as Maverick. A zone is determined to be a Maverick if it stays 4ºF below the Space Heating setpoint for 1 hour or 4ºF above the Space Cooling setpoint for 1 hour. During this 1 hour time period, the zone is still included in the voting, but it generates a **PRIORITY** call for heating or cooling to the MiniLink. During this 1 hour time period, if the Space Temperature moves to within 2ºF of its Space Heating or Space Cooling Setpoint, the **PRIORITY** is canceled. If the zone stays in **PRIORITY** for greater than 1 hour, it then becomes a Maverick zone. At that point, its **PRIORITY** is canceled and the zone is ignored in the voting process until the Space Temperature changes to within 2ºF of its Space Heating or Space Cooling Setpoint. If at least 75% of the zones go Maverick simultaneously, the MiniLink assumes an abnormal condition has occurred in the building and resets all the zones back to normal. It then restarts the 1 hour Maverick test over again for all zones. Maverick testing can be disabled if your system is connected to a personal computer with the Prism 2 Computer Software installed.

Alarm Detection and Reporting

The AZ 2 Zone/VAV Controller continuously performs self diagnostics during normal operations to determine if any operating failures have occurred. These failures can be reported to the user in several ways, depending on the type of system and options installed by the user. If an AZ 2 System Manager TS is connected, the alarms will be reported on the Status Screens. If the Prism 2 computer front end software is installed, the alarms will be reported on the main screen of the program and be logged to disk. If the remote communications option is installed, all alarms except the Damper Feedback Failure condition can initiate an e-mail to alert someone to the alarm condition. See the *Prism 2 Technical Guide* for further information on this topic.

Tenant Override Logs

If you require tenant billing for push-button override usage, a MiniLink must be installed on each local loop. The MiniLink has the ability to track the amount of override time generated by each space sensor equipped with push-button override.

Storing and retrieving these logs requires a dedicated computer running the Prism 2 front-end software program. No other method exists for retrieving these logs. That means that all of your units must be connected together on the communications loop and the loop must be terminated at a CommLink 5 device connected to the on-site computer.

WARNING: This computer must be on 24 hours a day 7 days a week running the Prism 2 software in order for tenant logging to be tracked.

The tenant logs are kept on the dedicated job site computer's hard drive. The only limitation to the number of logs stored is the capacity of the hard drive on the computer to which it is being logged.

NOTE: For proper time and date stamping of the tenant log, you must configure the air handler to broadcast the time so that the AZ 2 Zone/VAV Controllers can read it and use it in their tenant and trend logs.

Zone/VAV Internal Trend Logging

Internal Trend Logging

In order to retrieve and utilize these logs, a computer with Prism 2 computer software installed must be connected to the AZ 2 Controls System. The AZ 2 Zone/VAV Controller continuously maintains an Internal Trend Log, which records a fixed set of values at an interval configured by the user.

There are 120 log values available. Once all 120 log values have been recorded, the oldest value is replaced by each subsequent new value. This means the user is required to retrieve the logs at an interval that is shorter than the duration of the last 120 logs. Shown below are some log intervals and the duration of 120 logs.

1 Minute Interval.....2 Hour Duration

15 Minute Interval.....30 Hour Duration

30 Minute Interval.....60 Hour Duration

60 Minute Interval.....120 Hour Duration

The fixed items in the log are listed below with the column header in parentheses:

- Date (Date)
- Time (Time)
- Space Temperature (Space)
- Active Cooling Setpoint (CoolSP)
- Active Heating Setpoint (HeatSP)
- Supply Air Temperature (SAT)
- Discharge Air Temperature (DAT)
- Airflow (Airflow) [P.I. Units Only]
- Current CO2 Level (CO2)
- Damper Position (Damper)
- Proportional Heat (Heat)
- Current Operating Mode (Mode)
- Space Temperature Mode (SPCMode)
- SAT Mode (SATMode)
- Fan Status (Box)
- Box Heat Stages (BoxHt)
- Auxiliary Heat Stages (AuxHt)

NOTE: For proper time and date stamping of the tenant log, you must configure the AZ 2 Controller to broadcast the time so that the AZ 2 Zone/VAV Controllers can read it and use it in their tenant and trend logs.

CAUTION: These logs are subject to loss if a power outage occurs.

Force Modes or Overrides

The AZ 2 Zone/VAV Controller damper can be forced to one of several positions. These force modes aid the user during troubleshooting or air balancing, etc.

- Force Damper Full Open (Ignores Airflow Reading)
- Force Damper Full Closed (Ignores Airflow Reading)
- Force to Maximum Airflow/Damper Setpoint
- Force to Minimum Airflow/Damper Setpoint
- Force to Fixed Airflow/Damper Setpoint
- Force Damper to Re-Calibrate

The Force to Fixed Airflow/Damper mode also has a setpoint associated with it. This allows the user to provide a non-changing fixed amount of air into the space that doesn't affect the Minimum or Maximum setpoints. That means the user doesn't have to disturb the real minimum and maximum setpoints to achieve a nonstandard setting during their troubleshooting or air balancing modes.

The Force to Minimum mode uses the currently active minimum setting based on the Vent, Cooling, or Heating modes. Whatever mode the AZ 2 Zone/VAV Controller is in determines the minimum used by the force mode.

The damper force modes will remain in effect until cancelled by the user or until the power is removed. Unlike the AZ 2 Controllers which require the initiating device to be present at all times during a force mode, the damper force modes are more permanent since they are less likely to damage any equipment. There are no force commands available for the auxiliary relays.

Mounting Zone/VAV Controller On Terminal Unit

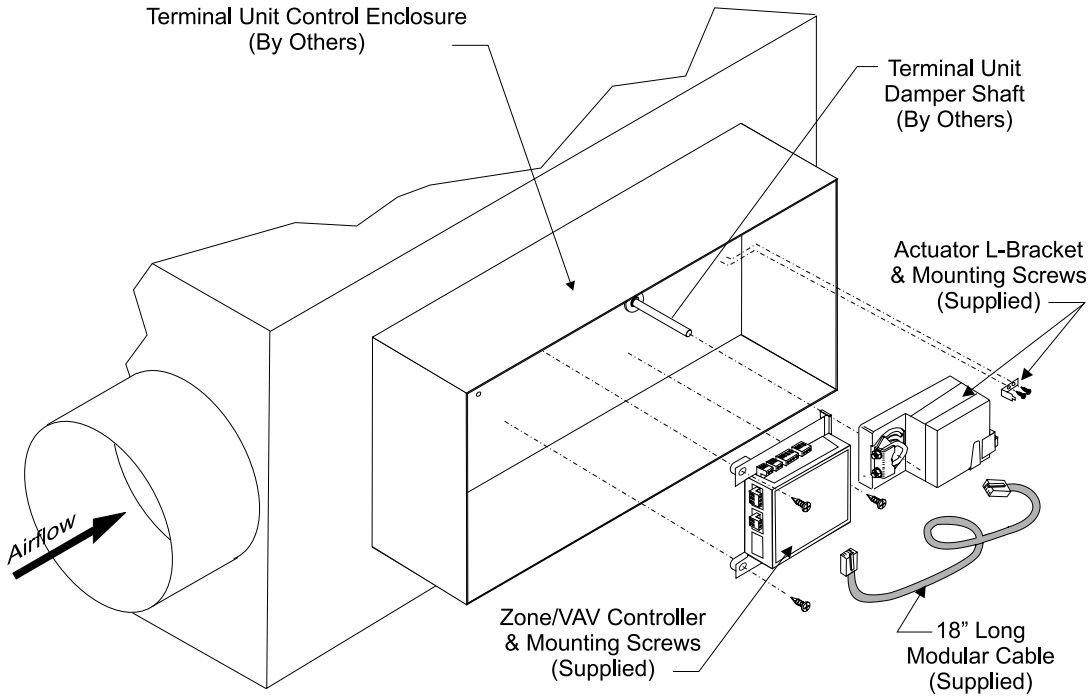


Figure 121: AZ 2 Zone/VAV Controller Terminal Unit Mounting

Note: The Zone/VAV controller is designed for direct acting operation which by default is clockwise to open. This is determined by looking straight at the end of the damper shaft and observing that it moves in a clockwise direction to open the damper. If the damper on the terminal unit is not installed for clockwise to open operation, the AAON Zone Controller can be configured for counterclockwise to open operation via the operator interface or through the Prism software. It must be changed prior to system start-up for the designated units for the zone damper to function properly. See your operator interface or Prism manual for further information on re-configuring for reverse acting operation. Installation is the same as for clockwise to open units except all references to clockwise will now be counter-clockwise direction.

Installation Instructions

1.) The terminal unit damper (by others) should be installed so the damper shaft turns in a clockwise direction to open the damper. This is the software default for the AAON Zone Controller Actuator. If this is not possible, the controller can be re-configured for counter-clockwise to open operation using the Prism software. See "Note:" above for details. All installation instructions are based on the clockwise to open default. Check the damper for proper rotation and mark the end of the damper shaft to indicate open and closed positions.

2.) Loosen the (2) shaft mounting bracket nuts on the ends of the damper actuator's shaft mounting U-bolt and slide damper actuator assembly over the terminal unit damper shaft. The actuator may have to be rotated from position shown depending on the terminal unit's available mounting area and damper shaft location and whether this is a left or right hand installation. Hand tighten the U-bolt nuts until the damper shaft is loosely secured to the shaft.

3.) After positioning the damper actuator over the damper shaft secure the damper actuator to the control, enclosure base using the supplied L-bracket and 2 screws.

4.) Turn the damper blade to its fully closed position. With the manual override clutch button depressed, rotate the actuator clamp to within approximately 1/16" - 1/8" distance between the actuator stop and the clamp, depending on the damper seal design. Tighten the (2) shaft mounting bracket nuts on the ends of the damper actuator's shaft mounting U-bolt with an 8 mm wrench to 3-5 ft-lb of torque. On dampers with edge seals, the actuator will compress the damper blade seal when reaching the end position. Adjust the end stops, if required. Attach the actuator cable between the actuator and controller.

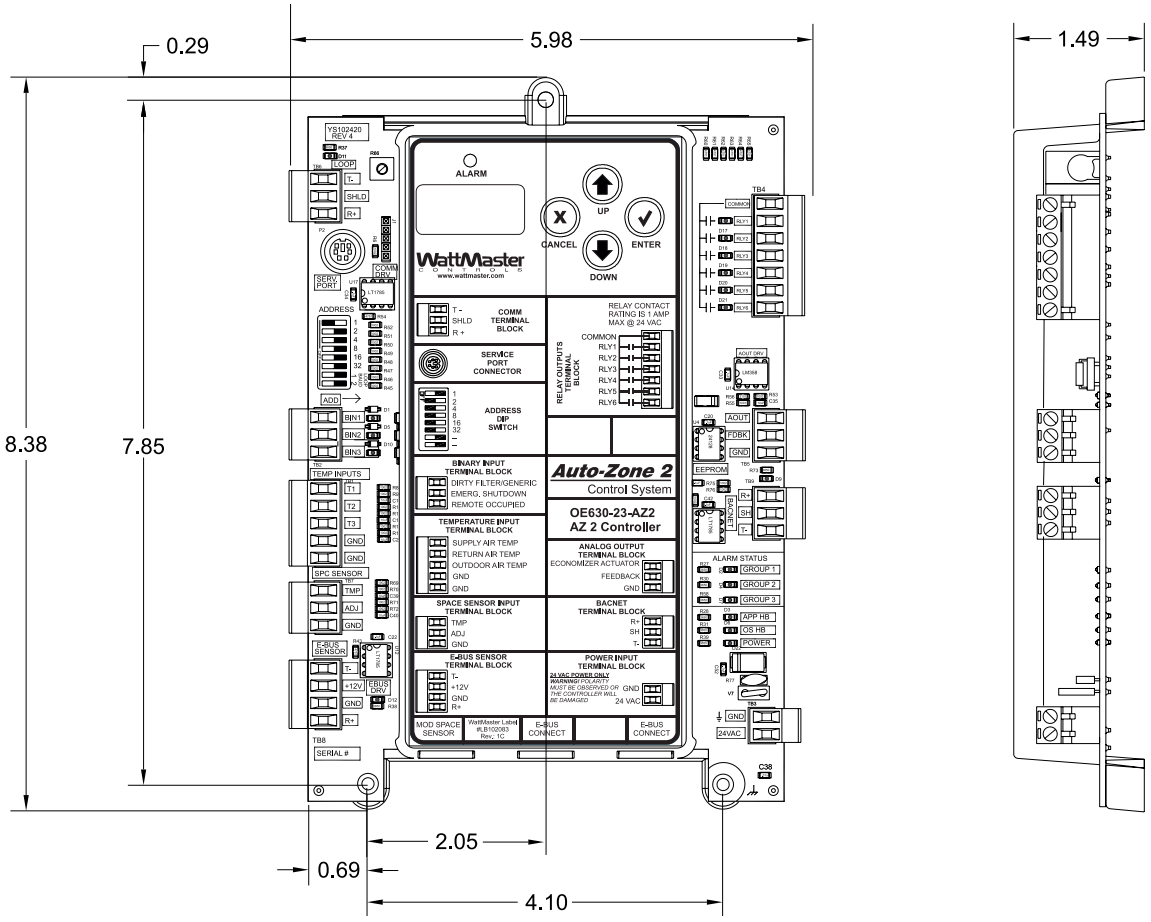


Figure 122 OE630-23-AZ2 – AZ 2 Controller Dimensions

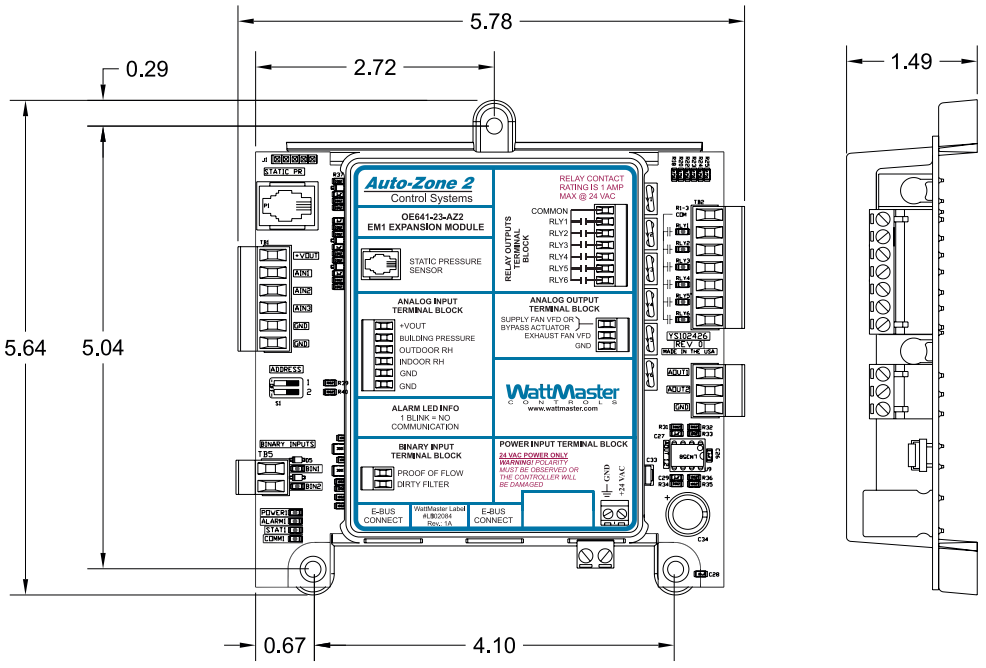


Figure 123: OE641-23-AZ2 – EM1 Expansion Module Dimensions

Controller & Modules Dimensions

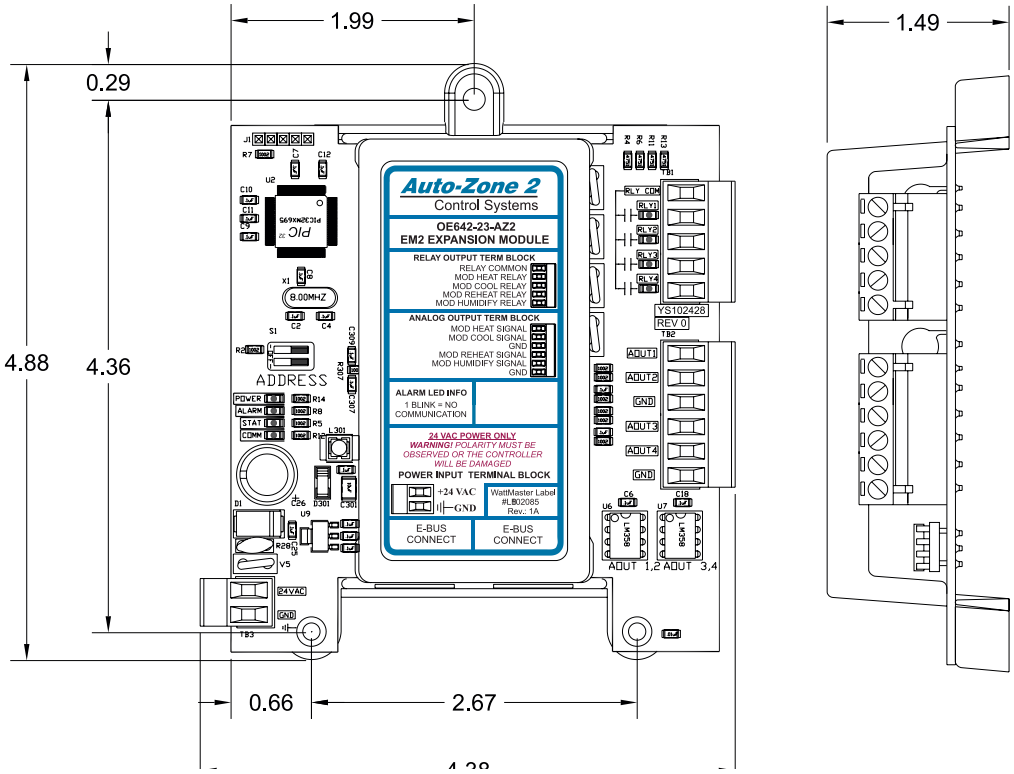


Figure 124: OE642-23-AZ2 – EM2 Expansion Module Dimensions

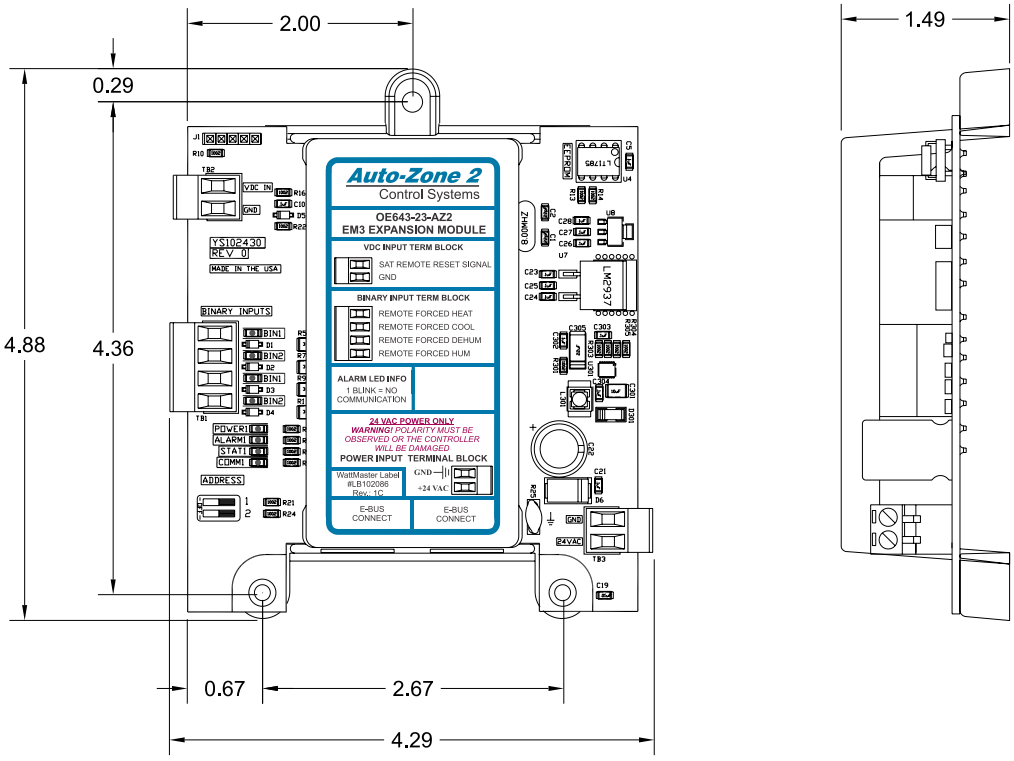
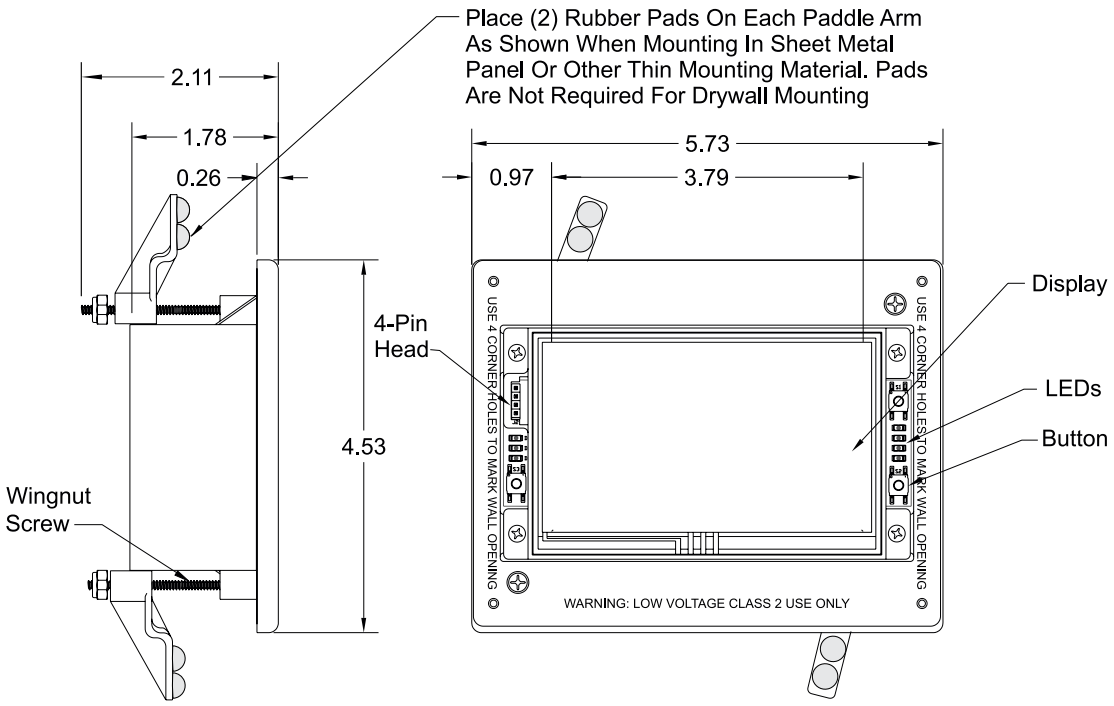
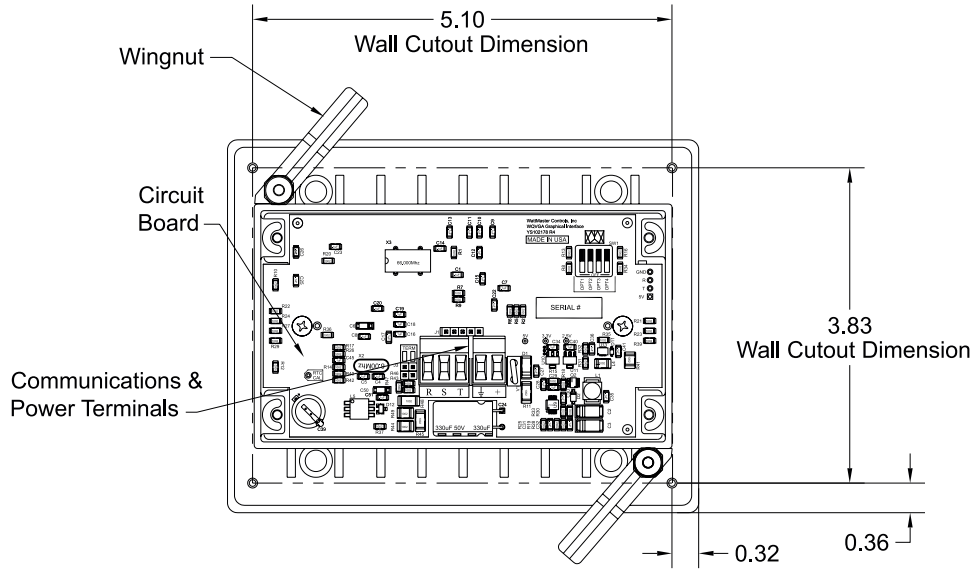


Figure 125: OE643-23-AZ2 – EM3 Expansion Module Dimensions



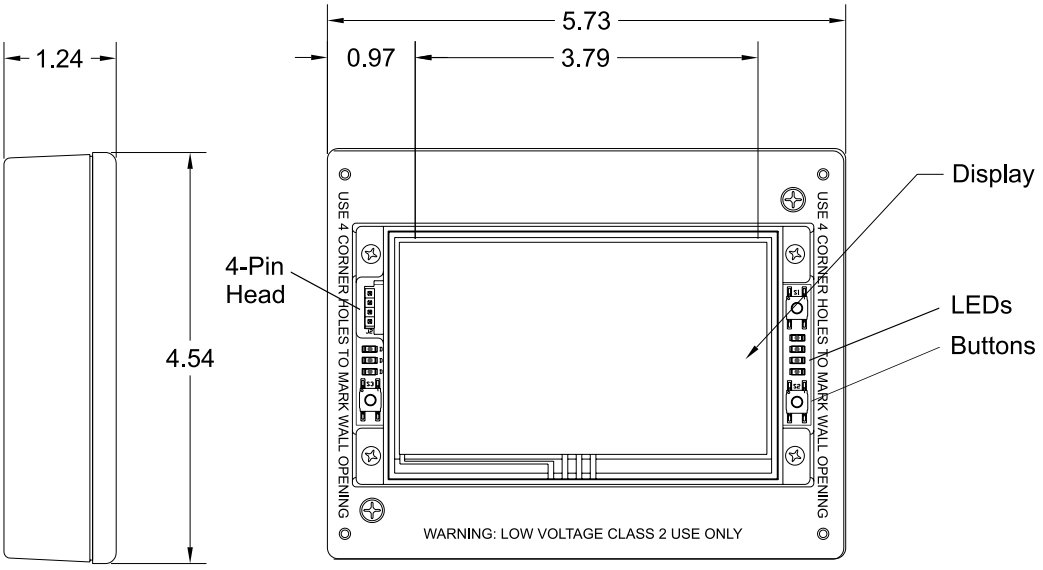
Left Side View **Front View (Cover Removed)**



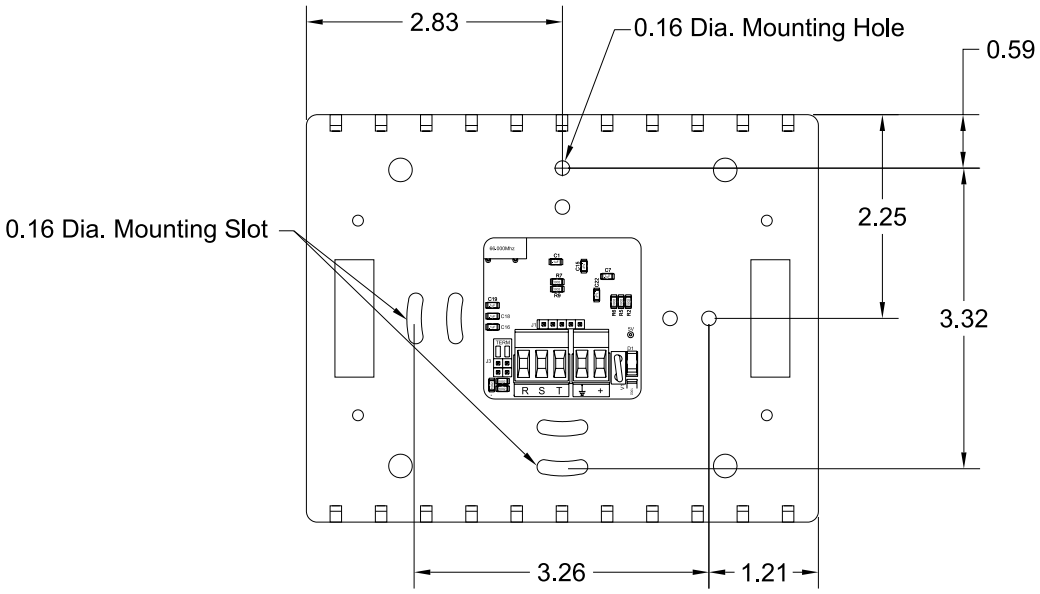
Back View

Figure 126: System Manager TS Dimensions and Components (Flush Wall Mount)

System Manager TS Surface Mount Components and Dimensions



Left Side View **Front View (Cover Removed)**



Back View

Figure 127: System Manager TS Dimensions and Components (Surface Mount)

Zone/VAV Controller Actuator Package & Exp. Module Dimensions

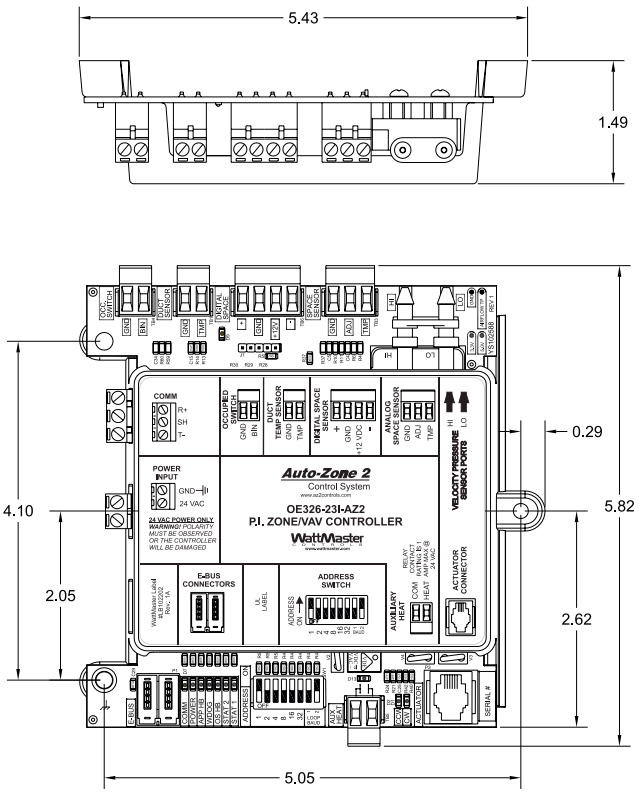


Figure 128: Zone/VAV Controller Dimensions

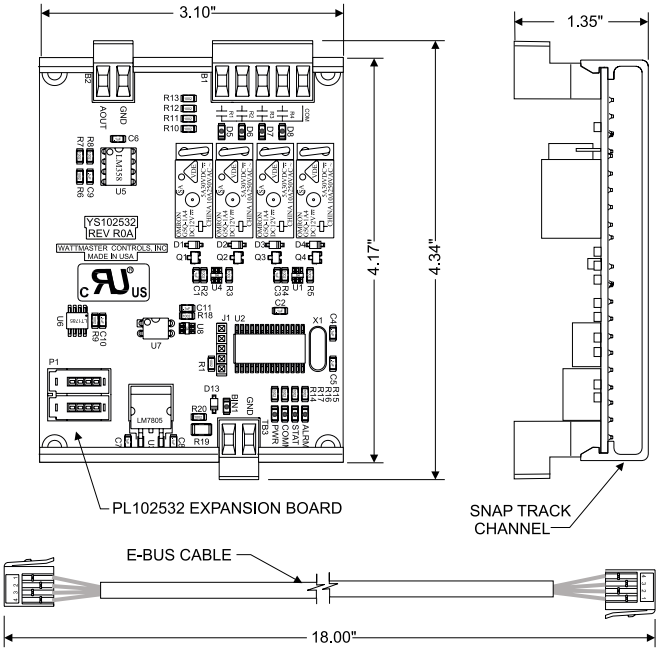


Figure 129: OE325-03 Expansion Module Dimensions

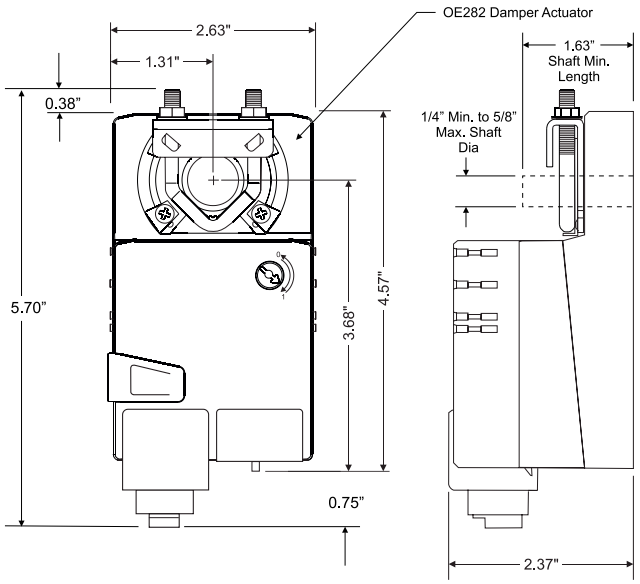


Figure 130: OE282 Actuator Dimensions

MiniLink & CommLink 5 Dimensions

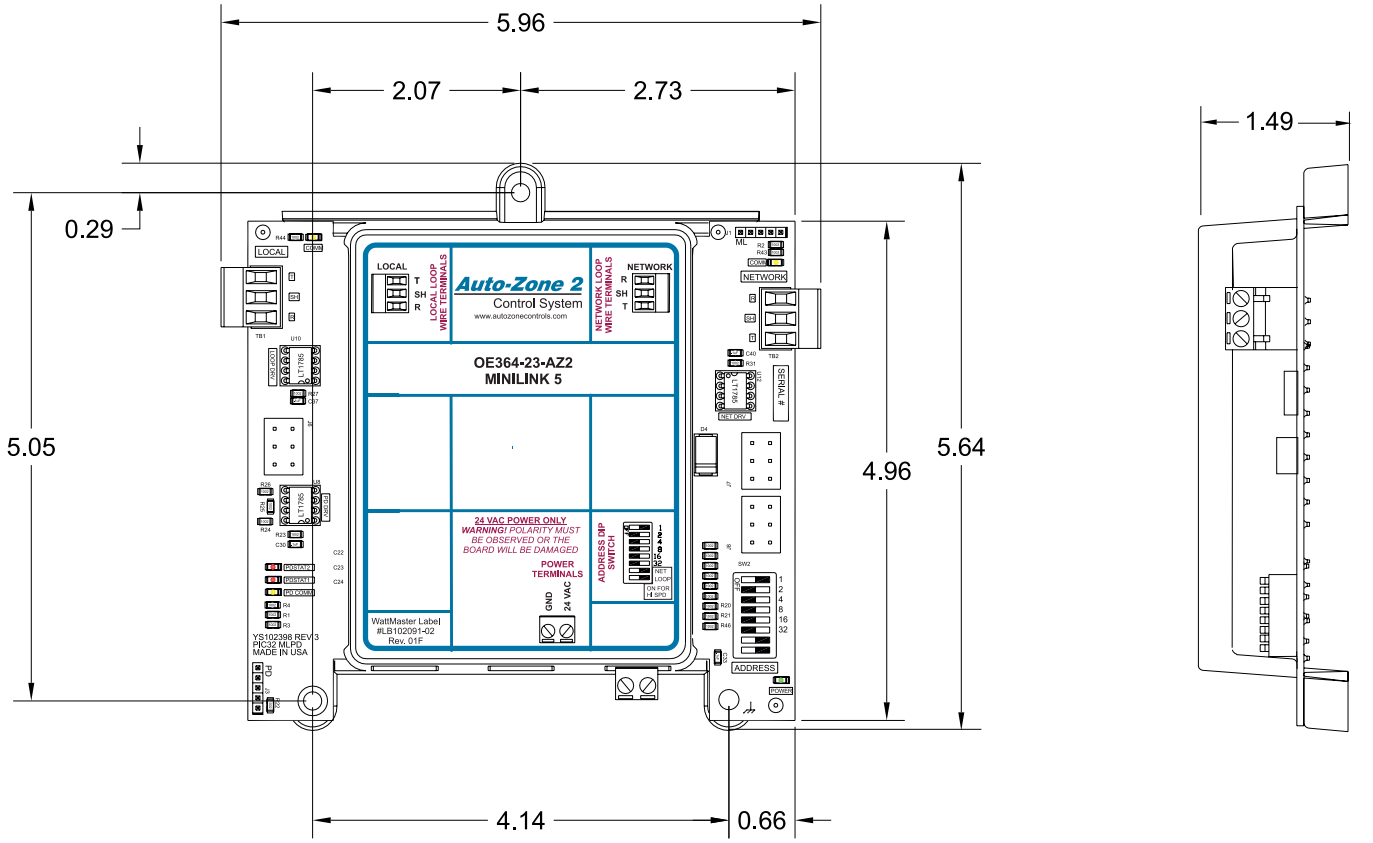


Figure 131: MiniLink Communication Interface Dimensions

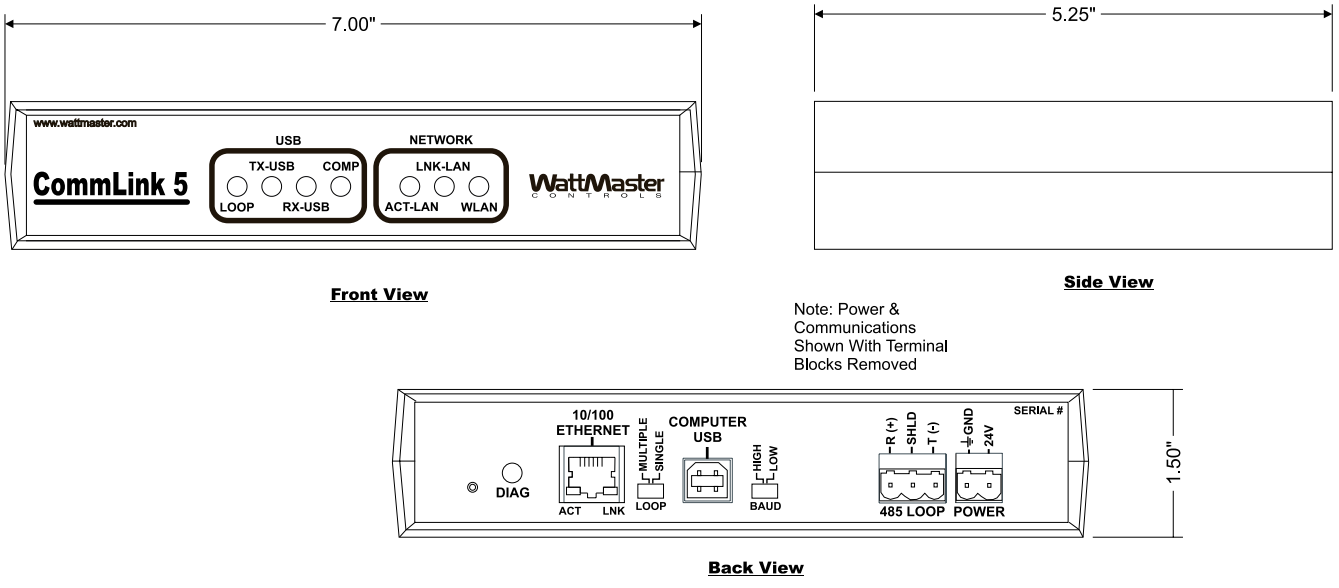


Figure 132: CommLink 5 Dimensions

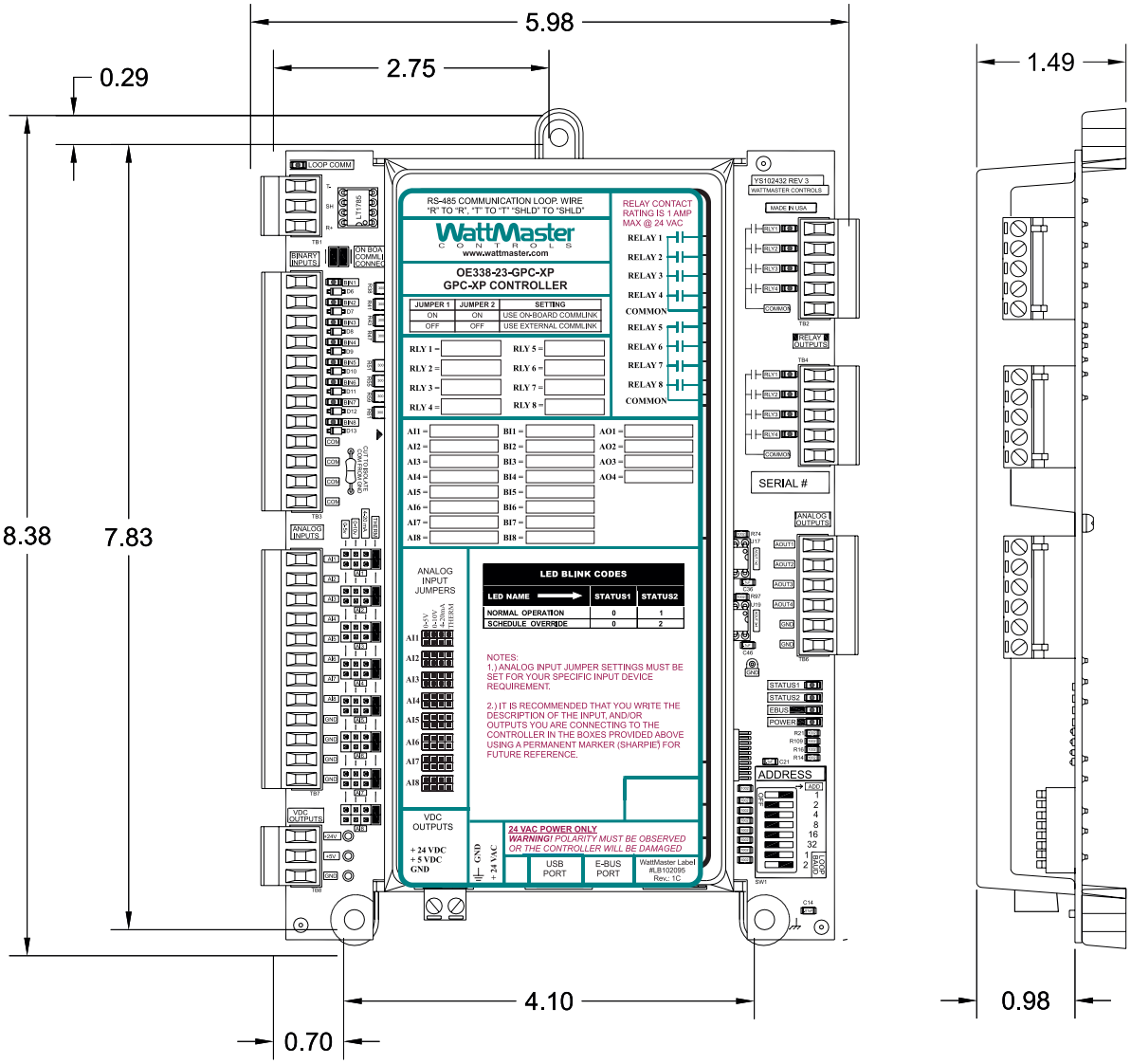


Figure 133: GPC-XP Dimensions

Input/Output Map

AZ 2 Controller I/O		
Input	**Description**	**Type**
T1	Supply Air Temperature Sensor	10k Ohm Thermistor - Type III
T2	Return Air Temperature Sensor	10k Ohm Thermistor - Type III
T3	Outdoor Air Temperature Sensor	10k Ohm Thermistor - Type III
TMP	Analog Wired Space Sensor	10k Ohm Thermistor - Type III
ADJ	Analog Wired Space Sensor	10k Ohm to 15k Ohm Resistance Slider
T-	E-BUS Sensor Hard Wire Terminal	E-BUS Communication Signal
+12V	E-BUS Sensor Hard Wire Terminal	E-BUS Communication Signal
R-	E-BUS Sensor Hard Wire Terminal	E-BUS Communication Signal
MOD SPACE SENSOR	Modular Room Sensor Input Connector	10k Ohm Thermistor - Type III
BIN1	Dirty Filter Switch, Generic Alarm, Water Proof Of Flow Switch	24 VAC Powered Contact
BIN2	Emergency Shutdown	24 VAC Powered Contact
BIN3	Remote Forced Occupied Mode	24 VAC Powered Contact
Output	**Description**	**Type**
R1	Supply Fan Relay	24 VAC Powered Contact
R2 Thru R6	*Configurable Relays	24 VAC Powered Contact
AOUT	Economizer Actuator	0-10 VDC Signal
EM1 Expansion Module I/O		
Input	**Description**	**Type**
STATIC PR	Modular Duct Static Pressure Sensor	0-5 VDC Signal Via Modular Plug
AIN1	Building Pressure Sensor	0-5 VDC Signal
AIN2	Outdoor Air Humidity Sensor	0-5 VDC Signal
AIN3	Indoor Air Humidity Sensor	0-5 VDC Signal
BIN1	Proof Of Flow Switch	24 VAC Powered Contact
BIN2	Dirty Filter Switch	24 VAC Powered Contact
Output	**Description**	**Type**
AOUT1	Main Fan VFD/Bypass Damper	0-10 VDC Signal
AOUT2	Exhaust Fan VFD	0-10 VDC Signal
R1 Thru R6	*Configurable Relays	24 VAC Powered Contact
EM2 Expansion Module I/O		
Output	**Description**	**Type**
AOUT1	Modulating Heating Signal	0-10 VDC Signal
AOUT2	Modulating Cooling Signal	0-10 VDC Signal
AOUT3	Modulating Reheat Signal	0-10 VDC Signal
AOUT4	Modulating Humidifier Signal	0-10 VDC Signal
R1	Modulating Heat Enable Relay	24 VAC Powered Contact
R2	Modulating Cooling Enable Relay	24 VAC Powered Contact
R3	Modulating Reheat Enable Relay	24 VAC Powered Contact
R4	Modulating Humidifier Enable Relay	24 VAC Powered Contact
EM3 Expansion Module I/O		
Input	**Description**	**Type**
VDC IN	Remote Reset Signal	0-10 VDC Signal
BIN1	Remote Forced Heating Mode	24 VAC Powered Contact
BIN2	Remote Forced Cooling Mode	24 VAC Powered Contact
BIN3	Remote Forced Dehumidification Mode	24 VAC Powered Contact
BIN4	Remote Forced Humidification Mode	24 VAC Powered Contact

*Configurable Relays Can Be Configured For Any Of The Items In The Table Below:			
Cooling Stages	Aux. Heat (Heat Pumps)	Low Ambient	Alarm
Heating Stages	Emergency Heat (Heat Pumps)	Reheat Control (Dehumidification)	Occupied
Pre-heat	Compressor Stage (Heat Pumps)	Exhaust Fan	Economizer/OA Damper
Warm-up Mode	Reversing Valve (Heat Pumps)	Humidifier	

Table 10: Input/Output Map

LED Diagnostics

Using LEDs To Verify Operation

The AZ 2 Controller is equipped with 7 LEDs that can be used as trouble-shooting tools. See **Figure 135** for the LED locations. **See Table 11** for Diagnostic Alarms Blink Codes. The LEDs and their uses are as follows:

ALARM LED - This LED is located above the LCD display to indicate an alarm(s). The alarm(s) will display in the LCD window. The alarm(s) will also cause a diagnostic code to blink from one or more of the ALARMS GROUP LEDs. See **Table 11** for a list Diagnostic Alarm Codes.

ALARMS GROUP 1 - This is a diagnostic blink code LED. It will light up and blink out diagnostic codes. See **Table 11** for Diagnostic Alarm Codes for Group 1.

ALARMS GROUP 2 - This is a diagnostic blink code LED. It will light up and blink out diagnostic codes. See **Table 11** for Diagnostic Alarm Codes for Group 2.

ALARMS GROUP 3 - This is a diagnostic blink code LED. It will light up and blink out diagnostic codes. See **Table 11** for Diagnostic Alarm Codes for Group 3.

APP HB - This LED will light up and blink continuously to indicate the application software is working properly. When power is applied to the controller and the AZ 2 Controls system is working properly, the APP HB will light up and blink continuously. If this LED does not light up or blink continuously, there is a problem and you should contact AAON Controls Technical Support for assistance.

OPS HB - When power is applied to the controller and the AZ 2 Controls system is working properly, the OPS HB will light up and blink continuously. If this LED does not light up or blink continuously, there is a problem and you should contact AAON Controls Technical Support for assistance

POWER - When the AZ 2 Controller is powered up, the POWER LED should light up and stay on continuously. If it does not light up, check to be sure that you have 24 VAC connected to the controller, that the wiring connections are tight, and that they are wired for the correct polarity. The 24 VAC power must be connected so that all ground wires remain common. If after making all these checks, the POWER LED does not light up, please contact AAON Controls Technical Support for assistance.

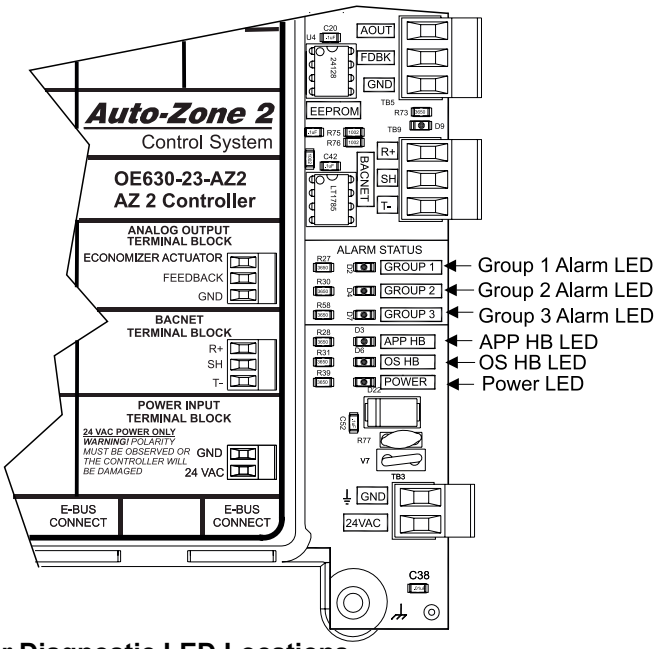


Figure 134 : AZ 2 Controller Diagnostic LED Locations

Group 1 Sensor Alarm Description	Alarms Group 1 LED Blinks
No Alarm	0
Supply Air Temp. Sensor Shorted	1
Supply Air Temp. Sensor Open	2
Outdoor Air Temp. Sensor Shorted	3
Outdoor Air Temp. Sensor Open	4
Outdoor Air Temp. Broadcast Missing	5
Space Temp. Sensor Shorted	6
Space Temp. Sensor Open	7
Digital Space Temp. Sensor Missing	8
Return Air Temp. Sensor Shorted	9
Return Air Temp. Sensor Open	10
High Static Pressure	11
RH Broadcast Missing	12

Group 2 Mechanical Alarms Description	Alarms Group 2 LED Blinks
No Alarm	0
Cooling Failed	1
Heating Failed	2
Fan Proof Of Flow Failed	3
Emergency Shutdown	4
Dirty Filter	5
Hi or Low Supply Air Temp. Shutdown	6
Hi Static Pressure Shutdown	7
Water Proof Of Flow Failed	8

Group 3 Fail Mode Alarm Description	Alarms Group 3 LED Blinks
No Alarm	0
Low Supply Air Temp.	1
High Supply Air Temp	2
High or Low Space temp.	3
Zone Communications Failed	4
Missing EM1 Expansion Module	5
Missing EM2 Expansion Module	6
Missing EM3 Expansion Module	7
Generic Alarm	8
Missing Zone	9
Missing Suction Pressure Sensor	10
Missing CO2 Sensor	11

Table 11: Diagnostic ALARMS LEDs Blink Code Interpretation

Celsius/Fahrenheit Table

Celsius	Fahrenheit	Celsius	Fahrenheit	Celsius	Fahrenheit
0.0	32.0	20.0	68.0	40.0	104.0
1.0	33.8	21.0	69.8	41.0	105.8
2.0	35.6	22.0	71.6	42.0	107.6
3.0	37.4	23.0	73.4	43.0	109.4
4.0	39.2	24.0	75.2	44.0	111.2
5.0	41.0	25.0	77.0	45.0	113.0
6.0	42.8	26.0	78.8	46.0	114.8
7.0	44.6	27.0	80.6	47.0	116.6
8.0	46.4	28.0	82.4	48.0	118.4
9.0	48.2	29.0	84.2	49.0	120.2
10.0	50.0	30.0	86.0	50.0	122.0
11.0	51.8	31.0	87.8	51.0	123.8
12.0	53.6	32.0	89.6	52.0	125.6
13.0	55.4	33.0	91.4	53.0	127.4
14.0	57.2	34.0	93.2	54.0	129.2
15.0	59.0	35.0	95.0	55.0	131.0
16.0	60.8	36.0	96.8	56.0	132.8
17.0	62.6	37.0	98.6	57.0	134.6
18.0	64.4	38.0	100.4	58.0	136.4
19.0	66.2	39.0	102.2	59.0	138.2

Table 12: Celsius/Fahrenheit Conversion Table

MiniLink Configuration

If you have a Zoning System follow the instructions that follow to configure the MiniLink.

From the *Main Screen*, *touch* the **<My System>** icon. The *Selected Unit Screen* will appear. See **Figure 34.**

In **Figure 135**, Network Loop 1 address and Local Loop 60 address are selected. This is the address of the MiniLink on Local Loop #1. This loop can be any Network Loop address (1,2,3 etc., thru 60) and address 60 is always the address of the MiniLink on whatever Local Loop you are working with. Once the address is selected it is indicated in the figure with white text.

Figure 135: Entering The MiniLink Address

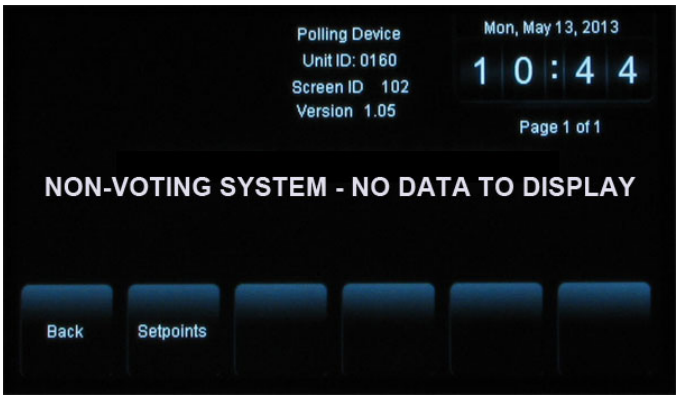


Figure 136: Default Screen For The MiniLink

The MiniLink defaults to "Non-Voting System" unless it has been configured previously for Zoning. This is the correct setting for all other uses except Zoning Systems. After entering the address for the first time the screen above will appear. Select the "Setpoints" button to proceed.

NOTE: The MiniLink only needs to be configured if you are using a Zoning System on this loop.

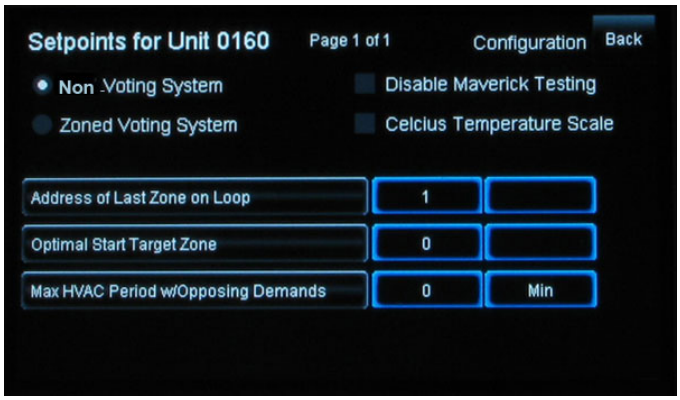


Figure 137: Entering The MiniLink Address

VAV System

This configuration is used for Constant Volume, Single Zone VAV, or VAV applications. This configuration also allows tenant logging for your VAV system. The MiniLink defaults to this setting.

Zoned Voting System

This configuration defines the system as a Zoned system. This enables the MiniLink to gather information from the Zone/VAV Controllers to command the AZ 2 Controller Mode of Operation. Once this is selected and you exit the setpoint screen, the MiniLink Status Screen will change and will now display the HVAC unit's mode of operation and the heating and cooling demands from the zones.

Disable Maverick Testing

This option allows the AZ 2 Control System to ignore trouble Zones and allow them to continually vote. Any voting zone demand is included in the voting regardless of temperature.

Celsius Temperature Scale

This option is used to convert MiniLink from Fahrenheit to Celsius Scaling.

NOTE: The AZ 2 Controller will also need to be configured for "Celsius Temperature Scale." if this is selected for the MiniLink.

Address of Last Zone on Loop

This is the address of the last voting zone on the local loop. Note: Other non-voting zones can be added above this address. Maximum of 16 voting zones.

Optimal Start Target Zone

This is the unit ID of the Zone that you want to be satisfied by the normally scheduled start time. If you enter "-1" into this box, it will average all zones instead of picking a specific zone. If you do not require Optimal Start, leave this value set to "0".

Max HVAC Period with Opposing Demands

This is the amount of time that you want to allow between the changeover from Heating to Cooling. It is recommended to not exceed more than four mode changes per hour (15 min or more).

A

B

C

D

E

F

G

H

I

K

L

M

N

O

P

R

S

S-W

T

U

V

W

Z

Auto-Zone 2
Control System

Form: G026090
Printed in the USA
February 2019

AAON Inc.
8500 NW River Park Drive Parkville, MO
64152
Phone (816) 505-1100
www.az2controls.com
Fax (816) 505-1101