



Auto-Zone 3

Control System

Auto-Zone 3 Controller

Technical Guide

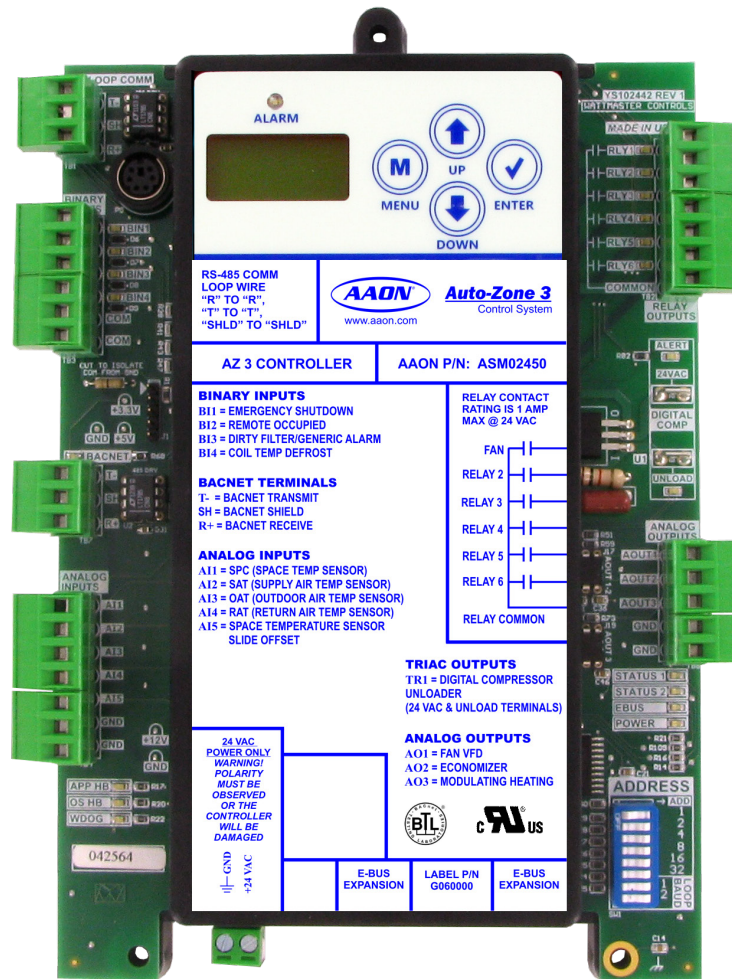


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AZ 3 Controller

Features

The ASM02450 AZ 3 Controller is designed with 5 analog inputs, 3 analog outputs, 1 triac output (for control of a single Copeland Scroll™ Digital Compressor), 4 binary inputs, and 6 relay outputs (5 configurable). It also has an on-board BACnet® port for connection to an MS/TP network. The Controller contains a 2 x 8 LCD character display and 4 buttons that allow for status and alarm display and force modes as well as BACnet® configuration.

The ASM02451 AZ 3 EM1 Expansion Module provides an additional 6 analog inputs, 4 analog outputs, 3 binary inputs, and 5 configurable relay outputs. The ASM02452 AZ 3 EM2 Expansion Module provides an additional 1 analog input and 4 binary inputs. The ASM02453 AZ 3 E-BUS 12 Relay Expansion Module provides up to 12 additional configurable relay outputs.

There are also 2 E-BUS Expansion Ports, which allow for connection of the 3 expansion modules listed above, communicating sensors or future E-BUS Modules via modular cable assemblies. There are presently 8 different communicating sensors available. Two of these sensors have LCD displays: E-BUS Digital Space Temperature Sensor and E-BUS Digital Space Temperature and Humidity Sensor. There is a communicating E-BUS Space Temperature and Humidity Sensor with no LCD display as well as an E-BUS Space CO₂ Sensor, and E-BUS Duct CO₂ Sensor. In addition, the E-BUS Horizontal Outdoor Air Temperature and Humidity Sensor, E-BUS Vertical Outdoor Air Temperature and Humidity Sensor, and the E-BUS Return Air Temperature and Humidity Sensor are available for connection to the AZ 3 Controller.

The AZ 3 Controller provides for Constant Volume, VAV, Single Zone VAV, MUA, and Air to Air Heat Pump applications.

Most basic HVAC unit control applications can be configured using only the AZ 3 Controller. If the application requires more inputs and/or outputs, the optional expansion modules are available to provide for additional analog, binary, or digital inputs and outputs as required.

Other features of the AZ 3 Controller include:

- Modulating Cooling Output for Chilled Water Valve Control
- Modulating Heating Output (Hot Water Valve, Steam Valve, SCR Electric Heat Control)
- Configurable for Heat Pump Applications
- Heat Pump Defrost Operation
- Auxiliary and Emergency Heat Options for Heat Pumps
- Advanced Dehumidification Capabilities
- Single Zone VAV Control w/Optional CAV Heating
- Primary/Secondary Heating Control

- Remote Forced Cooling, Heating, Humidification and Dehumidification Control
- Remote SAT Reset Signal
- Adaptive Supply Air Reset
- Selectable Mode Enable Sensor
- Fan Proving Interlock
- Dirty Filter Alarm
- Emergency Shutdown Input (Smoke Detector/Firestat or other Shutdown Conditions)
- Drybulb/Wetbulb/Dewpoint Control of Economizer Operation
- Building Pressure Control (Direct or Reverse Acting)
- Remote Forced Occupied Capability
- IAQ Economizer Reset
- Direct Digital Control of Digital Scroll Compressors
- Title 24 Economizer Certified
- 7-Day, 2-Event-per-Day Scheduling
- 14 Holiday Event Scheduling
- Daylight Savings Time Adjustment
- Trend Logging Capability
- Static Pressure Control for Filter Loading Applications
- Water Source Heat Pump Monitoring
- On-board BACnet® port for connection to an MS/TP network (See Appendix C)



Zone Voting

The Auto-Zone 3 (AZ 3) Controller can be configured to be the unit controller in a zone voting system where the individual zones vote to put the unit into occupied Cooling or Heating Mode. To be used in this application, AZ 3 VAV/Zone BACnet® Controllers must also be used in order to allow communication between the zones and the AZ 3 Controller. Duct static pressure control can be accomplished with a supply fan VFD or a bypass damper. See the *AZ 3 VAV/Zone BACnet® Controller Technical Guide* for complete information on the AZ 3 VAV/Zone BACnet® Controllers that are used with the AZ 3 Controller when configured for Zone Voting.

Variable Air Volume Unit

The AZ 3 Controller can be configured to control VAV units that are typically designed for occupied Cooling Mode only, where VAV boxes equipped with reheat satisfy heating demands in individual spaces. In this application, unit heat is typically used for Morning Warm-Up. Morning Cool-Down is also available. The controller can be configured to control the supply fan VFD to maintain a Duct Static Pressure Setpoint.

The AZ 3 Controller can also control VAV units that may require occupied heating operation to “temper” the outdoor air if it is too cold outside for the mixed air to maintain the Cooling Supply Air Setpoint.

See the *AZ 3 VAV/Zone BACnet® Controller Technical Guide* for complete information on the AZ 3 VAV/Zone BACnet® Controllers that are used with the AZ 3 Controller configured for VAV.

Constant Air Volume Unit

The AZ 3 Controller can be configured for any Constant Volume applications that typically use Space Temperature or Return Air Temperature control and serve a single zone.

Single Zone VAV

This is a hybrid CAV/VAV application for a unit serving a single space and using Space Temperature Setpoints to enable Heating and Cooling Modes. Heating and Cooling are controlled to meet their respective Supply Air Setpoints while the supply fan modulates to maintain the Space Temperature Setpoints. Single Zone VAV applications can be configured for VAV Cooling and either VAV or CAV Heating. Single Zone VAV operation requires the use of modulating Heating or Cooling sources.

Make-Up Air Unit

The AZ 3 Controller can be configured for 100% Outdoor Air control for Make-Up Air units. All HVAC Modes are determined from the Outdoor Temperature and Humidity Sensors. The Outdoor Air Volume should be at least 50% or higher to be configured for Outdoor Air control.

CV Single Loop System

The most basic of the Auto-Zone 3 systems is the CV Single Loop System. It consists of one or more Constant Volume (CV), Make-up Air (MUA) and/or Single Zone VAV (SZVAV) units each having their own AZ 3 Controller and associated expansion module(s).

The communications loop can have up to 59 controllers daisy-chained together back to a MiniLink PD. This is called a Local Loop. The MiniLink provides for alarm polling of all controllers and has the capability of broadcasting select sensor values to all controllers on the local loop. This can be useful, for example, if you want to have one Outdoor Air Temperature Sensor to be used by all the controllers. 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 communications interface wires to the MiniLink's Network communication terminals. This is called the Network Loop. The CommLink 5 also connects via a USB cable to any Windows® computer with Prism 2 software installed for configuring and monitoring of the system. Prism 2 is a Windows® based graphical interface designed by AAON. An optional IP Module is also available to provide Intranet/Internet connectivity to the control system. See **Figure 1 on page 8** for a Typical CV Single Loop System Layout.

CV Multiple Loop System

If you have more than 59 CV, MUA and/or SZVAV Units or other controllers such as the GPC-XP on your building project you will need to use a CV Multiple Loop System. It is very similar to the CV Single Loop System except it has more than one local communications loop. This system allows for up to 60 of these local loops to be tied together.

Each local communications loop can have up to 59 controllers daisy-chained together back to a MiniLink PD. This is called a Local Loop. The MiniLink provides for alarm polling of all controllers and has the capability of broadcasting select sensor values to all controllers on the control system. This can be useful, for example, if you want to have one Outdoor Air Temperature Sensor to be used by all the controllers. 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 communications interface is daisy-chained to one MiniLink's Network communication terminals and from it to all the other MiniLink's Network communication terminals. This is called the Network Loop. The CommLink 5 also connects via a USB cable to any Windows® computer with Prism 2 software installed for configuring and monitoring of the system. Prism 2 is a Windows® based graphical interface designed by AAON. An optional IP Module is also available to provide Intranet/Internet connectivity to the control system. See **Figure 2 on page 8** for a Typical CV Multiple Loop System Layout.

VAV/Zone Single Loop System

If you have a single HVAC unit that will be using VAV terminal units or are using a zoning system and have VAV/Zones on your system, you should select the VAV/Zone Single Loop System. On a Variable Volume Variable Temperature Zoning System, up to 16 VAV/Zone BACnet® 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/Zone BACnet® controllers in addition to the HVAC unit controller that serves those VAV boxes.

The communications loop can have up to 59 controllers daisy-chained together back to a MiniLink PD. This is called a Local Loop. The MiniLink provides for alarm polling of all controllers and has the capability of broadcasting select sensor values to all controllers on the local loop. This can be useful, for example, if you want to have one Outdoor Air Temperature Sensor to be used by all the controllers. 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.

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VAV/Zone Multiple Loop System

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 VAV/Zone Multiple Loop System. On a Zoning System, each local loop allows up to 16 VAV/Zone BACnet® Controllers to be voting zones and additional controllers to be non-voting zones. For VAV systems, you can have up to 58 total VAV/Zone BACnet® controllers in addition to the HVAC unit controller that serves those VAV boxes. This system allows for up to 60 of these local loops to be tied together.

Each local communications loop can have up to 59 controllers daisy-chained together back to a MiniLink PD. This is called a Local Loop. The MiniLink provides for alarm polling of all controllers and has the capability of broadcasting select sensor values to all controllers on the control system. This can be useful, for example, if you want to have one Outdoor Air Temperature Sensor to be used by all the controllers. 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 communications interface is daisy-chained to one MiniLink's Network communication terminals and from it to all the other MiniLink's Network communication terminals. This is called the Network Loop. The CommLink 5 also connects via a USB cable to any Windows® computer with Prism 2 software installed for configuring and monitoring of the system. Prism 2 is a Windows® based graphical interface designed by AAON. An optional IP Module is also available to provide Intranet/Internet connectivity to the control system. See **Figure 4 on page 9** for a Typical VAV/Zone Multiple Loop System Layout.

VAV/Zone & CV Single Loop System

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

The communications loop can have up to 59 controllers daisy-chained together back to a MiniLink PD. This is called a Local Loop. The MiniLink provides for alarm polling of all controllers and has the capability of broadcasting select sensor values to all controllers on the local loop. This can be useful, for example, if you want to have one Outdoor Air Temperature Sensor to be used by all the controllers. 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 communications interface wires to the MiniLink's Network communication terminals. This is called the Network Loop. The CommLink 5 also connects via a USB cable to any Windows® computer with Prism 2 software installed for configuring and monitoring of the system. Prism 2 is a Windows® based graphical interface designed by AAON. An optional IP Module is also available to provide Intranet/Internet connectivity to the control system. See **Figure 5 on page 10** for a Typical VAV/Zone & CV Single Loop System Layout.

VAV/Zone & CV Multiple Loop System

If you have multiple HVAC units using VAV Terminal Units or a Zoning system, also have CV, MUA and/or SZVAV units and other controllers such as the GPC-XP controller and/or your total number of controllers exceeds 58 you should select the VAV/Zone & CV Multiple Loop System. Each local loop provides for up to 58 Zone, VAV, CV, MUA, SZVAV and GPC-XP controllers in addition to the HVAC unit controller that is connected to the VAV/Zone BACnet® 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 VAV/Zone BACnet® Controllers can be voting zones, and additional controllers can be made up of non-voting zones, CV, MUA, SZVAV units and GPC-XP controllers. For VAV systems, you can also have up to 58 total VAV/Zone BACnet® Controllers, CV, MUA, SZVAV units and GPC-XP controllers in addition to the HVAC unit controller that serves those VAV boxes.

Each local communications loop can have up to 59 controllers daisy-chained together back to a MiniLink PD. This is called a Local Loop. The MiniLink provides for alarm polling of all controllers and has the capability of broadcasting select sensor values to all controllers on the control system. This can be useful, for example, if you want to have one Outdoor Air Temperature Sensor to be used by all the controllers. 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 communications interface is daisy-chained to one MiniLink's Network communication terminals and from it to all the other MiniLink's Network communication terminals. This is called the Network Loop. The CommLink 5 also connects via a USB cable to any Windows® computer with Prism 2 software installed for configuring and monitoring of the system. Prism 2 is a Windows® based graphical interface designed by AAON. An optional IP Module is also available to provide Intranet/Internet connectivity to the control system. See **Figure 6 on page 10** for a Typical VAV/Zone & CV Multiple Loop System Layout.

System Architecture

CV System Diagrams

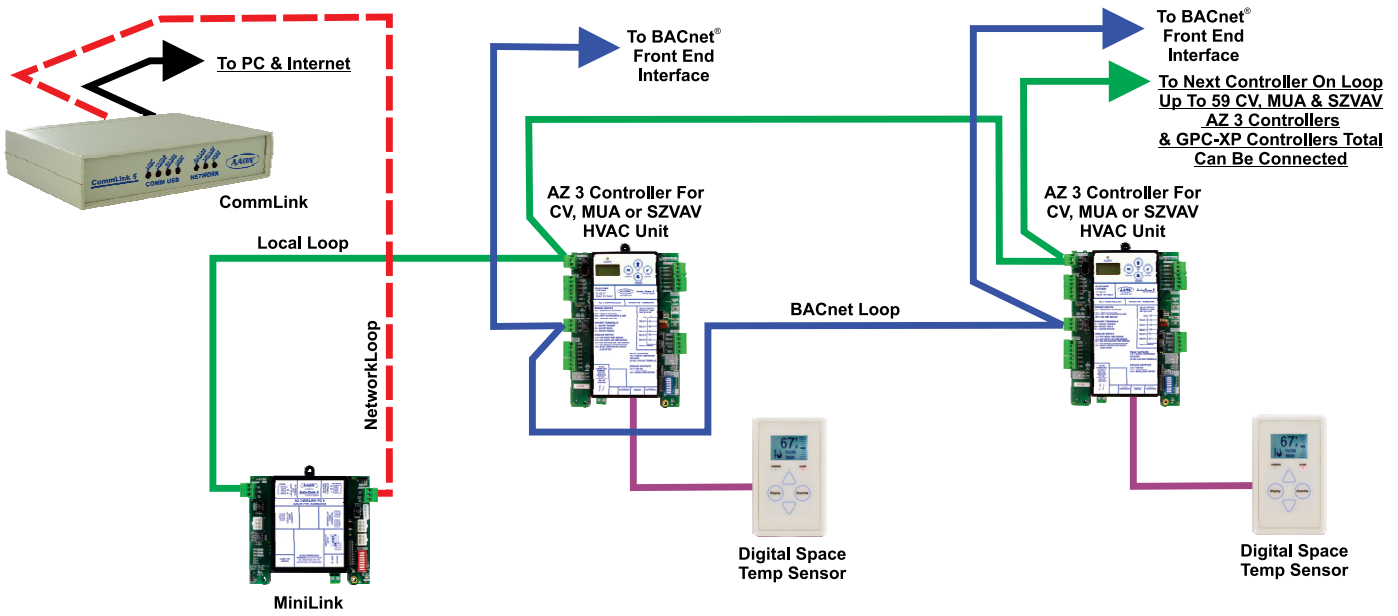


Figure 1: Typical CV Single Loop System Layout

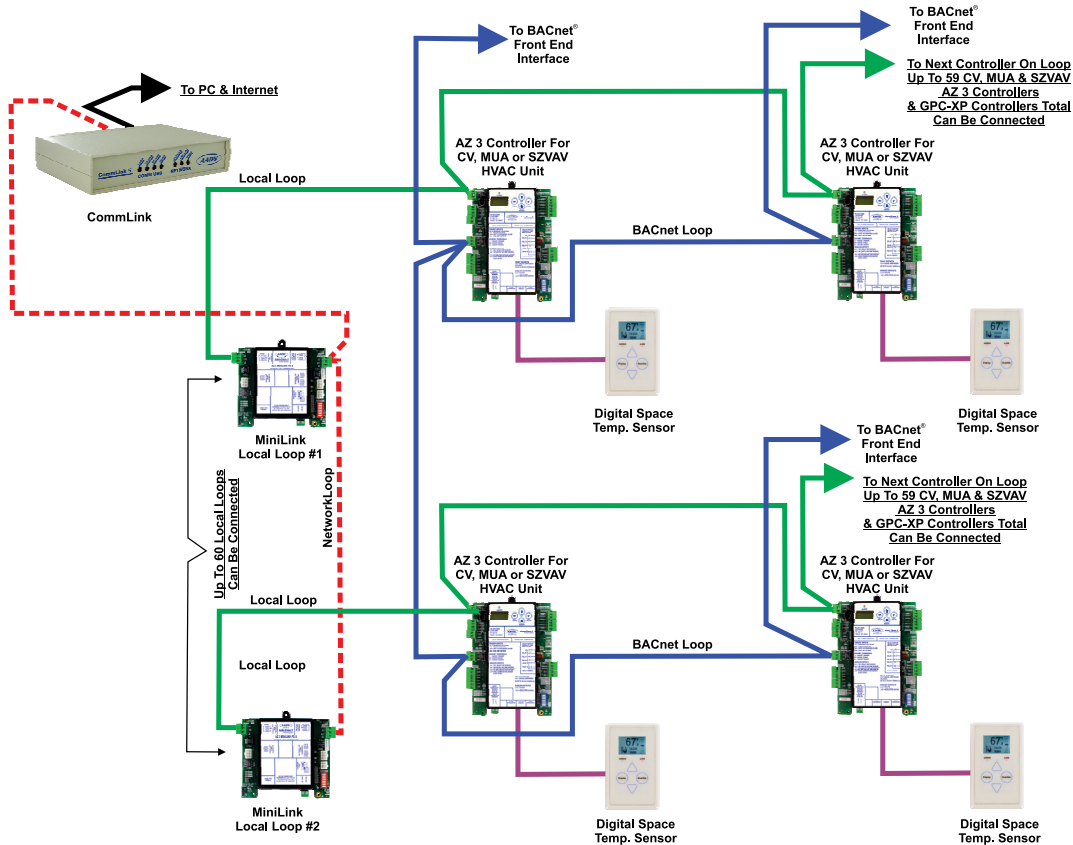


Figure 2: Typical CV Multiple Loop System Layout

System Architecture

VAV/Zone with CV Units System Diagrams

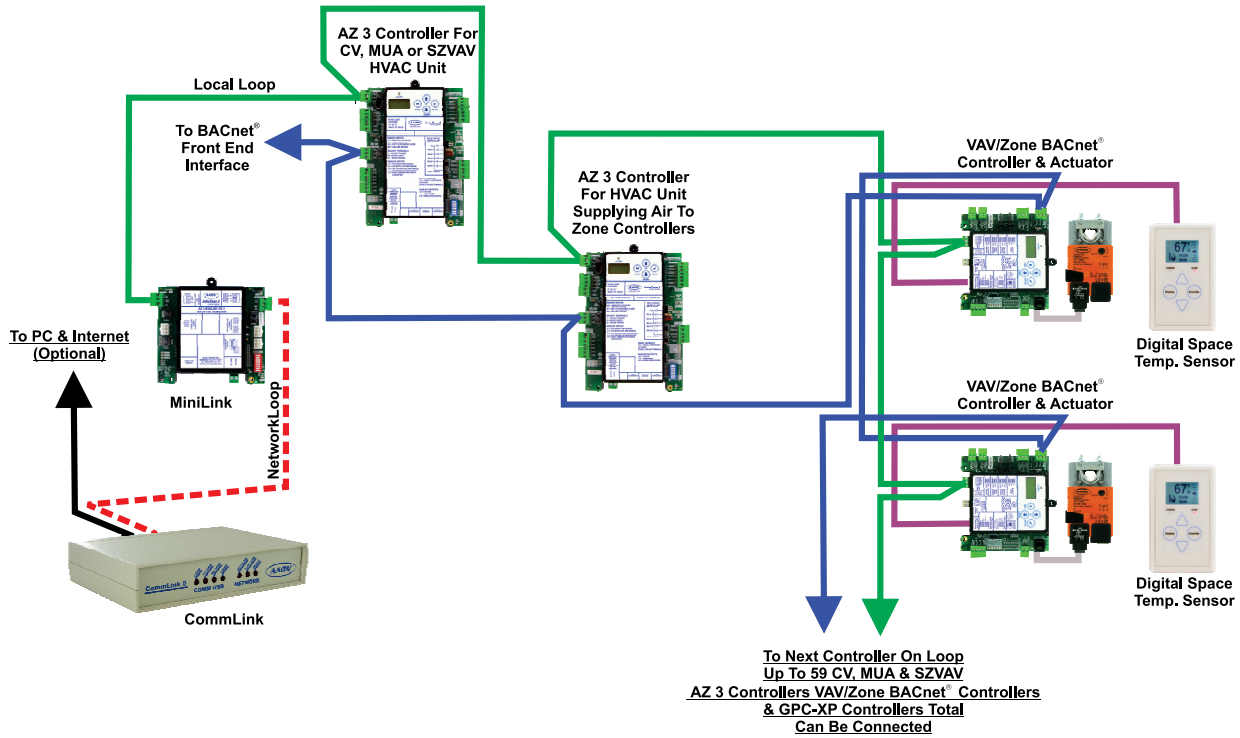


Figure 5: Typical VAV/Zone & CV Units Single Loop System Layout

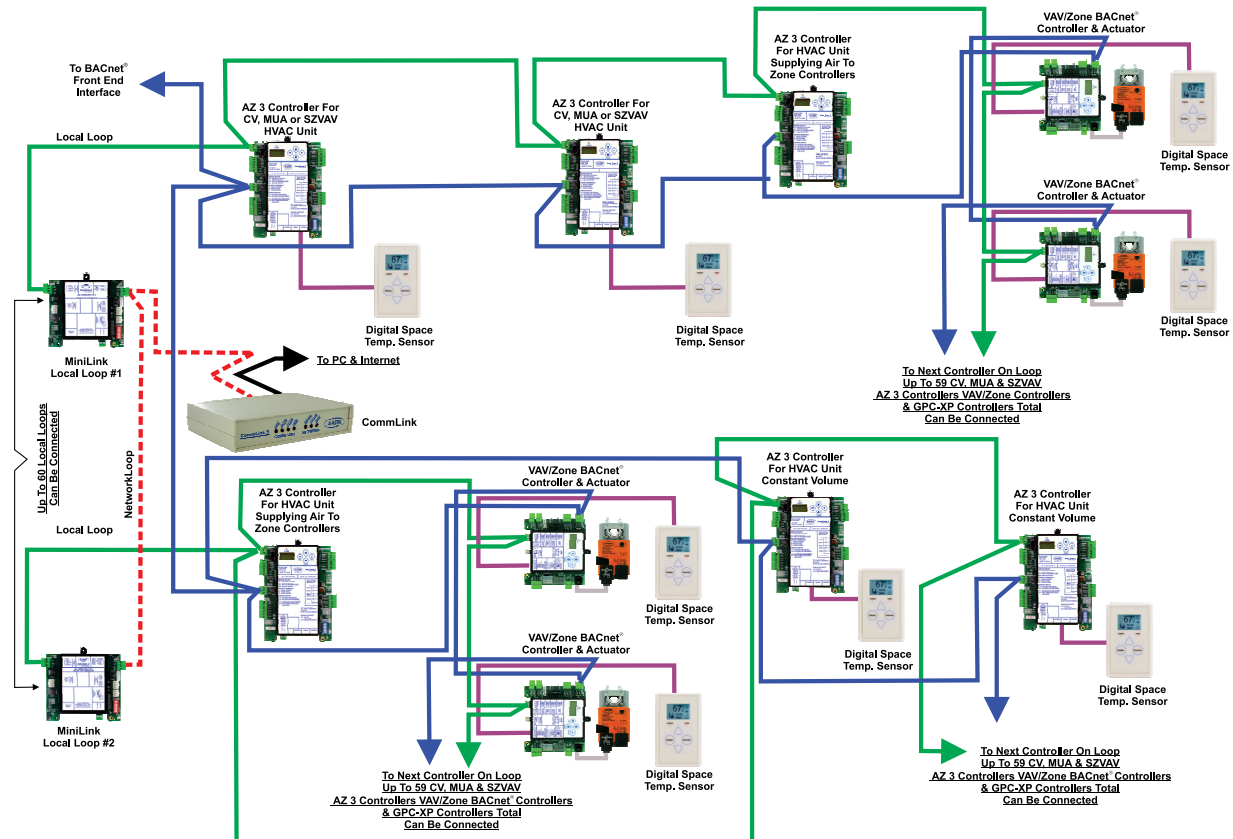
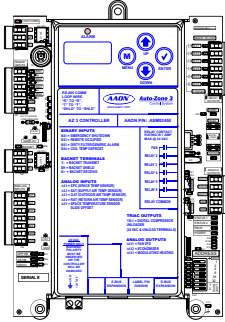
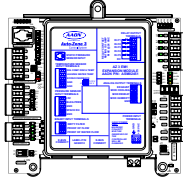
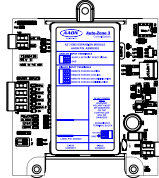
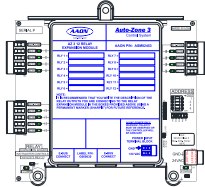
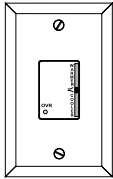
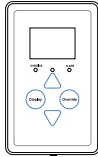
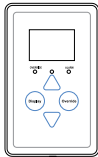
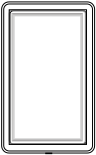
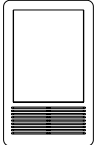
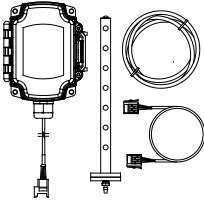
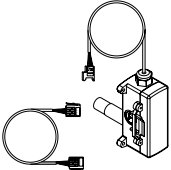
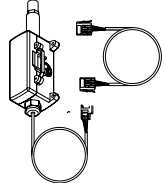
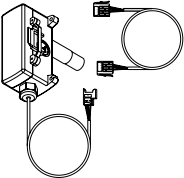
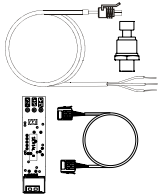


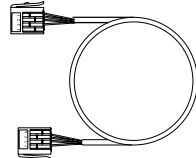

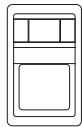
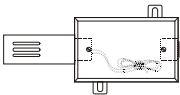
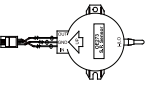
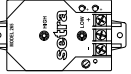
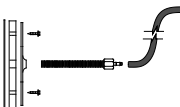
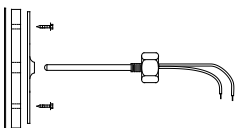
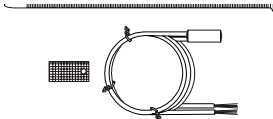
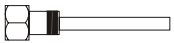
Figure 6: Typical VAV/Zone & CV Units Multiple Loop System Layout

PART NO.	PART DESCRIPTION	ILLUSTRATION	PAGE NO.
<p>ASM02450</p>	<p>AZ 3 Controller</p> <p>The AZ 3 Controller provides 5 analog inputs, 3 analog outputs, 1 triac input, 4 binary inputs, and 6 relay outputs (5 configurable). It also has an on-board BACnet® port for connection to an MS/TP network. The Controller contains a 2 x 8 LCD character display and 4 buttons that allow for status and alarm display as well as BACnet® configuration. It presently allows for the addition of the EM1 Expansion Module, EM2 Expansion Module, and the E-BUS 12 Relay Expansion Module.</p> <p>NOTE: Setup, configuration and monitoring of the AZ 3 Controller requires Prism 2 Front-End Software used with a personal computer.</p>		<p>Page 20</p>
<p>ASM02451</p>	<p>AZ 3 EM1 Expansion Module</p> <p>The EM1 Expansion Module adds VAV/Zone capabilities, building pressure control, leaving water temperature monitoring for water source heat pump, Title 24 Economizer control and other functions. It provides 6 additional analog inputs, 3 binary inputs, 5 additional relay outputs, and 4 analog outputs. It connects with an EBC E-BUS cable to the AZ 3 Controller or other expansion module.</p>		<p>Page 38</p>
<p>ASM02452</p>	<p>AZ 3 EM2 Expansion Module</p> <p>The EM2 Expansion Module adds remote forced heating, cooling, and dehumidification using 4 additional binary inputs. It also has an analog input that can be used as a remote voltage input to reset the Supply Air Setpoint. It connects with an EBC E-BUS cable to the AZ 3 Controller or other expansion module.</p>		<p>Page 50</p>
<p>ASM02453</p>	<p>AZ 3 E-BUS 12 Relay Expansion Module</p> <p>The AZ 3 E-BUS 12 Relay Expansion Module adds 12 configurable relay outputs to the AZ 3 Control System. It connects to the AZ 3 Controller or another expansion module with an EBC E-BUS cable.</p>		<p>Page 52</p>
<p>ASM02227 ASM01638 ASM01642 ASM01643</p>	<p>Standard Space Sensor–Plain, w/Override, w/Slide Adjust Only, w/Override and Slide Adjust</p> <p>Includes: Standard Space Sensor - Plain, with Override, with Slide Adjust only, and with Override and Slide Adjust. For wall mounting. Used with AZ 3 Controller. Connects to controller via field fabricated wiring.</p>		<p>Page 27</p>
<p>ASM01819</p>	<p>E-BUS Digital Space Sensor - Temperature Only</p> <p>The E-BUS Digital Space Temperature Sensor is used with the AZ 3 Controller for space air temperature sensing applications. LCD Display and keypad allow for setpoint adjustment, override, and display of certain status and setpoints. Uses EBC E-BUS cable, sold separately.</p>		<p>Page 24</p>
<p>ASM01820</p>	<p>E-BUS Digital Space Sensor - Temperature and Humidity</p> <p>This sensor is used with the AZ 3 Controller for space air temperature and humidity sensing applications. LCD Display and keypad allow for setpoint adjustment, override, and display of certain status and setpoints. Uses EBC E-BUS cable, sold separately.</p>		<p>Page 24</p>

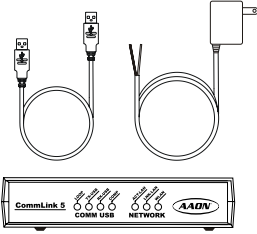
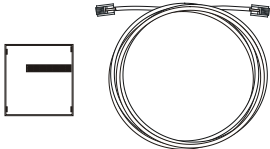
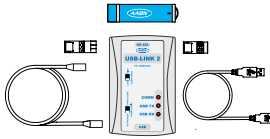
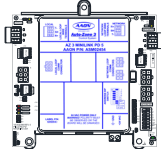

Parts and Descriptions

PART NO.	PART DESCRIPTION	ILLUSTRATION	PAGE NO.
ASM02221	<p>E-BUS Digital Space Sensor - Temp and Humidity - No Display</p> <p>The E-BUS Digital Space Sensor - Temperature and Humidity without a Display is used with the AZ 3 Controller for space air temperature and humidity sensing applications if a display is not desired. Contains no LCD Display or keypad. Uses an EBC E-BUS cable, sold separately.</p> <p>Includes: E-BUS Digital Space Temperature/Humidity Sensor Only.</p>		<p>Page 24</p>
ASM01829	<p>E-BUS CO₂ Wall-Mounted Sensor</p> <p>Used with the AZ 3 Controller for CO₂ sensing applications where wall mounting in the space is desired. Connects to the AZ 3 Controller with an EBC E-BUS cable, sold separately.</p> <p>Includes: Wall-Mounted CO₂ Sensor Only.</p>		<p>Page 25</p>
ASM01831	<p>E-BUS Return Air Duct-Mounted CO₂ Sensor with Remote Pickup Tube</p> <p>Used with the AZ 3 Controller for duct-mounted return air CO₂ sensing applications. Connects to the AZ 3 Controller with an EBC E-BUS cable, sold separately.</p> <p>Includes: Return Air Duct-Mounted CO₂ Sensor, Integral Aspiration Box, Airflow Pickup Tube, 10 feet of 1/4" tubing, and 10 ft. EBC Cable. If a longer EBC cable is required, it must be ordered separately.</p>		<p>Page 26</p>
ASM01836	<p>E-BUS Horizontal Outdoor Air Temperature & Humidity Sensor</p> <p>Used for outdoor temperature and humidity sensing applications. Connects to the AZ 3 Controller or E-BUS Adapter Hub using an EBC E-BUS cable.</p> <p>Includes: E-BUS Horizontal Outdoor Air Temperature & Humidity Sensor, mounted in a weatherproof handy box with attached 3 foot EBC E-BUS Cable with jack. A 25 foot EBC cable is included to connect to the AZ 3 Controller. If a longer EBC cable is required, it must be ordered separately.</p>		<p>Page 30</p>
ASM01838	<p>E-BUS Vertical Outdoor Air Temperature & Humidity Sensor</p> <p>Used for outdoor temperature and humidity sensing applications. Connects to the AZ 3 Controller or E-BUS Adapter Hub using an EBC E-BUS cable.</p> <p>Includes: E-BUS Vertical Outdoor Air Temperature & Humidity Sensor, mounted in a weatherproof handy box with attached 3 foot EBC E-BUS Cable with jack. A 25 foot EBC cable is included to connect to the AZ 3 Controller. If a longer EBC cable is required, it must be ordered separately.</p>		<p>Page 30</p>
ASM01840	<p>E-BUS Return Air Temperature & Humidity Sensor</p> <p>Used for return air temperature and humidity sensing applications. Connects to the AZ 3 Controller or E-BUS Adapter Hub using an EBC E-BUS cable.</p> <p>Includes: E-BUS Return Air Temperature & Humidity Sensor, mounted in a weatherproof handy box attached to a 3 foot EBC E-BUS Cable with jack. A 50 foot EBC cable is included to connect to the AZ 3 Controller. If a longer EBC cable is required, it must be ordered separately.</p>		<p>Page 31</p>
ASM01845	<p>Suction Pressure Transducer Kit with E-BUS Adapter</p> <p>Used for suction pressure sensing applications. Connects to AZ 3 Controller using E-BUS Adapter Board and EBC E-BUS cable.</p> <p>Includes: Suction Pressure Transducer, modular cable with a modular connector on one end and bare stripped wires on the other end, E-BUS Adapter, and 3 Foot EBC E-BUS cable. If a longer EBC cable is required, it must be ordered separately.</p>		<p>Page 32</p>

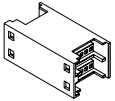
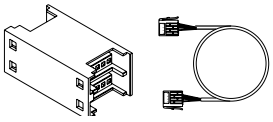
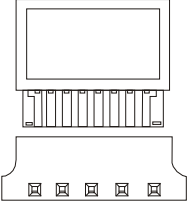
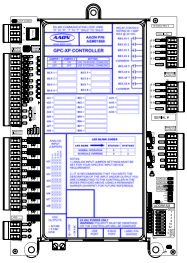
Parts and Descriptions

PART NO.	PART DESCRIPTION	ILLUSTRATION	PAGE NO.
G029440 (1.5') G012870 (3') G029460 (10') G045270 (25') G029510 (50') G029530 (75') G029450 (100') G029470 (150') V36590 (250') G018870 (1000')	<p>EBC E-BUS Cables</p> <p>The EBC E-BUS Cables attach to the AZ 3 Controller, AZ 3 Expansion Modules, and E-BUS Sensors. The EBC E-BUS cables can be crimped and clamped to the E-BUS connector. Different lengths can be joined together using an E-BUS extension adapter. The E-BUS Cables are available in 1.5, 3, 10, 25, 50, 75, 100, 150, and 250 foot lengths.</p> <p>Includes: EBC E-BUS Cable Assembly.</p> <p>The G018870 is a 1000 Foot Spool of bulk EBC cable that can be used with the G018890 bulk EBC Connectors (see bulk connectors below).</p>		N/A
G018890	<p>EBC Bulk Connectors</p> <p>Includes: (1) Bulk Connector. Crimps to EBC Spool Cable. Must be crimped using a 3M E-9E EBC Crimp tool.</p>		N/A
ASM01646	<p>3% Space Mounted Relative Humidity Sensor 0-5 VDC Output</p> <p>Used for humidity sensing applications when a non-digital space sensor is used.</p> <p>Includes: 0-5 VDC, Space Mounted Relative Humidity Transmitter only.</p>		Page 38, 45
G042230	<p>Outdoor Air Temperature Sensor</p> <p>Used for temperature sensing applications.</p> <p>Includes: 10k Ohm Outdoor Air Temperature Sensor, 2 wire, mounted in a weatherproof handy box only.</p>		Page 22, 29
ASM01640	<p>Duct Static Pressure Sensor</p> <p>Used for duct static pressure sensing applications.</p> <p>Includes: 0-5" W.C., 0-5 VDC, Static Pressure Sensor only.</p>		Page 38, 40
ASM01832	<p>Building Static Pressure Sensor</p> <p>Used for Building Pressure Sensing.</p> <p>Includes: -0.25 to +0.25" W.C., 0-5 VDC, 24 VAC/VDC supply power Building Pressure Sensor only.</p>		Page 38, 44
ASM02242	<p>Static Pressure Pick-up Tube</p> <p>Used with Static Pressure Sensor for static pressure sensing applications.</p> <p>Includes: Static Pressure Pick-up Tube with 1 ft. length of FRP tubing, gasketed mounting bracket, and screws.</p>		Page 40
G051240 G051250	<p>Duct Temperature Sensor - 6" Probe Duct Temperature Sensor - 12" Probe</p> <p>G051240 = 6" probe length. G051250 = 12" probe length. Used for return or supply air temperature sensing applications.</p> <p>Includes: 10k Ohm Duct Temperature Sensor, 2 wire only.</p>		Page 28, 33
ASM01624	<p>Strap-on Temperature Sensor Kit</p> <p>Used for water temperature sensing applications. Includes: sensor, thermal mastic, and plastic mounting strap.</p> <p>Includes: 10k Ohm, Type 3, Strap-on Temperature Sensor, 2 wire.</p>		Page 43
ASM02243	<p>Immersion Well for G051240 Water Temperature Sensor</p> <p>The thermowell is designed to thread into a 1/2" FPT elbow or tee in the water piping system.</p> <p>Includes: Stainless steel thermowell to be used with the G051240 Temperature Sensor.</p>		Page 42

Parts and Descriptions

PART NO.	PART DESCRIPTION	ILLUSTRATION	PAGE NO.
ASM01874	<p>CommLink 5 Communications Interface</p> <p>The CommLink 5 connects to your control system using a USB computer connection to provide direct on-site communications with the control system from a computer with the Prism 2 software installed. For remote communications, see IP Module Kit.</p> <p>Includes: CommLink 5, 6 ft. long USB cable, and 120/24 VAC power supply. Required on all networked systems or if direct computer or remote computer connection is required. Connects to your computer's USB 1.1 or 2.1 port. Prism 2 computer front-end software must be installed on the direct or remote connected computer in order to communicate with your system.</p>		<p>See <i>CommLink 5 Technical Guide</i></p>
ASM01902	<p>IP Module Kit - Internet/LAN Connection</p> <p>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.</p> <p>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.</p>		<p>See <i>IP Module Technical Guide</i></p>
ASM02244	<p>USB-Link 2 Kit</p> <p>The USB-Link 2 is a pocket-sized communications interface used to connect a laptop computer to your controls system for configuration and monitoring purposes, utilizing a modular cable connection to the service port connector on the controllers and a USB cable to connect to a laptop computer.</p> <p>Includes: USB-Link 2 for multiple or single loop systems, USB cable, modular connection cable, two mini-DIN to terminal adapters, and Prism 2 software and Manual on a USB Flash Drive.</p>		<p>See <i>USB-Link 2 Technical Guide</i></p>
ASM02454	<p>AZ 3 MiniLink PD 5</p> <p>Used with AZ 3 control system to provide network communications, zone voting, alarming, and tenant logging capabilities. An AZ 3 MiniLink PD 5 is required on each loop of a Networked system.</p> <p>Includes: AZ 3 MiniLink PD 5.</p>		<p>See <i>AZ 3 MiniLink PD 5 Technical Guide</i></p>
ASM02533	<p>Prism 2 Front-End Computer Software</p> <p>Prism 2 provides standard, easy to understand status screens for each type of AZ 3 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.</p> <p>Includes: Prism Software and also Prism 2 Technical Guide in PDF format on a USB Flash Drive.</p>		<p>See <i>Prism 2 Technical Guide</i></p>

Parts and Descriptions

PART NO.	PART DESCRIPTION	ILLUSTRATION	PAGE NO.
G033970	<p>E-BUS Adapter Hub</p> <p>The E-BUS Adapter Hub is used for connecting E-BUS devices and Controllers together with EBC E-BUS cables of varying lengths.</p> <p>Includes: E-BUS Adapter Hub.</p>		N/A
ASM01635	<p>E-BUS Adapter Hub with 1.5 Foot EBC E-BUS Cable</p> <p>The E-BUS Adapter Hub is used for connecting E-BUS devices and Controllers together with EBC E-BUS cables of varying lengths.</p> <p>Includes: E-BUS Adapter Hub and 1.5 foot EBC E-BUS cable.</p>		N/A
ASM01907	<p>Communication Surge Protector Kit</p> <p>Used to isolate power surges to the communications wiring caused by lightning strikes for communications wiring loops that are routed outdoors or between buildings. One kit is required at each point where the communications wiring leaves or enters a building.</p> <p>Includes: Communication Surge Protector, Base Module, and Mounting/Wiring Instructions.</p>		N/A
ASM01868	<p>GPC-XP Controller</p> <p>The GPC-XP Controller is used for controlling equipment or processes that cannot be controlled using a standard HVAC controller. Prism 2 computer front end software is used 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, and other mechanical equipment. In addition, the GPC-XP provides (1) Lead/Lag start capability.</p> <p>The GPC-XP has 8 configurable analog inputs which will accept signals from thermistor temperature sensors, 4-20mA or 0-5VDC or 0-10VDC transmitters. Custom formulas created by available math functions and operators can be used in conjunction with the analog inputs to create a calculated value to be used and displayed for a specific analog input. The inputs are set for the desired scaling by means of a jumper bar. An additional input is available for communicating sensors available from AAON Controls. The GPC-XP also supports 8 wet contact binary inputs, which can be configured for either normally open or normally closed operation. The GPC-XP has 8 relay outputs for on/off control and 4 analog outputs for proportional control signals. Highest/lowest/average of the analog input values can be used in the GPC-XP logic or broadcast to other controllers on the control system loop. The GPC-XP also has 8 separate, 2 events per day schedules, which can be assigned to any input or output for operational control or alarm recognition based on time of day. These schedules can also be configured to broadcast to other AAON controllers installed on the control system loop.</p> <p>Includes: GPC-XP Controller only.</p>		<p>See <i>GPC-XP Controller Technical Guide</i></p>

AZ 3 Controller Dimensions

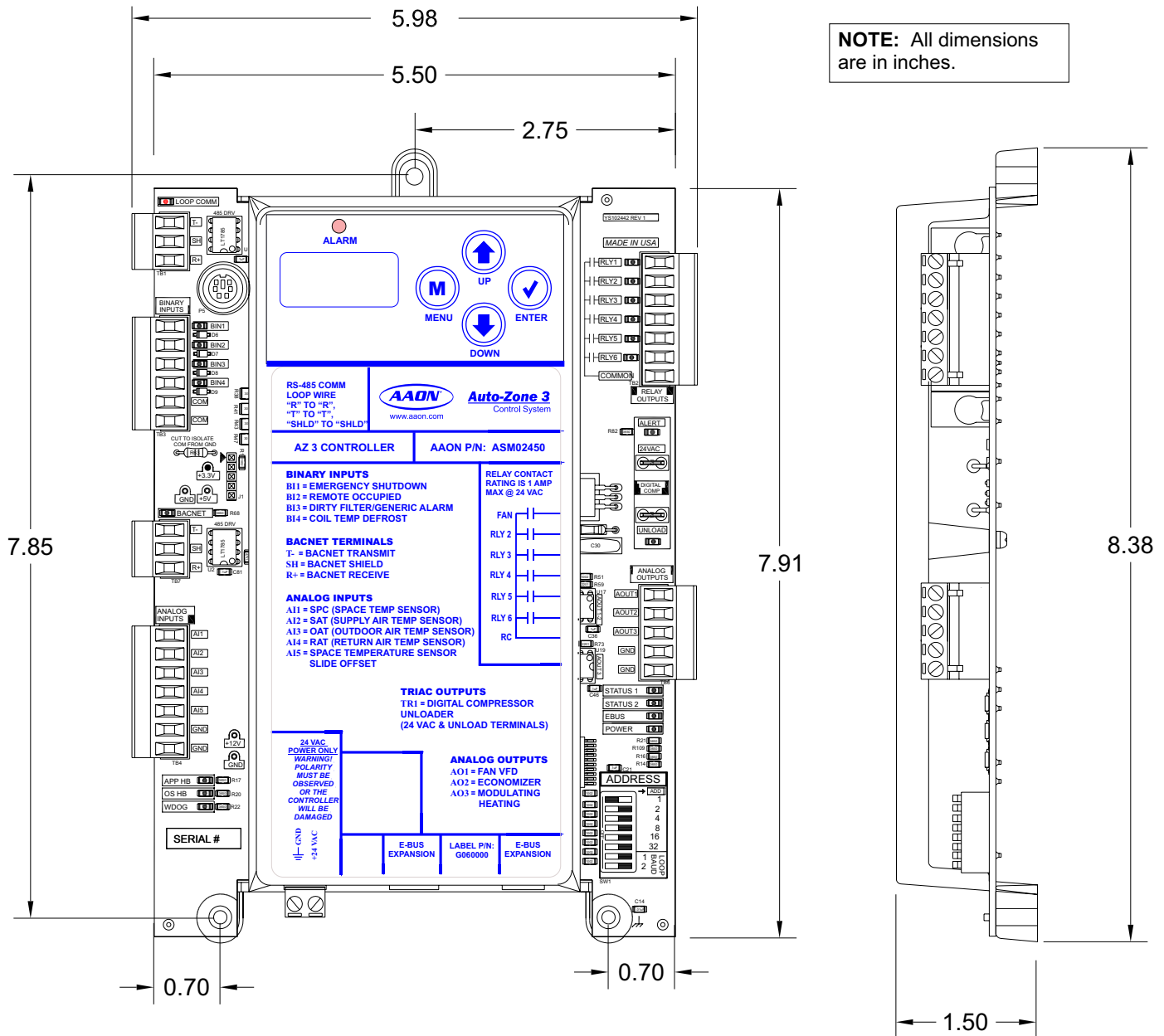


Figure 7: AZ 3 Controller Dimensions

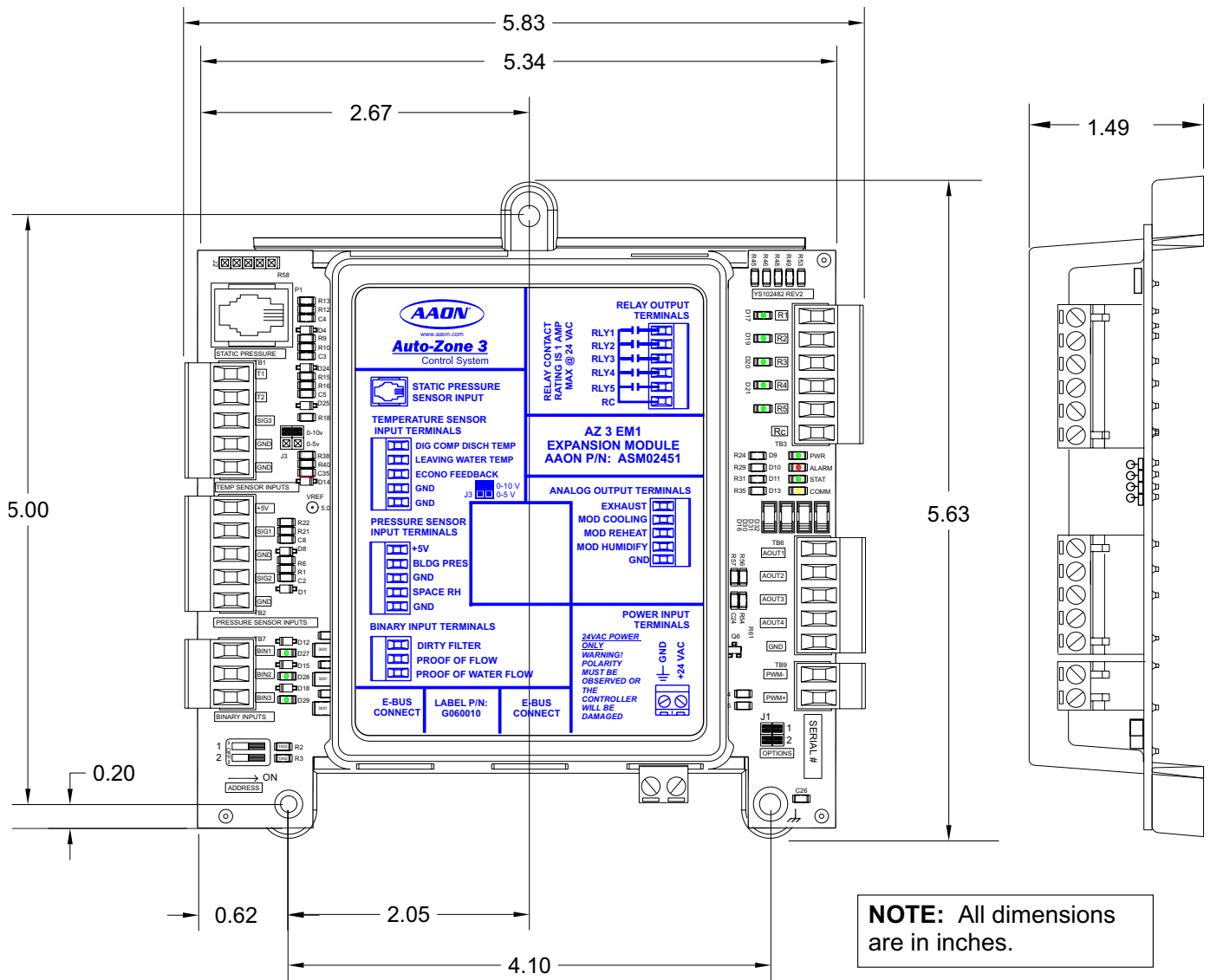


Figure 8: AZ 3 EM1 Expansion Module Dimensions

AZ 3 EM2 Dimensions

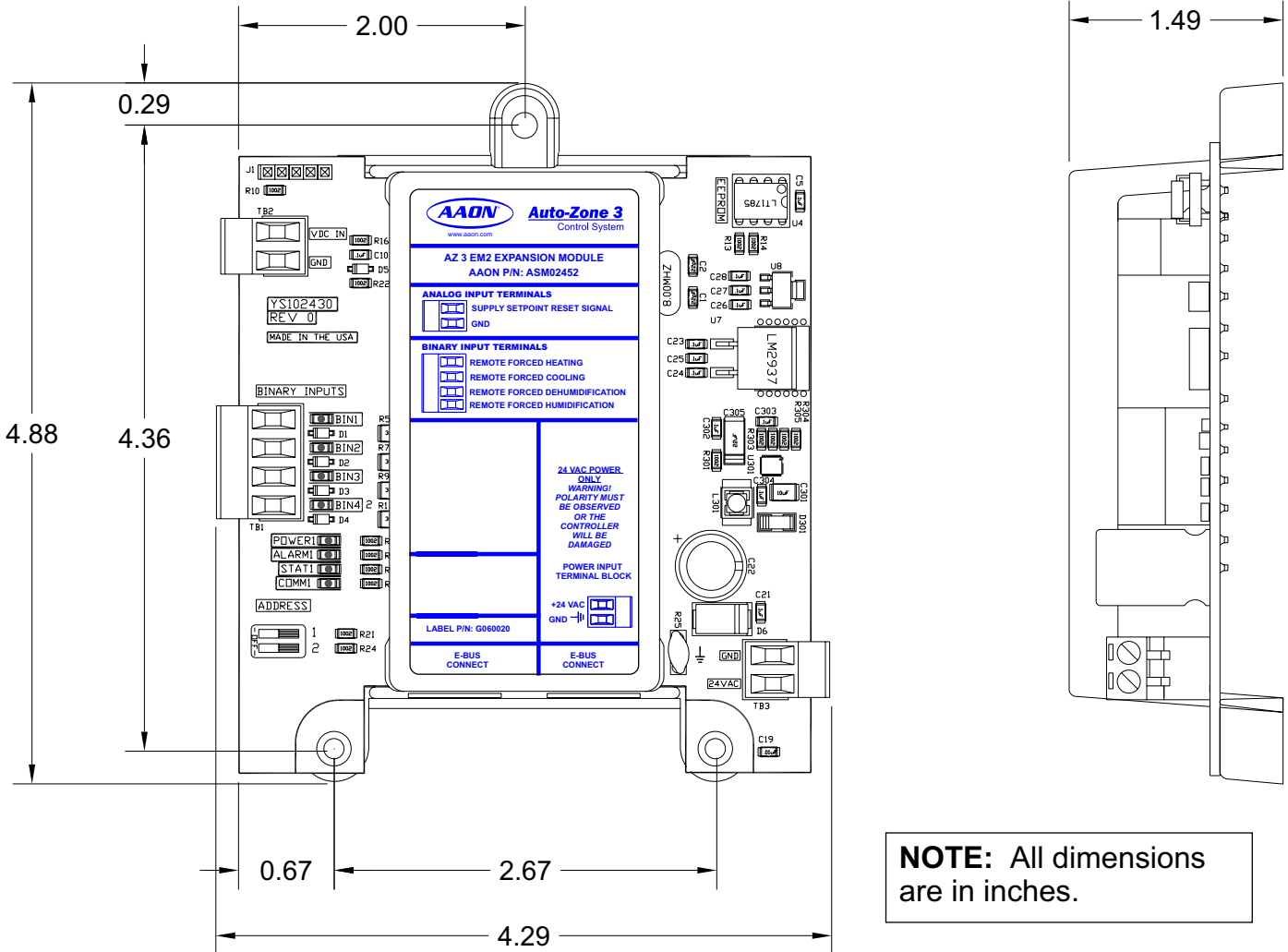
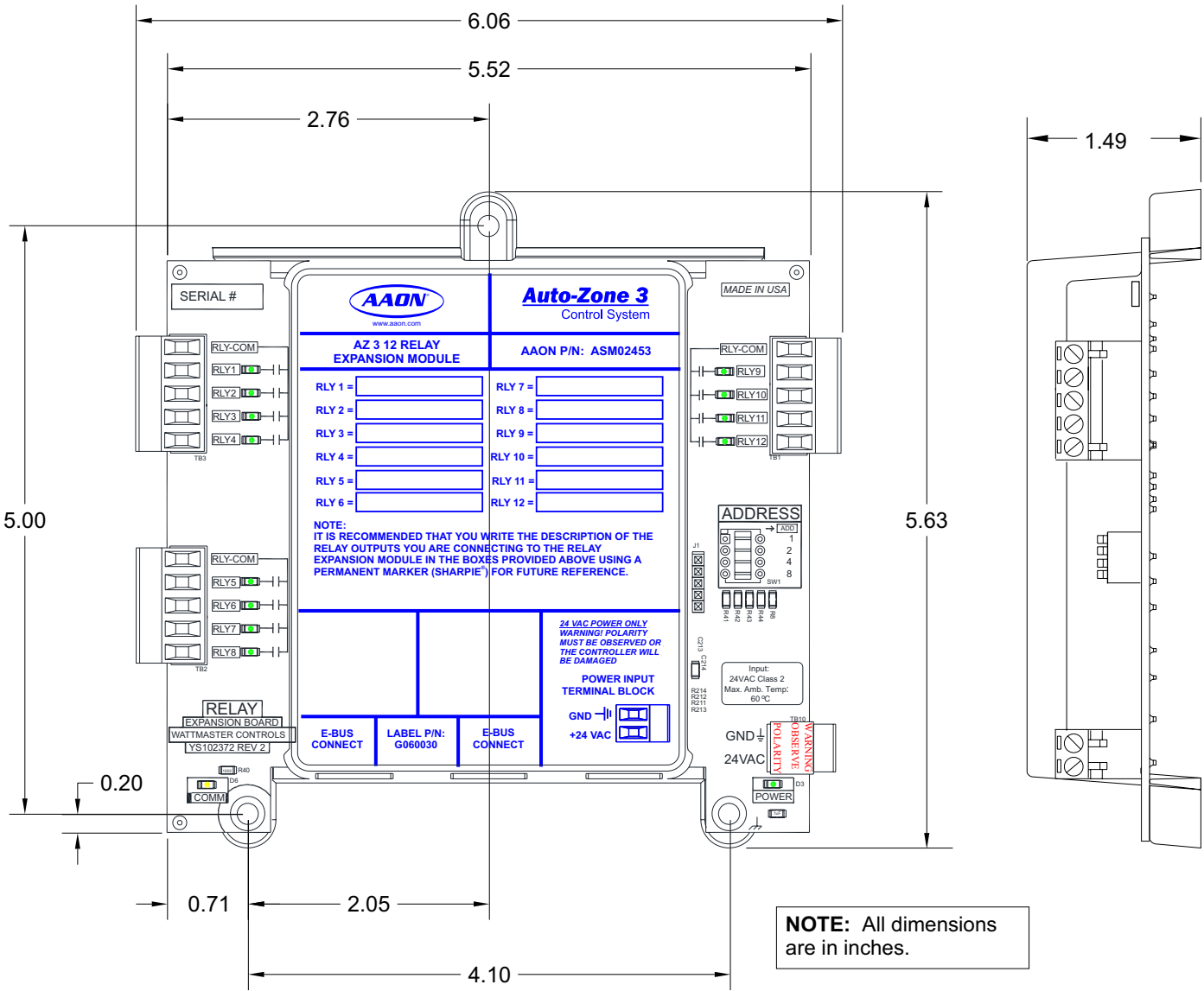


Figure 9: AZ 3 EM2 Expansion Module Dimensions

AZ 3 E-BUS 12 Relay Expansion Module Dimensions



NOTE: All dimensions are in inches.

Figure 10: AZ 3 E-BUS 12 Relay Expansion Module Dimensions

Installation & Wiring

AZ 3 Controller Components

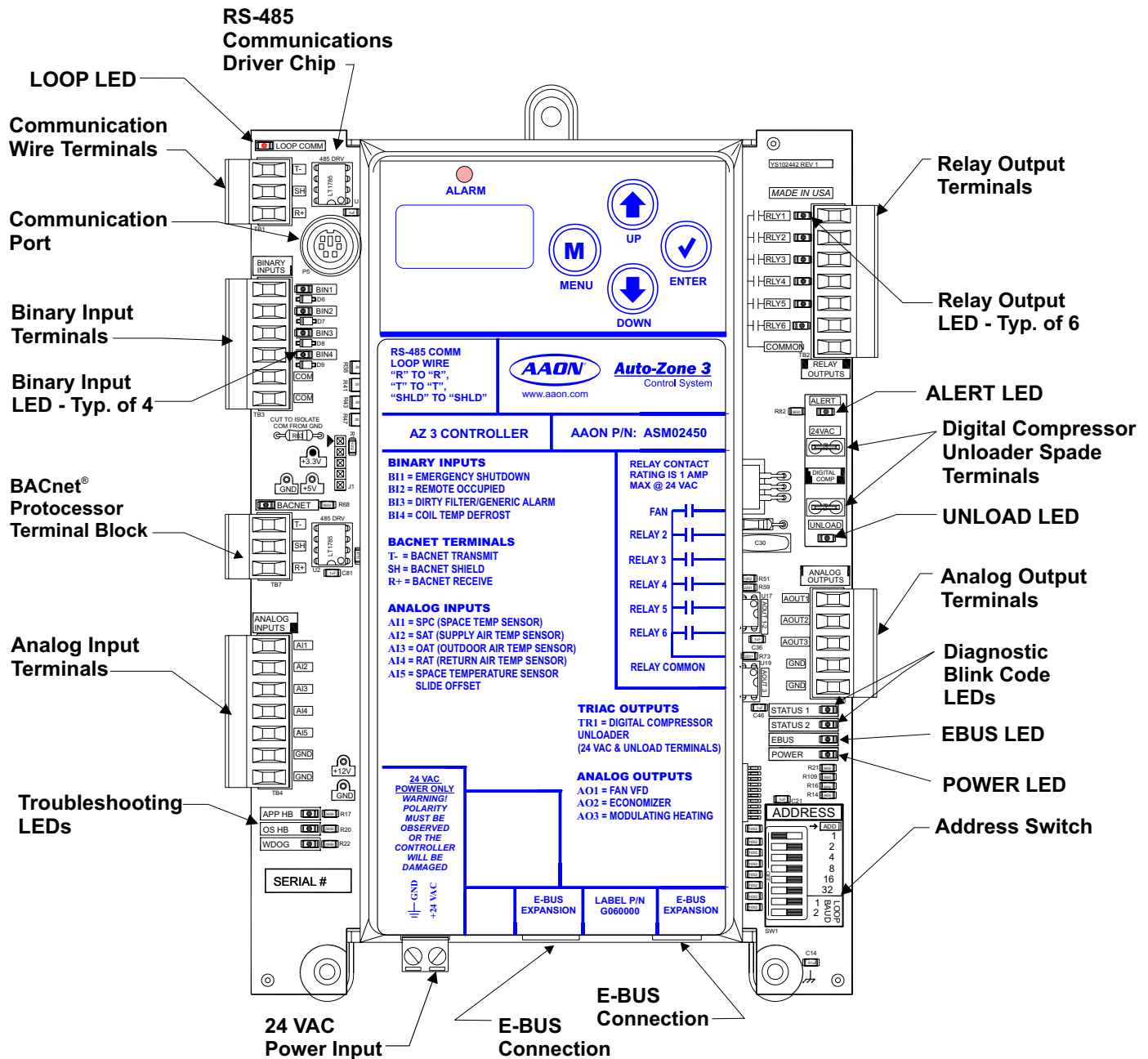


Figure 11: AZ 3 Controller Components

Important Wiring Considerations

General

Correct wiring of the AZ 3 Controller is the most important factor in the overall success of the controller installation process. The following information pertains to field wiring. If troubleshooting of the controller is required, it is a good idea to be familiar with the system wiring.

Controller Mounting

It is important to mount the controller in a location that is free from extreme high or low temperatures, moisture, dust, and dirt. See **Table 1** for a list of the required operating conditions for the AZ 3 Controller and associated expansion modules.

The AZ 3 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 3 Controller needs to be installed in an environment, which can maintain a temperature range between 10°F and 150°F and between 0% to 95% RH levels (non-condensing). Be careful not to damage the electronic components when mounting the controller.

Voltage Current & Environment

The AZ 3 Controller and expansion modules 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**.

Control Device	Voltage	VA Load	Temperature	Humidity (Non-Condensing)
AZ 3 CONTROLLER	18-30 VAC	8	10°F TO 150°F	0% TO 95% RH
EM1 EXP. MODULE	18-30 VAC	5	-30°F TO 150°F	0% TO 95% RH
EM2 EXP. MODULE	18-30 VAC	5	-30°F TO 150°F	0% TO 95% RH
E-BUS 12 RELAY EXPANSION MODULE	18-30 VAC	15	-30°F TO 150°F	0% TO 95% RH

Table 1: Voltage Current & Environment

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 3 Controller and expansion modules.

Please carefully read and apply the following information when wiring the AZ 3 Controller or the Expansion Modules. See **Figures 12 & 13 on pages 22 & 23** for AZ 3 input and output wiring. See **Figures 28 & 29 on pages 38 & 39** for the AZ 3 EM1 Expansion Module wiring. See **Figures 40 & 41 on pages 50 & 51** for AZ 3 EM2 Expansion wiring and **Figure 42 on page 52** for the AZ 3 E-BUS 12 Relay Expansion Module wiring.

1. All wiring is to be in accordance with local and national electrical codes and specifications.
2. All 24 VAC wiring must be connected so that all ground wires remain common. Failure to follow this procedure can result in damage to the controller and connected devices.
3. Minimum wire size for 24 VAC wiring should be 18-gauge.
4. Minimum wire size for all sensors should be 24-gauge. Some sensors require 2-conductor wire and some require 3-or 4-conductor wire.
5. Minimum wire size for 24 VAC thermostat wiring should be 22-gauge.
6. Be sure that all wiring connections are properly inserted and tightened into the terminal blocks. Do not allow wire strands to stick out and touch adjoining terminals which could potentially cause a short circuit.
7. When communication wiring is to be used to interconnect AZ 3 Controllers together or to connect to other communication devices, all wiring must be plenum-rated, minimum 18-gauge, 2-conductor, twisted pair with shield. AAON can supply communication wire that meets this specification and is color coded for the network or local loop. Please consult your Auto-Zone 3 distributor for information. If desired, Belden #82760 or equivalent wire may also be used.
8. Before applying power to the AZ 3 Controller, be sure to recheck all wiring connections and terminations thoroughly.

AZ 3 Controller Input Wiring

AZ 3 Controller Inputs

The ASM02450 AZ 3 Controller is designed with 5 analog inputs, 3 analog outputs, 1 triac output, 4 binary inputs and 6 relay outputs (5 configurable).

There are also 2 E-BUS Expansion Ports, which allow the use of communicating sensors and the E-BUS Modules.

See **Figures 12 & 13** for wiring details. Detailed wiring for all inputs and outputs are found on the pages that follow.

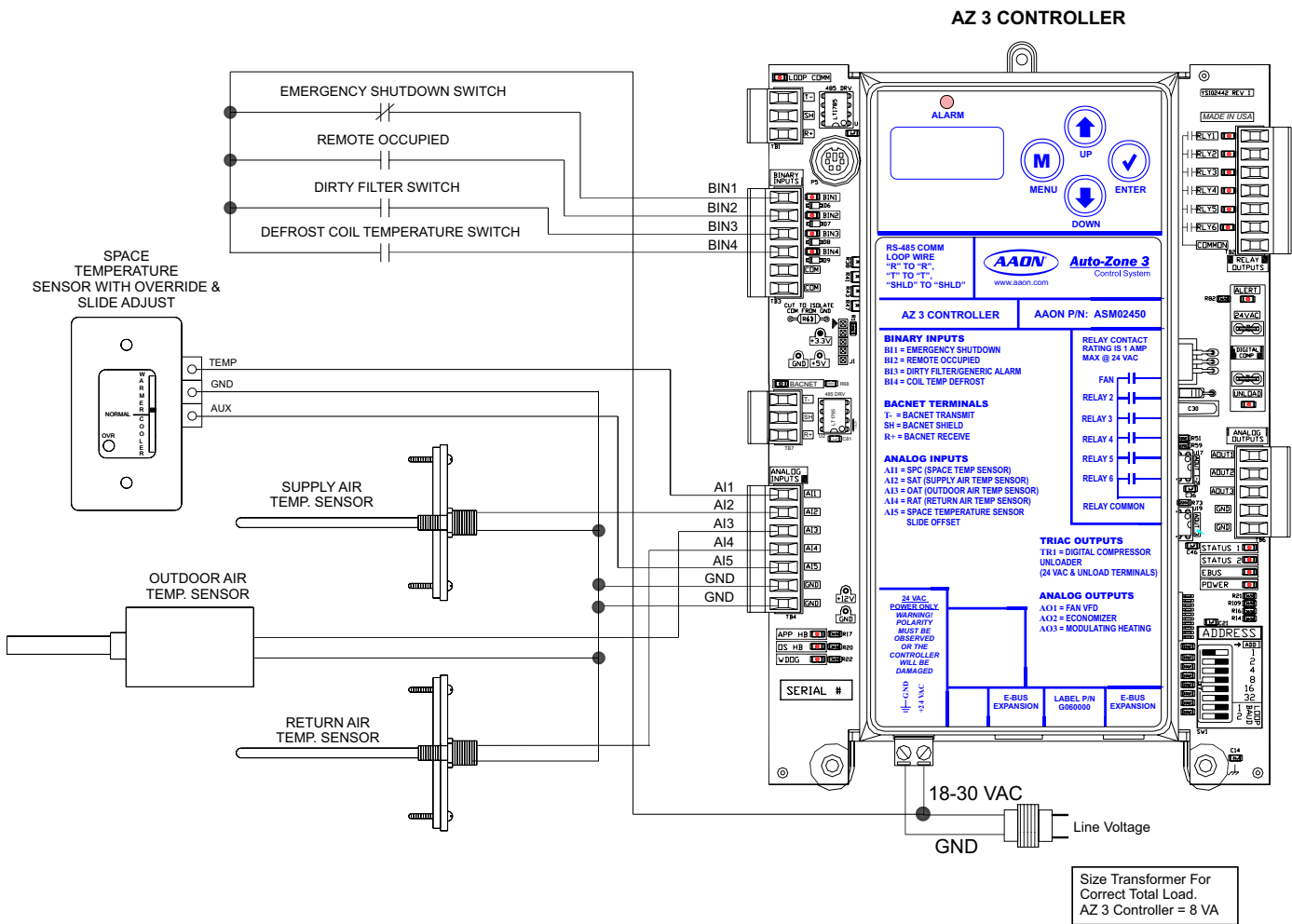


Figure 12: AZ 3 Controller Input Wiring

AZ 3 Controller Outputs

The ASM02450 AZ 3 Controller must be connected to 24 VAC as shown in the wiring diagram below. Please see **Table 1 on page 21** for correct VA requirements to use when sizing the transformer used for powering the Controller.

Also, please note that when wiring the AZ 3 Controller, its contacts must be wired as wet contacts (connected to 24 VAC).

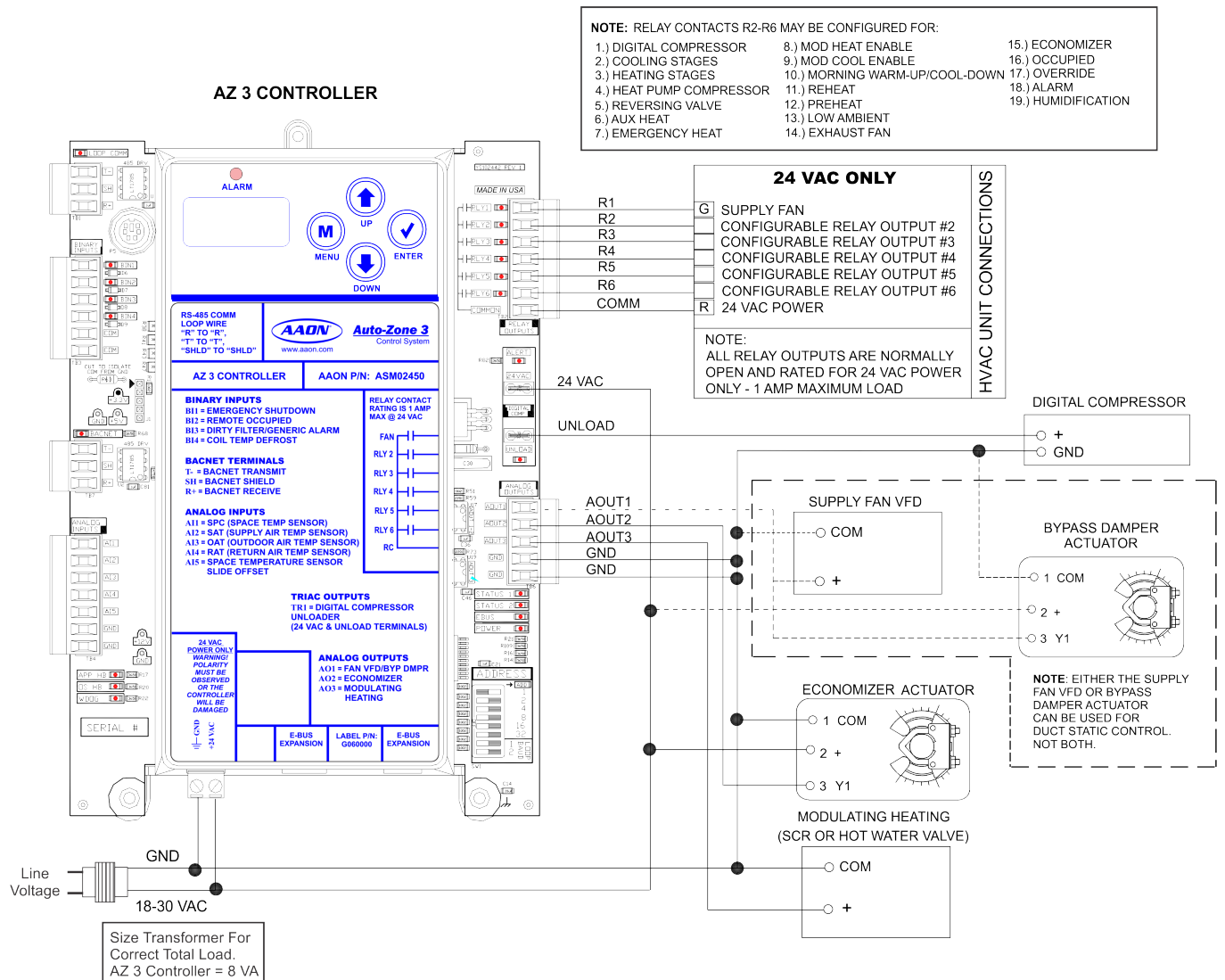


Figure 13: AZ 3 Controller Output Wiring

E-BUS Digital Space Sensor Wiring

E-BUS Digital Space Sensor

The ASM01819 E-BUS Digital Space Temperature Sensor can be used to sense Space Temperature. The ASM01820 or ASM02221 E-BUS Digital Space Temperature Sensor can be used to sense Space Temperature and Humidity. The ASM02221 has no LCD display or keypad. The Sensor connects to the AZ 3 Controller with the EBC E-BUS cable. It can also be daisy-chained with a CO₂ Sensor for applications requiring both a wall-mounted CO₂ sensor and space temperature sensor.

The E-BUS Digital Space Sensor should be mounted at the building code specified height on the wall in an area that does not have drafts or is exposed to direct sunlight. See **Figure 14** below for wiring details.

NOTE: If using multiple E-BUS Sensors or Modules, the E-BUS Hub (ASM01635) may be required.

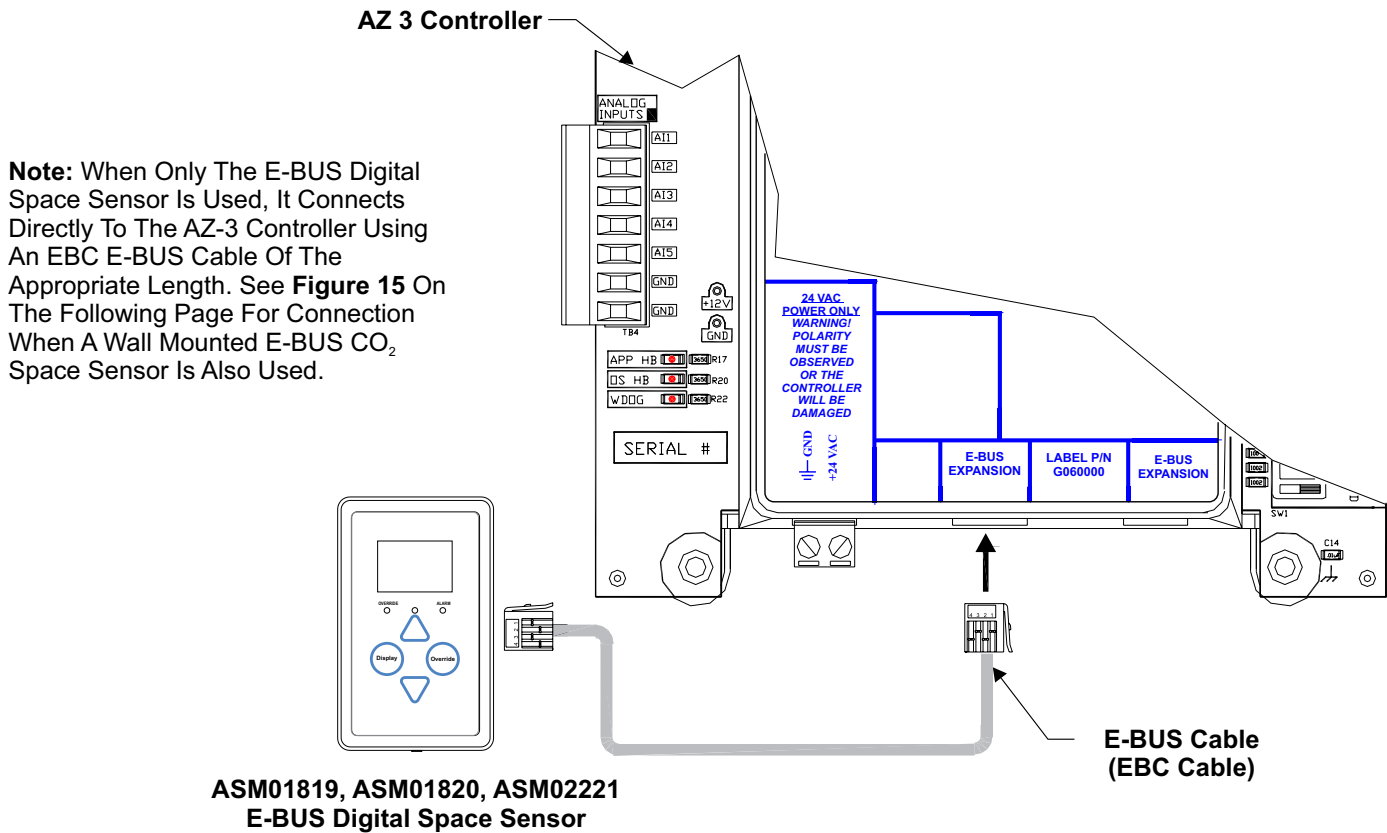


Figure 14: E-BUS Digital Space Sensor Wiring

Wall-Mounted E-BUS CO₂ Sensor Wiring

E-BUS CO₂ Wall-Mounted Sensor

The ASM01829 Wall-Mounted E-BUS CO₂ Sensor is used to monitor CO₂ levels in the space served by the HVAC unit. The E-BUS CO₂ Sensor connects to the AZ 3 Controller with an EBC E-BUS cable. It can be daisy-chained with the E-BUS Digital Space Sensor (ASM01819, ASM01820 or ASM02221) for applications requiring both a Space CO₂ sensor and Space temperature sensor.

It should be mounted at building code height on the wall in an area that does not have drafts or is exposed to direct sunlight. See **Figure 15** below for wiring details and installation notes. A Duct-Mounted E-BUS CO₂ Sensor can be used if desired instead of the Wall-Mounted E-BUS CO₂ Sensor. See **Figure 16 on page 26** for Duct-Mounted E-BUS CO₂ Sensor wiring details.

NOTE: If using multiple E-BUS Sensors or Modules, the E-BUS Hub (ASM01635) may be required.

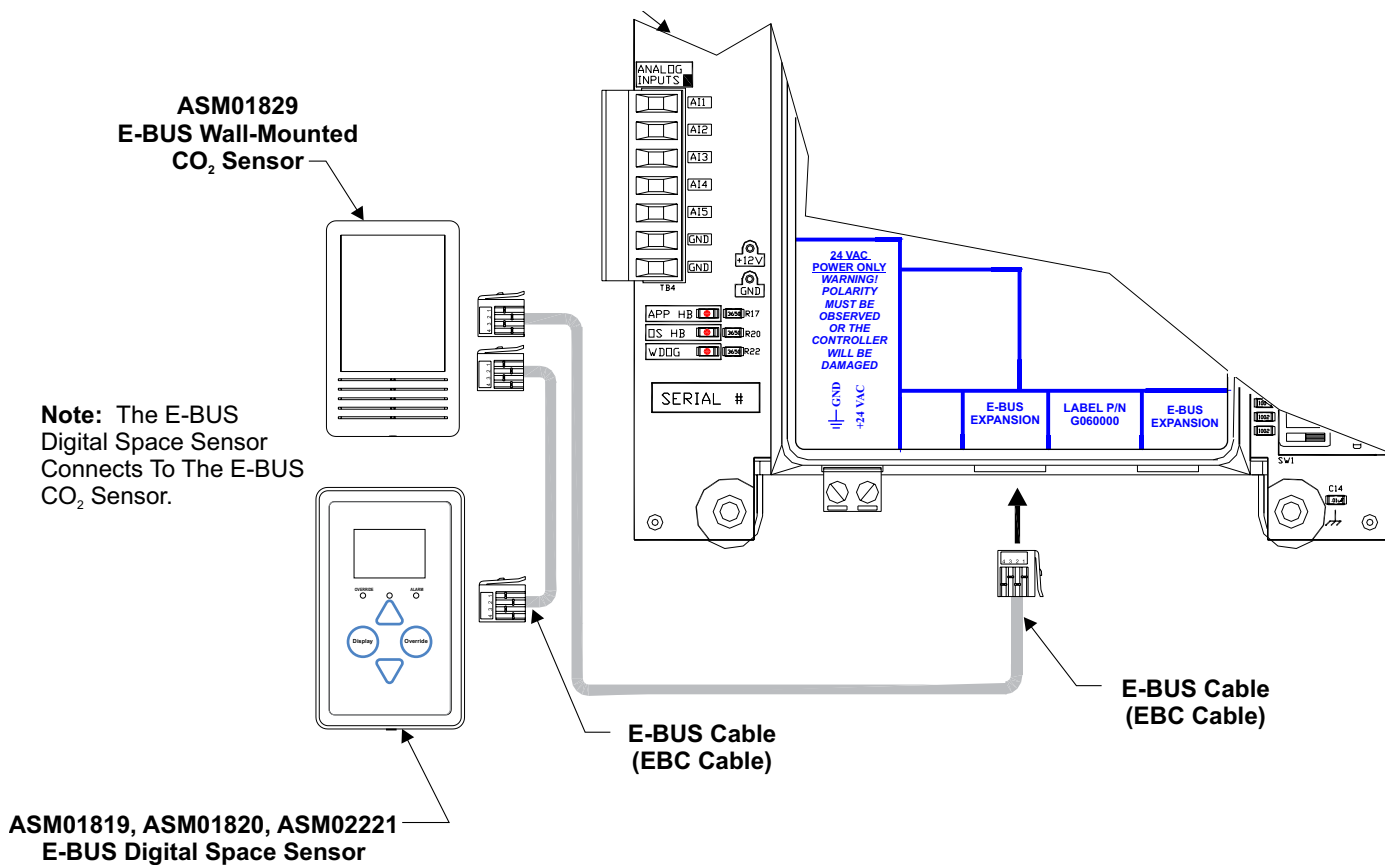


Figure 15: Wall-Mounted E-BUS CO₂ Sensor Wiring

Duct-Mounted E-BUS CO₂ Sensor

Duct-Mounted E-BUS CO₂ Sensor

The ASM01831 Duct-Mounted E-BUS CO₂ Sensor with Remote Pickup Tube is used for sensing the current CO₂ level in the HVAC unit's return air stream. This is useful when you want an average CO₂ reading in the area served by the HVAC unit or when you don't want a wall-mounted E-BUS CO₂ Sensor due to sensor tampering concerns in the space.

The Duct-Mounted E-BUS CO₂ Sensor is comprised of the CO₂ Sensor, the Aspiration Box Assembly, an Airfoil Remote Pickup Tube, 10 foot length of FRP Tubing and a 10 foot long E-BUS Cable.

The Remote Pickup Tube is designed to be mounted in the return air duct of the HVAC unit. The CO₂ Sensor is connected via FRP tubing to the E-BUS CO₂ Sensor enclosure to sample the CO₂ level in the duct. See **Figure 16** below for wiring and installation details.

NOTE: If using multiple E-BUS Sensors or Modules, the E-BUS Hub (ASM01635) may be required.

Note:
 1.) The Duct Mounted E-BUS CO₂ Sensor Connects To The AZ 3 Controller Or Other Module E-BUS Port Using An EBC E-BUS Cable Of The Required Length Or The Provided 10 Foot EBC Cable.
 2.) See The Installation Sheets Included With The E-BUS Duct Mounted Return Air CO₂ Sensor Package For Complete Wiring And Connection Instructions.

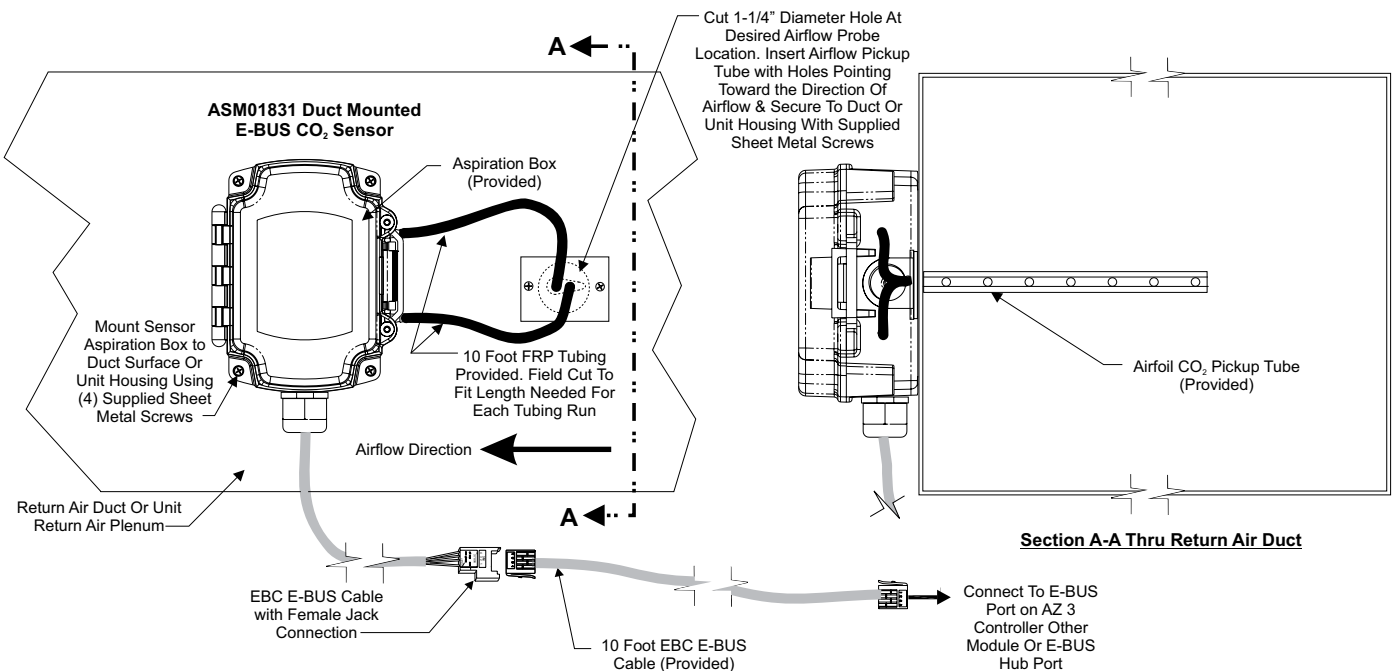


Figure 16: Duct-Mounted E-BUS CO₂ Sensor Wiring

Space Temperature Sensor Wiring

Space Temperature Sensor

The ASM02227, ASM01638, ASM01642 & ASM01643 Space Temperature Sensors are typically used for constant volume HVAC unit applications controlling one zone. All Space Temperature Sensors are a 10K Type III thermistor type sensors. They should be mounted at the required building code height in the space that is to be controlled.

The Space Temperature Sensor is available as a plain sensor (ASM02227), sensor with override button (ASM01638), sensor with slide adjust (ASM01642), and sensor with slide adjust and override (ASM01643) configurations.

See **Figure 17** below for complete Space Temperature Sensor wiring details.

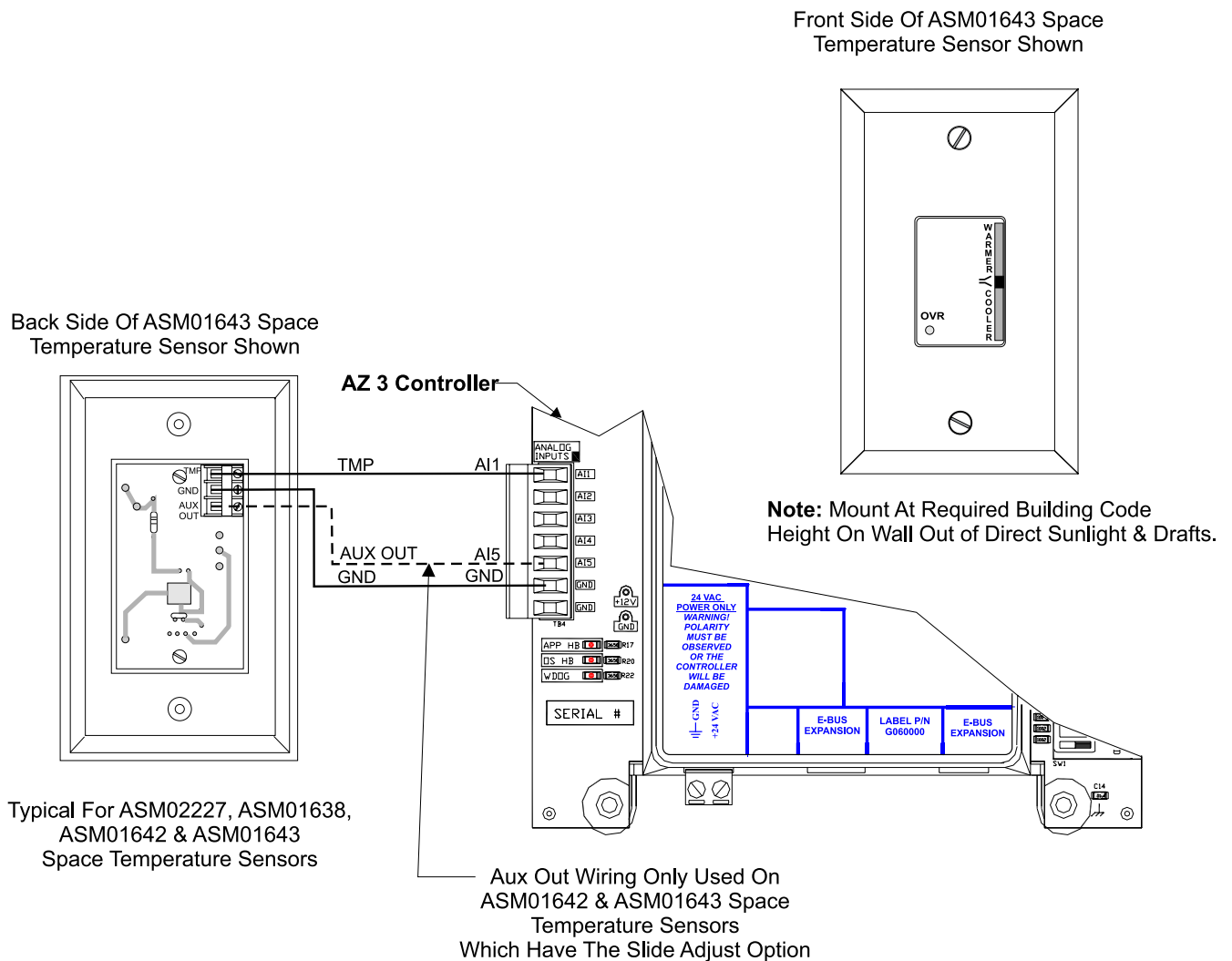


Figure 17: Space Temperature Sensor Wiring and Slide Adjust

Installation & Wiring

Supply Air Temperature Sensor Wiring

Supply Air Temperature Sensor

The G051250 Supply Air Temperature Sensor must be wired as shown for proper operation. The Supply Air Temperature Sensor is a 10K Ohm Type III thermistor sensor. The Supply Air Temperature Sensor should be mounted in the unit discharge plenum or in the supply air duct. See **Figure 18** below for details.

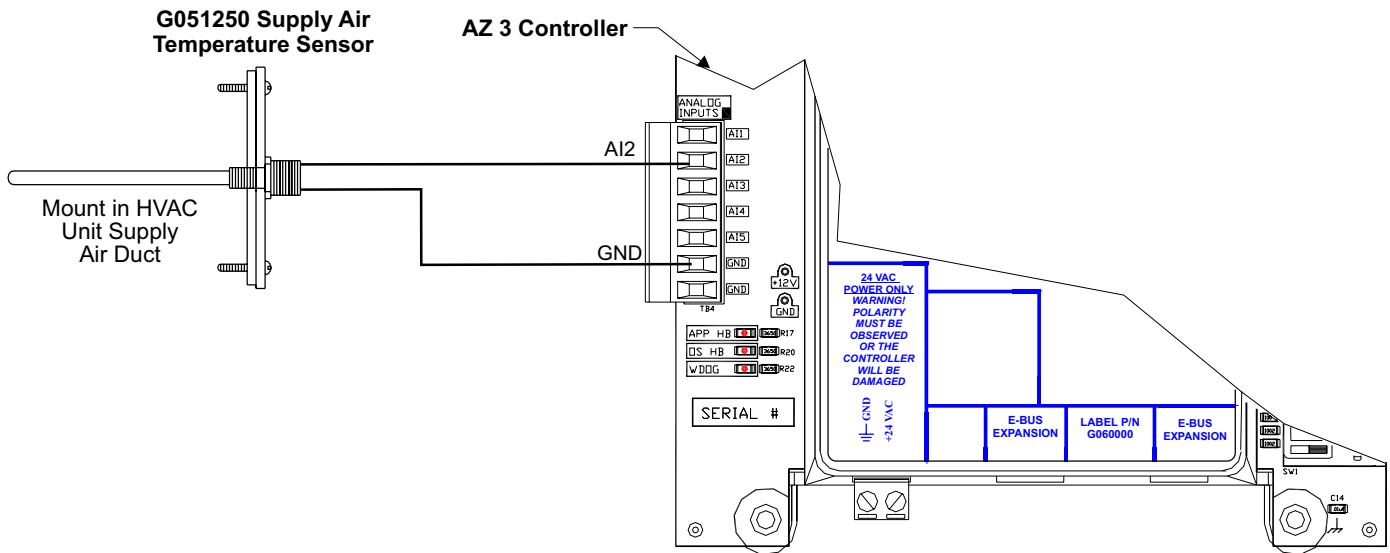


Figure 18: Supply Air Temperature Sensor Wiring

Outdoor Air Temperature Sensor Wiring

Outdoor Air Temperature Sensor

The G042230 Outdoor Air Temperature Sensor must be wired as shown for proper operation of the AZ 3 Controller. The Outdoor Air Temperature Sensor is a 10K Ohm Type III thermistor sensor. The sensor should be mounted in the upright position as shown 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. See **Figure 19** below for details.

For applications involving Outdoor Air Humidity, the ASM01836 or ASM01838 E-BUS Horizontal or Vertical Outdoor Air Temperature & Humidity Sensor must be used instead. See **Figure 20** on page 30 for details.

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.

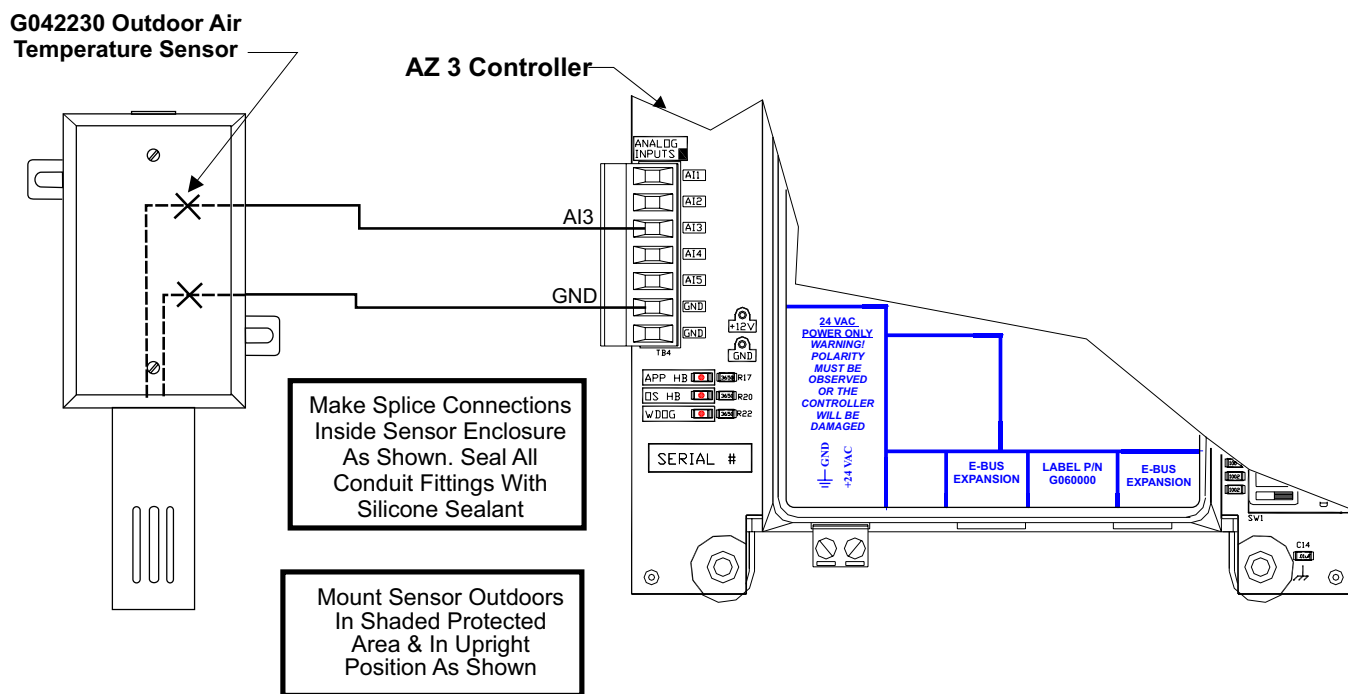


Figure 19: Outdoor Air Temperature Sensor Wiring

E-BUS Outdoor Air Temperature & Humidity Sensor Wiring

E-BUS Horizontal or Vertical Outdoor Air Temperature & Humidity Sensor

The ASM01836 (Horizontal) or ASM01838 (Vertical) E-BUS Outdoor Air Temperature & Humidity Sensor connects to the AZ 3 Controller. An EBC E-BUS cable plugs into the Sensor's attached 3 foot cable and then plugs into the E-BUS port of the AZ 3 Controller or other E-BUS Expansion Board. The sensor should be mounted in the upright position as shown in an area that is protected from the elements and direct sunlight. See **Figure 20** below for details.

CAUTION: Be sure to mount the Outdoor Air Temperature & Humidity 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.

NOTE: If using multiple E-BUS Sensors or Modules, the E-BUS Hub (ASM01635) may be required.

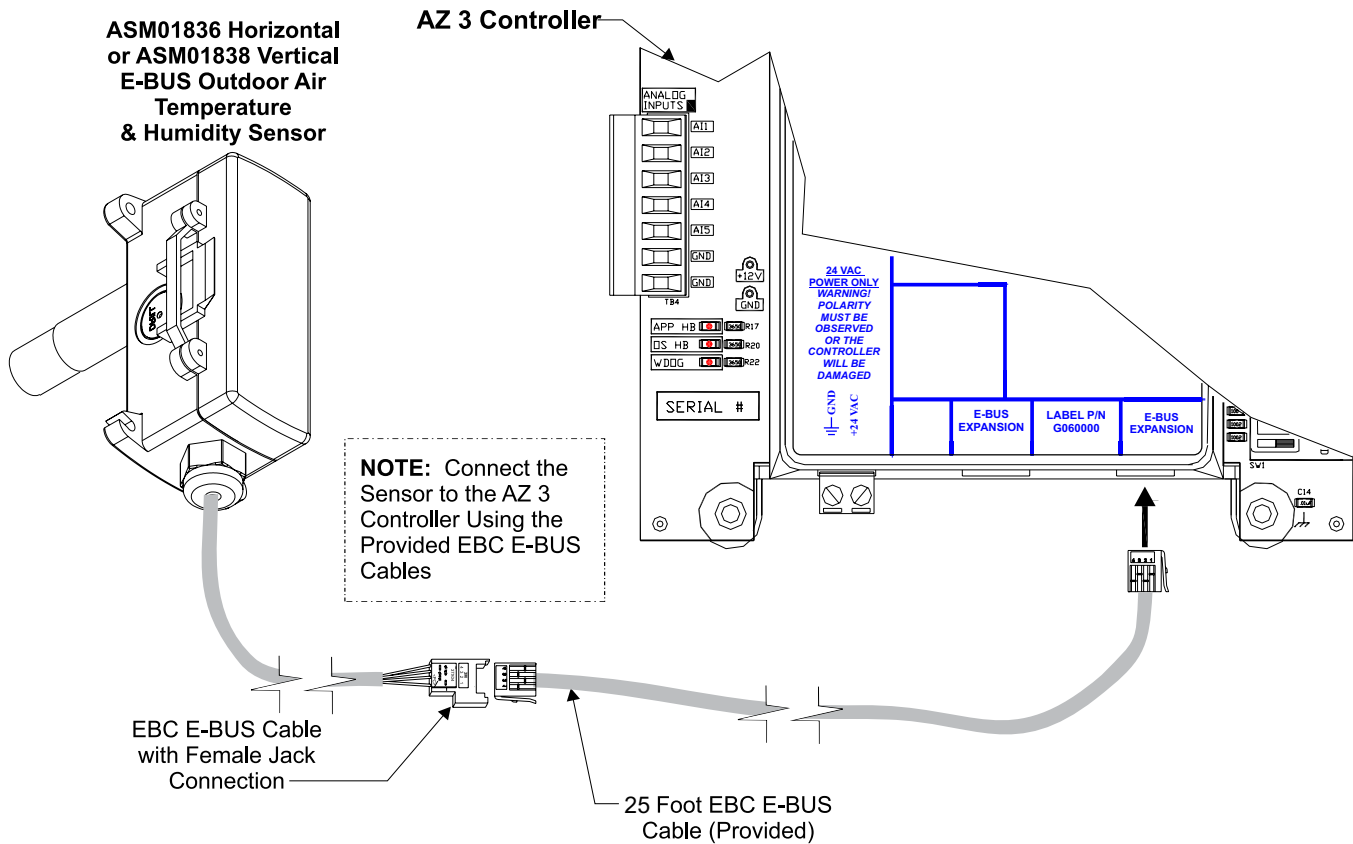


Figure 20: E-BUS Outdoor Air Temperature & Humidity Sensor Wiring

E-BUS Return Air Temperature & Humidity Sensor Wiring

E-BUS Return Air Temperature & Humidity Sensor

NOTE: If using multiple E-BUS Sensors or Modules, the E-BUS Hub (ASM01635) may be required.

The ASM01840 E-BUS Return Air Temperature & Humidity Sensor connects to the AZ 3 Controller. A 50 foot EBC E-BUS cable (provided) plugs into the Sensor's attached 3 foot cable and then plugs into the E-BUS port of the AZ 3 Controller or other E-BUS Expansion Board. The sensor should be mounted in the upright position as shown in an area that is protected from the elements and direct sunlight. See **Figure 21** below for details.

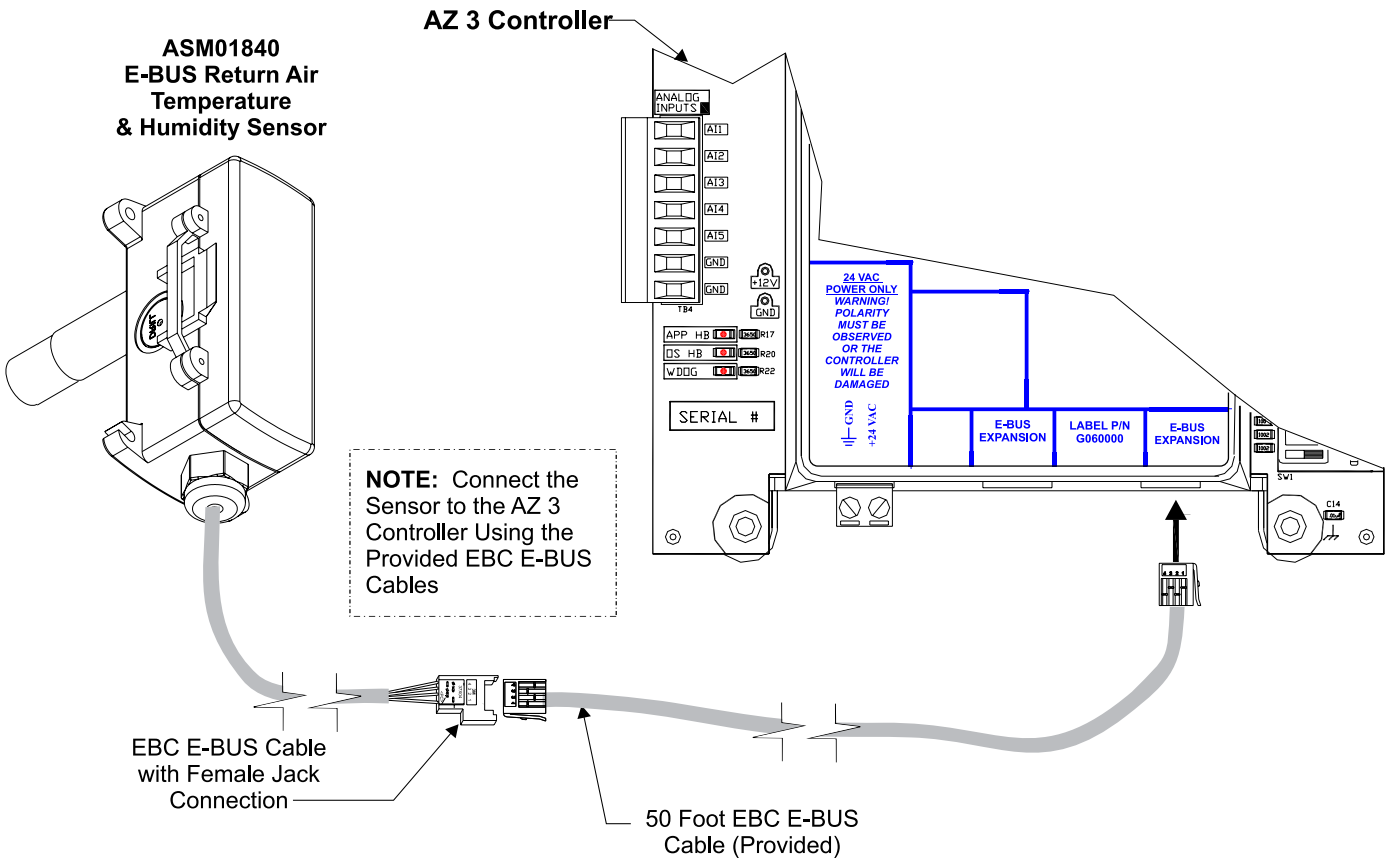


Figure 21: E-BUS Return Air Temperature & Humidity Sensor Wiring

Suction Pressure Transducer Wiring

Suction Pressure Transducer Kit

The ASM01845 Suction Pressure Transducer Kit is comprised of the ASM02222 Suction Pressure Transducer, modular cable with a modular connector on one end and bare stripped wires on the other end, an E-BUS Adapter Board, and a 3 foot EBC E-BUS Cable. It is required for any AZ 3 application with DX Cooling that requires Dehumidification and for Water Source Heat Pump applications.

The Suction Pressure Transducer is used to measure suction pressure at the HVAC unit's DX evaporator coil suction line. This suction line pressure is converted to saturated refrigerant temperature by the AZ 3 Controller. This temperature is used by the AZ 3 Controller to accurately control the compressors to a suction temperature setpoint to provide optimum performance from the system during Dehumidification operation and to provide compressor protection on Water Source Heat Pump units.

The Suction Pressure Transducer wires to the AZ 3 Controller as shown in **Figure 22** below. In this application, the Suction Pressure

Transducer connects to the E-BUS Adapter Board's V, SIG, and GND terminals through a cable. The cable is supplied with a 3-pin Packard mating connector for attachment to the sensor on one end and has 3 color-coded stripped wires on the other end. The stripped wire ends can be spliced to other wires to extend the wiring length when required. The EBC E-BUS Cable connects to the E-BUS Adapter Board. This cable must then connect to the AZ 3 Controller directly or to an AZ 3 Expansion Board connected to the AZ 3 Controller.

NOTE: In most cases, the AZ 3 Controller will not be directly controlling the digital compressor. Generally, digital compressor control will be done by the unit manufacturer's compressor controller. When this is the case, a relay output should be configured for each "Cooling Stage", and the previous Suction Pressure Transducer information would not apply.

NOTE: If using multiple E-BUS Sensors or Modules, the E-BUS Hub (ASM01635) may be required.

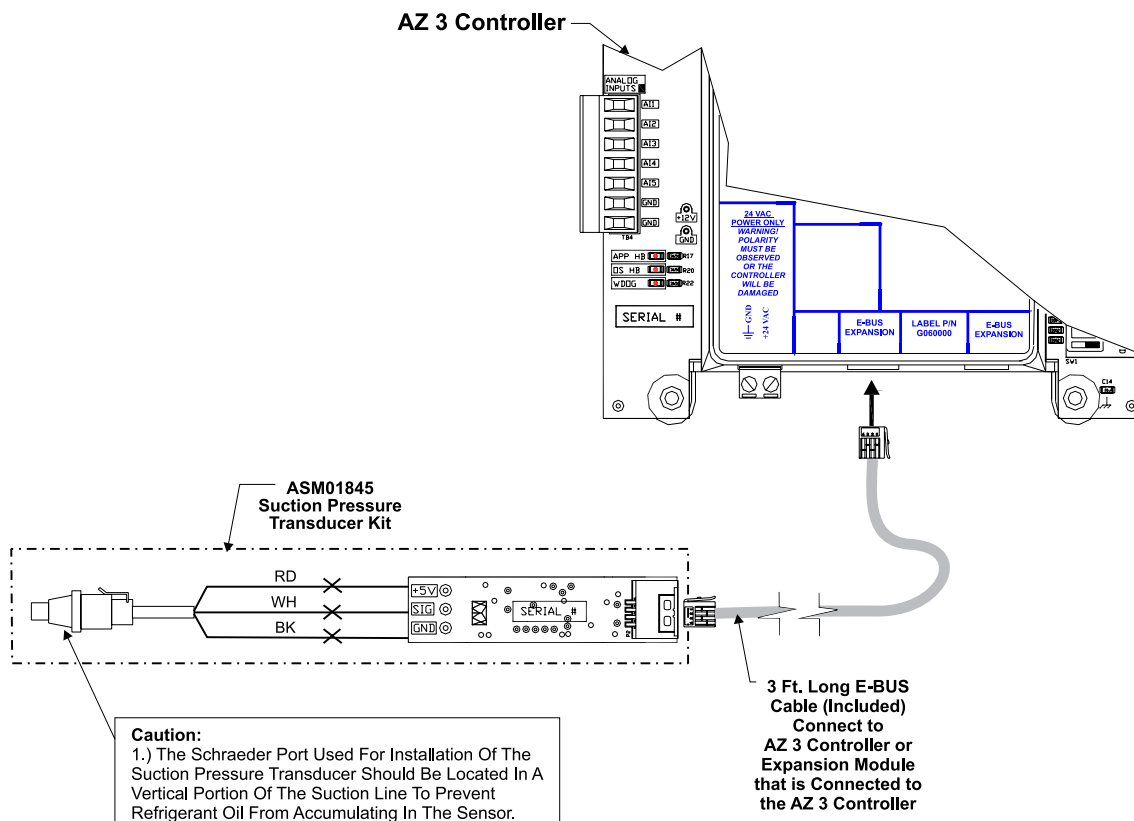


Figure 22: Suction Pressure Transducer Kit Wiring

Return Air Temperature Sensor Wiring

Return Air Temperature Sensor

The G051250 Return Air Temperature Sensor must be wired as shown in **Figure 23** below.

The Return Air Temperature Sensor is a 10K Type III thermistor sensor. The Return Air Temperature Sensor should be mounted in the return air duct. If the system has a Zoning Bypass Damper installed, be sure the return air sensor is located upstream of the bypass duct connection.

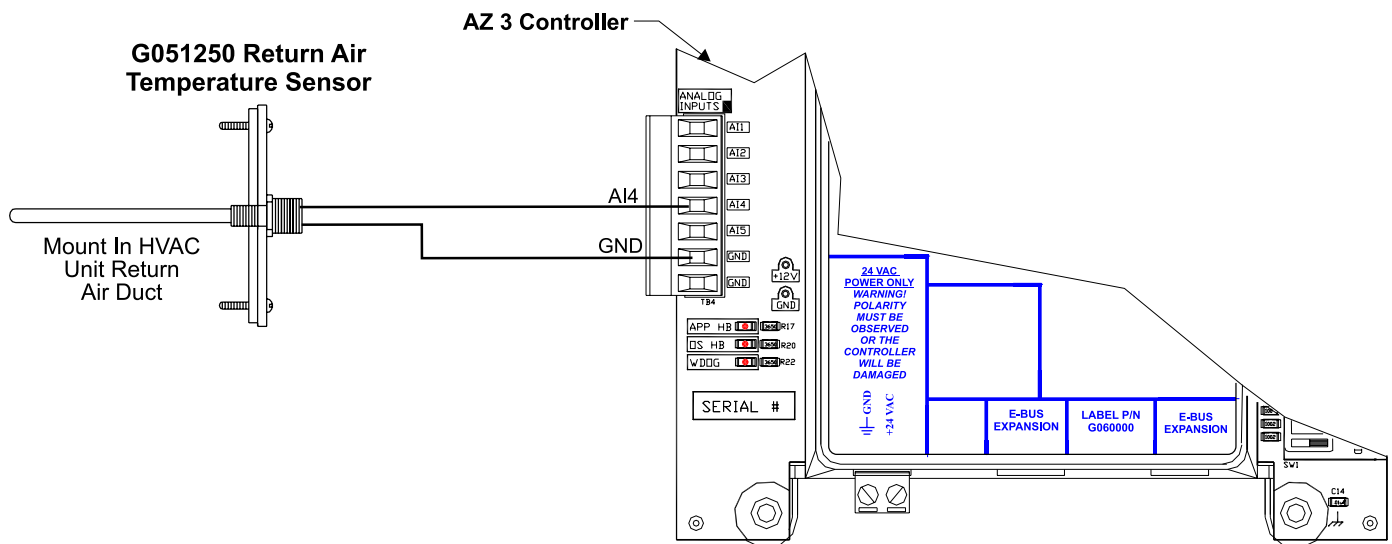


Figure 23: Return Air Temperature Sensor Wiring

Digital Compressor Unloader Wiring

Digital Compressor Unloader

NOTE: In most cases, the AZ 3 Controller will not be directly controlling the digital compressor. Generally, digital compressor control will be done by the unit manufacturer's compressor controller. When this is the case, a relay output should be configured for each "Cooling Stage" and the previous Digital Compressor Unloader information would not apply.

The Digital Compressor Unloader uses a solenoid unloader as the capacity control method. The unloader solenoid is energized in an on/off pattern to deliver the capacity needed by the digital compressor to achieve setpoint.

The Unloader Solenoid output is a triac output. The maximum continuous solenoid load is 0.5A and the peak inrush current is 6A.

Only (1) Digital Compressor can be controlled with the AZ 3 Controller. See **Figure 24** below for wiring details.

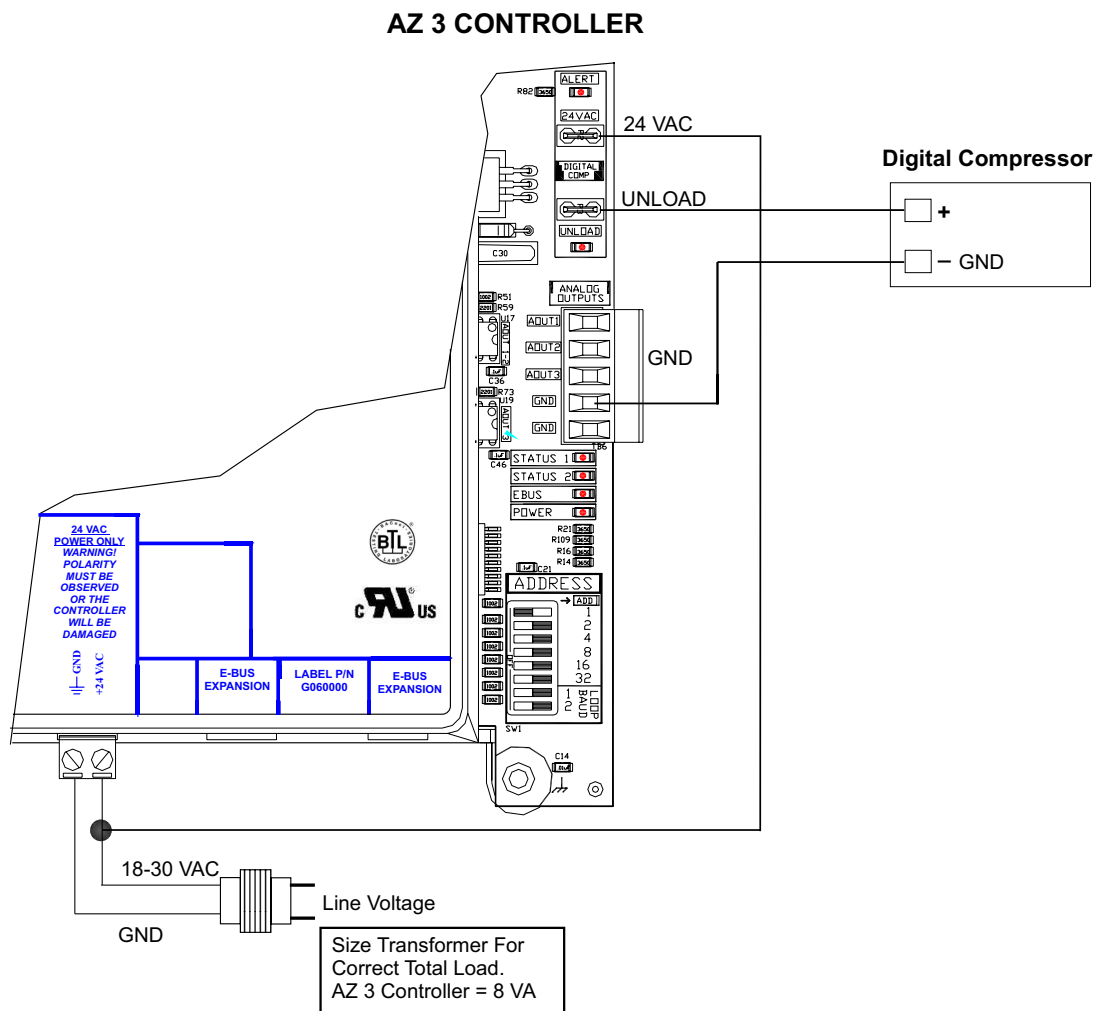


Figure 24: Digital Compressor Unloader Wiring

Supply Fan VFD Signal Wiring or Bypass Damper Actuator Wiring

Supply Fan VFD Signal or Bypass Damper Actuator

The Supply Fan VFD Signal is a user-adjustable signal with a range of 0-10 VDC from AOUT1 on the AZ 3 Controller. This signal output can be connected to the Supply Fan Variable Frequency Drive to modulate the Supply Fan speed. See Figure 25 below for detailed wiring.

NOTE: Alternatively, this output can be used to control a Bypass Damper, if present. Please see the AZ 3 VAVZB Controller Technical Guide for detailed Bypass Damper Actuator wiring.

CAUTION: Variable Frequency Drive units can sometimes cause large transient noise spikes, which can cause interference to be propagated on other electronic equipment. Use shielded wire wherever possible and route all sensor and controller wiring away from the Variable Frequency Drive and the HVAC Unit electrical wiring.

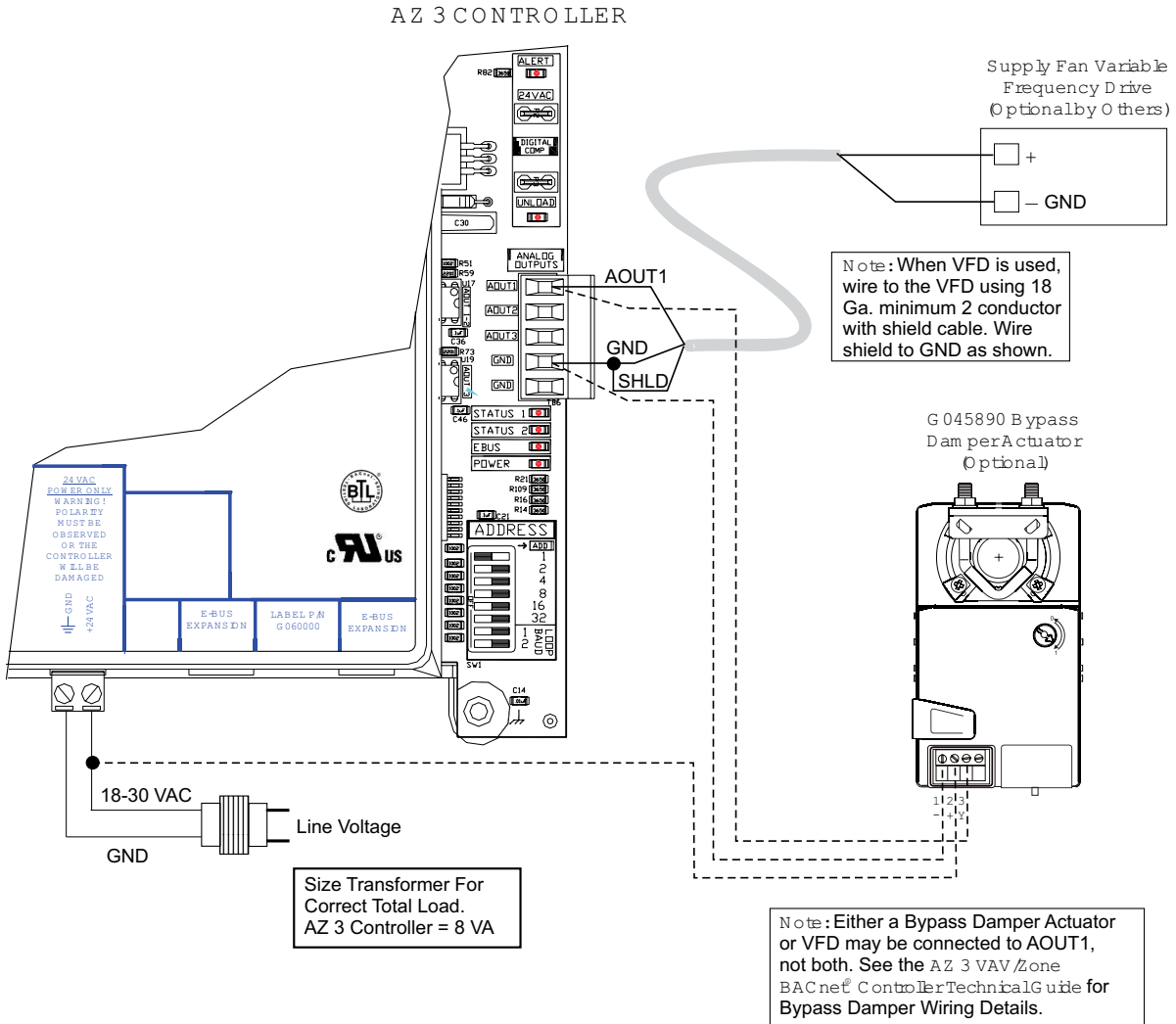


Figure 25: Supply Fan VFD Signal Wiring or Bypass Damper Actuator Wiring

Installation & Wiring

Economizer Actuator Wiring

Economizer Damper Actuator

The Economizer Damper Actuator signal voltage output (using AOUT2) is user-adjustable, but must be set to 2-10 VDC for this application. This signal output is used by the AZ 3 Controller to modulate the Economizer Damper Actuator in order to control the amount of Outdoor Air delivered to the HVAC unit for Free Cooling and/or Indoor Air Quality requirements.

In addition, when Title 24 Code requirements are specified on your project the feedback signal must wire from the economizer actuator to the AZ 3 EM1 Expansion Module. See **Figure 26** below and **Figure 31 on page 41**, which depicts the EM1 Expansion Module Title 24 Economizer Feedback Wiring.

WARNING: It is very important to be certain that all wiring is correct as shown in the wiring diagram below. Failure to observe the correct polarity will result in damage to the actuator or AZ 3 Controller.

NOTE: If using multiple E-BUS Sensors or Modules, the E-BUS Hub (ASM01635) may be required.

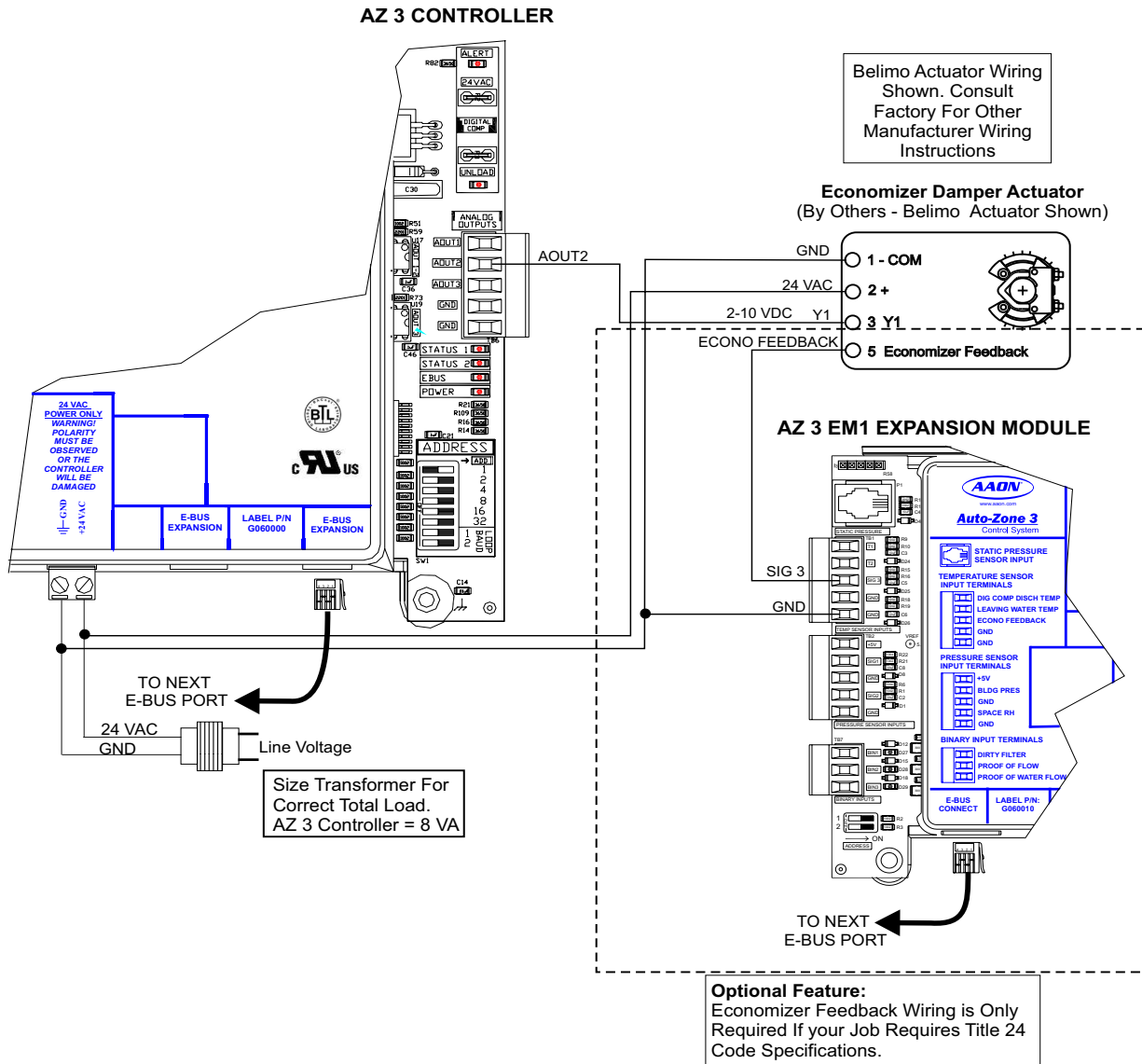


Figure 26: Economizer Damper Actuator Wiring

Modulating Heating Device

The Modulating Heating Device signal voltage output is a user-adjustable signal with a range of 0-10 VDC from AOUT3 when programming the controller. The output signal can be configured for either Direct Acting or Reverse Acting operation as required.

The Output signal is normally used to control a Modulating Hot Water Valve or Modulating Steam Valve or is used for SCR Control of an Electric Heating Coil. See **Figure 27** below for detailed wiring of the Modulating Heating Device.

WARNING: It is very important to be certain that all wiring is correct as shown in the wiring diagram below. Failure to observe the correct polarity could result in damage to the Modulating Heating Device or the AZ 3 Controller.

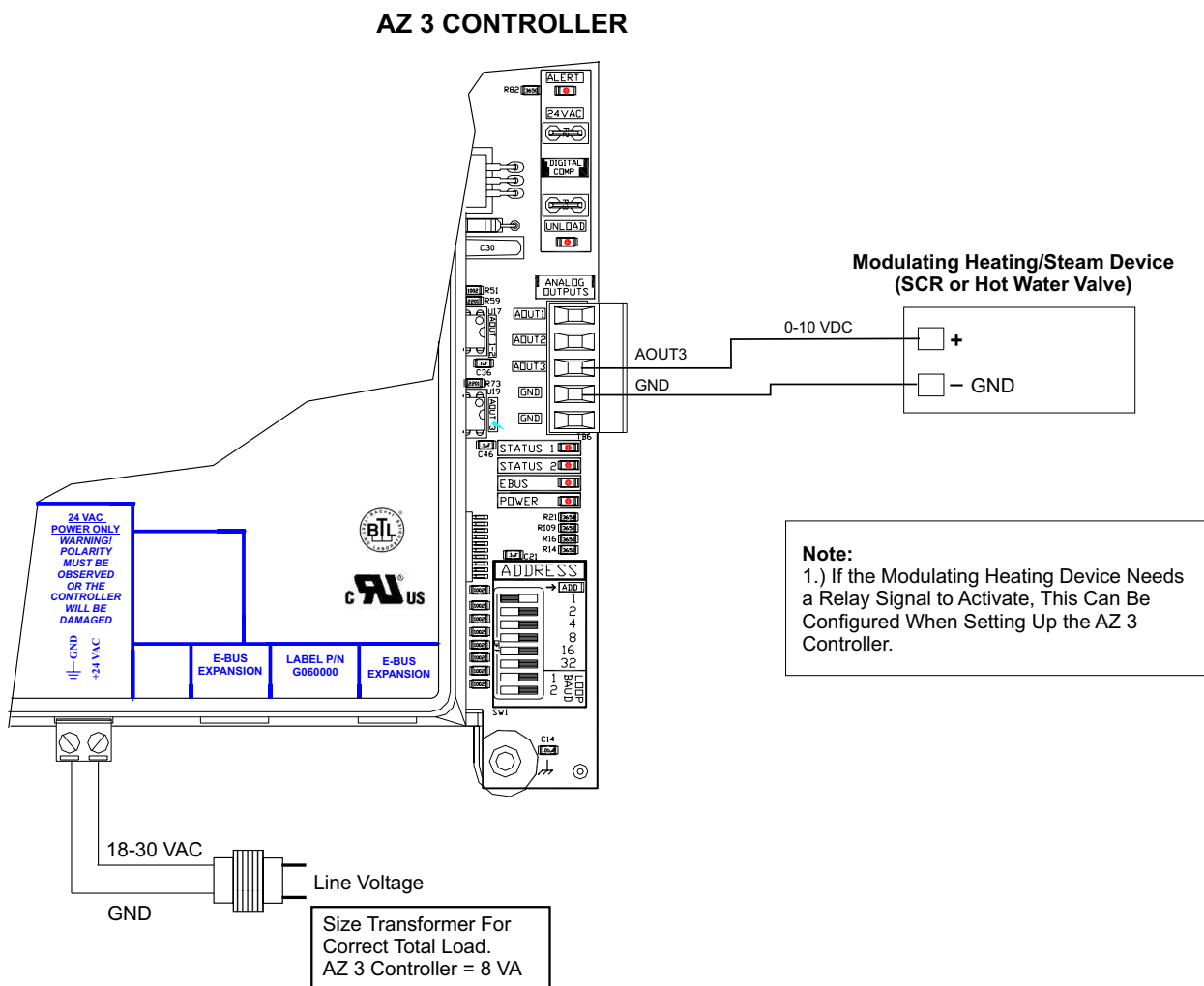


Figure 27: Modulating Heating Device Wiring

Installation & Wiring

AZ 3 EM1 Expansion Module Input Wiring

AZ 3 EM1 Expansion Module Inputs

The ASM02451 AZ 3 EM1 Expansion Module provides an additional 6 analog inputs, 4 analog outputs, 3 binary inputs, and 5 configurable relay outputs. See **Figure 28** below for complete wiring details.

The ASM02451 AZ 3 EM1 Expansion Module can be used in conjunction with the ASM02452 AZ 3 EM2 Expansion Module and the ASM02453 AZ 3 E-BUS 12 Relay Expansion Module. The expansion modules can be used individually or together to provide the required inputs and outputs for your specific applications.

NOTE: If using multiple E-BUS Sensors or Modules, the E-BUS Hub (ASM01635) may be required.

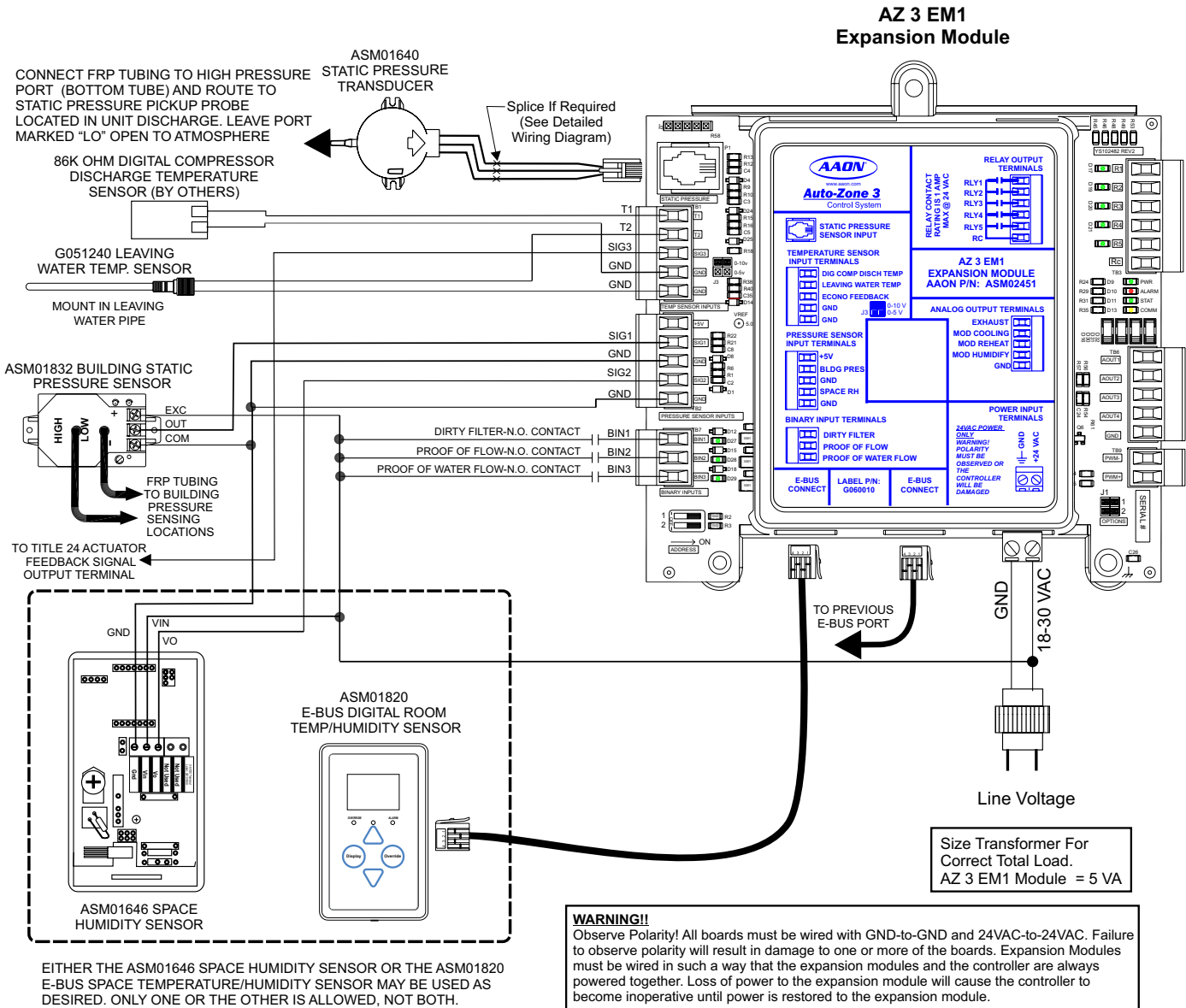


Figure 28: EM1 Expansion Module Input Wiring

AZ 3 EM1 Expansion Module Output Wiring

AZ 3 EM1 Expansion Module Outputs

The AZ 3 EM1 Expansion Module must be connected to 24 VAC as shown in the wiring diagram below. Please see **Table 1 on page 21** for correct VA requirements to use when sizing the transformer used for powering the expansion module.

Please note that when wiring the AZ 3 EM1 Expansion Module, its contacts must be wired as wet contacts (connected to 24 VAC). See **Figure 29** below for detailed wiring.

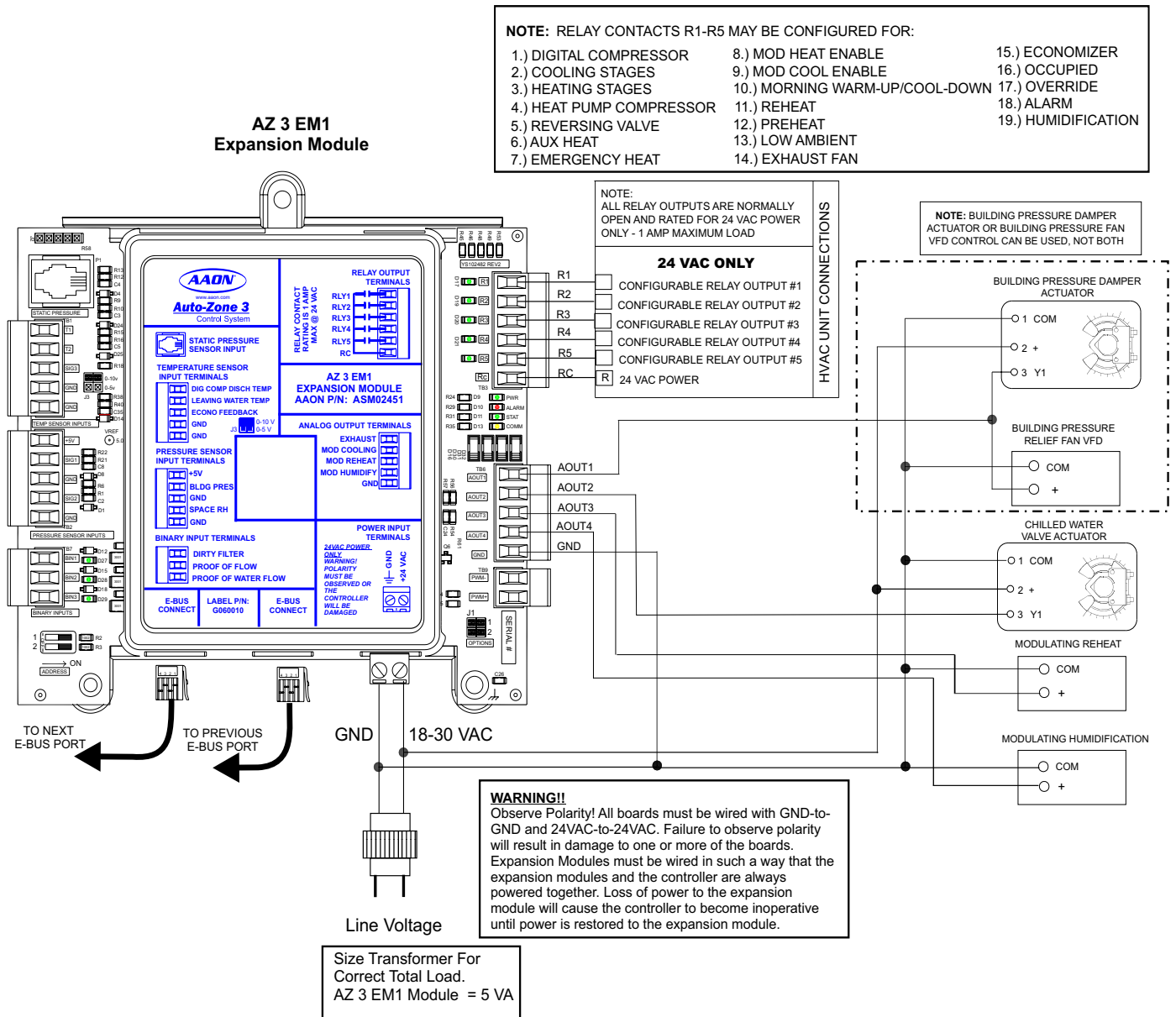


Figure 29: EM1 Expansion Module Output Wiring

Static Pressure Transducer Wiring

Static Pressure Transducer

The ASM01640 Static Pressure Transducer plugs directly into the AZ 3 EM1 Expansion Module's Static Pressure port. 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. See **Figure 30** below for detailed wiring.

CAUTION: It is strongly recommended that you use pneumatic tubing instead of relocating the sensor. Extending the wires could cause voltage drop problems.

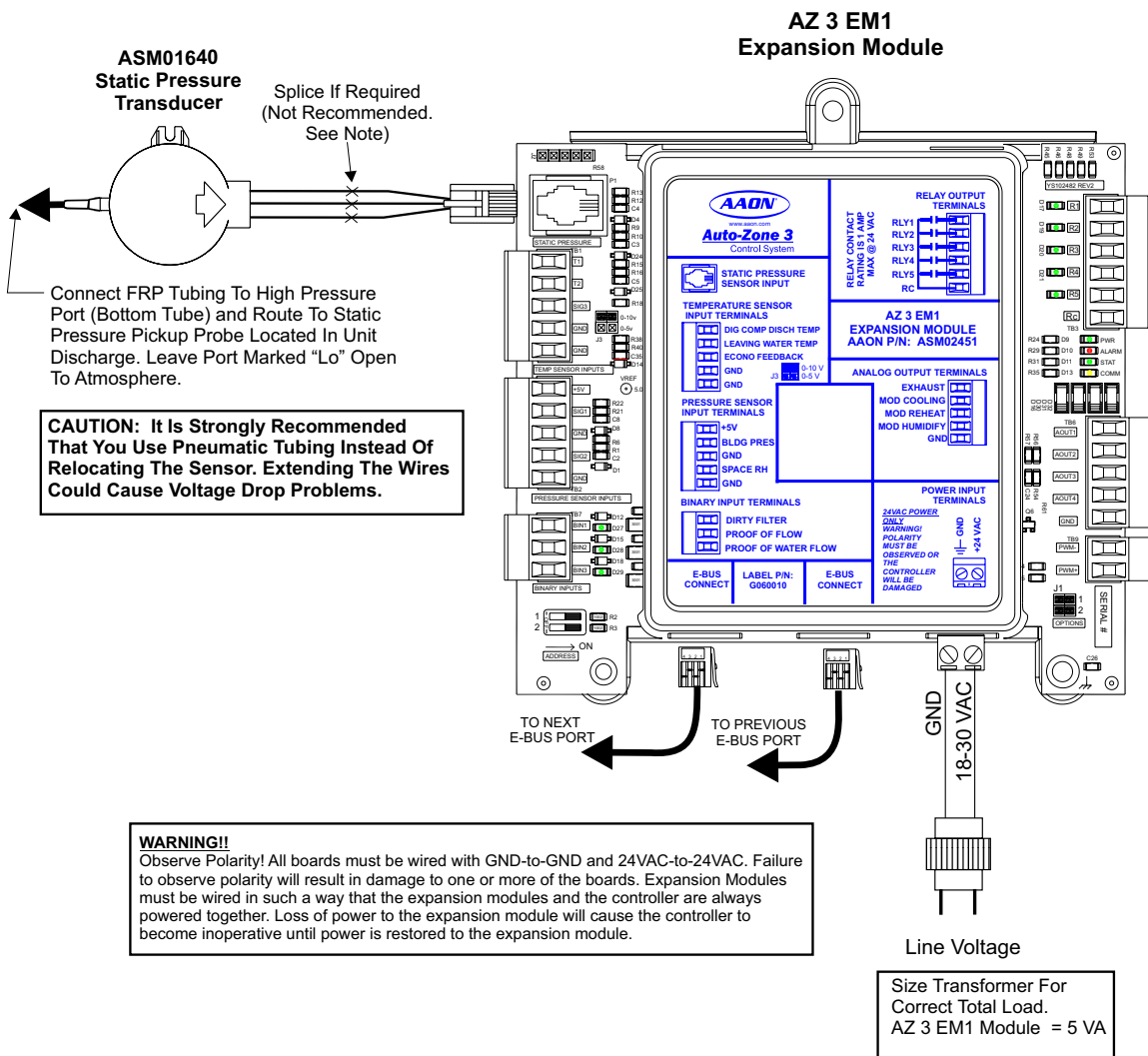


Figure 30: Static Pressure Transducer Wiring

Digital Compressor Temp Sensor & Title 24 Economizer Wiring

Digital Compressor Discharge Temperature Sensor

A Digital Compressor Discharge Temperature Sensor (by others) must be wired as shown in **Figure 31** below for proper operation of a Digital Scroll Compressor.

NOTE: In most cases, the AZ 3 Controller will not be directly controlling the digital compressor. Generally, digital compressor control will be done by the unit manufacturer's compressor controller. When this is the case, a relay output should be configured for each "Cooling Stage" and the stated Digital Compressor Temperature Sensor information would not apply.

The Discharge Temperature Input is a thermistor input. There is no polarity requirement for the thermistor.

NOTE: For Title 24 Economizer Feedback wiring, short wire runs are recommended.

Title 24 Economizer Actuator Feedback

If the controller has been configured for Title 24 Economizer operation, the Economizer Actuator Feedback signal will be wired to the AZ 3 EM1's SIG3 input. The jumper should be set to 0-10V. See **Figure 26** on page 36 for wiring.

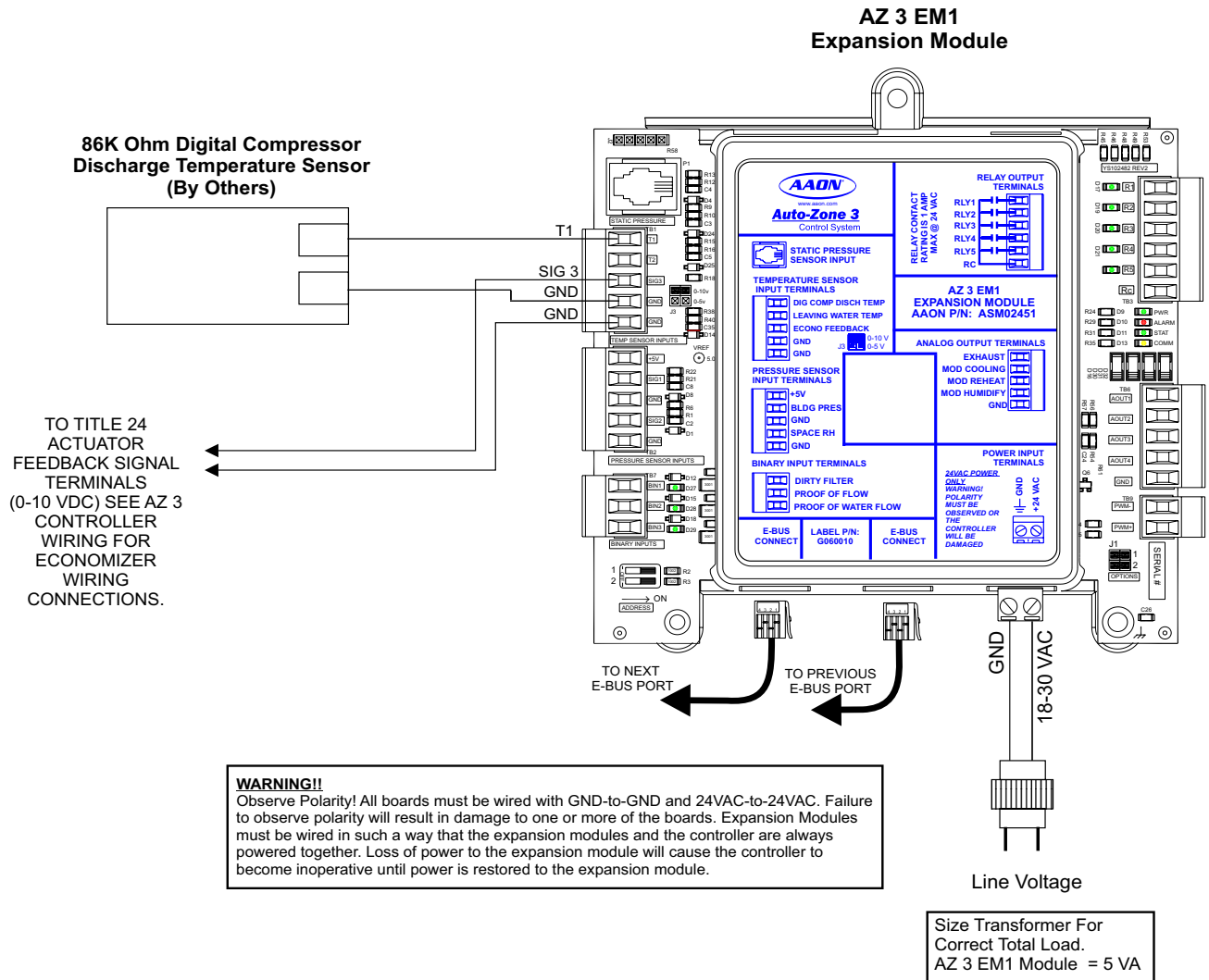


Figure 31: Digital Compressor Temperature Sensor & Title 24 Economizer Feedback Wiring

Installation & Wiring

Leaving Water Temperature Sensor Wiring

Immersion Style Sensor Installation

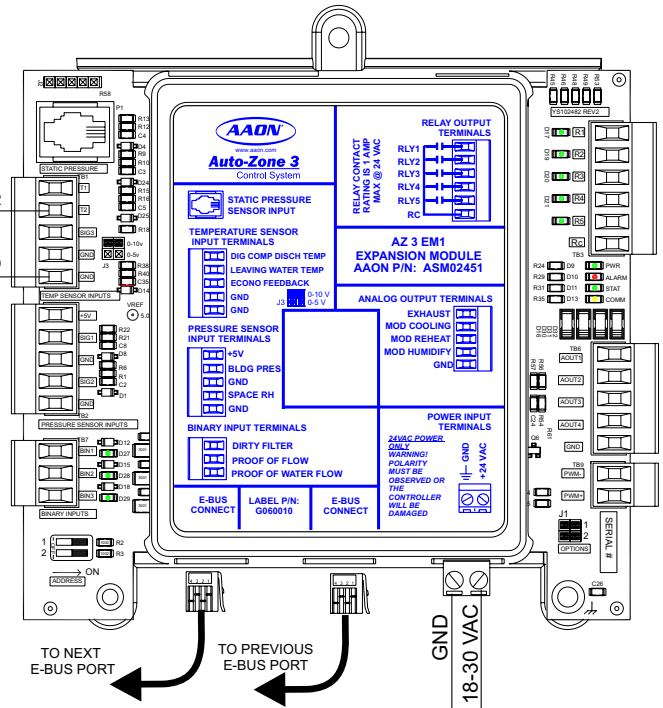
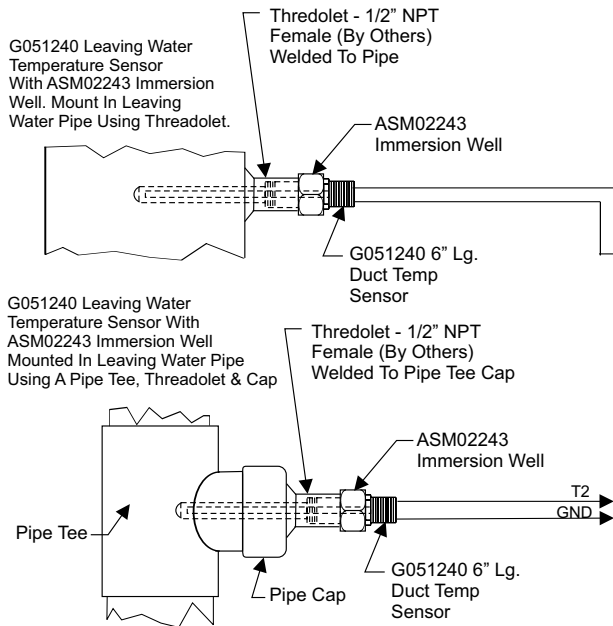
The G051240 6 inch Long Duct Temperature Sensor and ASM02243 Immersion Well must be wired and installed as shown in **Figure 32** below. The Leaving Water Temperature Sensor is a 10K Ohm Type III thermistor sensor.

NOTE: You may use either the ASM01624 Strap-On Type Temperature Sensor Kit or a G051240 6 inch long Duct Temperature Sensor and ASM02243 Type Immersion Well combination for Leaving Water Temperature sensing. Only one type may be used, not both.

For pipes up to 2 inches in diameter, the strap-on sensor is the most economical choice. For larger pipes, the immersion well is more expensive, but delivers the accuracy needed for larger pipes. See **Figure 33 on page 43** for strap-on applications.

When installed, the immersion well should be located so the end of the immersion well is in the approximate center of the pipe. With pipes smaller than 10 inches in diameter, this may require the use of an elbow to allow for the immersion well to fit in the center of the pipe.

AZ 3 EM1 Expansion Module



WARNING!!
Observe Polarity! All boards must be wired with GND-to-GND and 24VAC-to-24VAC. 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 controller are always powered together. Loss of power to the expansion module will cause the controller to become inoperative until power is restored to the expansion module.

Size Transformer For Correct Total Load.
AZ 3 EM1 Module = 5 VA

Figure 32: Leaving Water Temperature Sensor Wiring

Leaving Water Temperature Sensor Wiring

Strap-On Style Sensor Installation

The ASM01624 Leaving Water Temperature Sensor Kit must be wired and Installed as shown in **Figure 33** below. The Leaving Water Temperature Sensor is a 10K Ohm Type III thermistor sensor.

NOTE: You may use either the ASM01624 Strap-On Type Temperature Sensor Kit or a G051240 6 inch long Duct Temperature Sensor and ASM02243 Type Immersion Well combination for Leaving Water Temperature sensing. Only one type may be used, not both.

For pipes up to 2 inches in diameter, the strap-on sensor is the most economical choice. For larger pipes, the immersion well is more expensive, but delivers the accuracy needed for larger pipes.

For immersion well type installations, see **Figure 32 on page 42** for complete wiring and connection details.

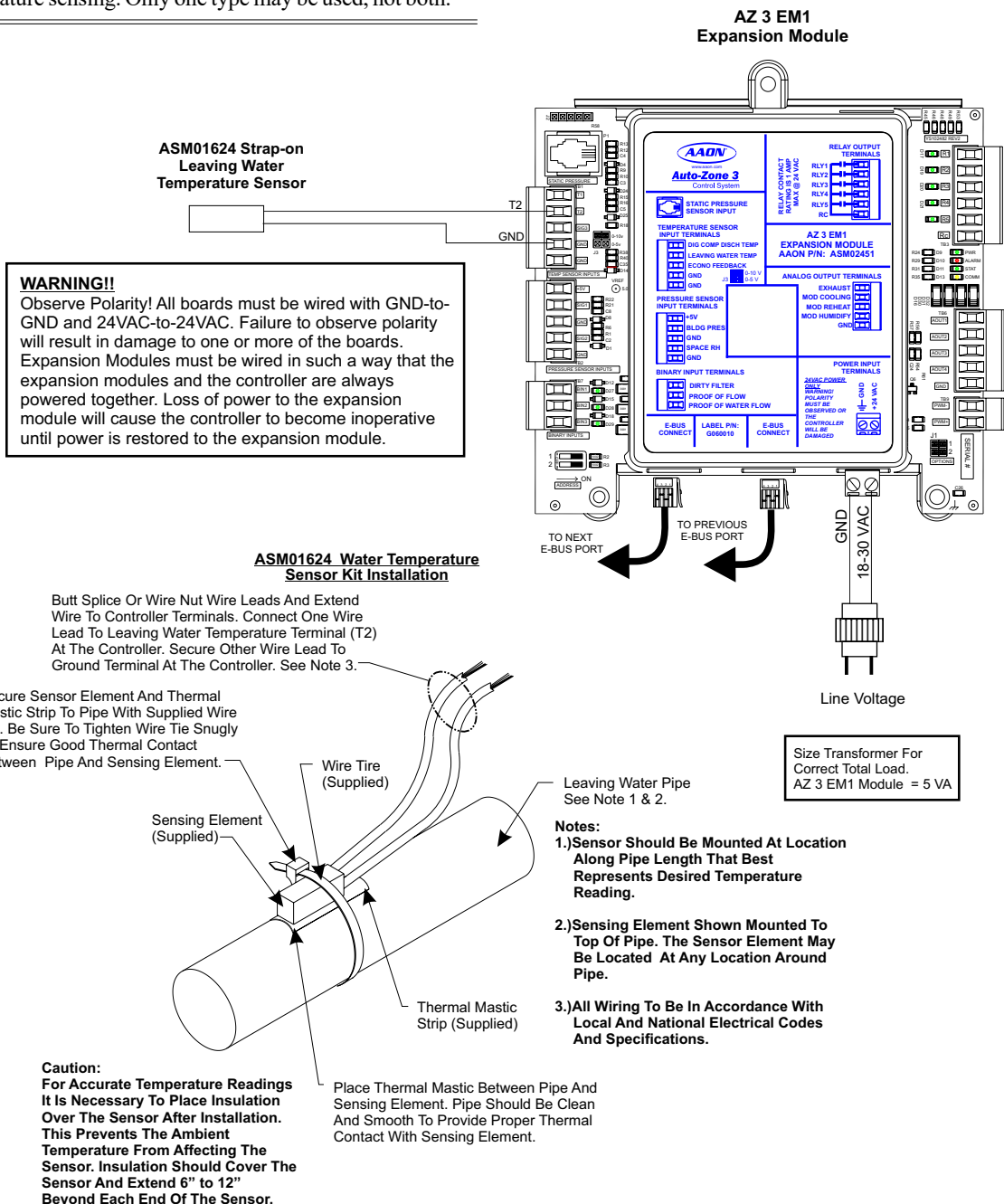


Figure 33: Strap-On Leaving Water Temperature Sensor Wiring

Installation & Wiring

Building Static Pressure Sensor Wiring

Building Static Pressure Sensor

The ASM01832 Building Static Pressure Sensor must be wired as shown in **Figure 34** below. There are 3 terminal connections on the Building Static Pressure Sensor. Connect the power side of the 24 VAC power source to the terminal labeled “+ EXC.” Connect the GND side of the 24 VAC power source to the terminal labeled “- COM.” Connect the remaining terminal labeled “OUT” to SIG1 on the AZ 3 EM1 terminal block.

WARNING: It is very important to be certain that all wiring is correct as shown in the wiring diagram below. Failure to observe the correct polarity will result in damage to the HVAC Unit Controller, Building Static Pressure Sensor, and the AZ 3 Expansion Module.

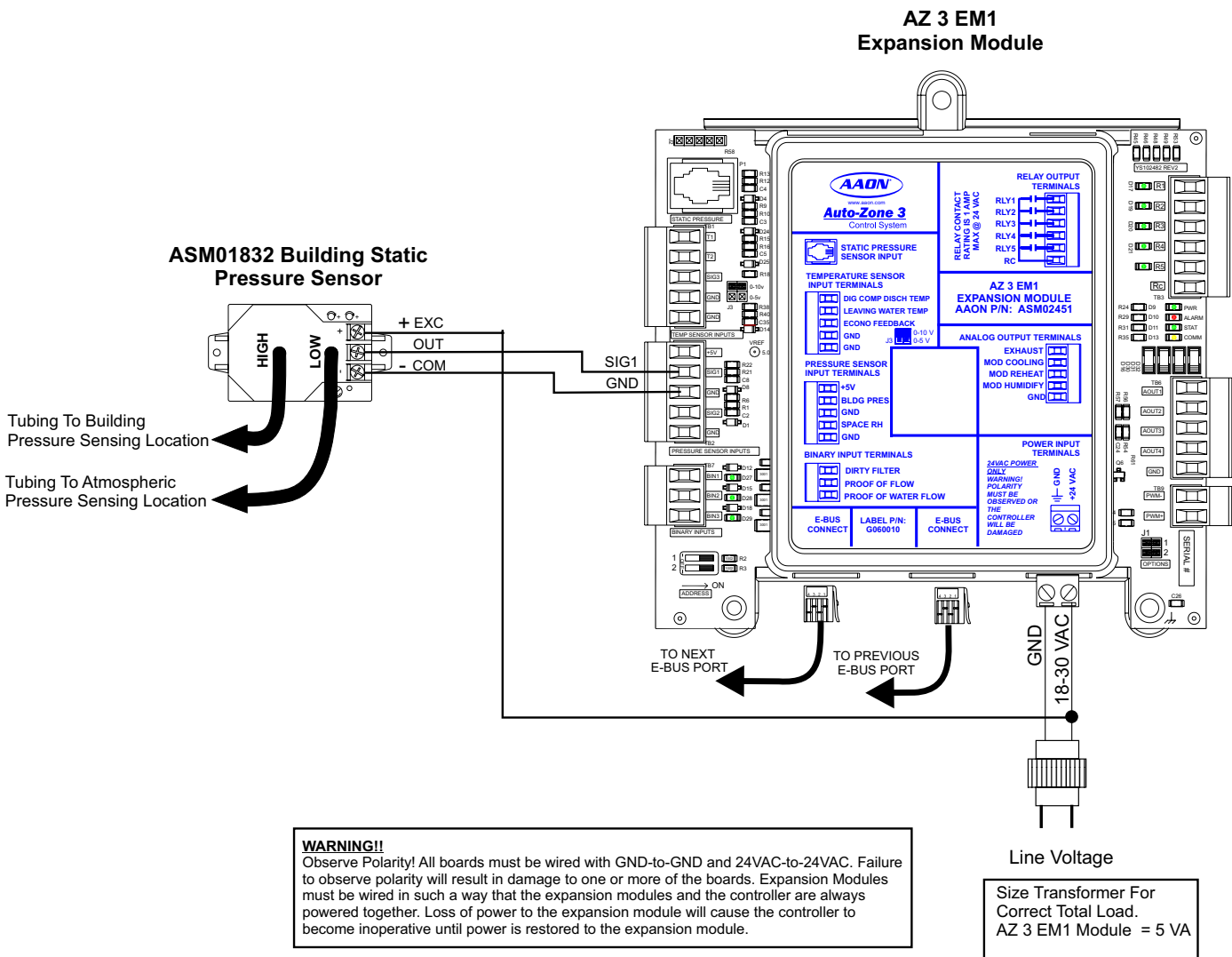


Figure 34: Building Static Pressure Sensor Wiring

Installation & Wiring

Space Humidity Sensor Wiring

Space Humidity Sensor

The ASM01646 Space Humidity Sensor must be wired as shown in **Figure 35** below. The Space Humidity Sensor may be used in situations where you are using an ASM02227, ASM01638, ASM01642, or an ASM01643 Space Temperature Sensor and need to control Space Humidity. See **Figure 35** below for complete wiring details.

If desired, you can also use an ASM01820 E-BUS Space Temperature/Humidity Sensor with LCD Display or an ASM02221 E-BUS Space Temperature/Humidity Sensor without LCD Display instead of using a separate Space Humidity Sensor and Space Temperature Sensor.

When using one of the E-BUS combination Space Temperature/Humidity Sensors it would connect to an available E-BUS port on a Controller, Expansion Module or E-BUS Hub.

NOTE: If using multiple E-BUS Sensors or Modules, the E-BUS Hub (ASM01635) may be required.

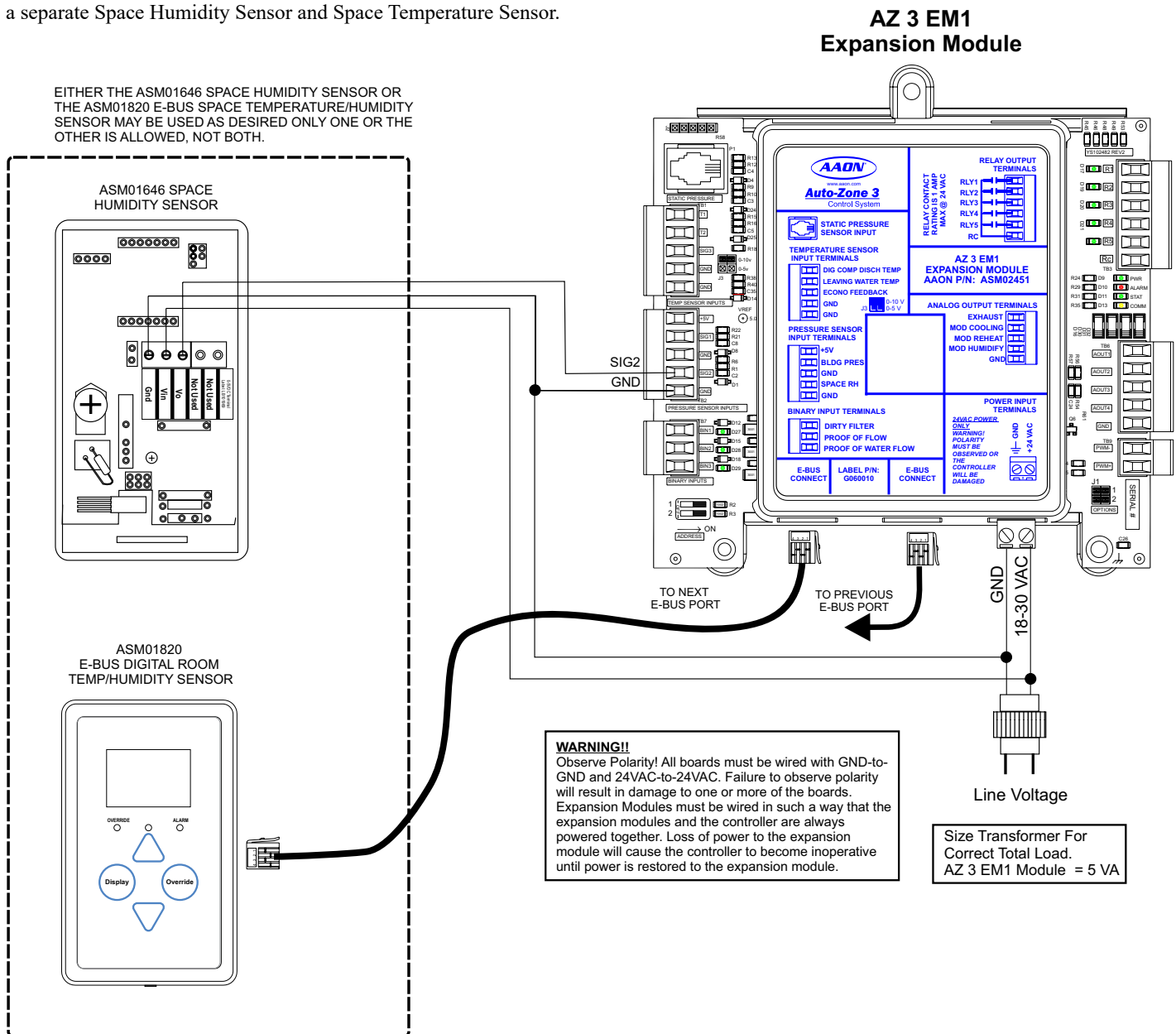


Figure 35: Space Humidity Sensor or E-BUS Space Temperature/Humidity Sensor Wiring

Building Pressure Control Output Wiring

Building Pressure Control Output

The Building Pressure Control Output is a 0-10 VDC or 2-10 VDC signal sent from the AZ 3 EM1 Expansion Module. When using the output for Direct Building Pressure Control (output signal rises on a rise in building pressure), the output signal can be connected to either a Variable Frequency Drive controlling an exhaust fan or to a damper actuator controlling an exhaust damper (both by others). When used in this manner, the output signal must be configured for Direct Acting operation. See **Figure 36** below for detailed wiring of the Building Pressure Control Output Signal.

When using this output for Reverse Building Pressure Control (output signal rises on a fall in building pressure), a damper actuator controlling an OA Damper or Supply Fan VFD would be used. When using the OA damper for Reverse Building Pressure Control, the output signal must be configured for Reverse Acting operation.

A Building Pressure Sensor connected to SIG1 on the AZ 3 EM1 Expansion Module is used to sense and control the signal to the Building Pressure Output. The Building Static Pressure Sensor must be connected in order for the Building Pressure Output to operate correctly. See **Figure 36** below for complete wiring details.

NOTE: When using Reverse Building Pressure Control using the Outdoor Air Damper, Economizer free cooling is not available.

CAUTION: Variable Frequency Drive units can cause large transient noise spikes that can cause interference to be propagated on other electronic equipment. Use shielded wire wherever possible and route all sensor and controller wiring away from the Variable Frequency Drive and the HVAC unit electrical wiring.

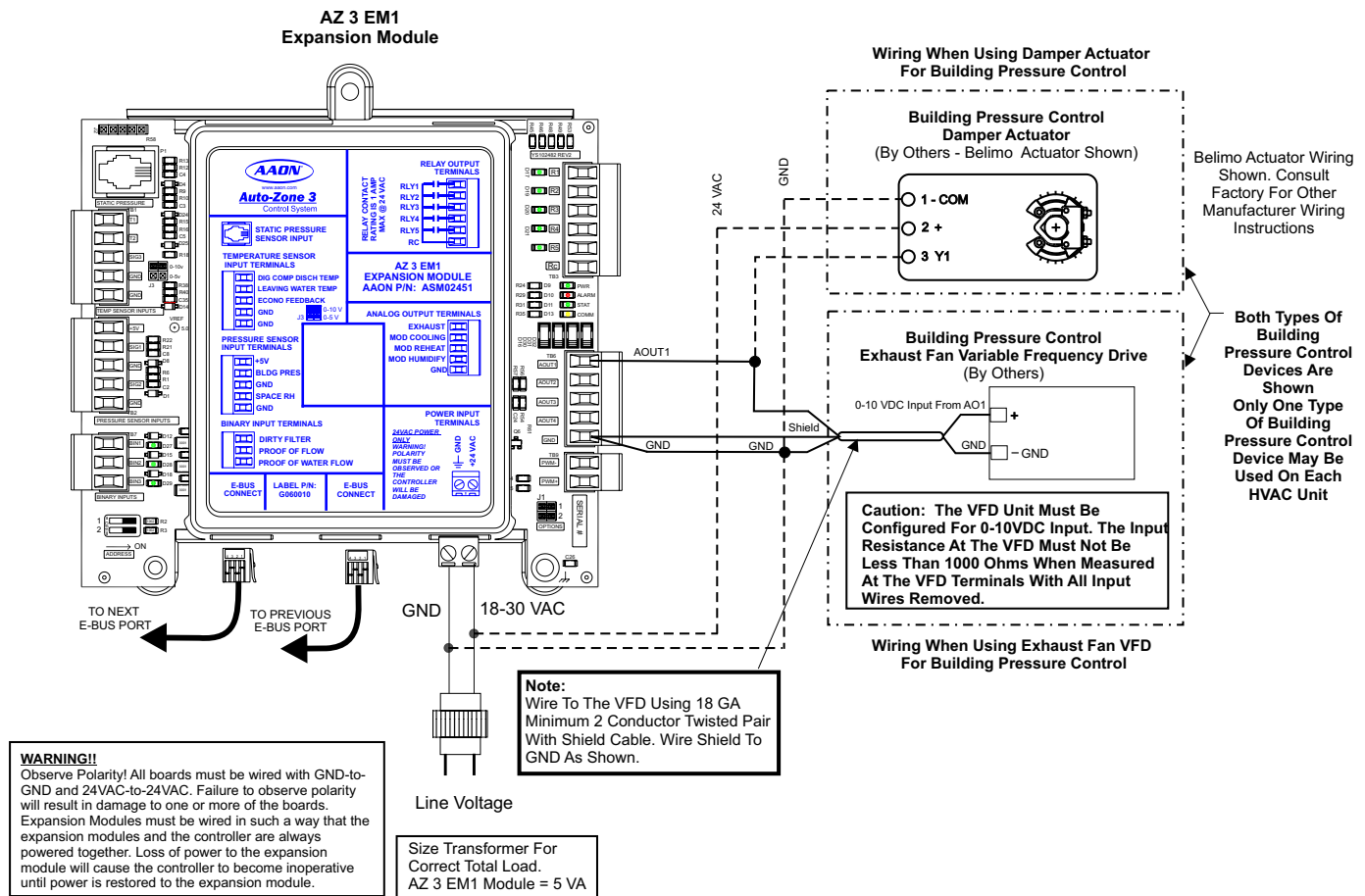


Figure 36: Building Pressure Control Output Wiring

Chilled Water Valve Actuator Wiring

Modulating Cooling Output

The AZ 3 EM1 Analog Output 2 is used to control a Modulating Chilled Water Valve (supplied by others) to maintain the Cooling Supply Air Temperature Setpoint. The output is configured for either 0-10 VDC or 2-10 VDC operation and can be configured for direct acting or reverse acting operation.

The wiring shown is for a Belimo actuator. Other actuators wiring terminals may differ. You should consult your actuators wiring instructions for the correct terminal designations for all wiring connections. See **Figure 37** below for typical Belimo actuator wiring details.

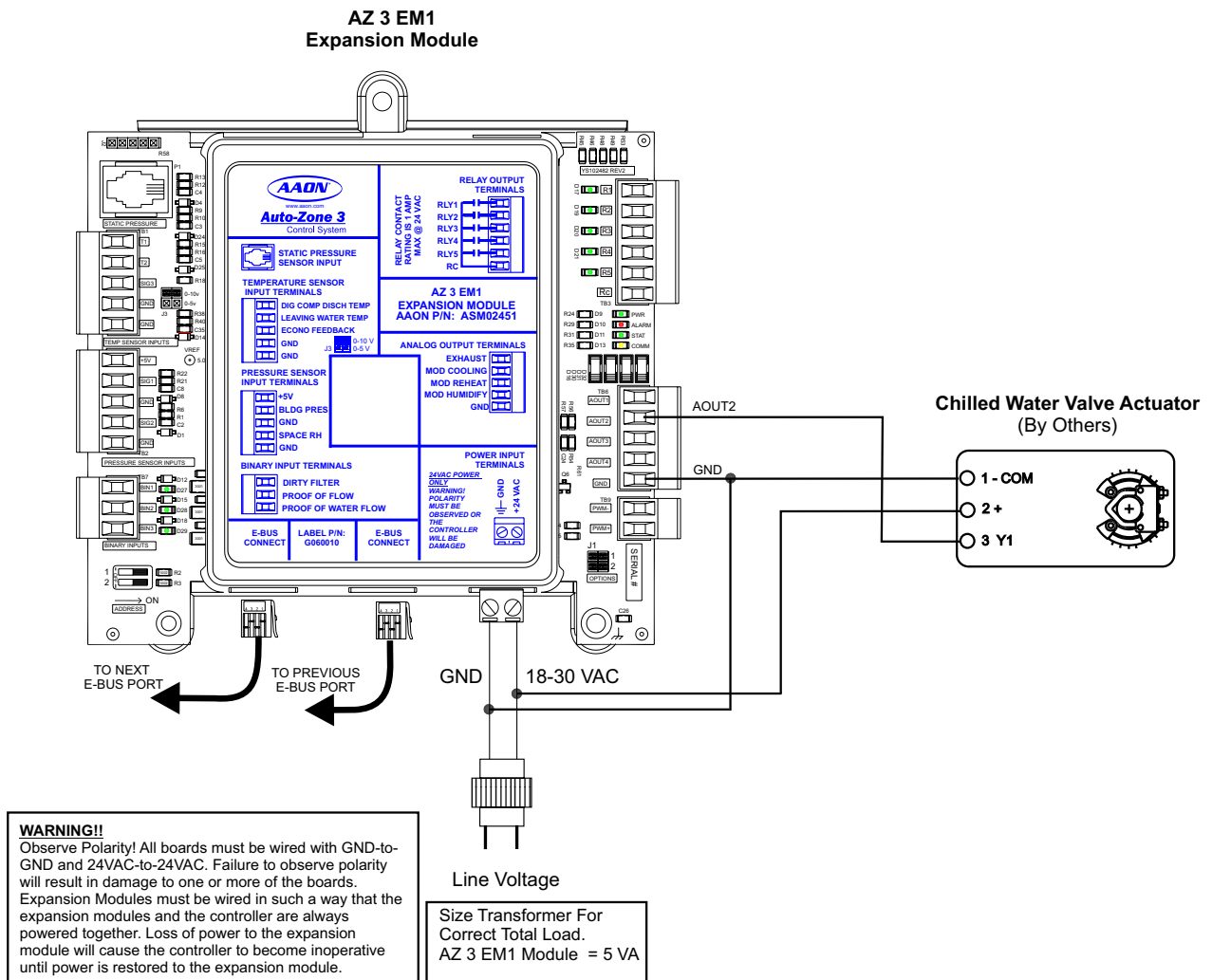


Figure 37: Chilled Water Valve Actuator Wiring

Installation & Wiring

Modulating Reheat Wiring

Modulating Reheat Output

The AZ 3 EM1 Expansion Module Analog Output 3 provides an output for controlling a Modulating Reheat device during Dehumidification. This could be a Hot Water Valve, Steam Valve, or a SCR Electric Heater.

The output is configured for either 0-10 VDC or 2-10 VDC operation as needed for the particular Modulating Reheat device being used. See **Figure 38** below for the Modulating Reheat Output wiring details.

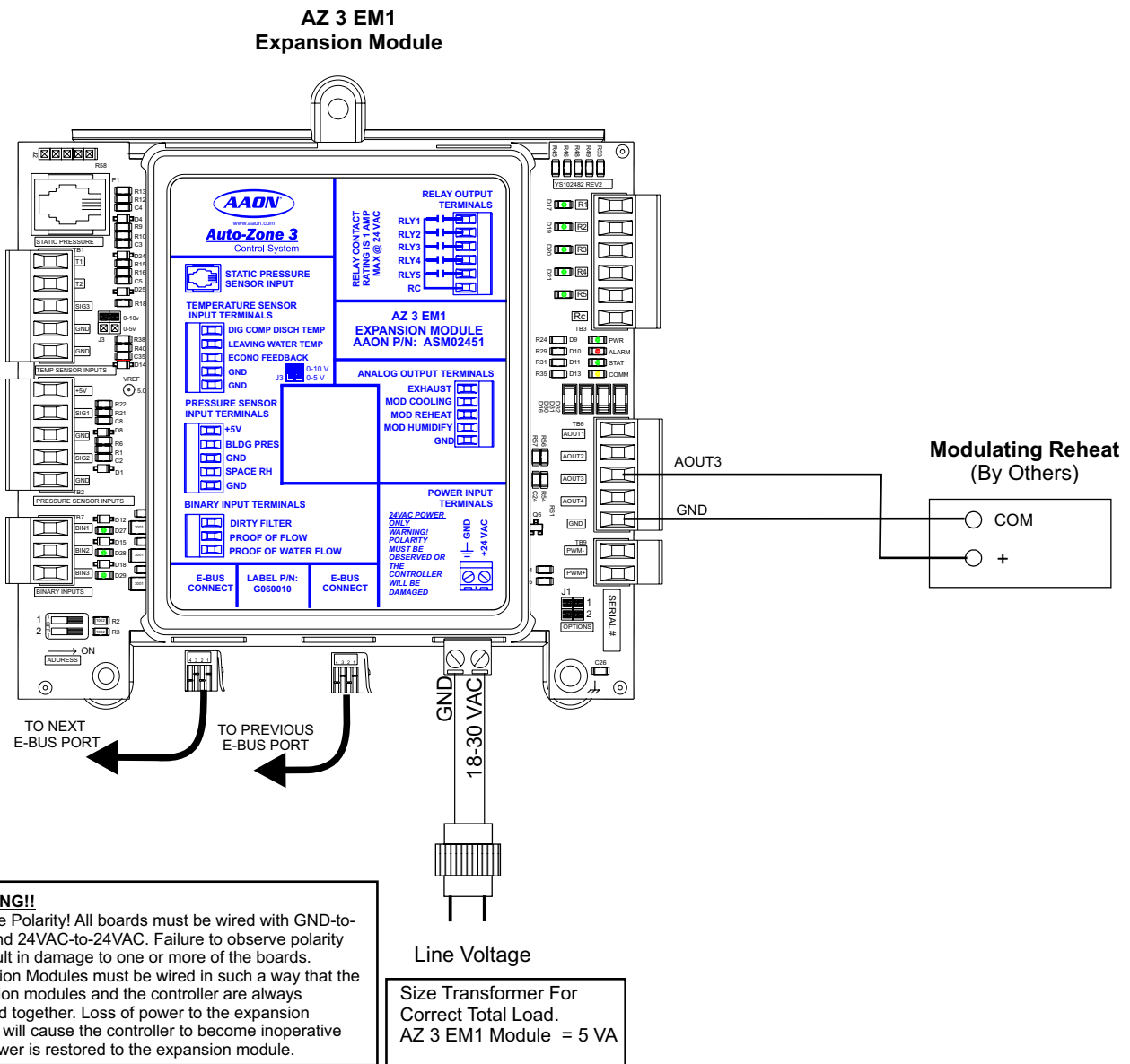


Figure 38: Modulating Reheat Wiring

Modulating Humidification Wiring

Modulating Humidification Output

The AZ 3 EM1 Expansion Module Analog Output 4 provides an output for controlling a Modulating Humidification device. Generally, this is a steam generating type with a dispersion tube located in the HVAC Unit airstream.

The output is configured for either 0-10 VDC or 2-10 VDC operation as needed for the particular Modulating Humidification device being used. See Figure 39 below for the Modulating Humidification Output wiring details.

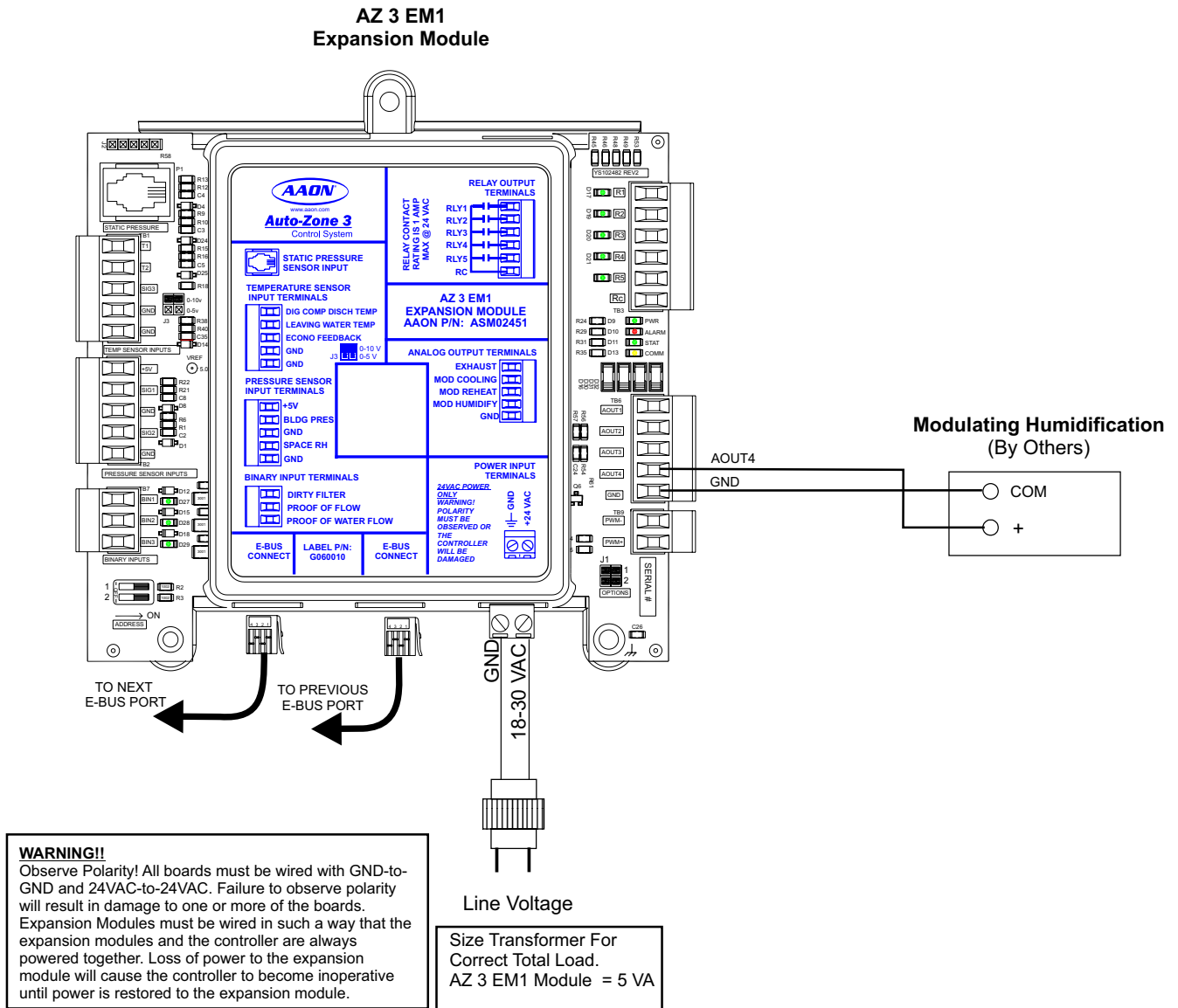


Figure 39: Modulating Humidification Wiring

AZ 3 EM2 Expansion Module

AZ 3 EM2 Expansion Module

The ASM02452 AZ 3 EM2 Expansion Module provides 1 additional analog input and 4 binary inputs. See **Figure 40** below and **Figure 41 on page 51** for complete wiring details.

The AZ 3 EM2 Expansion Module can be used in conjunction with the AZ 3 EM1 Expansion Module and the E-BUS 12 Relay Expansion Module. The expansion modules can be used individually or together to provide the required inputs and outputs for your specific applications.

Remote SAT Reset Signal

The Remote Supply Air Temperature Reset Signal is connected to AIN1 for applications requiring Remote Reset of the Supply Air Temperature Setpoint.

When the Slide Offset option on the Space Sensor is used, the Remote Supply Air Temperature Reset Signal cannot be used. Only one of these options may be used for AZ 3 Controller applications.

This input on the AZ 3 EM2 Expansion Module can accept a configurable voltage signal from 0-10 VDC (Direct or Reverse Acting). See **Figure 40** below and **Figure 41 on page 51** for complete wiring details.

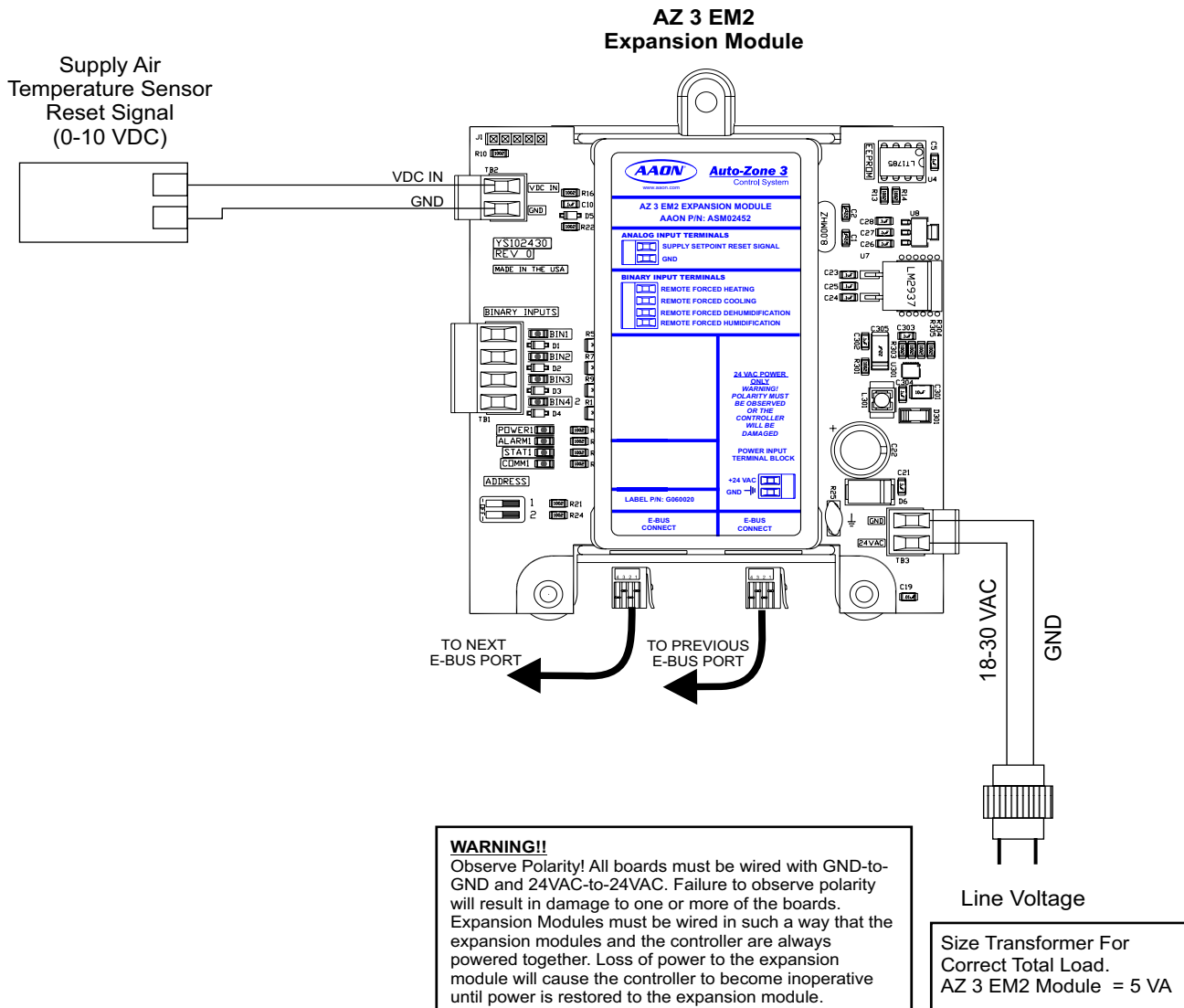


Figure 40: Remote Supply Air Temperature Reset Wiring

BIN1-BIN4 - Forced Binary Inputs

The AZ 3 Controller can be configured to accept 24 VAC wet contact closures to force the unit into Cooling, Heating, Dehumidification and Humidification.

If the Forced Contact configuration option is selected, it applies to all four modes. See **Figure 41** below for wiring details.

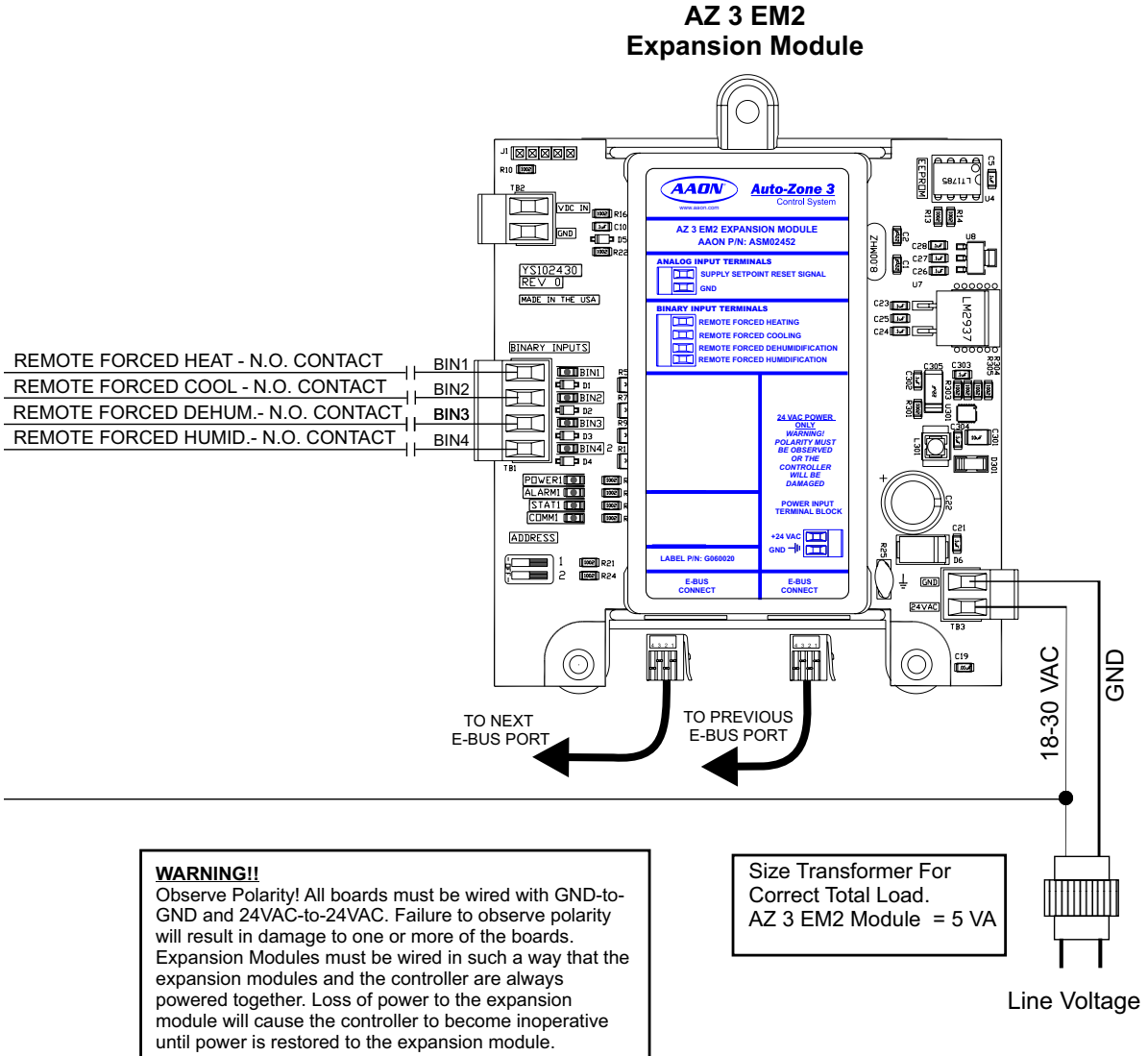


Figure 41: Forced Binary Inputs Wiring

Installation & Wiring

E-BUS 12 Relay Expansion Module Wiring

E-BUS 12 Relay Expansion Module

The ASM02453 E-BUS 12 Relay Expansion Module provides for 12 N.O. Dry Contact Configurable Relay Outputs. See **Figure 42** below for complete wiring details.

The ASM02453 AZ 3 E-BUS 12 Relay Expansion Module can be used in conjunction with the ASM02451 AZ 3 EM1 Expansion Module and the ASM02452 AZ 3 EM2 Expansion Module. The expansion modules can be used individually or together to provide the required inputs and outputs for your specific applications.

NOTE: If using multiple E-BUS Sensors or Modules, the E-BUS Hub (ASM01635) may be required.

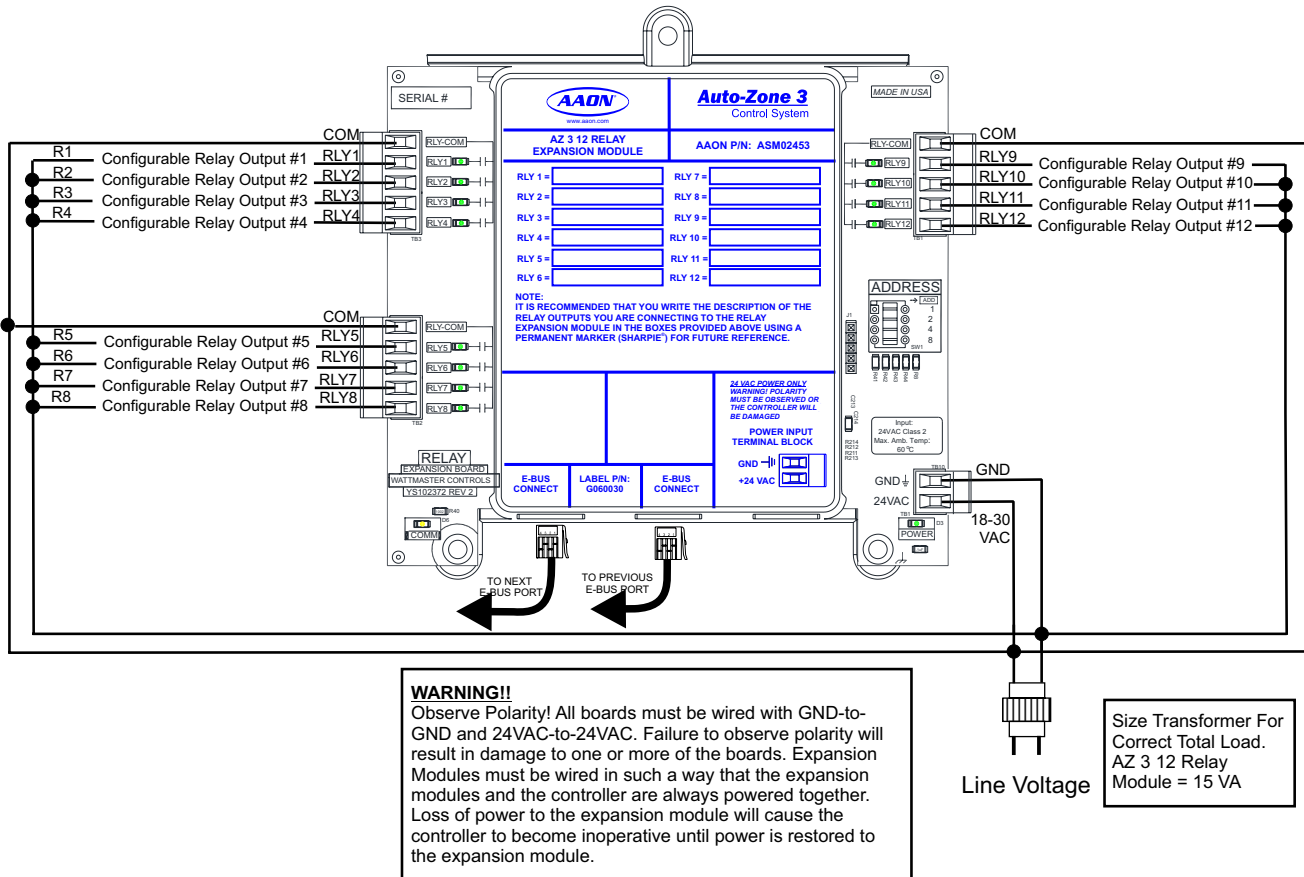
WARNING!!
Observe Polarity! All boards must be wired with GND-to-GND and 24VAC-to-24VAC. Failure to observe polarity will result in damage to one or more of the boards. Expansion Modules must be wired in such a way that the expansion modules and the controller are always powered together. Loss of power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

Note:
A Total Of 23 Relays Are Available By Use Of The Relays on the AZ 3 Controller, EM1 Expansion Module & 12 Relay Expansion Module. All Expansion Module Relay Outputs Are User-Configurable For The Options On The Relay Output Configuration List.

- NOTE:** RELAY CONTACTS R1-R12 MAY BE CONFIGURED FOR:
- | | | |
|--------------------------|--------------------------------|---------------------|
| 1.) DIGITAL COMPRESSOR | 8.) MOD HEAT ENABLE | 15.) ECONOMIZER |
| 2.) COOLING STAGES | 9.) MOD COOL ENABLE | 16.) OCCUPIED |
| 3.) HEATING STAGES | 10.) MORNING WARM-UP/COOL-DOWN | 17.) OVERRIDE |
| 4.) HEAT PUMP COMPRESSOR | 11.) REHEAT | 18.) ALARM |
| 5.) REVERSING VALVE | 12.) PREHEAT | 19.) HUMIDIFICATION |
| 6.) AUX HEAT | 13.) LOW AMBIENT | |
| 7.) EMERGENCY HEAT | 14.) EXHAUST FAN | |

Note:
All Relay Outputs Are Normally Open And Rated For 24 VAC Power Only. 1 Amp Maximum Load.

AZ 3 E-BUS 12-Relay Expansion Module



WARNING!!
Observe Polarity! All boards must be wired with GND-to-GND and 24VAC-to-24VAC. 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 controller are always powered together. Loss of power to the expansion module will cause the controller to become inoperative until power is restored to the expansion module.

Figure 42: E-BUS 12 Relay Expansion Module Wiring

Start-up & Commissioning

Addressing, Baud Rate & Powering Up

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 and Baud Rate

All AZ 3 Controllers are equipped with address switches. If the AZ 3 Controller is to operate as a stand-alone system (not connected to any other HVAC unit or VAV/Zone BACnet® Controllers), the controller address switch should be set for address 1. When the system is to be connected to other HVAC unit controllers on a CV system communication loop, each controller's address switch must be set with a unique address between 1 and 59. When the controller is to be used in a VAV/Zone application, the AZ 3 Controller serving the VAV boxes or zones must be set to address 59. Only one of the AZ 3 Controllers set to address 59 is allowed for each loop on a multiple loop system. Other AZ 3 Controllers configured for CV, MUA, and SZVAV may reside on the same loop with an AZ 3 Controller used with VAV/Zones. All controllers on the loop, except the AZ 3 Controller that is serving the VAV/Zones, must use a unique address between 1 and 58.

Address switches 7 and 8 are used for the baud rate selection for the AZ 3 Control System. See Figure 43 below for address switch and baud rate 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 3 Controller requires 8 VA of power delivered to it at 24 VAC. 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.

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 3 Controller. After all the wiring checks are complete, apply power to the AZ 3 Controller.

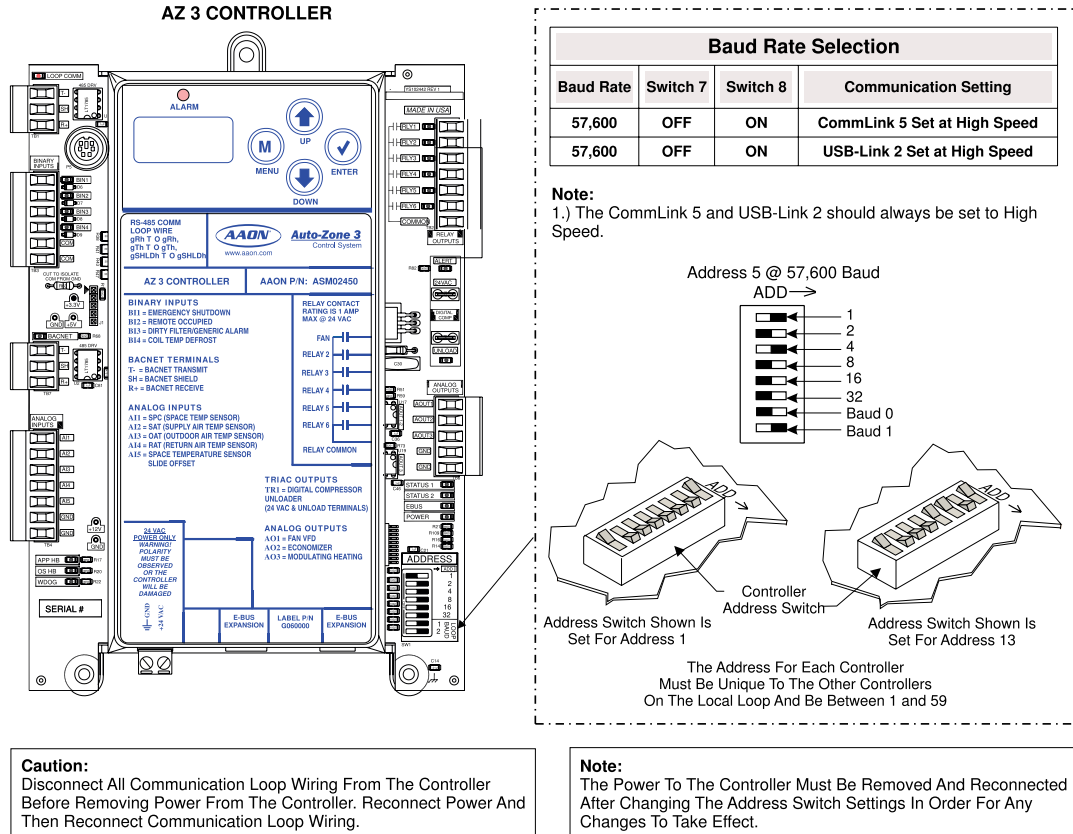


Figure 43: AZ 3 Controller Address Switch and Baud Rate Setting

Start-up & Commissioning

Initialization & Configuring the Controller

Initialization

When power is first applied, STATUS 1 LED and STATUS 2 LED will flash out the controller address. STATUS 1 LED will flash to represent the tens position. STATUS 2 LED will flash to represent the ones position. After the controller address has flashed, STATUS 1 LED and STATUS 2 LED will flash the diagnostic blink codes.

Example of a controller address of 59:
STATUS 1 LED will flash 5 times. STATUS 2 LED will flash 9 times.

See **Table 6 on page 78** in the Troubleshooting Section of this manual for detailed diagnostic blink code information.

Configuring the Controller

The next step in the process is configuring the controller for your specific requirements. In order to configure the AZ 3 Controller, you must use an operator interface. Currently the only operator interface available for programming and monitoring of the AZ 3 Controller is by using a computer with Prism 2 software and a CommLink 5 to connect to the control system or controller. See **Figure 44** below.

When using a Laptop or Desktop computer with the Prism Computer Front End Software, refer to the *Prism 2 Technical Guide*.

We recommend that you proceed with the configuration and setup of the AZ 3 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.

NOTE: For BACnet® Configuration, see Appendix C.

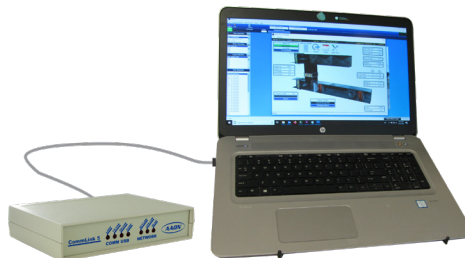
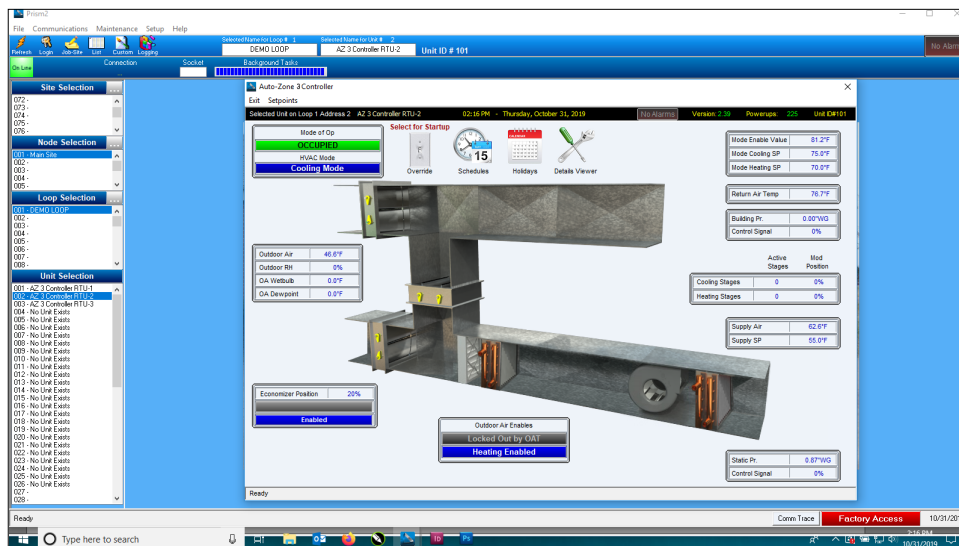


Figure 44: Prism 2 Graphical Software Operator Interface

AZ 3 Controller and Expansion Modules Input/Output Maps

Input/Output Maps

See **Table 2** for the AZ 3 Controller’s Inputs/Outputs, **Table 3** for the AZ 3 EM1 Expansion Module’s Inputs/Outputs, and **Table 4** for the AZ 3 EM2 Expansion Module’s Inputs/Outputs.

AZ 3 CONTROLLER	
Analog Inputs	
1	Space Temperature (AI1)
2	Supply Air Temperature (AI2)
3	Outdoor Air Temperature (AI3)
4	Return Air Temperature Sensor (AI4)
5	Space Temperature Sensor Slide Adjust (AI5)
Binary Inputs	
1	Emergency Shutdown (BI1)
2	Remote Occupied (BI2)
3	Dirty Filter/Generic Alarm (BI3)
4	Defrost Coil Temperature Switch (BI4)
Analog Outputs	
1	Supply Fan VFD or Bypass Damper (AOUT1)
2	Economizer (Outdoor Air Damper) (AOUT2)
3	Modulating Heating (Hot Water, Steam, or SCR) (AOUT3)
Relay Outputs (24 VAC)	
1	Fan Relay (R1)
2	Configurable Relay (R2)
3	Configurable Relay (R3)
4	Configurable Relay (R4)
5	Configurable Relay (R5)
6	Configurable Relay (R6)
7	Digital Compressor Unloader (TR1)

Table 2: AZ 3 Controller Inputs & Outputs

The following E-BUS sensors and adapter board are available to connect to the AZ 3 Controller via E-BUS ports or E-BUS Expansion Modules:

- E-BUS Digital Space Sensor - LCD Display
Temp Only or Temp & Humidity
- E-BUS Digital Space Sensor - No LCD Display
Temp & Humidity
- E-BUS Space and Return Air CO₂ Sensors
- E-BUS Horizontal or Vertical Outdoor Air
Temperature & Humidity Sensor
- Suction Pressure Transducer with E-BUS Adapter
Board

AZ 3 EM1 EXPANSION MODULE	
Analog Inputs	
1	Duct Static Pressure (AI1)
2	Discharge Temperature (For Digital Compressor) (T1)
3	Leaving Water Temperature (T2)
4	Economizer Feedback (SIG3)
5	Building Pressure (SIG1)
6	Space RH Sensor (SIG2)
Binary Inputs	
1	Dirty Filter (BIN1)
2	Proof Of Flow (BIN2)
3	Proof of Water Flow (BIN3)
Analog Outputs	
1	Exhaust Fan VFD (AOUT1)
2	Modulating Cooling (AOUT2)
3	Modulating Reheat (AOUT3)
4	Modulating Humidify (AOUT4)
Relay Outputs (24 VAC)	
1	Configurable Relay (R1)
2	Configurable Relay (R2)
3	Configurable Relay (R3)
4	Configurable Relay (R4)
5	Configurable Relay (R5)

Table 3: AZ 3 EM1 Inputs & Outputs

AZ 3 EM2 EXPANSION MODULE	
Analog Input (Configurable 0-10 VDC)	
1	Remote SAT Reset (AIN1)
Binary Inputs	
1	Remote Forced Heating (BIN1)
2	Remote Forced Cooling (BIN2)
3	Remote Forced Dehumidification (BIN3)
4	Remote Forced Humidification (BIN4)

Table 4: AZ 3 EM2 Inputs & Outputs

AZ 3 Controller Inputs

AZ 3 Controller Inputs

AI1 - Space Temperature Sensor Input

The Space Temperature Sensor will initiate Occupied Heating and Cooling modes if the unit is configured for Space Temperature control. It is always the sensor used to initiate Unoccupied Heating and Cooling modes. If the Space Temperature Sensor used is equipped with the optional Push-Button Override feature, this input will detect user overrides and switch the unit from the Unoccupied Mode back to the Occupied Mode operation for a user-adjustable amount of time. The Space Temperature Sensor input can also be configured to reset the Supply Air Temperature Setpoint.

AI2 - Supply Air Temperature Sensor Input

Once the unit is in the Heating or Cooling Mode (based on the temperature at the mode enable sensor), the unit will control the staging or modulation of the heating or cooling sources to maintain a Heating or Cooling Supply Air Setpoint. The HVAC unit must always have a Supply Air Temperature Sensor installed.

AI3 - Outdoor Air Temperature Sensor Input

The Outdoor Air Temperature is used to lock out Heating or Cooling to conserve energy at whatever temperature you deem appropriate for each Mode of Operation. This sensor is also used to initiate Heating and Cooling modes on a Make Up Air unit. The Outdoor Air Temperature Sensor can also be used for Pre-Heater operation and for Low Ambient Protection operation.

AI4 - 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 HVAC Mode Enable Sensor. The Return Air Temperature Sensor is also used to initiate or cancel the Morning Warm-up Period on VAV-configured units. If the Return Air Temperature Sensor is connected, the Outdoor Air Temperature must be at least 5°F below the Return Air Temperature to allow Economizer Cooling operation.

NOTE: For AI1 through AI4, all Temperature Sensors must be Thermistor Type III, which provide 77.0°F @ 10K Ohms Resistance.

AI5 - Space Temperature Sensor Slide Adjust

If the Space Temperature Sensor being used has the optional Slide Adjust feature, its AUX output is connected to this input. The Slide Adjust control is used to vary the HVAC Mode Heating and Cooling Setpoints by a user-configured maximum amount.

If the Space Temperature is configured as the SAT Reset Source, the Slide Adjustment adjusts both the HVAC Mode Enable Heating and Cooling setpoints and the SAT Reset Source Heating and Cooling setpoints simultaneously by a user-configurable maximum amount.

B11 - Emergency Shutdown Input

This wet contact input is used to initiate shutdown of the HVAC unit when a N.C. Smoke Detector, Firestat, or other shutdown device contact is opened. All of the shutdown devices must be provided by others. When the shutdown condition occurs, the controller remains active and can initiate alarm relays.

B12 - Remote Occupied Input

A Remote Occupied Switch (by others) that provides a wet contact closure whenever the HVAC unit is required to be in Occupied Mode.

B13 - Dirty Filter/Generic Alarm Contact Closure Input

This wet contact input can be configured for either Dirty Filter Alarm (requires a Differential Pressure Switch) or a Generic Alarm. Binary Input 1 on the EM1 Module is designated for Dirty Filter Alarm, as well. So, if a Dirty Filter Alarm and Generic Alarm are both needed, you would need to use this input for the Generic alarm condition and the input on the EM1 for the Dirty Filter Alarm.

B14 - Defrost Coil Temperature Switch Input

This wet contact input monitors a Defrost Coil Temperature Switch on air to air heat pump units. If the compressors are operating in the Heating Mode and this switch closes, it will initiate a Defrost Mode.

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. All Binary Inputs are optional. This means that you must configure the AZ 3 Controller to recognize these input signals.

AZ 3 Controller Outputs

AZ 3 Controller Outputs

AOUT1 - Supply Fan VFD Control Signal or Bypass Damper Actuator

This user-adjustable voltage signal is used to modulate the Supply Fan VFD in VAV, Single Zone VAV, or Filter Loading applications. Alternatively, a Bypass Damper Actuator can be used to control duct static pressure based on a signal received from a static pressure sensor located in the main system ductwork. One or the other may be used, not both.

AOUT2 - Economizer (Outdoor Air Damper) Control Signal

This user-adjustable voltage signal is used to control the Outdoor Air Damper during Economizer operation. It is also used to maintain the Outdoor Air Damper at its Minimum Position during the Occupied Mode when the Outdoor Air Temperature is not suitable for Economizer Cooling purposes. This minimum position can be reset based on CO₂ override conditions.

On a Make-up Air Unit this output would be used to drive the outdoor air damper to its configured minimum position (typically 100%).

Finally, this output can be used to control the Outdoor Air Damper during Reverse Acting Building Pressure Control to maintain a Building Pressure Setpoint. If using this option, economizer free cooling is not available.

AOUT3 - Modulating Heat Control Signal

This output can be configured with a user-adjustable voltage range of operation, which can be set up to provide either a direct or reverse acting operation. This output is used to operate a modulating heating device to maintain the Heating Supply Air Setpoint during the Heat Mode of operation.

TR1 - Digital Compressor Unloader

The unloader solenoid is energized in an on/off pattern to deliver the capacity needed by (1) digital compressor to achieve its setpoint, if the AZ 3 Controller is controlling the digital compressor.

R1 - Supply Fan (Enable)

This is a non-configurable output.

R2-R6 - User-Configurable Relays

These relays are configurable by the user. For all the available configuration options, see **Table 5** below.

No.	Relay Description	Details
1	Digital Compressor	Configured for a Digital Compressor.
2	Cooling Stage	Configured for each fixed stage of cooling (except heat pump compressor).
3	Heating Stage	Configured for each fixed stage of heating.
4	Humidification	Configure if a 0-10 or 2-10 VDC Modulating Humidification source needs a relay to enable it.
5	Heat Pump Compressor	Configured for a Fixed Heat Pump Compressor stage.
6	Reversing Valve	Configured for the Reversing Valve of a heat pump unit.
7	Aux Heat	Configured for a fixed stage of Aux Heat in a heat pump unit.
8	Emergency Heat	Configured for a fixed stage Emergency Heat in a heat pump unit.
9	Mod Heat Enable	Configure if a 0-10 or 2-10 VDC Modulating Heat source needs a relay to enable it.
10	Mod Cool Enable	Configure if a 0-10 or 2-10 VDC Modulating Cool source needs a relay to enable it.
11	Morning Warm-Up/ Cool-Down (VAV Boxes)	Configure (1) Relay for Morning Warm-Up/Cool-Down when Non-Auto-Zone 3 VAV/Zone BACnet® Controllers are used.
12	Reheat	Configure (1) Relay for On/Off Reheat when used.
13	Preheat	Configure (1) Relay for On/Off Preheat when used.
14	Low Ambient	Configure for Low Ambient operation.
15	Exhaust Fan	Configure (1) Relay for enabling exhaust fan when Building Pressure Control is used.
16	Economizer Active	If configured, this relay will energize if unit is in Economizer mode and the damper has moved 5% above its Economizer Minimum Setpoint position.
17	Occupied Active	If configured, this relay will energize whenever the unit is in the Occupied Mode.
18	Override Active	If configured, this relay will energize anytime the space sensor Push-button override is active.
19	Alarm Active	If configured, this relay will energize anytime a AZ 3 Controller alarm is active.

Table 5: User-Configurable Relay Outputs

AZ 3 EM1 Expansion Module Inputs & Outputs

AZ 3 EM1 Expansion Module

AI1 - Duct Static Pressure Sensor Input

This phone jack-style input connection accepts a Duct Static Pressure Sensor modular cable input. 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.

T1 - Digital Compressor Discharge Temperature Sensor Input

The Digital Compressor Discharge Temperature Sensor monitors the discharge temperature from the Digital Compressor to protect against overheating.

NOTE: In most cases, the AZ 3 Controller will not be directly controlling the digital compressor. Generally, digital compressor control will be done by the unit manufacturer's compressor controller. When this is the case, a relay output should be configured for each "Cooling Stage" and the following Digital Compressor Discharge Temperature Sensor is not needed.

T2 - Leaving Water Temperature Sensor Input

This input monitors the Condenser Leaving Water Temperature and determines if the water source condenser is operating in a safe water temperature range. This requires the use of a 10k Ohm Type III thermistor sensor.

SIG3 - Econo Title 24 Feedback Signal Input

This input monitors the Economizer Feedback signal (0-10VDC) for Title 24 monitoring requirements. It allows for Title 24 alarms to be displayed in the Prism 2 software alarms screen.

SIG1 - Building Static Pressure Sensor Input

This Sensor is only required if you wish to configure the AZ 3 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. In addition, for Reverse Acting Pressure Control applications, it can control an Outdoor Air Damper Actuator. The other available control method is to configure one of the Relay Outputs as an Exhaust Fan output that will activate the Exhaust Fan any time the Building Pressure is above the Building Pressure Setpoint.

SIG2 - Space Humidity Sensor Input

If you don't want to use a combination E-BUS Space Temperature/Humidity Sensor, you can connect an analog Space Humidity Sensor to this input and use a separate standard Space Temperature Sensor connected to AI1 on the AZ 3 Main Controller.

BIN1 - Dirty Filter Input

When this wet contact input closes (filter is dirty), the AZ 3 Controller indicates a Dirty Filter Alarm.

BIN2 - Air Proof of Flow Input

This wet contact input is for the Air Proof of Flow Switch. If the Air Proof of Flow Switch contact opens while the Supply Fan is operating it will stop the fan.

BIN3 - Water Proof of Flow Input

This wet contact input is for the Water Proof of Flow Switch. If the Water Proof of Flow Switch contact opens while the Condenser Valve is operating, the controller will react to protect the system depending on the current mode of operation.

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. All Binary Inputs are optional. This means that you must configure the AZ 3 Controller to recognize these input signals.

AOUT1 - Building Pressure Control Signal

This user-adjustable voltage signal is used to provide Direct Acting Building Pressure Control using an Exhaust Fan VFD or a modulating Exhaust Damper.

NOTE: For Reverse Acting Building Pressure Control using the Outdoor Air Damper or Supply Fan VFD, the AZ 3 Controller will use the outputs specific to those devices. On the main AZ 3 Controller, AOUT2 would control the Outdoor Air Damper and AOUT1 would control the Supply Fan VFD to maintain the Building Pressure Setpoint.

AOUT2 - Modulating Chilled Water Signal

This output is used to control a Modulating Chilled Water Valve to maintain the Cooling Supply Air Temperature Setpoint. This output can be configured with a user-adjustable voltage range of operation, which can be set up to provide either direct or reverse acting operation.

AOUT3 - Modulating Reheat Signal

This is a direct acting output signal that is used to modulate a Modulating Reheat device (0-10 or 2-10 VDC signal) for Dehumidification Reheat applications.

AOUT4 - Modulating Humidification

This is a direct acting output signal that is used to modulate a Humidification device (0-10 or 2-10 VDC signal) when the unit requires humidification.

AZ 3 EM2 Module Inputs & E-BUS 12 Relay Exp. Module Outputs

R1-R5 - User-Configurable Relays

These relays are configurable by the user. For all the available configuration options, see **Table 5 on page 57**.

AZ 3 EM2 Expansion Module

AIN1 - Remote SAT Reset Signal

If a Remote SAT Reset Signal is configured as the Reset Source, this input can be used to accept a configurable voltage input between 0-10 VDC (Direct or Reverse Acting) to reset the Supply Air Temperature Setpoint. See the Supply Air Temperature Reset section in the Sequence of Operations for more details.

BIN1 - Remote Forced Heating Mode Input

A wet contact closure on this input is used to provide a means for another BAS or control device (by others) to force the unit into Heating Mode.

BIN2 - Remote Forced Cooling Mode Input

A wet contact closure on this input is used to provide a means for another BAS or control device (by others) to force the unit into Cooling Mode.

BIN3 - Remote Forced Dehumidification Input

A wet contact closure on this input is used to provide a means for another BAS or control device (by others) to force the AZ 3 Controller into Dehumidification Mode.

BIN4 - Remote Forced Humidification Input

A wet contact closure on this input is used to provide a means for another BAS or control device (by others) to force the AZ 3 Controller into Humidification Mode.

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. All Binary Inputs are optional. This means that you must configure the AZ 3 Controller to recognize these input signals.

E-BUS 12 Relay Expansion Module

Please refer to the user-configurable relays in **Table 5 on page 57** for relay definitions.

Sequence of Operation

Supply Fan, HVAC Source & Occupied/Unoccupied Operation

Supply Fan Operation

Anytime the Supply Fan is requested to start, a 1 minute minimum off timer must be satisfied. If the timer is satisfied, the Supply Fan relay is activated while all other outputs are held off until their minimum off timers have been met.

Upon going into the Occupied Mode or upon power-up, the controller will initiate a user-adjustable Fan Starting Delay to provide a staggered start for systems with several HVAC units.

In Fan Cycle Mode or when going unoccupied, the Supply Fan is held on for 2 minutes after the last stage of Heating or Cooling stages off.

Purge Mode

When going into Occupied Mode, an optional “Purge Mode” is initiated. The fan runs with the Economizer closed, and all Cooling and Heating is de-energized. The length of the Purge Mode is user-adjustable.

Occupied Mode

The Supply Fan can be configured to run continuously (default) or to cycle with Heating, Cooling, or Dehumidification.

Unoccupied Mode

The Supply Fan will cycle on a call for Heating, Cooling or Dehumidification.

HVAC Source Configuration Options

The AZ 3 Controller can be configured to have various HVAC Source options that will determine the mode of operation (Heating, Cooling, or Vent Mode) of the unit. The following are descriptions of those options.

Space Temperature—Typical selection for CAV recirculating units.

Return Air Temperature—Optional selection for CAV recirculating units.

Single Zone VAV—Selected for a Space Temperature controlled Single Zone VAV application.

Outdoor Air Temperature—Typical selection for 100% Outdoor Air (MUA) or High Percentage Outdoor Air units.

Supply Air Temperature—Selected for Cooling Only VAV units with optional Morning Warm-Up.

Supply Air Tempering—Selected for VAV units maintaining a Supply Air Setpoint with cooling or heating where heat may be required to temper the supply air temperature during very cold conditions. See the Supply Air Tempering section in the Sequence of Operations section of this technical guide for a description of this option.

HVAC Mode Set by Remote Contact Input

Provides for wet contact closures to force the unit into Heating, Cooling, Humidification and Dehumidification modes. If this option is selected, it applies to all four modes, and all four modes will only be initiated by these contact closures.

Occupied/Unoccupied Mode

The AZ 3 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 3 Controller can be forced into the Occupied Mode by inputting a Forced Schedule from any operator interface.

Remote Forced Occupied Signal

This Forced Occupied input can be used in place of, or in conjunction with, the internal AZ 3 Schedule. When this wet contact input closes, it will force the AZ 3 Controller into the Occupied Mode. When the Remote Forced Occupied Signal is removed, the controller will revert to the Unoccupied Mode of operation, or if an internal AZ 3 schedule is also being used, it will revert back to the current scheduled mode.

Setting the Internal Week Schedule to ‘0’ will cause the controller to only look for the Remote Forced Occupied Signal for Occupied/Unoccupied commands.

Internal Week Schedule

An Internal Week Schedule, which supports up to two start/stop events per day and allows scheduling of up to 14 holiday periods per year is available for determining Occupied and Unoccupied Schedules. It also allows for daylight savings configuration.

Unoccupied Operation

Uses Unoccupied Setback Offset Setpoints for heating and cooling calls. If Unoccupied Setback Setpoints are left at the default 30°F, no Unoccupied Setback operation will occur and the unit will be off. The Outdoor Air Damper will be closed except if the unit is in unoccupied Economizer Free Cooling mode.

If there is no call for Heating or Cooling, the unit will be off.

HVAC Modes of Operation, Cooling Mode

HVAC Modes of Operation

There are 8 possible HVAC Modes of Operation. They are as follows:

- Cooling Mode/Economizer
- Heating Mode
- Vent Mode
- Dehumidification Mode
- Humidification Mode
- Heat Pump
- Warm-Up Mode/Cool-Down Mode
- Off Mode

Cooling Mode

Occupied Cooling is enabled when the temperature at the Mode Enable Sensor rises one deadband above the Cooling Setpoint. Cooling is disabled when the Mode Enable temperature falls one deadband below the Cooling Setpoint. The setpoint and deadband are user-adjustable.

Unoccupied Cooling operation is enabled when the Space Temperature rises above the Cooling Mode Enable Setpoint plus the Unoccupied Cooling Offset.

Mechanical cooling is disabled if the Outdoor Air Temperature (OAT) falls 1°F below the Cooling Lockout Setpoint and will remain disabled until the OAT rises 1°F above the Cooling Lockout Setpoint. If the OAT disables mechanical cooling while it is currently operating, mechanical cooling will stage off as minimum run times and stage down delays are satisfied.

If the economizer is enabled, it will function as the first stage of cooling (see Economizer section).

On/Off Cooling

In the Cooling Mode, as the Supply Air Temperature (SAT) rises above the Active Supply Air Cooling Setpoint (see Supply Air Temperature Setpoint Reset section for explanation), cooling will begin to stage on. Each stage must meet its Minimum Off Time (adj.) before it is allowed to energize, and successive stages are subject to a Cooling Stage Up Delay (adj.).

Cooling stages will continue to run until the SAT falls below the Active Supply Air Temperature Setpoint minus the Cooling Stage Control Window at which point the cooling will begin to stage off. Each stage must meet its Minimum Run Time (adj.) before it is allowed to stage off and successive stages are subject to a Cooling Stage Down Delay (adj.).

Modulating Chilled Water Cooling

If Modulating Chilled Water is being used, 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 Active Supply Air Temperature 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 1°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.

Cooling With Digital Compressor

NOTE: In most cases, the AZ 3 Controller will not be directly controlling the digital compressor. Generally, digital compressor control will be done by the unit manufacturer's compressor controller. When this is the case, a relay output should be configured for each "Cooling Stage", and the following Digital Compressor Sequence information would not apply.

In the Cooling Mode, as the Supply Air Temperature (SAT) rises above the Active Supply Air Cooling Setpoint (see Supply Air Temperature Setpoint Reset section for explanation), the Digital Compressor will stage on and modulate to control the Active Supply Air Cooling Setpoint. One Digital Compressor can be controlled with the AZ 3 Controller.

If additional cooling is required, fixed compressor stages can be staged on while the Digital Compressor continues to modulate.

To stage up the extra compressor(s), the SAT needs to be above the Active Supply Air Cooling Setpoint and the Digital Compressor needs to be at 100% for a period equal to the Stage Up Delay. Once a fixed compressor is enabled, the digital compressor signal will go to 50% and modulate up as needed. This will repeat as additional fixed compressors are staged up. For compressors to stage on, Minimum Off Times (adj.) must be satisfied as well as Stage Up Delays (adj.).

To stage down the extra compressor(s), the SAT needs to be below the Active Supply Air Cooling Setpoint minus the Cooling Stage Control Window, the Digital Compressor needs to be below 30%, and the Stage Down Delay requirement met. Once a fixed compressor stages off, the digital compressor will go to 50% and modulate down as needed. This will repeat as additional fixed compressors stage off.

For compressors to stage down, Minimum Run Times (adj.) must be satisfied as well as Stage Down Delays (adj.). The digital compressor is always the last compressor to be deactivated.

Sequence of Operation

Economizer & Dehumidification

Economizer Operation

Economizer operation is enabled when the Outdoor Air (OA) drybulb, wetbulb, or dewpoint temperature falls below the Economizer Enable Setpoint by 1°F and if the Outdoor Temperature is at least 5°F below the Return Air Temperature (if that value is available). Economizer operation is disabled when the OA temperature rises 1°F above the Economizer Enable Setpoint.

The Economizer acts as the 1st stage of cooling and controls to the Active Supply Air Cooling Setpoint. An Economizer Minimum Position can be programmed into the controller. During Economizer Operation, the economizer will modulate between this minimum position and 100%. If the economizer reaches 100% and the Supply Air Temperature is still above setpoint, mechanical cooling is then allowed to stage up while the economizer is held at the full open position. Any time cooling stages are currently running, and the economizer becomes enabled, it will immediately open to 100%.

During Heat and Vent Modes, the Economizer will remain at its minimum position. The only exception to this can occur during VAV Operation with Outdoor Air Temperature Control (VAV Tempering). See that section for more details. During Unoccupied Mode, the Economizer can be used for night setback free cooling; otherwise, it will remain closed.

IAQ (CO₂) Override of the Economizer simply resets the Economizer Minimum Position higher. See IAQ (CO₂) Control Operation section for more details.

If utilizing the Title 24 Economizer option, an Economizer feedback signal (0-10 VDC) can be wired into the AZ 3 EM1 Expansion Module for status monitoring. Several Title 24 alarm conditions can also be annunciated and are listed in the Alarms section of this manual.

Dehumidification Mode

On VAV, CAV and Single Zone VAV units, the Dehumidification Mode is initiated when the Indoor Humidity rises above the Low Indoor Humidity Setpoint by 4%. The unit will leave the Dehumidification Mode when the humidity falls 4% below this setpoint.

On 100% Outdoor Air (MUA) units with Outdoor Air Temperature Control, Dehumidification is initiated when the Outdoor Air Dewpoint rises above the Outdoor Air Dewpoint Setpoint by 2°F. The unit will leave the Dehumidification Mode when the humidity falls 2°F below this setpoint. The Outdoor Air Dewpoint is calculated using the Outdoor Air Temperature and the Outdoor Air Humidity.

There are four configuration options for Dehumidification operation.

In Occupied Vent Mode Only—Dehumidification can only be initiated in the Occupied Mode when there is no call for Heating or Cooling. This creates a Vent Dehumidification Mode.

In Both Occupied and Unoccupied Vent Mode—Dehumidification can be initiated in the Occupied and Unoccupied Modes when there is no call for Heating or Cooling. This creates a Vent Dehumidification Mode.

NOTE: Do not use this option on an MUA unit that does not have return air and which is not configured for space controlled Night Setback operation. Damage to the unit could occur since the OA damper remains closed in the Unoccupied Mode.

In All Modes while Occupied—Dehumidification can be initiated anytime in the Occupied Mode during Cooling, Heating, or Vent Mode. This can create a Cooling Dehumidification Mode, a Heating Dehumidification Mode, or a Vent Dehumidification Mode.

In All Modes while Occupied and Unoccupied—Dehumidification can be initiated anytime in the Occupied or Unoccupied Mode during Cooling, Heating, Vent, or Off Mode. This can create a Cooling Dehumidification Mode, a Heating Dehumidification Mode, or a Vent Dehumidification Mode. This configuration should not be used for an MUA unit with no return air, since it could start the unit in the Unoccupied Mode when the Outdoor Air damper is closed. Any calls for Unoccupied Dehumidification use the same Dehumidification Setpoint as during the Occupied Mode since you never want humidity to get out of control.

There is no Dehumidification allowed during Heat Mode on a Heat Pump unit.

Dehumidification Operation

For DX Cooling Stages, the AZ 3 activates the Cooling Stages based on the actual Evaporator Coil Temperature compared to the Evaporator Coil Suction (Saturation) Temperature Setpoint. The Evaporator Coil Suction (Saturation) Temperature is calculated by using the Suction Pressure Sensor and converting the pressure to temperature.

NOTE: In most cases, the AZ 3 Controller will not be directly controlling the digital compressor. Generally, digital compressor control will be done by the unit manufacturer's compressor controller. In this case, a relay output should be configured for "Cooling Stage" and the following sequence would not apply

Digital Compressors

For Copeland Scroll™ Digital Compressor units, the AZ 3 will modulate the Copeland Scroll™ Digital Compressor to maintain the Evaporator Coil Suction (Saturation) Temperature Setpoint and activate Fixed Capacity Compressors as necessary.

If the Fixed Capacity Compressor is activated, the Copeland Scroll™ Digital Compressor will only be allowed to modulate within the range of 70% - 100% in order to prevent the loss of reheat capacity during low load conditions. If, with both compressors on, the digital compressor has modulated down to its 70% minimum and the Coil Suction Temperature falls below the Coil Temperature Setpoint minus the Cooling Stage Control Window, then the second compressor will

stage off once its Compressor Minimum Run Time and the Stage Down Delay Timers have been met. At that point, the Copeland Scroll™ Digital Compressor can modulate down as needed to maintain the Coil Temperature Setpoint.

NOTE: If the Coil Suction (Saturation) Temperature drops below 32°F, any cooling remaining on will be forced to stage off.

For Modulating Chilled Water units, the AZ 3 Controller will modulate the Chilled Water Valve to a fixed 100% position during Dehumidification to provide full moisture removal capabilities. With On/Off Chilled Water units, the Cooling Relay will energize to open the valve.

During Dehumidification, the Economizer will be held to its minimum position. If the unit will be using the CAV/MUA Dual Mode (Hood On/Off) Operation, Dehumidification will require the use of an Outdoor and Indoor Humidity Sensor.

Reheat

During the Dehumidification Mode, the AZ 3 Controller activates Cooling to extract moisture from the Supply Air and utilizes either a Reheat, or Heating source to reheat the Supply Air. Reheat is always controlled to the Active Supply Air Setpoint (see the Supply Air Temperature Setpoint Reset section for further explanation) which will be different depending on whether the unit is in Cooling Mode Dehumidification, Heating Mode Dehumidification, or Vent Mode Dehumidification.

During Cooling Dehumidification, Reheat is controlled to the Active Cooling Supply Air Setpoint. During Heating Dehumidification, Reheat is controlled to the Active Heating Supply Air Setpoint. During Vent Dehumidification, Reheat is controlled to a calculated setpoint that is halfway between the Heating and Cooling Mode Enable Setpoints.

If the unit is equipped with an On/Off reheat source, then one of the relays will be configured for Reheat. The Reheat Relay will be activated if the SAT is less than the SAT Setpoint. The Hot Gas Reheat Relay will remain on during the Dehumidification Mode regardless of the Supply Air Temperature. This is to ensure a steady Supply Air Temperature.

Coil Suction (Saturation) Temperature Reset

The Indoor Humidity can be used to reset the Coil Suction (Saturation) Temperature Setpoint. A user-adjustable range of Indoor Humidity values can be used to reset the Coil Temperature Setpoint between a user-adjustable range of values. As the Indoor Humidity rises within its range, the Coil Suction (Saturation) Temperature Setpoint will be lowered within its range.

Heating - Staged On/Off

Available heating options are Staged (by defining relay outputs) and Modulating (0-10 VDC, adjustable).

Heating is enabled when the temperature at the Mode Enable Sensor falls one deadband below the Heating Setpoint. Heating is disabled when the Mode Enable temperature raises one deadband above the Heating Setpoint.

In the Heating Mode, as the Supply Air Temperature falls below the Active Supply Air Heating Setpoint (see Supply Air Temperature Setpoint Reset section for explanation), the heating will begin to stage on or to modulate. Each stage must meet its Minimum Off Time (adj.) before it is allowed to energize, and successive stages are subject to a Heating Stage Up Delay (adj.).

Heating stages will continue to run until the Supply Air Temperature rises above the Active Supply Air Temperature Setpoint plus the Heating Stage Control Window at which point the heating will begin to stage off. Each stage must meet its Minimum Run Time (adj.) before it is allowed to stage off, and successive stages are subject to a Heating Stage Down Delay (adj.).

Mechanical heating is disabled if the Outdoor Air Temperature (OAT) rises 1°F above the Heating Lockout Setpoint and will remain disabled until the OAT falls 1°F below the Heating Lockout Setpoint. If the OAT disables mechanical heating while it is currently operating, mechanical heating will stage off as minimum run times and stage down delays are satisfied.

Heating - Modulating

The AZ 3 Controller supports various forms of Modulating Heat such as SCR Electric Heat, Modulating Hot Water Heat, and Modulating Steam Heat. This references Modulating Heat that is controlled from AOUT3 on the AZ 3 Controller with a user-adjustable voltage range between 0-10 VDC. Modulating Gas, which is controlled by the MODGAS-X Controller, is not included in this section. Whichever form of Modulating Heating is used, the AZ 3 Controller will modulate the Heat Source to achieve the Active Supply Air Temperature Setpoint.

The Modulating Heating 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 Active Supply Air Temperature Setpoint based on the Modulating Heating 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 Heating Proportional Window. The larger the Modulating Heating 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.

Sequence of Operation

Ventilation, Humidification & Off Mode

For example, if the Modulating Heating 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 Active Supply Air Temperature Setpoint by 5°F or more, the signal will adjust 10% each Time Period.

Hot Water Coil Protection

Fan On Mode

If anytime the fan is on, the Supply Air Temperature falls below the user-adjustable Low Supply Air Temperature Cutoff Setpoint for at least one minute, the Hot Water Valve will move to a user-adjustable position configured with the Hot Water Valve Protection Position Setpoint. If the Supply Air Temperature rises back above the Low Supply Air Cutoff by 5°F, the valve will return to its normal position.

If the Supply Air Temperature remains below the Low Supply Air Temperature Cutoff Setpoint for ten minutes, the unit will then shut down and the Low Supply Air Temperature Cutoff Alarm will be generated. If the Supply Air Temperature rises above the Low Supply Air Cutoff by 5°F, the alarm (if generated) will clear and the unit will attempt to restart and resume normal operation.

Fan Off Mode

If anytime the fan is off, the Outdoor Air Temperature falls below the user-adjustable Low Ambient Setpoint, the Hot Water Valve will move to the user-adjustable Hot Water Valve Protection Position Setpoint. If the Outdoor Temperature rises above the Low Ambient Setpoint, the valve will return to its normal position.

If the Hot Water Valve Protection Position Setpoint is left at the default of 0%, the controller will not initiate this protection sequence.

Primary and Secondary Heating

The AZ 3 Controller can activate two forms of Heating, which are classified as Primary and Secondary Heat Sources. The following section describes that operation.

Primary Modulating Heat with Secondary Staged Heat

The Modulating Heat source can be Modulating Hot Water, Modulating Steam, or SCR Electric Heat. In this case, the modulating heat will be the first form of heat used and will operate as described above to attempt to achieve the Active Supply Air Heating Setpoint. If the modulating heat 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 can then modulate as necessary to achieve the Active Supply Air Heating Setpoint. If there are additional stages of heat, they will stage up as described, with the Primary Heat Source modulating as necessary.

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 there are multiple stages of Secondary Heat, they will stage off in the same manner. Then, if the Supply Air Temperature rises above the Active Supply Air Heating Setpoint plus the Heating Stage Control Window, the Primary Heat Source will modulate to 0% to allow the Supply Air Temperature to cool off.

Ventilation Mode

This mode is only available in the Occupied Mode of operation on units configured for continuous Supply Fan operation and is generated anytime there is no demand for heating or cooling. The fan will operate at the configured Minimum Vent speed.

Humidification Mode

If an indoor humidity sensor is installed, the Indoor Air Humidity can be used to initiate Humidification Mode when the humidity level falls below the Humidification Target less the Humidification Target Deadband. Humidification Mode is disabled when the humidity level rises above the Humidification Target plus the Humidification Target Deadband.

ON/OFF Humidification: If On/Off Humidity Control is configured in the AZ 3 controller, a relay on the main controller or on EM1 must be configured for “Humidifier”. This relay will be energized to enable a humidifier whenever there is a call for humidification.

Modulating Humidification: If “Modulating Humidity Control” is configured in the AZ 3 Controller, Analog Output 4 on EM1 will be utilized to send a 0-10 VDC (adjustable) signal to a humidifier.

Humidification can also be configured to operate in the Unoccupied Mode and will utilize the same setpoints.

For Humidification control, connect either an E-BUS Indoor Temperature/Humidity Sensor to the AZ3 Controller or a 0-5 VDC Indoor Humidity Sensor to the designated terminal on EM1.

Remote Contact Control, Space Sensor, IAQ, Morning Warm-Up**Off Mode**

Off Mode occurs in the Unoccupied Mode when there is no heating or cooling demand. The Supply Fan is off and the outdoor air damper is closed.

Off Mode can only occur in the Occupied Mode if the fan is configured to cycle with heating and cooling and there is no call for heating or cooling.

AZ 3 Remote Contact Control

A Remote Contact Control option can be configured on the AZ 3 Controller to initiate the HVAC Modes of operation. If this option is configured, all Heating, Cooling, Dehumidification and Humidification modes will only be initiated based on 24 VAC wet contact closures on the Forced Heating, Forced Cooling, Forced Dehumidification and Forced Humidification inputs on the EM2 Expansion Module. This is a single configuration option that applies to all four modes. When using this Remote Contact Control, configure the Outdoor Air Sensor as the controlling sensor.

If both the Forced Heating and Forced Cooling inputs are inactive or if both are simultaneously active, then the unit is in a Vent mode (neutral) state. In this condition in the Occupied Mode, only the fan would be on for ventilation. In this condition in the Unoccupied Mode, the unit would just be off.

If Forced Dehumidification is also being used, it will operate in conjunction with the Forced Heating and Forced Cooling inputs according to which Dehumidification option you have configured. The four configuration options are described in the Dehumidification Mode section on [page 62](#).

Space Sensor Operation

Space Sensors are available as a Plain Sensor, Sensor with Override, Sensor with Setpoint Slide Adjust, and Sensor with Override and Setpoint Slide Adjust (this is the version that is factory supplied).

An E-BUS Digital Space Sensor is also available with override and setpoint adjustment capability. Sensors with Setpoint Slide Adjust can be programmed to allow Space Setpoint adjustment of up to $\pm 10^\circ$ F.

If the Space Temperature is the SAT/Reset Source, then the Slide Adjust will adjust the HVAC Mode Enable Setpoints and the SAT/Reset Source Setpoints simultaneously.

During Unoccupied hours, the Override Button can be used to force the unit back into the Occupied Mode (by pressing the button for less than 3 seconds) for a user-defined override duration of up to 8.0 hours. Pressing the button between 3 to 10 seconds cancels the override.

IAQ (CO₂) Control Operation

If you have configured the AZ 3 Controller to monitor and control CO₂ levels, the Economizer operation will be modified as follows:

1. If the CO₂ levels remain below the Low CO₂ Level Setpoint, the Economizer Minimum Position will remain at its configured value.
2. As the level of CO₂ increases above the Minimum CO₂ Level Setpoint, the Economizer Minimum Position will start to reset higher. The Economizer Minimum Position will be proportionally reset higher as the CO₂ rises within the range set by the Minimum CO₂ Level Setpoint and the Maximum CO₂ Level Setpoint. If the CO₂ level reaches the High CO₂ Level Setpoint, the Economizer Minimum Position will be reset to the Maximum Reset Position.
3. The Maximum Reset Position Setpoint is the highest the Economizer Minimum Position can be reset to during CO₂ Control Operation. This setpoint is user-adjustable and does not keep the Economizer from opening further during Economizer operation.

Morning Warm-Up/Cool-Down Mode

NOTE: Morning Warm-Up/Cool-Down can be configured for any application, but should not be used on 100% Outdoor Air Units, since the Outdoor Air Damper remains closed during Warm-Up.

When the AZ 3 Controller is configured for Morning Warm-Up and switches to the Occupied Mode of Operation (not Override or Force 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. Heating will then be controlled to the Warm-Up Supply Air Temperature Setpoint.

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 stand-alone VAV boxes 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.

Single Zone VAV Supply Air Setpoint Reset

Morning Cool-Down Mode Operation

When the AZ 3 Controller is configured for Morning Cool-Down and switches to the Occupied Mode of Operation (not Override Mode), the unit compares the Return Air Temperature to a Cool-Down Target Temperature. If the Return Air Temperature is above this Setpoint, the Cool-Down Mode is initiated. Cooling will then be controlled to the Cool-Down Supply Air Temperature Setpoint.

This mode remains in effect until the Return Air Temperature drops below the Target Temperature or a user-adjustable Time Period expires. Cool-Down is not initiated by Push-Button Overrides or Unoccupied Cooling demands. The Outdoor Air Damper remains closed during Cool-Down Mode.

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

If you have stand-alone VAV boxes that need to be forced wide open during the Cool-Down Mode, you can configure one of the relay outputs to be used during this Mode. If the Cool-Down Mode is active, the relay is activated. This relay then becomes the Force Open Command for all VAV boxes to which it is wired.

Single Zone VAV

Single Zone VAV Operation is a hybrid CAV/VAV application where the Supply Fan VFD is modulated to maintain the Space Temperature Setpoint while heating or cooling is modulated to maintain the Supply Air Setpoint. This application can be configured to use VAV Cooling and either VAV Heating or CAV Heating. There is no Supply Air Setpoint reset function on a Single Zone VAV unit.

VAV Cooling and VAV Heating require modulating cooling and heating sources in order to maintain a constant Supply Air Temperature no matter what the fan speed is. CAV Heating must be configured if using a staged form of heat.

The Space Temperature Sensor determines the heating or cooling mode of operation. Heating and cooling are enabled and disabled as described previously in the Heating and Cooling sections.

In the Cooling Mode, the modulating cooling source will modulate to maintain the Cooling Supply Air Setpoint. The Supply Fan VFD will begin operation at the Minimum VFD Cooling Speed (30% default) and modulate between this setpoint and 100% as needed to maintain the Space Temperature within the Space Cooling Reset Window created by configuring a Space Cooling High and a Space Cooling Low Reset Source Setpoint.

If the unit is configured for VAV Heating, then in the Heating Mode the modulating heating source will modulate to maintain the Heating Supply Air Setpoint. The Supply Fan VFD will begin operation at the Minimum VFD Heating Speed (50% default) and modulate between this setpoint and the Maximum VFD Heating Speed (100% default) as needed to maintain the space temperature within the Space Heating

Reset Window created by configuring a Space Heating High and a Space Heating Low Reset Source Setpoint.

If the unit needs to be configured for CAV Heating, set the Minimum VFD Heating Speed to be the same as the Maximum VFD Heating Speed desired during heating. Once the unit enters the Heating Mode, the Supply Fan will run at the set Maximum VFD Heating Speed (100% default) and Heating will occur as described in the Heating Section of this sequence.

In the Vent Mode of operation, the Supply Fan will operate at the VFD Vent Speed (user-adjustable).

During Dehumidification, the fan will operate as described above, depending on if the Space Temperature is calling for Cooling, Heating, or Vent Mode of operation.

Supply Air Temp Setpoint Reset

Various sources can be configured to reset the Supply Air Temperature (SAT) Setpoint. Since the Supply Air Temperature Setpoints are not fixed during reset, we refer to them as “Active Supply Air Temperature Setpoints.” The following Reset Source options are available in this release:

1. Space Temperature
2. Outdoor Air Temperature
3. Return Air Temperature
4. Fan VFD Signal
5. Remote SAT 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 SAT Setpoint would be reset to the configured High SAT Setpoint, and the Low Reset Setpoint would reset to the Low SAT Setpoint.

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 a Remote SAT Reset Signal is configured as the Reset Source, a configurable voltage signal (between 0 and 10 VDC, direct or reverse acting) can be used to reset the Supply Air Temperature Setpoint. You can configure what voltage will correspond to the Low SAT Setpoint and what voltage will correspond to the High SAT Setpoint in both the Heating and the Cooling Modes. The EM2 Expansion Module is required for this option.

Low Ambient Temperature and Static Pressure Control

Low Ambient Operation

A Low Ambient Relay can be configured. Whenever the Outdoor Air Temperature falls below the Low Ambient Setpoint, this Low Ambient Relay will energize. This operation occurs in both the Occupied and Unoccupied Modes of Operation.

Pre-Heat Operation

A Pre-Heat relay can be configured to energize anytime the Supply Fan is operating and the Outdoor Air Temperature is below the Pre-Heat Setpoint. This option allows pre-heating of cold outside air before it reaches the evaporator coils and is useful in Hot Water/Chilled Water applications or during CO₂ control of the economizer in low temperature conditions. This operation only occurs in the Occupied Mode of Operation.

Duct Static Pressure Control

If the AZ 3 Controller has been configured for Duct Static Pressure Control, then anytime the Supply Fan is operating, the unit will be controlling to a Duct Static Pressure Setpoint. The Static Pressure Control Output Signal can be used to control a Supply Fan VFD (Direct Acting Operation) or a Zoning Bypass Damper Actuator (Reverse Acting Operation).

The Duct Static Pressure Setpoint, the Setpoint Deadband, the Static Pressure Control Signal, and the Static Control Rate are all user-adjustable. The Static Control Rate is the amount of time that elapses between each adjustment to the Duct Static Pressure Control Output Signal. The default period is 10 seconds and should not be changed unless close observation reveals that the Supply Fan or Bypass Damper is hunting and not maintaining a stable pressure reading.

For Supply Fan VFD operation, the Output Signal increases (increases the 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.

For Bypass Damper operation, the AZ 3 Controller will reverse the logic of the Output Signal. The Output Signal decreases (closes the 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 the Zoning Bypass Damper) if the Duct Static Pressure is above the Duct Static Pressure Setpoint by the Deadband amount.

If the Static Pressure ever rises 0.5" above the Duct Static Pressure Setpoint, the Duct Static Pressure Control Output Signal will be cut in half every control period until the Static Pressure is brought under control. This is to prevent damage to the ductwork if all the VAV boxes are closed or some other blockage occurs in the ductwork.

WARNING: The manufacturer does not assume responsibility for protecting the equipment from over-pressurization! You should always install mechanical high static protection cutoffs to protect your system!

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 3 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 3 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 Fan Control. This feature cannot be used if this is a VAV or Zoning application with typical Duct Static Pressure Control, or if this unit has been configured for Single Zone VAV operation. A Dirty Filter Alarm will not be displayed when using this feature.

Building Static Pressure Control

The AZ 3 Controller can maintain Building Static Pressure anytime the Supply Fan is operating. A Building Pressure Transducer must be connected to the AZ 3 EM1 Expansion Module. The following are the available control options.

Direct Acting Building Pressure Control

- **On/Off Exhaust Fan**—If an On/Off Exhaust Fan is being used, a relay output must be configured for “Exhaust Fan”. This relay will energize whenever the Building Pressure rises above the Building Pressure Setpoint by the Deadband amount. The relay will de-energize when the Building Pressure falls below the Building Pressure Setpoint by the Deadband amount.

MUA Operation

- **Exhaust Fan VFD or Modulating Exhaust Damper**—If configured for Modulating Exhaust, a user-adjustable voltage output (Building Pressure Output on the AZ 3 EM1 Expansion Module) will be used to control this fan or damper. An Exhaust Relay can be configured if necessary to enable the fan or damper. Whenever the Building Pressure rises above the Building Pressure Setpoint by the Deadband amount, the Exhaust Fan Relay will energize and the Modulating Signal will activate to control the Building Pressure Setpoint. If the Building Pressure falls below the Building Pressure Setpoint by the Deadband amount, the Modulating Signal will modulate towards 0% as it attempts to maintain the Building Pressure Setpoint. The Exhaust Fan Relay is energized whenever the Modulating Signal is above 0%.

Reverse Acting Building Pressure Control

- **Outdoor Air Damper**—If this option is configured, the AZ 3 Controller will use the user-adjustable Economizer/Outdoor Air Damper output signal (AOUT2 — Economizer Control Signal) to maintain the Building Pressure Setpoint. Whenever the Building Pressure falls below the Building Pressure Setpoint by the Deadband amount, the modulating Economizer Output Signal will modulate the damper open to control the Building Pressure Setpoint. If the Building Pressure rises above the Building Pressure Setpoint by the Deadband amount, the damper will modulate towards closed as it attempts to maintain the Building Pressure Setpoint. When this option is selected, no Economizer free cooling or CO₂ IAQ operation will be available.
- **Supply Fan VFD**—Careful consideration should be made regarding the effects of potential reduced airflow when using this option. Contact AAON Technical Support if you have questions. If this option is selected, the user-adjustable Supply Fan VFD Output (AOUT1 on the AZ 3 Controller) will be used to control the Supply Fan VFD to maintain the Building Pressure Setpoint in similar fashion to the Outdoor Air Damper control described above.

MUA Operation

- **Occupied Mode**—The AZ 3 Controller will use the normal Cooling and Heating Mode Enable Setpoints in conjunction with the Outdoor Air (OA) temperature sensor to determine the mode of operation. The Outdoor Air Dewpoint Setpoint will initiate the Dehumidification Mode. See the Cooling, Heating and Dehumidification Modes of Operation sections for those details. The Outdoor Air Damper will be modulated to the Economizer Minimum Damper Position (normally set at 100% for an MUA unit).
- **Unoccupied Mode**—Normally, a MUA unit is off during the Unoccupied Mode. However, if the unit has Return Air, it can be configured to operate as a recirculating Night Setback Controlled unit during Unoccupied Hours. This is accomplished by simply configuring Night Setback Temperature Setpoints (anything other than the default 30°F) on a unit that is also configured for Outdoor Temperature Control (MUA). With this configuration, when the unit goes Unoccupied, it will close the Outdoor Air Damper and begin to use a Space Temperature Sensor in conjunction with the existing Heating and Cooling Setpoints, offset by the Night Setbacks, to make Night Setback calls. If a Space Humidity Sensor is installed, and the unit is configured for Night Humidity control, the AZ 3 Controller will use the Space Humidity Setpoint for unoccupied Dehumidification calls.

Supply Air Tempering, Air to Air Heat Pump Operation

**Supply Air Tempering
(VAV Operation with Outdoor Air
Temperature Control)**

On a VAV unit that may need daytime heating in order to maintain the Cooling Supply Air Setpoint, previous controllers used a Supply Air Tempering sequence with the Supply Air Temperature Sensor configured as the Controlling Sensor. The AZ 3 Controller accomplishes the same result using the VAV Tempering Setpoints to initiate Cooling and Heating.

To utilize this sequence, the HVAC Mode Enable Source must be configured as Supply Air Tempering. Then, configure the VAV Tempering HVAC Setpoints for the OA temperature values that will enable Cooling and Heating. The VAV Tempering Heating Setpoint should be set at or above the OA Temperature, that when mixed with the Return Air (with the economizer at its minimum position), will require Heating in order to achieve the Heating Supply Air Setpoint. The VAV Tempering Cooling Setpoint would be set above that, which will allow a Vent Mode in between.

Then, configure the Cooling and Heating Supply Air Setpoints. While not set at the same value (see below), those would normally both be set at or near 55°F to allow the box heat to keep spaces comfortable.

With this configuration, as the OA Temperature rises above the VAV Tempering Cooling Setpoint, the unit will be in Cooling Mode, controlling to the Cooling Supply Air Setpoint. The economizer can operate as normal for free cooling to maintain the Cooling Supply Air Setpoint.

During the Vent Mode, when the OA Temperature is between the VAV Tempering Cooling and Heating Setpoints, the economizer can modulate if necessary to maintain the Cooling Supply Air Setpoint.

Whenever the OA Temperature falls below the VAV Tempering Heating Setpoint, the unit will be in Heating Mode controlling to the Heating Supply Air Setpoint. The Heating Supply Air Setpoint should be set at least 2°F below the Cooling Supply Air Setpoint. The economizer can still modulate if necessary to maintain the Cooling Supply Air Setpoint. Configured this way, even if the OA Temperature is below the VAV Tempering Heating Setpoint, if the Supply Air Temperature is too warm (above the Cooling Supply Air Setpoint), the economizer can modulate open to maintain the Cooling Supply Air Setpoint. If the Supply Air Temperature drops below the Cooling Supply Air Setpoint, the economizer will have time to close off before heating is energized below the Heating Supply Air Setpoint. During Morning Warm-Up, heating will be controlled to the Morning Warm-Up Supply Air Setpoint (see the Morning Warm-Up Mode Operation section for complete details).

In this operation, if Night Setback operation will be initiated by a space sensor connected to the AZ 3 Controller, then the Night Setback Cooling and Heating Offsets will be applied to the normal Occupied HVAC Mode Enable Setpoints. During Night Setback operation, Heating will be controlled to the Morning Warm-Up Supply Air Setpoint.

Finally, configure the AZ 3 Controller for Duct Static Pressure Control (see the Duct Static Pressure Control section for complete details).

Air to Air Heat Pump Operation

Cooling Mode will operate in the same manner as described in the Cooling section.

A reversing valve relay output can be configured to activate with the first compressor stage in the Heating Mode or the Cooling Mode of operation.

In the Heating Mode, Compressor Heat, Auxiliary Heat, and Emergency Heat can be used to achieve the Active Supply Air Heating Setpoint. Auxiliary Heat can be either a modulating or staged form of heat, or it can be a modulating form of heat followed by staged heat.

When Auxiliary Heat comes on in conjunction with a digital compressor heat stage, the digital compressor will be locked at 100% until the Supply Air Temperature (SAT) rises above the SAT Heating Setpoint plus the Heat Staging Window. At that point, the Auxiliary Heat will stage off (after a stage down delay) and the digital compressor heat will be allowed to modulate.

When the Outdoor Air Temperature (OAT) is below the Heating Lockout, but above the OAT Compressor Heating Lockout, Compressor Heat will be used and can be supplemented by Auxiliary Heat.

When the OAT is below the OAT Compressor Heating Lockout, Compressor Heat is locked out. Auxiliary Heat will then be the primary heat and can be supplemented with stage(s) of Emergency Heat (if available). Emergency heat is only available when the OAT is below the OAT Compressor Lockout.

There is no Dehumidification allowed during Heat Mode on a Heat Pump unit.

NOTE: If controlled by the AZ 3 Controller, any digital compressor stage in a Heat Pump unit must be configured as a “Digital Compressor”. The AZ 3 Controller will know it will operate as a heat pump compressor by the unit being configured as having a Reversing Valve. Any fixed Heat Pump compressor stage must be configured as a “Heat Pump Compressor” rather than a “Cooling Stage.”

Sequence of Operation

Heat Pump Defrost, Water Source Heat Pump Operation

Heat Pump Standard Defrost Operation

When using the AZ 3 Controller with an installed Defrost Coil Temperature Switch, a Defrost Cycle is available.

If the compressor(s) are operating in the Heating Mode and the Defrost Coil Temperature Switch closes, the unit will enter the Defrost Mode, provided the user-adjustable Defrost Interval Timer has elapsed since the last Defrost Cycle.

In the Defrost Cycle, the reversing valve signal is switched to the opposite operation, and the compressors are brought to maximum capacity. Auxiliary Heat will be used to attempt to maintain the Heating SAT Setpoint.

The unit will leave the Defrost Mode after 10 minutes have elapsed or if the Defrost Coil Temperature Switch opens.

If the unit leaves the compressor heating mode, the Defrost Interval will restart once the unit re-enters the compressor heating mode.

Heat Pump Adaptive Defrost Operation

The Adaptive Defrost operation adjusts the time interval (Adaptive Defrost Timer) in between Defrost Mode cycles.

As stated above, the unit will leave the Defrost Mode after 10 minutes have elapsed or if the Defrost Coil Temperature Switch opens. If the Defrost Cycle is terminated because the 10 minute timer runs out, this could be an indicator that the unit may need more defrost time. To address this issue, the Adaptive Defrost Timer value will be subtracted from the original Defrost Interval.

If the Defrost Cycle is terminated between the 8th and 9th minute, the Defrost Interval will not be changed.

If the Defrost Cycle is terminated before the 8th minute, this could be an indicator that the unit may need less defrost time. To address this issue, the Adaptive Defrost Timer value will be inversely proportionally added to the original Defrost Interval as the termination time moves from 8 minutes to 0 minutes.

Water Source Heat Pump Operation

Cooling Mode will operate in the same manner as described in the Cooling section.

A reversing valve relay output can be configured to activate with the first compressor stage in the Heating Mode or the Cooling Mode of operation.

In the Heating Mode, Auxiliary Heat can be used with Compressor Heat to achieve the Active Supply Air Heating Setpoint. Auxiliary Heat can be either modulating or staged forms of heat, or it can be a modulating form of heat followed by staged heat.

When Auxiliary Heat comes on in conjunction with a digital compressor heat stage, the digital compressor will be locked at 100% until the Supply Air Temperature (SAT) rises above the SAT Heating Setpoint plus the Heat Staging Window. At that point, the Auxiliary Heat will stage off (after a stage down delay) and the digital compressor heat will be allowed to modulate.

There is no Dehumidification during Heat Mode of a Water Source Heat Pump Unit. There is no Defrost Mode on a Water Source Heat Pump Unit.

NOTE: If controlled by the AZ 3 Controller, any digital compressor stage in a Heat Pump unit must be configured as a “Digital Compressor”. The AZ 3 Controller will know it will operate as a heat pump compressor by the unit being configured as having a Reversing Valve. Any fixed Heat Pump compressor stage must be configured as a “Heat Pump Compressor” rather than a “Cooling Stage.”

The unit can be configured for the percentage of glycol it has. The options are 0%-40% in 5% increments.

Proof of Flow

1. If there is a call for a compressor and there is no Proof of Flow (POF) Input enable:
 - Compressors will not be enabled.
 - The AZ 3 Controller will wait up to 3 minutes to activate the POF Alarm and the POF LEDs will blink a code, indicating failure. If POF failure still exists, compressors will remain disabled.
2. If compressor(s) are running and the POF contact opens for 2 seconds during Heat Pump Heating:
 - Compressors will be disabled.
 - POF Alarm will activate and POF LEDs will blink the code, indicating failure.
 - If after a 2 minute delay POF is established, compressors will be enabled.
3. If compressor(s) are running and the POF contact opens for 2 seconds during Cooling:
 - POF input will be ignored.
 - No alarm will be generated.

Low Suction Pressure Detection

1. If the Suction Pressure falls below the Low Suction Temperature Setpoint for longer than a minute, compressors will be disabled for 10 minutes.
2. If after 10 minutes, the Suction Pressure is still below setpoint, then after one additional minute:
 - A Low Suction Pressure Alarm will be activated and the Status LEDs will blink a code indicating this alarm.
 - The compressors will be locked out until power is cycled.
3. If after the initial 10 minute disable period, the pressure has risen above setpoint, restart compressors and resume testing for a Low Suction Pressure condition.
4. If compressors run for 2 hours without falling below the Low Suction Temperature Setpoint, then all counters and timers are cleared.

5. If another Low Suction condition occurs within that 2 hour period:
 - A Low Suction Pressure Alarm will be activated and the Status LEDs will blink a code indicating this alarm.
 - The compressors will be locked out until power is cycled.
6. If multiple compressors are enabled to come back on simultaneously, a 2 second start-up delay is implemented to avoid a power surge.

Unsafe Suction Pressure Detection

If the Suction Pressure falls below the Unsafe Suction Pressure Setpoint for 5 seconds:

- Compressors will be locked out immediately.
- Power will need to be cycled to restart the unit.

Low Leaving Water Temperature

NOTE: This safety is only monitored in Heat Mode.

- 1a. If the Leaving Water Temperature falls below the Low Leaving Water Temperature Setpoint with 2 compressors on:
 - The 2nd compressor will stage off.
 - A Low Leaving Water Temperature Alarm will activate and LEDs will blink the code, indicating failure.
 - Compressor 2 will be locked out until the Leaving Water Temperature is 6°F above setpoint.
- 1b. If the Leaving Water Temperature remains below setpoint after a 1 minute stage off delay:
 - The 1st compressor will stage off.
 - A Low Leaving Water Temperature Alarm will activate and LEDs will blink the code, indicating failure.
 - Compressor 1 and 2 will be locked out until the Leaving Water Temperature is 12°F above setpoint.

Safety Monitoring

2. If the Leaving Water Temperature falls below the Low Leaving Water Setpoint with only 1 compressor on:
 - The 1st compressor will stage off.
 - A Low Leaving Water Temperature Alarm will activate and LEDs will blink the code, indicating failure.
 - Compressor 1 will be locked out until the Leaving Water Temperature is 12°F above setpoint.

Temperature Protection

Temperature Protection is activated when the Supply Air Temperature (SAT) rises above the High Cutoff Temperature (immediate) or drops below the Low Cutoff Temperature (for 10 minutes). In either case, an alarm will be created. Both cutoff setpoints are user-adjustable. This mode shuts off the unit (with a 3 minute fan off delay) until the mode is cancelled.

This mode is cancelled when the SAT drops 5°F below the High Cutoff Temperature Setpoint or rises 5°F above the Low Temp Cutoff Temperature Setpoint or when the unit changes back into Occupied Operation.

Outdoor Air Lockouts

The compressors are disabled during Cooling Mode when the Outdoor Air Temperature is below the Compressor Cooling Lockout Setpoint.

Mechanical heating is disabled when the Outdoor Air Temperature is above the Heating Lockout Setpoint.

For Air to Air Heat Pumps, the compressors are disabled during Heating Mode when the Outdoor Air Temperature is below the Compressor Heating Lockout Setpoint.

System Broadcasts

You can configure the AZ 3 Controller to broadcast Building Pressure, Outdoor Air Temperature, and Outdoor Air Humidity to any other AZ 3 Controller that does not have one or more of these sensor(s). A CommLink 5 or MiniLink PD 5 must be used to utilize the broadcast function.

Alarm Detection and Reporting

The AZ 3 Controller continuously performs self diagnostics during normal operation to determine if any operating failures have occurred.

These failures (alarms) can be reported to a computer running Prism 2 software.

Diagnostic LEDs on the AZ 3 Controller will generate “blink codes” for certain alarm conditions.

The following are the available alarm designations for the AZ 3 Controller:

- Bad SAT Sensor
- Bad OAT Sensor
- Bad Space Sensor
- Missing Main Exp Board
- Missing CO₂ Sensor
- Bad Compressor Discharge Sensor
- Missing Suction Pressure Sensor
- Missing 12RLY Board
- Mech Cooling Failure
- Mech Heating Failure
- Fan Proving Alarm
- Dirty Filter Alarm
- Emergency Shutdown
- High Supply Air Temperature Cutoff
- Low Supply Air Temperature Cutoff
- High Control Temp
- Low Control Temp
- Digital Compressor Cutoff
- Digital Compressor Lockout
- Low Suction Pressure
- Unsafe Suction Pressure

Sensor Failure Alarms

Supply Air Temperature Sensor Failure Alarm

The Supply Air Temperature Sensor Failure Alarm is generated when the controller detects an open or short circuit on the Supply Air Temperature Sensor input. Once the alarm is generated, the unit will be completely shut down. If a sensor is properly detected after the unit has alarmed, the alarm will be cleared and the unit will restart operations.

Space Temperature Sensor Failure Alarm

If the Space Sensor is configured as the Controlling Sensor (Mode Enable Sensor) or as the Reset Sensor, and if the controller detects an open or short circuit on the Space Sensor input, then a Space Temperature Sensor Failure Alarm is generated. If the Space Sensor is configured as the Controlling Sensor and the Failure Alarm is generated, the unit will shut down. If the Space Sensor is only configured as a Reset Sensor and the Failure Alarm is generated, the Space Temperature setpoint will default to a value half way between the Heating and Cooling Mode Enable Setpoints, and the unit will continue to run.

Outdoor Air Temperature Sensor Failure Alarm

The Outdoor Air Temperature Sensor Failure Alarm is generated when the controller detects an open or short circuit on the Outdoor Air Temperature Sensor input. When this occurs, the Outdoor Air reading will be artificially set to the halfway point between the Cooling and Heating Lockout Setpoints. This will allow the cooling and the heating to continue operating.

Return Air Temperature Sensor Failure Alarm

If the Return Air Temperature Sensor is configured as the Controlling Sensor (Mode Enable Sensor) or as the Reset Sensor, and if the controller detects an open or short circuit on the Return Air Sensor input, then a Return Air Temperature Sensor Failure Alarm is generated. If the Return Air Sensor is configured as the Controlling Sensor and the Failure Alarm is generated, the unit will shut down. If the Return Air Sensor is only configured as a Reset Sensor and the Failure Alarm is generated, the Return Air Temperature setpoint will default to a value half way between the Heating and Cooling Mode Enable Setpoints, and the unit will continue to run.

CO₂ Sensor Failure Alarm

This alarm is generated if the controller is configured to have a CO₂ sensor, but does not detect it. IAQ Mode is disabled when this occurs. If a sensor is properly detected after the unit has alarmed, the alarm will be cleared and the unit will be returned to CO₂ control.

Compressor Discharge Sensor Failure Alarm

This alarm is generated if the unit is configured to have a digital scroll compressor, but the Digital Compressor Discharge Temperature Sensor is not detected or is shorted.

Suction Pressure Sensor Failure Alarm

If the controller detects the Suction Pressure Sensor is missing, this alarm is generated and the unit will shut down. If the sensor is properly detected after the unit has alarmed, the alarm will be cleared and the unit will restart.

Missing Expansion Module Alarm

EM1 Expansion Missing
EM2 Expansion Missing
E-BUS 12 Relay Board Missing

If the controller is configured to have any of the above Expansion Boards (Modules), but the controller does not detect that board, then the applicable alarm will occur. If the board is properly detected after the unit has alarmed, the alarm will be cleared.

Mechanical Failure Alarms

Mechanical Cooling Failure

The Mechanical Cooling Failure Alarm is generated if the Supply Air Temperature fails to drop 5°F (within a user-adjustable period) from the temperature the supply air was at when the cooling was activated. The alarm will be cleared when the Supply Air Temperature drops the 5°F and sets the failure timer back to zero. This alarm does not apply for Modulating Cooling.

Mechanical Heating Failure

The Mechanical Heating Failure Alarm is generated if the Supply Air Temperature fails to rise 5°F (within a user-adjustable time period) from the temperature the supply air was at when the heating was activated. The alarm will be cleared when the Supply Air Temperature rises the 5°F and sets the failure timer back to zero. This alarm does not apply for Modulating Heating.

Proof of Flow Interlock Alarm

A Proof of Flow switch (by others) provides a 24 VAC wet contact closure when the Supply Fan is operating. If this contact opens while the fan is being called to run, all heating and cooling is disabled, the Outdoor Air Damper closes, and a Fan Proving Alarm is generated. Fan Proving needs to be configured for this alarm to occur.

Dirty Filter/Generic Alarm

When used as a Dirty Filter Alarm, a differential pressure switch (by others) is used to provide a 24 VAC wet contact closure to indicate a dirty filter status. A Dirty Filter Alarm is then generated. Dirty Filter needs to be configured for this alarm to occur.

A 24 VAC wet contact closure is used as a Generic Alarm.

Safety Monitoring

Emergency Shutdown Alarm

A 24 VAC wet contact input is available to be used when a N.C. Smoke Detector (by others), Firestat, or other shutdown condition occurs. If this contact opens, it will initiate shutdown of the AZ 3 Controller and will generate an alarm condition. This contact closure does not produce an instantaneous shutdown. Emergency Shutdown needs to be configured for this alarm to occur.

Failure Mode Alarms

High and Low Supply Temp Alarm

These alarms are activated when the Supply Air Temperature (SAT) rises above the High Cutoff Temperature Setpoint (immediate) or drops below the Low Cutoff Temperature Setpoint (for 10 minutes). Both cutoff setpoints are user-adjustable. This mode shuts off the unit (with a 3 minute fan off delay) until the mode is cancelled.

This mode is cancelled when the SAT drops 5°F below the High Cutoff Temperature Setpoint or rises 5°F above the Low Temp Cutoff Temperature Setpoint, or when the unit changes back into Occupied Operation.

On non-MUA units, if the Supply Air Temperature falls 5°F below the Low Supply Air Temperature Cutoff, the Outdoor Air Damper will fully close in an attempt to bring the Supply Air Temperature up before the 10 minute cutoff occurs.

High and Low Control Temp Failure

When the Controlling Sensor Temperature rises above the Cooling Mode Enable Setpoint plus the Control Mode High Alarm Offset Setpoint, the controller will generate a High Control Temp Failure Alarm.

When the Controlling Sensor Temperature drops below the Heating Mode Enable Setpoint minus the Control Mode Low Alarm Offset Setpoint, the controller will generate a Low Control Temp Failure Alarm. Both offset setpoints are user-adjustable.

Digital Compressor Cutoff Alarm

If the digital compressor discharge temperature rises above 268°F (131.11°C) or the sensor is shorted, which will read a temperature of 300°F (148.88°C), this alarm will be generated.

The alarm is removed when the compressor discharge temperature drops below 250°F (121.11°C). Once the compressor is shut off, it remains off for 30 minutes.

Digital Compressor Lockout Alarm

If a total of 5 Digital Compressor High Temperature Cutoffs have occurred within four hours, the AZ 3 Controller will lock out the digital compressor and this alarm will be generated. The ALERT LED will continually flash 6 times to signal the lockout. The lockout can only be reset by cycling the 24 VAC power off and on to the controller.

If the unit runs for 60 minutes without a digital compressor discharge temperature alarm, then the counter is reset to zero.

WSHP Proof of Flow Alarm

On a Water Source Heat Pump unit, if water flow is not proven within a certain time limit, this alarm will be generated. This alarm condition will disable the compressor(s) or prevent activation of compressor(s).

Low Suction Pressure Alarm

On a Water Source Heat Pump unit, if the Suction Pressure falls below the Low Suction Pressure Setpoint, this alarm will be generated. This alarm condition will disable the compressor(s) or prevent activation of compressor(s).

Unsafe Suction Pressure Alarm

On a Water Source Heat Pump unit, if the Suction Pressure falls below the Unsafe Suction Pressure Setpoint, this alarm will be generated. This alarm condition will disable the compressor(s) or prevent activation of compressor(s).

WSHP Low Leaving Water Temperature Alarm

On a Water Source Heat Pump unit, if the Leaving Water Temperature falls below the Low Leaving Water Temperature Setpoint while in the Heating Mode, this alarm will be generated. This alarm condition will disable the compressor(s) or prevent activation of compressor(s).

Title 24 Economizer Alarms

Economizer Temperature Sensor Failure

Outdoor Air or Supply Air Temperature Sensor is shorted or missing.

Economizer Not Economizing When It Should

Economizer is enabled, but not following the desired Economizer position commanded.

Economizer Is Economizing When It Should Not

Economizer is not enabled, but the feedback signal indicates a position more open than the minimum.

Economizer Damper Not Modulating

Economizer is enabled, but not within 10% of desired position within 150 seconds.

Economizer Excess Outdoor Air Filter

Economizer feedback is lost or Economizer is not following commanded position.

Relay Outputs

There are 5 Relay Outputs that are configurable for the AZ 3 Controller (Relay #1 is reserved for the Supply Fan and is not configurable). See **Table 5 on page 57** for descriptions of the configuration options.

Additional Relays can be added with the addition of the EM1 Expansion Module and/or the E-BUS 12 Relay Expansion Module.

Trend Logging

The AZ 3 Controller continuously maintains an Internal Trend Log in memory that records a fixed set of values at a user-defined interval.

There are 120 log positions (timed retrievals) available on the controller. Once these positions are full, the controller begins overwriting the oldest data.

Values can be retrieved using the Prism 2 graphical front-end software program. With Prism 2 running continuously, values can be saved to the computer hard drive at regular intervals to keep from losing data.

The following are the fixed items that can be logged:

- Date
- Time
- Mode of Op (Occupied / Override / Unoccupied)
- HVAC Mode
- Space Temperature
- Indoor Humidity
- Active Cooling Mode Setpoint
- Active Heating Mode Setpoint
- Supply Air Temperature
- Supply Air Temperature Setpoint
- Digital Compressor Discharge Temperature
- Return Air Temperature
- Leaving Water Temperature
- Outdoor Air Temperature
- Outdoor Air Humidity
- Outdoor Air Dewpoint
- IAQ Mode Active (0=No, 1=Yes)
- CO₂
- Building Pressure
- Building Pressure Relief VFD Signal
- Duct Static Pressure
- Main Fan Speed VFD Signal
- Economizer Signal Percentage
- Economizer Position
- Modulating Cool Signal - (Digital Compressor)
- Modulating Heat Signal
- Reheat Signal
- Suction Pressure
- Coil Temperature
- Coil Temperature Setpoint
- Binary Inputs
(1=Emergency, 2=Proof of Flow, 4=Dirty Filter, 8=Defrost, 16=Hood On, 32=Remote Occupied, 64=Water POF) Main
Fan Status
- Relay Outputs Status

Using AZ 3 LEDs to Verify Operation

The AZ 3 Controller is equipped with LEDs that can be used to verify operation and perform troubleshooting. There are LEDs for communication, operation modes, and diagnostic codes. See **Figure 45 on page 77** for the LED locations. The LEDs associated with these inputs and outputs allow you to see what is active without using a voltmeter. The LEDs and their uses are as follows:

① Operation LEDs - Troubleshooting

POWER - This green LED will light up to indicate that 24 VAC power has been applied to the controller.

APP HB - This green LED will light up and blink continuously to indicate the application software is working properly.

OS HB - This green LED will light up and blink continuously to indicate the operating system is working properly.

WDOG - This green LED will light up and stay lit to indicate the operating system is working properly.

② Diagnostic LEDs

ALARM - This red LED is a diagnostic blink code LED. It will light up and stay lit when there is an alarm present. The type of alarm will display on the LCD display.

STATUS 1 - This red LED is a diagnostic blink code LED. It will light up and blink out diagnostic codes. STATUS 1 LED also represents the tens column in the address blink code. See **Table 6** on page 78 for Status Blink Code descriptions. The blink code descriptions are also located on the Controller's front cover.

STATUS 2 - This red LED is a diagnostic blink code LED. It will light up and blink out diagnostic codes. STATUS 2 LED also represents the ones column in the address blink code. See **Table 6** on page 78 for Status Blink Code descriptions. The blink code descriptions are also located on the Controller's front cover.

③ Communication LEDs

EBUS - This yellow LED will blink to signal E-BUS communications.

LOOP COMM - This yellow LED will light up and blink continuously to indicate the AZ 3 Controller is communicating.

BACNET - This yellow LED will light up and blink continuously to indicate BACnet® communications.

④ Compressor LEDs

ALERT - This red LED will light up and blink a code to indicate why the digital scroll compressor is not working properly.

UNLOAD - This green LED will light up and blink continuously when the digital scroll compressor is in cooling mode.

⑤ Relay LEDs

RLY1 - This green LED will light up when the Supply Fan is enabled and will stay lit as long as the Supply Fan is active.

RLY2 - This green LED will light up when Relay 2 is enabled and will stay lit as long as Relay 2 is active.

RLY3 - This green LED will light up when Relay 3 is enabled and will stay lit as long as Relay 3 is active.

RLY4 - This green LED will light up when Relay 4 is enabled and will stay lit as long as Relay 4 is active.

RLY5 - This green LED will light up when Relay 5 is enabled and will stay lit as long as Relay 5 is active.

RLY6 - This green LED will light up when Relay 6 is enabled and will stay lit as long as Relay 6 is active.

⑥ Binary Input LEDs

BIN1 - This green LED will light up when the Emergency Shutdown contact is closed.

BIN2 - This green LED will light up when the Proof of Flow switch is closed.

BIN3 - This green LED will light up when the Dirty Filter switch is closed.

BIN4 - This green LED will light up when the Defrost Coil Temperature switch is closed.

AZ 3 EM1 Expansion Module LEDs

The AZ 3 EM1 Expansion Module is equipped with 4 LEDs that can be used as very powerful troubleshooting tools. See **Figure 45** on page 77 for LED locations. The LEDs and their uses are as follows:

PWR - This LED will light up to indicate that 24 VAC power has been applied to the controller.

ALARM - If the module does not receive communications for more than 1 minute, this LED will light up, the relays will turn off, and the Analog Outputs will go to 0 VDC.

STAT - If the software is running, this LED should blink at a rate of 1 blink per second.

COMM - Every time the module receives a valid E-BUS request from the AZ 3 Controller, this LED will blink on and then off, signifying that it received a valid request and responded.

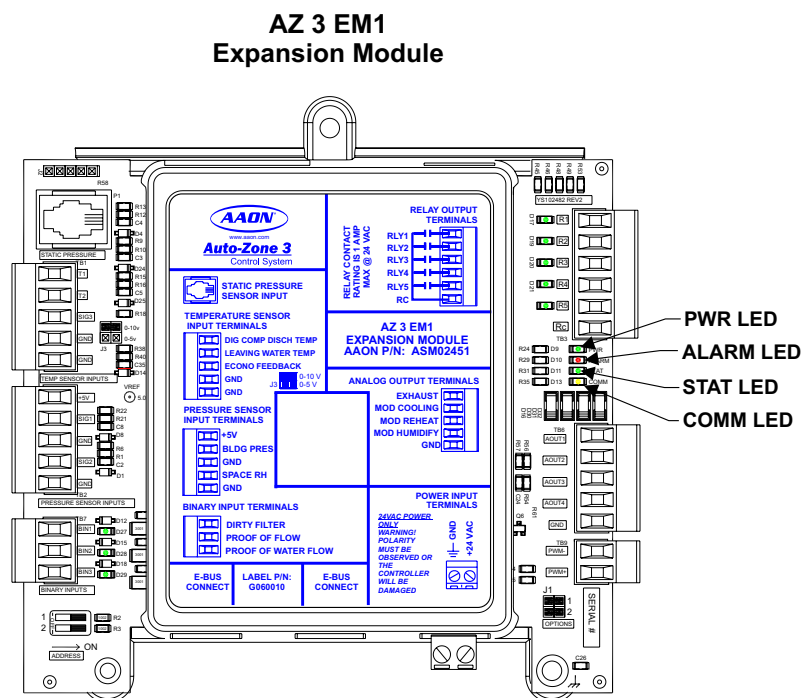
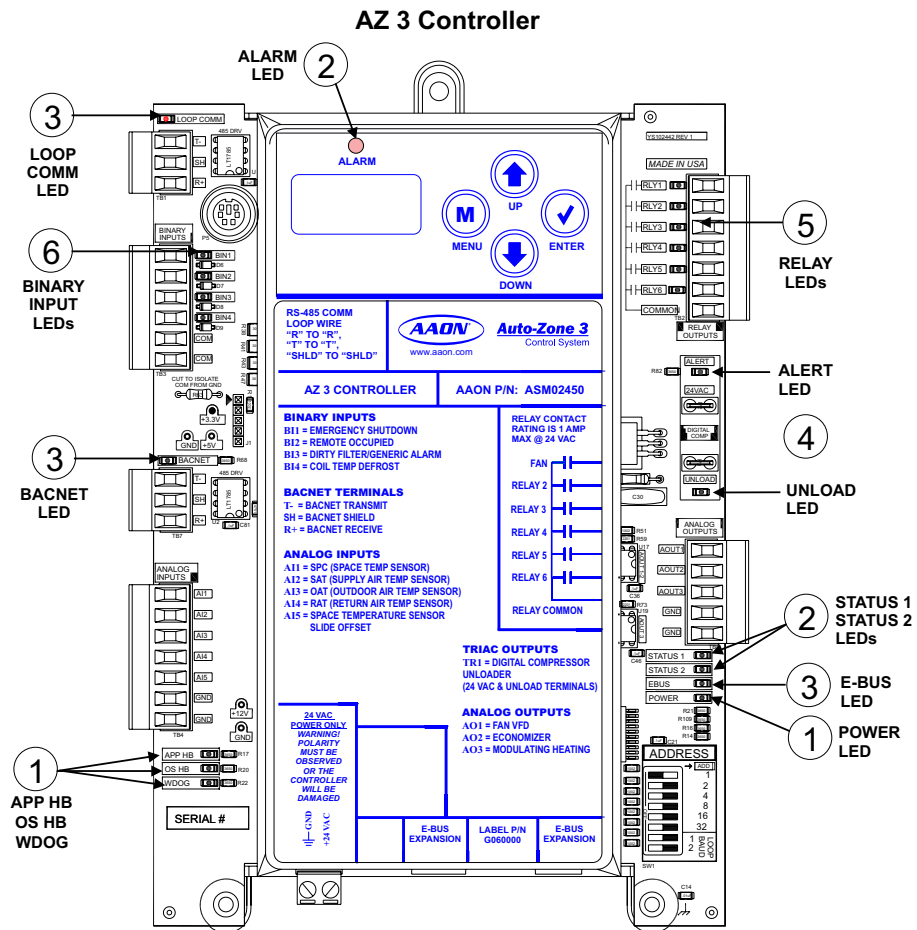


Figure 45: AZ 3 Controller & EM1 Expansion Module LED Locations

LED Diagnostics

Diagnostic LED Operation

POWER LED Operation

When the AZ 3 Controller is first 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 at 866-918-1100.

Diagnostic LED Operation

When power is first applied, the STATUS 1 and STATUS 2 LEDs will be off for 1 second. At this time, both LEDs will blink to indicate the setting of the address switch and then will extinguish for 5 seconds. Verify that the address switch setting is correct by counting the number of blinks.

If the address switch is not correct, first remove the communication loop terminal plug from the controller and then from the power terminal plug. Set the address dipswitches correctly. See **Figure 43 on page 53** for correct address switch setting instructions. After you are sure the address switch setting is correct, first reconnect the power connection and then reconnect the communication loop connection to the controller.

NOTE: You must always cycle power to the Controller being addressed after changing address switch settings in order for the changes to take effect.

Reapply power to the controller and observe the blink code to verify the address is set correctly. If the STATUS 1 and STATUS 2 LEDs now blink the correct address, your controller is addressed correctly. If they don't light up at all, the controller is not operating correctly and could be defective. Once the controller is done blinking the address, the LEDs will blink a code every 10 seconds to indicate controller status. If all of these tests are made and the controller still doesn't operate, please contact AAON Controls Technical Support at 866-918-1100.

The Blink Code Descriptions in **Table 6** cover multiple alarm conditions. You will need to use one of the AZ 3 Interface Tools to determine the specific alarm condition. See the Alarm descriptions on **page 74** for further details.

Digital Compressor LED Operation

UNLOAD LED

Any time there is a signal going to the Digital Compressor Unloader Solenoid Valve the Unload LED will be on.

ALERT LED

The ALERT LED will blink the alarm codes for the digital compressor. See **Table 7**.

Blink Code Description	STATUS 1 LED Blinks	STATUS 2 LED Blinks
NORMAL OPERATION	0	1
SUPPLY AIR SENSOR FAILURE	1	2
OUTDOOR AIR SENSOR FAILURE	2	2
SPACE SENSOR FAILURE	3	2
MISSING EXPANSION MODULE*	4	2
CO2 SENSOR FAILURE	6	2
MECHANICAL COOLING FAILURE	1	3
MECHANICAL HEATING FAILURE	2	3
FAN PROVING FAILURE	3	3
DIRTY FILTER ALARM	4	3
EMERGENCY SHUTDOWN	5	3
ECONOMIZER TITLE 24 ALARM	6	3
LOW SUPPLY TEMP ALARM	1	4
HIGH SUPPLY TEMP ALARM	2	4
CONTROL TEMP HI ALARM	3	4
CONTROL TEMP LOW ALARM	4	4
WATER PROOF FAILURE	6	4
SUCTION PRESSURE ALARM*	7	4
LOW LEAVING WATER TEMP	8	4
PUSH-BUTTON OVERRIDE	1	5
OUTPUT FORCE ACTIVE	0	6
* MISSING EXP. MODULE – INCLUDES MULTIPLE MODULES AIRFLOW SENSOR FAILURE – INCLUDES MULTIPLE AIRFLOW SENSORS SUCTION PRESSURE ALARM – INCLUDES SUCTION PRESSURE SENSOR FAILURE ALARM, LOW SUCTION PRESSURE ALARM, AND UNSAFE SUCTION PRESSURE ALARM		

Table 6: Diagnostic LED Blink Code Interpretation

Blink Code Description	ALERT LED Blinks
NORMAL OPERATION	0
MISSING DISCHARGE SENSOR	1
HIGH TEMPERATURE CUTOFF TIMEOUT PERIOD (30 MINUTES)	3
HIGH DISCHARGE TEMPERATURE CUTOFF	4
COMPRESSOR LOCKED OUT	6

Table 7: ALERT LED Blink Code Interpretation

Temperature Sensor Testing

Space, Supply Air, Outdoor Air or Return Air Temperature Sensor Testing

The following sensor voltage and resistance table is provided to aid in checking sensors that appear to be operating incorrectly. Many system-operating problems can be traced to incorrect sensor wiring. Be sure all sensors are wired per the wiring diagrams in this manual.

If the sensors still do not appear to be operating or reading correctly, check voltage and/or resistance to confirm that the sensor is operating correctly per the tables. Please follow the notes and instructions that appear after the chart when checking sensors.

Temperature – Resistance – Voltage for Type III 10 K Ohm Thermistor Sensors			
Temp (°F)	Temp (°C)	Resistance (Ohms)	Voltage @ Input (VDC)
-10	-23.33	93333	4.51
-5	-20.55	80531	4.45
0	-17.77	69822	4.37
5	-15	60552	4.29
10	-12.22	52500	4.2
15	-9.44	45902	4.1
20	-6.66	40147	4.002
25	-3.88	35165	3.891
30	-1.11	30805	3.773
35	1.66	27140	3.651
40	4.44	23874	3.522
45	7.22	21094	3.39
50	10	18655	3.252
52	11.11	17799	3.199
54	12.22	16956	3.143
56	13.33	16164	3.087
58	14.44	15385	3.029
60	15.55	14681	2.972
62	16.66	14014	2.916
64	17.77	13382	2.861
66	18.88	12758	2.802
68	20	12191	2.746
69	20.55	11906	2.717
70	21.11	11652	2.691
71	21.66	11379	2.661
72	22.22	11136	2.635
73	22.77	10878	2.605

Table 8: Temperature/Resistance for Type III 10K Ohm Thermistor Sensors

Temperature – Resistance – Voltage for Type III 10 K Ohm Thermistor Sensors			
Temp (°F)	Temp (°C)	Resistance (Ohms)	Voltage @ Input (VDC)
74	23.33	10625	2.576
75	23.88	10398	2.549
76	24.44	10158	2.52
77	25	10000	2.5
78	25.55	9711	2.464
80	26.66	9302	2.41
82	27.77	8893	2.354
84	28.88	8514	2.3
86	30	8153	2.246
88	31.11	7805	2.192
90	32.22	7472	2.139
95	35	6716	2.009
100	37.77	6047	1.884
105	40.55	5453	1.765
110	43.33	4923	1.65
115	46.11	4449	1.54
120	48.88	4030	1.436
125	51.66	3656	1.339
130	54.44	3317	1.246
135	57.22	3015	1.159
140	60	2743	1.077
145	62.77	2502	1.001
150	65.55	2288	0.931

Table 8, cont.: Temperature/Resistance for Type III 10K Ohm Thermistor Sensors

Thermistor Sensor Testing Instructions

Use the resistance column to check the thermistor sensor while disconnected from the controllers (not powered).

Use the voltage column to check sensors while connected to powered controllers. Read voltage with meter set on DC volts. Place the “-” (minus) lead on GND terminal and the “+” (plus) lead on the sensor input terminal being investigated.

If the voltage is above 4.88 VDC, then the sensor or wiring is “open.” If the voltage is less than 0.05 VDC, then the sensor or wiring is shorted.

Copeland™ Discharge Thermistor Temperature Sensor Testing

Copeland™ Discharge Thermistor Temperature Sensor Testing

The following sensor voltage and resistance table is provided to aid in checking sensors that appear to be operating incorrectly. Many system-operating problems can be traced to incorrect sensor wiring. Be sure all sensors are wired per the wiring diagrams in this manual.

If the sensors still do not appear to be operating or reading correctly, check voltage and/or resistance to confirm that the sensor is operating correctly per the table. Please follow the notes and instructions that appear after the chart when checking sensors.

Discharge Thermistor Temperature/ Resistance			
Temp (°F)	Temp (°C)	Resistance (K Ohms)	Voltage @ Input (VDC)
-40	-40	2889.60	4.98
-31	-35	2087.22	4.97
-22	-30	1522.20	4.96
-13	-25	1121.44	4.95
-4	-20	834.72	4.94
5	-15	627.28	4.92
14	-10	475.74	4.89
23	-5	363.99	4.86
32	0	280.82	4.82
41	5	218.41	4.77
50	10	171.17	4.72
59	15	135.14	4.65
68	20	107.44	4.57
77	25	86.00	4.47
86	30	69.28	4.36
95	35	56.16	4.24
104	40	45.81	4.10
113	45	37.58	3.94
122	50	30.99	3.77
131	55	25.68	3.59
140	60	21.40	3.40
149	65	17.91	3.20
158	70	15.07	3.00
167	75	12.73	2.80
176	80	10.79	2.59
185	85	9.20	2.39

**Table 9: Discharge Thermistor Temperature/
Resistance**

Discharge Thermistor Temperature/ Resistance			
Temp (°F)	Temp (°C)	Resistance (K Ohms)	Voltage @ Input (VDC)
194	90	7.87	2.19
203	95	6.77	2.01
212	100	5.85	1.84
221	105	5.09	1.68
230	110	4.45	1.53
239	115	3.87	1.39
248	120	3.35	1.25
257	125	2.92	1.12
266	130	2.58	1.02
275	135	2.28	0.92
284	140	2.02	0.83
293	145	1.80	0.76
302	150	1.59	0.68
311	155	1.39	0.61
320	160	1.25	0.55
329	165	1.12	0.50
338	170	1.01	0.45
347	175	0.92	0.42
356	180	0.83	0.38

**Table 9, cont.: Discharge Thermistor Temperature/
Resistance**

Thermistor Sensor Testing Instructions

Use the resistance column to check the thermistor sensor while disconnected from the controllers (not powered).

Use the voltage column to check sensors while connected to powered controllers. Read voltage with meter set on DC volts. Place the “-” (minus) lead on GND terminal and the “+” (plus) lead on the sensor input terminal being investigated.

If the voltage is above 4.98 VDC, then the sensor or wiring is “open.” If the voltage is less than 0.38 VDC, then the sensor or wiring is shorted.

Duct Static & Building Pressure Sensor Testing

Duct Static Pressure Sensor Testing

Table 10 below is used to troubleshoot the Duct Static Pressure Sensors.

Duct Static Pressure Sensor			
Pressure @ Sensor (" W.C.)	Voltage @ Input (VDC)	Pressure @ Sensor (" W.C.)	Voltage @ Input (VDC)
0.00	0.25	2.60	2.33
0.10	0.33	2.70	2.41
0.20	0.41	2.80	2.49
0.30	0.49	2.90	2.57
0.40	0.57	3.00	2.65
0.50	0.65	3.10	2.73
0.60	0.73	3.20	2.81
0.70	0.81	3.30	2.89
0.80	0.89	3.40	2.97
0.90	0.97	3.50	3.05
1.00	1.05	3.60	3.13
1.10	1.13	3.70	3.21
1.20	1.21	3.80	3.29
1.30	1.29	3.90	3.37
1.40	1.37	4.00	3.45
1.50	1.45	4.10	3.53
1.60	1.53	4.20	3.61
1.70	1.61	4.30	3.69
1.80	1.69	4.40	3.77
1.90	1.77	4.50	3.85
2.00	1.85	4.60	3.93
2.10	1.93	4.70	4.01
2.20	2.01	4.80	4.09
2.30	2.09	4.90	4.17
2.40	2.17	5.00	4.25
2.50	2.25		

Table 10: Duct Static Pressure/Voltage for Duct Static Pressure Sensors

Duct Static Pressure Sensor Testing Instructions

Use the voltage column to check the Duct Static Pressure Sensor while connected to powered controllers. Read voltage with meter set on DC volts. Place the “-” (minus) lead on the GND terminal and the “+” (plus) lead on the 0-5 pin terminal on (TP) with the jumper removed. Be sure to replace the jumper after checking.

Building Pressure Sensor Testing

Table 11 below is used to troubleshoot the Building Pressure Sensors.

Building Pressure Sensor			
Pressure @ Sensor (" W.C.)	Voltage @ Input (VDC)	Pressure @ Sensor (" W.C.)	Voltage @ Input (VDC)
-0.25	0.00	0.01	2.60
-0.24	0.10	0.02	2.70
-0.23	0.20	0.03	2.80
-0.22	0.30	0.04	2.90
-0.21	0.40	0.05	3.00
-0.20	0.50	0.06	3.10
-0.19	0.60	0.07	3.20
-0.18	0.70	0.08	3.30
-0.17	0.80	0.09	3.40
-0.16	0.90	0.10	3.50
-0.15	1.00	0.11	3.60
-0.14	1.10	0.12	3.70
-0.13	1.20	0.13	3.80
-0.12	1.30	0.14	3.90
-0.11	1.40	0.15	4.00
-0.10	1.50	0.16	4.10
-0.09	1.60	0.17	4.20
-0.08	1.70	0.18	4.30
-0.07	1.80	0.19	4.40
-0.06	1.90	0.20	4.50
-0.05	2.00	0.21	4.60
-0.04	2.10	0.22	4.70
-0.03	2.20	0.23	4.80
-0.02	2.30	0.24	4.90
-0.01	2.40	0.25	5.00
0.00	2.50		

Table 11: Building Static Pressure/Voltage for Building Pressure Sensors

Building Pressure Sensor Testing Instructions

Use the voltage column to check the Building Static Pressure Sensor while connected to a powered expansion module. Read voltage with meter set on DC volts. Place the “-” (minus) lead on the terminal labeled GND and the “+” (plus) lead on the terminal SIG1 on the AZ 3 EM1 Expansion Module.

Suction Pressure Transducer Testing

Suction Pressure Transducer Testing for R410A Refrigerant

The Evaporator Coil Temperature is calculated by converting the Suction Pressure to Temperature. The Suction Pressure is obtained by using the Suction Pressure Transducer, which is connected into the Suction Line of the Compressor.

Use the voltage column to check the Suction Pressure Transducer while connected to the AZ3EM1 Expansion Module. The AZ 3 Controller and the AZ 3 EM1 Expansion Module must be powered for this test. Read voltage with a meter set on DC volts. Place the positive lead from the meter on the PR OUT terminal located on the AZ 3 EM1 Expansion Module terminal block. Place the negative lead from the meter on the ground (GND) terminal located adjacent to the PR OUT terminal on the AZ 3 EM1 Expansion Module terminal block. Use a refrigerant gauge set and/or an accurate electronic thermometer to measure the temperature or suction line pressure near where the Suction Pressure Transducer is connected to the suction line. Measure the Voltage at the terminals PR OUT and GND terminals and compare it to the appropriate chart depending on the refrigerant you are using. If the temperature/voltage or pressure/voltage readings do not align closely with the chart, your Suction Pressure Transducer is probably defective and will need to be replaced.

See **Table 12** for the Suction Pressure Transducer, Pressure, Temperature, and Voltage Chart for R410A Refrigerant testing. The charts show a temperature range from 20°F to 80°F. For troubleshooting purposes, the DC Voltage readings are also listed with their corresponding temperatures and pressures.

Suction Pressure Transducer Coil Pressure – Temperature – Voltage Chart for R410A Refrigerant					
Temperature °F	Pressure PSI	Signal DC Volts	Temperature °F	Pressure PSI	Signal DC Volts
21.19	80.94	1.8	59.03	168.10	3.2
24.49	87.16	1.9	61.17	174.32	3.3
27.80	93.39	2.0	63.19	180.55	3.4
30.99	99.62	2.1	65.21	186.78	3.5
33.89	105.84	2.2	67.23	193.00	3.6
36.80	112.07	2.3	69.24	199.23	3.7
39.71	118.29	2.4	71.15	205.46	3.8
42.30	124.52	2.5	72.95	211.68	3.9
44.85	130.75	2.6	74.76	217.91	4.0
47.39	136.97	2.7	76.57	224.14	4.1
49.94	143.2	2.8	78.37	230.36	4.2
52.23	149.42	2.9	80.18	236.59	4.3
54.50	155.65	3.0			
56.76	161.88	3.1			

Table 12: Coil Pressure/Voltage/Temp for Suction Pressure Transducers - R410A Refrigerant

LCD Display Screen & Navigation Keys

The LCD display screens and buttons allow you to view status and alarms, enable force modes, and make BACnet® configuration changes. See **Figure 46** and refer to **Table 13** for descriptions.

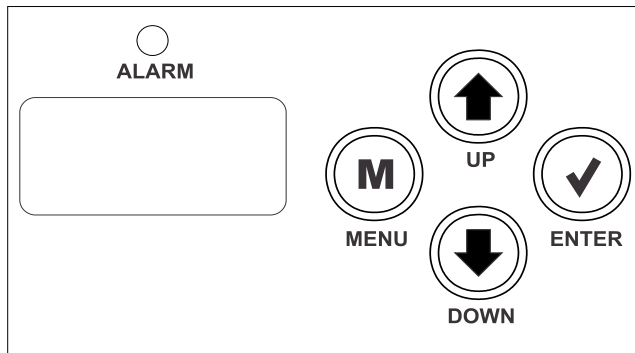


Figure 46: LCD Display and Navigation Keys





NAVIGATION KEY	KEY FUNCTION
MENU 	Use the MENU key to move through screens within Main Menu categories and return to the Main Menu while at other screens.
UP 	Use this key to adjust setpoints and change configurations.
DOWN 	Use this key to adjust setpoints and change configurations.
ENTER 	Use the ENTER key to navigate through the Main Menu Screen categories.


Table 13: Navigation Key Functions

Main Screens Map and Settings Screens


Main Screens Map


Refer to the following map when navigating through the LCD Main Screens. The first screen is an initialization screen. To scroll through the rest of the screens, press the **<MENU>** button.




Press  to go to the Settings Screens.




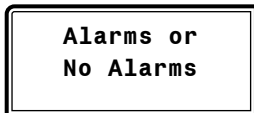
Press  to scroll through the Settings Screens.


Press  to go to the Status Screens.



Press  to scroll through the Status Screens.

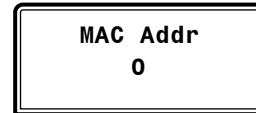
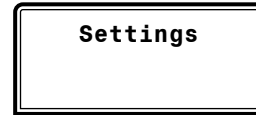
Press  to go to the Alarm Screens.



Press  to scroll through the Alarm Screens.

Settings Screens

Refer to the following map when navigating through the Settings Screens. From the Settings Screen, press **<ENTER>** to scroll through the screens.



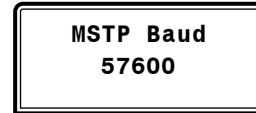
BACnet® - CURRENT MAC ADDRESS

Valid range is 0 to 254. Default is 0.



BACnet® - CURRENT DEVICE ID

A Device ID of up to 7 digits can be entered. The enter key move the cursor between the digit fields. Once the cursor is under a field, use the up and down arrow keys to select a number between 0 and 9.

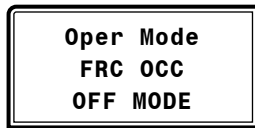


BACnet® - CURRENT BAUD RATE

9600, 19200, 38400, 57600, 76800. Default is 38400.

Status Screens

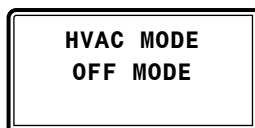
Refer to the following map when navigating through the Status Screens. From the Status Screen, press **<ENTER>** to scroll through the screens.



OPERATION MODE

This screen displays the current mode of operation. Options are:

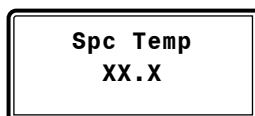
- UNOCCUPY (Unoccupied)
- OCCUPIED
- OVERRIDE
- HOL UNOC (Holiday Unoccupied)
- HOL OCC (Holiday Occupied)
- FRC OCC (Force Occupied)
- FRC UNOC (Force Unoccupied)
- REM OCC (Remote Occupied Contact)
- ZONE HEAT
- ZONE COOL
- ZONE OVR (Zone Override)



HVAC MODE

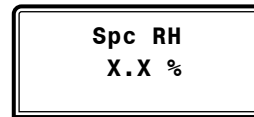
This screen displays the current HVAC Mode. Options are:

- OFF MODE
- VENT MODE
- COOL MODE
- HEAT MODE
- VENT RH
- COOL RH
- HEAT RH
- WARMUP
- DEFROST
- PURGE



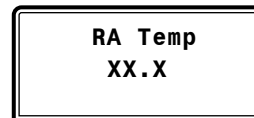
SPACE TEMPERATURE

40°F to 200°F or 5°C to 93°C



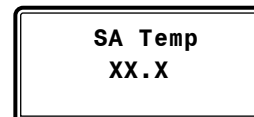
SPACE HUMIDITY

0.00% -100%



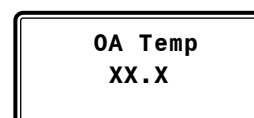
RETURN AIR TEMPERATURE

40°F to 200°F or 5°C to 93°C



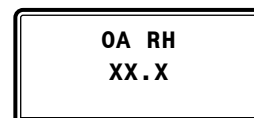
SUPPLY AIR TEMPERATURE

40°F to 200°F or 5°C to 93°C



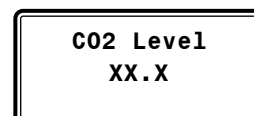
OUTDOOR AIR TEMPERATURE

40°F to 200°F or 5°C to 93°C



OUTDOOR AIR RELATIVE HUMIDITY

0.00% - 100%



CO₂ LEVEL

0.00% - 100%

Alarm Screens

Alarm Screens

If there are no Alarms, the Alarm Screen will display “No Alarms.” If there are alarms present, the screen will display, “Alarms.” You must press **<ENTER>** to scroll through the alarms. For alarm definitions, see page 73-74 and for troubleshooting, see page 76.



Alarms

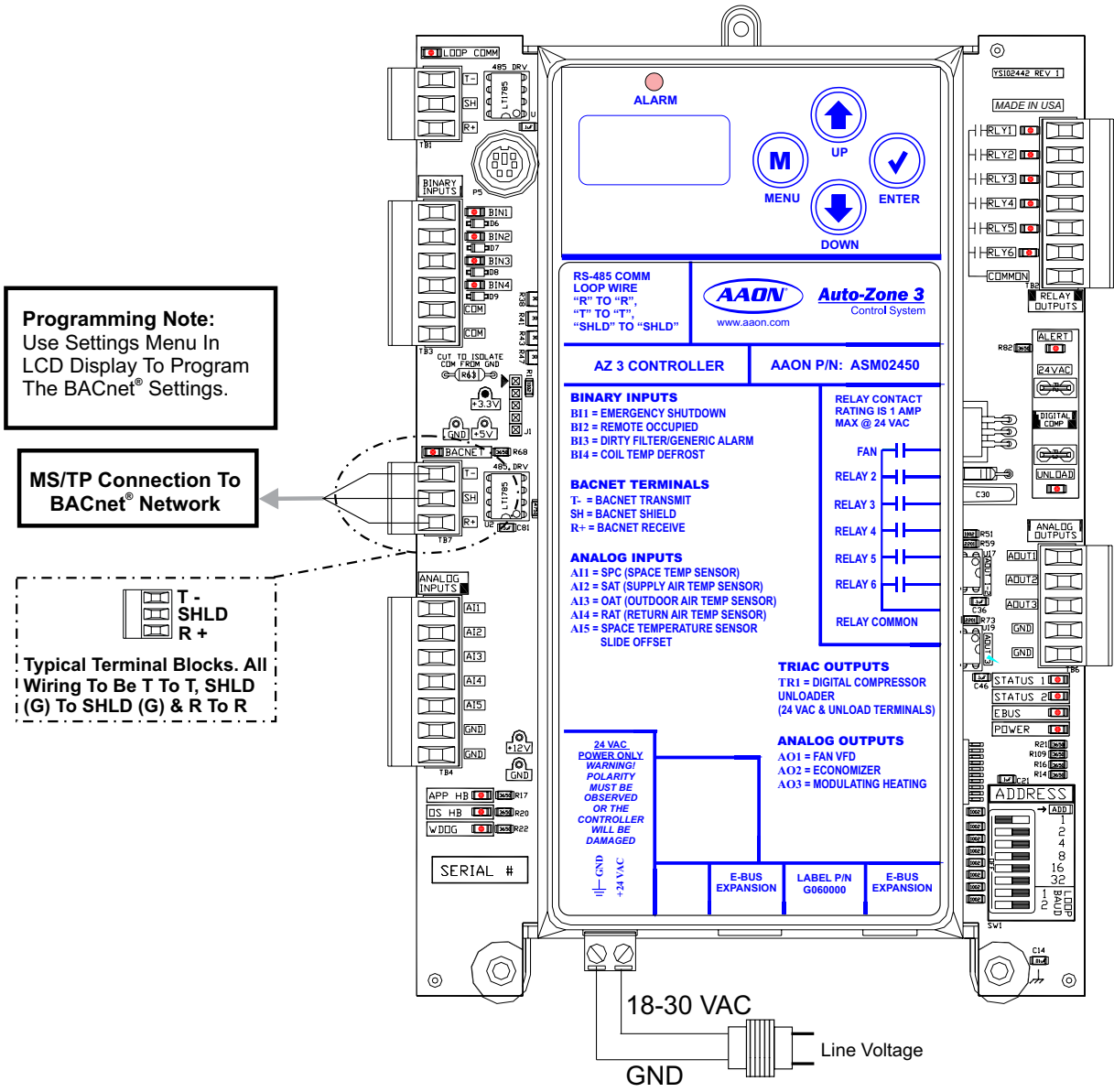
The screen will display the alarms as follows:

NO ALARMS	There are currently no alarms.
SAT SENSOR	See Supply Air Temperature Sensor Failure Alarm, page 73.
OAT SENSOR	See Outdoor Air Temperature Sensor Failure Alarm, page 73.
SPC SENSOR	See Space Temperature Sensor Failure Alarm, page 73.
MAIN EXP MISSING	See Missing Expansion Module Alarm, page 73.
SUCTION SENSOR	See Suction Pressure Sensor Failure Alarm, page 73.
CO2 SENSOR	See CO ₂ Sensor Failure Alarm, page 73.
COMP DISCHG	See Compressor Discharge Sensor Failure Alarm, page 72.
RLY EXP ALARM	See Missing Expansion Module Alarms, page 73.
COOLING FAILURE	See Mechanical Cooling Failure Alarm, page 73.
HEATING FAILURE	See Mechanical Heating Failure Alarm, page 73.
FAN POF FAILURE	See Proof of Flow Interlock Alarm, page 73.
DIRTY FILTER	See Dirty Filter Alarm, page 73.

EMERG SHUTDOWN	See Emergency Shutdown Alarm, page 74.
HI SAT ALARM	See High and Low Supply Temp Alarm, page 74.
LO SAT ALARM	See High and Low Supply Temp Alarm, page 74.
CONTROL TEMP HI	See High and Low Control Temp Failure, page 74.
CONTROL TEMP LO	See High and Low Control Temp Failure, page 74.
DIGITAL CUTOFF	See Digital Compressor Cutoff Alarm, page 74.
DIGITAL LOCKOUT	See Digital Compressor Lockout Alarm, page 74.
NO WATER FLOW	See WSHP Proof of Flow Alarm, page 74.
LOW SUCTION	See Low Suction Pressure Alarm, page 74.
UNSAFE SUCTION	See Unsafe Suction Pressure Alarm, page 74.
LOW WATER TEMP	See WSHP Low Leaving Water Temperature Alarm, page 74.
ECONO TITLE 24	See Title 24 Economizer Alarms, page 74.
????? ALARMS	This screen should never display, but if it does, it means the controller doesn't know what the alarm is.

BACnet® Connection to MS/TP Network

AZ 3 CONTROLLER



Programming Note:
Use Settings Menu In LCD Display To Program The BACnet® Settings.

MS/TP Connection To BACnet® Network

Typical Terminal Blocks. All Wiring To Be T To T, SHLD (G) To SHLD (G) & R To R

Wiring Notes:

- 1.) All wiring to be in accordance with local and national electrical codes and specifications.
- 2.) All communication wiring to be 18-gauge minimum, 2-conductor twisted pair with shield. Use Belden #82760 or equivalent.

Size Transformer For Correct Total Load.
AZ 3 Controller = 8 VA

Figure 47: AZ 3 BACnet® Connection to MS/TP Network

Appendix C

AZ 3 BACnet® Parameters

NOTE: Objects labeled AI and BI are read-only. Objects labeled AV are read/writeable. You cannot write directly to Sensor Inputs.

NOTE: When a new setpoint is received from BACnet®, it is maintained and used in temporary memory until the unit reaches midnight. It is then stored in permanent memory and will become the new default setpoint even if power is cycled. Therefore, if power is cycled prior to reaching midnight, the setpoint will not have been stored in permanent memory.

BACnet® Properties for the AZ 3 Controller

Parameter	Object	Description	Limits
Application Software Version	AI: 1	Current version of the software in the unit.	
Control Mode	AI: 2	Configured unit application.	See Control Mode Bits on page 95.
Control Status	AI: 3	Current Occupied/Unoccupied Status.	See Control Status Bits on page 95.
HVAC Mode	AI: 4	Current operational status.	See HVAC Mode Bits on page 95.
Control Temperature	AI: 5	Current value of the Control Temperature Sensor.	
Space Temperature	AI: 6	Current value of the Space Temperature Sensor.	
Supply Air Temperature	AI: 7	Current value of the Supply Air Temperature Sensor.	
Coil Temperature	AI: 8	Current Coil Temperature value.	
Discharge Temperature	AI: 9	Current value of the Digital Compressor Discharge Air Temperature Sensor.	
Outdoor Air Temperature	AI: 10	Current value of the Outdoor Temperature Sensor.	
Return Air Temperature	AI: 11	Current value of the Return Temperature Sensor.	
Leaving Water Temperature	AI: 12	Current value of the Leaving Water Temperature Sensor.	

BACnet® Properties for the AZ 3 Controller

Parameter	Object	Description	Limits
Outdoor Air Wetbulb Temperature	AI: 13	Current calculated Outdoor Wetbulb Temperature.	
Outdoor Air Dewpoint Temperature	AI: 14	Current Calculated Outdoor Air Dewpoint Temperature.	
Indoor Air Humidity	AI: 15	Current value of the Indoor Humidity Sensor.	
Outdoor Air Humidity	AI: 16	Current value of the Outdoor Humidity Sensor.	
Duct Static Pressure	AI: 17	Current Duct Static Pressure.	
Building Pressure	AI: 18	Current value of the Building Pressure Sensor.	
Suction Pressure	AI: 19	Current Suction Pressure Value.	
CO ₂	AI: 20	Current Indoor CO ₂ Level.	
Cooling Setpoint	AI: 21	Occupied Cooling Mode Enable Setpoint Mirror. Adjusted by Slide Adjust and Night Offsets.	
Heating Setpoint	AI: 22	Occupied Heating Mode Enable Setpoint Mirror. Adjusted by Slide Adjust and Night Offsets.	
Supply Air Setpoint	AI: 23	Current SAT Cooling or Heating Setpoint if there is no reset source; Current calculated SAT setpoint with Reset Source.	
Coil Temperature Setpoint	AI: 24	This is the current calculated Coil Suction Temperature target during Dehumidification Mode.	
Economizer Position	AI: 25	Current signal percentage to the Economizer Damper.	
Fan VFD Signal	AI: 26	Current Supply Fan VFD Signal.	
Modulating Heating Position	AI: 27	Current percentage of the Modulating Heating signal (Hot Water or SCR heat).	
Modulating Cooling Position	AI: 28	Current percentage of the Modulating Cooling Signal (Chilled Water or Digital Compressor).	
Building Pressure Exhaust Control Signal	AI: 29	Current Relief VFD Fan/Damper Signal.	
Reheat Valve Position	AI: 30	Current position of Modulating Reheat Valve.	

AZ 3 BACnet® Parameters

BACnet® Properties for the AZ 3 Controller				
Parameter	Object	Description	Limits	
Alarm Status	AI: 31	Indicates if Controller is in an Alarm Condition.	See Alarm Bits on page 96.	
Humidifier Valve Position	AI: 32	Current position of Humidifier Valve.		
Return Air Humidity	AI: 33	Return Air Humidity Reading.		
Sensor Slide Adjust Effect	AI: 34	Amount Of Current Sensor Slide Offset.		
Economizer Feedback for Title 24	AI: 35	Current position of feedback from Economizer actuator.		
Occupied Cooling Setpoint	AV: 1	If the control temperature rises one degree above this setpoint, the control will activate the cooling demand. If the control sensor is the Supply Air Sensor, then the cooling demand is always active.	1	110
Occupied Heating Setpoint	AV: 2	If the control temperature drops one degree below this setpoint, the control will activate the heating demand. If the control sensor is the Supply Air Sensor, then there is no heating demand.	1	110
VAV Tempering Outdoor Air Cooling Setpoint	AV: 3	This is the Cooling Mode Enable Setpoint used in Supply Air Tempering.	1	110
VAV Tempering Outdoor Air Heating Setpoint	AV: 4	This is the Heating Mode Enable Setpoint used Supply Air Tempering.	1	110
Unoccupied Cooling Offset	AV: 5	During the Unoccupied Mode of Operation, this Setpoint offsets the Occupied Cooling Setpoint up by this user-adjustable amount. If you do not want Cooling to operate during the Unoccupied Mode, use the default setting of 30°F for this setpoint.	0	30
Unoccupied Heating Offset	AV: 6	During the Unoccupied Mode of Operation, this Setpoint offsets the Occupied Heating Setpoint down by this user-adjustable amount. If you do not want Heating to operate during the Unoccupied Mode, use the default setting of 30°F for this setpoint.	0	30

BACnet® Properties for the AZ 3 Controller				
Parameter	Object	Description	Limits	
Mode Select Deadband	AV: 7	This value is added to and subtracted from the HVAC Mode Setpoints to create a control deadband range.	0	10
Max Coil Setpoint Reset Limit	AV: 8	This is the highest that the Coil Temperature will be reset to during Space Humidity Reset of the Coil Suction Temperature Setpoint. If no coil temperature reset is required, this value should be set the same as the Min Coil Setpoint Reset Limit.	35	70
Min Coil Setpoint Reset Limit	AV: 9	This is the lowest that the Coil Temperature will be reset to during Space Humidity Reset of the Coil Suction Temperature Setpoint. If no coil temperature reset is required, this value should be set the same as the Max Coil Setpoint Reset Limit.	35	70
Supply Air Cooling Setpoint	AV: 10	Supply Air Cooling Setpoint. If Supply Air Reset is configured this is the Low SAT Cooling Reset Value.	30	80
Supply Air Heating Setpoint	AV: 11	Supply Air Heating Setpoint. If Supply Air Reset is configured this is the Low SAT Heating Reset Value.	40	240
Max SAT Cooling Setpoint Reset Limit	AV: 12	If Supply Air Reset is configured this is the High SAT Cooling Reset Value.	0	100
Max SAT Heating Setpoint Reset Limit	AV: 13	If Supply Air Reset is configured this is the High SAT Heating Reset Value.	0	250
Supply Air Cooling Staging Window	AV: 14	In Cooling Mode, if the Supply Air Temperature drops below the Active Supply Air Cooling Setpoint minus this Staging Window, a Cooling Stage will be deactivated after its Minimum Run Time.	1	30

Appendix C

AZ 3 BACnet® Parameters

BACnet® Properties for the AZ 3 Controller				
Parameter	Object	Description	Limits	
Supply Air Heating Staging Window	AV: 15	In Heating Mode, if the Supply Air Temperature rises above the Active Supply Air Heating Setpoint plus this Staging Window, a Heating Stage will be deactivated after its Minimum Run Time.	1	50
Morning Warm-Up Target Temperature	AV: 16	If Morning Warm-Up is configured, upon entering the occupied mode, the Warm-up Mode will be activated if the Return Air Temperature falls one degree below this setpoint.	50	90
Morning Cool-Down Mode Target Temperature	AV: 17	If Morning Cool-Down is configured, upon entering the occupied mode, the Cool-Down Mode will be activated if the Return Air Temperature rises one degree above this setpoint.	5	90
Mechanical Cooling Outdoor Air Lockout	AV: 18	The AZ 3 will Lockout Mechanical Cooling when the Outdoor Air Temperature is below this Setpoint.	-29	100
Mechanical Heating Outdoor Air Lockout	AV: 19	The AZ 3 will Lockout Mechanical Heating when the Outdoor Air Temperature is above this Setpoint.	-29	150
Low Supply Air Temperature Cutoff	AV: 20	Cooling will be disabled if the Supply Air Temperature falls below this value. See sequence for more details.	0	100
High Supply Air Temperature Cutoff	AV: 21	Heating will be disabled if the Supply Air Temperature rises above this value. See sequence for more details.	0	250
Outdoor Air Dewpoint Setpoint	AV: 22	On an MUA unit, if the OA dewpoint rises above this setpoint, Dehumidification is initiated.	35	80
Economizer Enable Setpoint	AV: 23	The economizer is enabled if the outdoor drybulb, dewpoint, or wetbulb temperature falls below this setpoint.	-30	80
Preheat Setpoint	AV: 24	If the Supply Fan is energized this is the temperature at which the Preheat Relay will activate. Operates only in the Occupied Mode.	-30	70
Space Sensor Calibration Offset	AV: 25	If the Space Temperature Sensor is reading incorrectly, you can use this option to enter an offset temperature to adjust the Sensor's Temperature.	-100	100

BACnet® Properties for the AZ 3 Controller				
Parameter	Object	Description	Limits	
Supply Air Sensor Calibration Offset	AV: 26	If the Supply Air Temperature Sensor is reading incorrectly, you can use this option to enter an offset temperature to adjust the Sensor's Temperature.	-100	100
Return Air Sensor Calibration Offset	AV: 27	If the Return Temperature Sensor is reading incorrectly, you can use this option to enter an offset temperature to adjust the Sensor's Temperature.	-100	100
Outdoor Air Sensor Calibration Offset	AV: 28	If the Outdoor Temperature Sensor is reading incorrectly, you can use this option to enter an offset temperature to adjust the Sensor's Temperature.	-100	100
Coil Temperature Calibration Offset	AV: 29	If the Coil Temperature value is reading incorrectly, you can use this option to enter an offset temperature to adjust the Coil Temperature Value.	-100	100
Leaving Water Sensor Calibration Offset	AV: 30	If the Leaving Water Temperature Sensor is reading incorrectly, you can use this option to enter an offset temperature to adjust the Sensor's Temperature.	-100	100
CO ₂ Sensor Calibration Offset	AV: 31	If the CO ₂ Sensor is reading incorrectly, you can use this option to enter an offset value to adjust the Sensor's CO ₂ reading.	-500	500
Low Ambient Protection Setpoint	AV: 32	Temperature at which the Low Ambient Relay will activate in the Occupied or Unoccupied Mode.	-30	70
SAT Cool Setpoint Reset Source Low Limit	AV: 33	If doing Supply Air Setpoint Reset, this is the Low Reset Source value in Cooling that will correspond to the Supply Air Cool High Reset Setpoint.	-30	150
SAT Cool Setpoint Reset Source High Limit	AV: 34	If doing Supply Air Setpoint Reset, this is the High Reset Source value in Cooling that will correspond to the Supply Air Cooling Setpoint (Low Reset).	1	150
SAT Heat Setpoint Reset Source Low Limit	AV: 35	If doing Supply Air Setpoint Reset, this is the Low Reset Source value in Heating that will correspond to the Supply Air Heating High Reset Setpoint.	-30	150

AZ 3 BACnet® Parameters

BACnet® Properties for the AZ 3 Controller				
Parameter	Object	Description	Limits	
SAT Heat Setpoint Reset Source High Limit	AV: 36	If doing Supply Air Setpoint Reset, this is the High Reset Source value in Heating that will correspond to the Supply Air Heating Setpoint (Low Reset).	1	150
Control Temperature High Alarm Offset	AV: 37	If the temperature of the controlling sensor rises above the Occupied Cooling Setpoint by this value, a High Control Temp Alarm will occur. Only applies if configured for Space or Return Air Temp Control, or as Single Zone VAV.	0	50
Control Temperature Low Alarm Offset	AV: 38	If the temperature of the controlling sensor falls below the Occupied Heating Setpoint by this value, a Low Control Temp Alarm will occur. Only applies if configured for Space or Return Air Temp Control, or as Single Zone VAV.	0	50
Heat Pump Compressor Heat Lockout	AV: 39	Compressor Heat will be locked out below this setpoint.	-29	100
Minimum Main Fan VFD in Cooling Mode	AV: 40	In Single Zone VAV configuration, this is the fan speed at which the VFD will start when Cooling is initiated. In a VAV configuration, this is the lowest fan speed allowed in the Cooling Mode. In CAV and MUA configurations, this should be set to 100%.	0	100
Minimum Main Fan VFD in Heating Mode	AV: 41	In Single Zone VAV configuration, this is the fan speed at which the VFD will start when Heating is initiated. In a VAV configuration, this is the lowest fan speed allowed in the Heating Mode. In CAV and MUA configurations, this should be set to 100%.	0	100
Minimum Main Fan VFD in Vent Mode	AV: 42	Speed at which the VFD will operate in the Vent Mode in Single Zone VAV.	0	100
Maximum Main Fan VFD in Heat Mode	AV: 43	In Single Zone VAV configuration, this is the max fan speed the VFD can modulate up to in Heat Mode.	0	100

BACnet® Properties for the AZ 3 Controller				
Parameter	Object	Description	Limits	
Minimum Economizer Position	AV: 44	The minimum position of the Outdoor Air damper in the Occupied Mode. This can be reset upwards based on indoor CO ₂ levels.	0	100
Maximum Economizer CO ₂ Reset Limit	AV: 45	The maximum value the Economizer Minimum Position can be reset up to during CO ₂ override.	0	100
Maximum Economizer in Heat Mode	AV: 46	The maximum value the Economizer Maximum Position can be reset up to during Heating Mode.	0	100
Heat Pump Defrost Minimum Interval	AV: 47	The interval that must be met between Defrost Modes.	10 Min.	120 Min.
Heat Pump Adaptive Defrost Increment	AV: 48	Value added to or subtracted from the Defrost Interval depending on how long the unit remains in defrost. See sequence for details.	0	30
CO ₂ Minimum Setpoint	AV: 49	This is the threshold CO ₂ level at which the Economizer Min Damper Position Setpoint will begin to be reset higher.	0	2000
CO ₂ Maximum Setpoint	AV: 50	This is the CO ₂ level at which the Economizer Min Damper Position will be reset to the Economizer Max Position in High CO ₂ . In between the Min and Max CO ₂ levels the Economizer Min Damper Position will be proportionally reset between the configured Min Damper Position and the Max Position in High CO ₂ .	0	2000
Duct Static Pressure Setpoint	AV: 51	Current Static Pressure Setpoint.	.10	3.0
Duct Static Pressure Control Deadband	AV: 52	Value above and below the Duct Static Pressure Setpoint where no control change occurs.	.01	.5
Building Pressure Control Setpoint	AV: 53	Building Pressure Setpoint.	-.20	.20
Building Pressure Control Deadband	AV: 54	Value above and below the Building Pressure Setpoint where no control change occurs.	.01	.1

Appendix C

AZ 3 BACnet® Parameters

BACnet® Properties for the AZ 3 Controller				
Parameter	Object	Description	Limits	
SZ VAV Fan Speed Integral	AV: 55	The Integral Constant for Single Zone VAV Fan Control.	0	10
Warm-Up Supply Air Temperature Setpoint	AV: 56	Heating will be controlled to this Supply Air Setpoint during Warm-Up.	40	240
Cool-Down Supply Air Temperature Setpoint	AV: 57	Cooling will be controlled to this Supply Air Setpoint during Cool-Down.	30	80
Push-Button Override Duration	AV: 58	The Push-Button Override Duration Setpoint allows you to adjust the amount of time the Override will remain in effect when the Override Button is pressed.	0	8
Indoor Humidification Target	AV: 59	The Humidification Target is the Percent RH that you wish to attain	0	100
Indoor Dehumidification Setpoint	AV: 60	The Dehumidification Setpoint allows you to adjust the RH% at which Dehumidification Mode occurs	0	100
Indoor Dehumidification Reset Setpoint	AV: 61	The Dehumidification Reset Setpoint allows you to adjust the RH% at which Dehumidification Mode is Reset to A Different Coil Setpoint	0	100
Schedule Force	AV: 62	0 = Auto (uses controller's schedule) 1 = Forced Occupied 2 = Forced Unoccupied	0	2
HVAC Mode Override	AV: 63	Overrides normal controller operation in order to force the unit into this desired mode. Configuring for "Auto" will restore normal unit control of the mode of operation.	0=Auto 1=Vent 2=Cool 3=Heat 4=Vent Dehum. 5=Cool Dehum. 6=Heat Dehum.	
Fan VFD Override	AV: 64	Override to force the VFD to this percentage speed. Configuring "Auto" will restore normal unit control of the VFD speed.	0% 100%	Auto=65535
Outdoor Air Damper Override	AV: 65	Overrides all other Outdoor Air Damper position commands so as to maintain this fixed position. Configuring for "Auto" will restore normal unit control of the Outdoor Air Damper/ Economizer operation.	0% 100%	Auto=65535

BACnet® Properties for the AZ 3 Controller				
Parameter	Object	Description	Limits	
BACnet® Space Temperature	AV: 66	This is the BACnet® designated Space Temperature	0	150
BACnet® Space Humidity	AV: 67	This is the BACnet® designated Space Humidity	0	100
BACnet® Outdoor Air Temperature	AV: 68	This is the BACnet® designated Outdoor Air Temperature	0	100
BACnet® Outdoor Air Humidity	AV: 69	This is the BACnet® designated Outdoor Air Humidity	0	100
Cooling Enabled Status	BI: 1	Status that indicates Mechanical Cooling is enabled based on the Cooling Lockout.		
Heating Enabled Status	BI: 2	Status that indicates that Mechanical Heating is enabled based on the Heating Lockout.		
Economizer Enabled Status	BI: 3	Status that indicates the Economizer is enabled based on the Economizer Enable Setpoint.		
Emergency Heat Enabled Status	BI: 4	Shows the Emergency Heat is enabled based on the Compressor Heating Lockout.		
Bad Supply Air Sensor	BI: 5	Alarm that indicates a failure of the Supply Air Sensor.		
Bad Return Air Sensor	BI: 6	Failure of the Return Air Temperature Sensor.		
Bad Outdoor Air Sensor	BI: 7	Failure of the Outdoor Air Temperature Sensor.		
Bad Space Temp Sensor	BI: 8	Failure of the Space Temperature Sensor. If Space is the controlling sensor, the unit will shut down.		
Missing EM1 Expansion Module	BI: 9	EM1 Module is configured but not detected.		
Bad Coil Pressure Sensor	BI: 10	Failure of the Coil Pressure Sensor. Will disable Mechanical Cooling.		
Bad CO ₂ Sensor	BI: 11	Failure of the CO ₂ Sensor.		
Missing 12 Relay Expansion Module	BI: 12	E-BUS 12 Relay Expansion Module is configured, but not detected		
Bad Discharge Sensor	BI: 13	Failure of the Digital Compressor Discharge Temperature Sensor.		
Missing EM2 Expansion Module	BI: 14	EM2 Module is configured but not detected.		

AZ 3 BACnet® Parameters

BACnet® Properties for the AZ 3 Controller			
Parameter	Object	Description	Limits
Mechanical Cooling Alarm	BI: 15	Compressor Relays are enabled, but the Supply Air Temperature has not fallen 5°F within a user-adjustable time period. This does not apply for Modulating Cooling.	
Mechanical Heating Alarm	BI: 16	Heating Mode has been initiated but the Supply Air Temperature has not risen 5°F within a user-adjustable time period. This does not apply for Modulating Heating.	
Fan Proving Alarm	BI: 17	Alarm that indicates an Airflow failure from the Main Fan. Heating and Cooling will be disabled.	
Dirty Filter/Generic Alarm	BI: 18	Depending on how the binary input is configured this alarm indicates either a Dirty Filter or Generic Alarm	
Dirty Filter Alarm	BI: 19	Alarm that indicates the filters are dirty.	
Emergency Shutdown Alarm	BI: 20	Alarm that indicates that Emergency Shutdown has been activated. Will shut the unit down.	
BAD_OA_Damper Feedback Alarm	BI: 21	Alarm that indicates that OA Damper Feedback Signal is not being received.	
Title 24 Sensor Alarm	BI: 22	Outdoor Air or Supply Air Temperature Sensor is shorted or missing.	
Title 24 Not Economizing When It Should	BI: 23	Economizer is enabled, but not following the desired Economizer position commanded.	
Title 24 Economizing When It Should Not	BI: 24	Economizer is not enabled, but the feedback signal indicates a position more open than the minimum.	
Title 24 Damper Failure	BI: 25	Economizer is enabled, but not within 10% of desired position within 150 seconds.	
Title 24 Excess Outdoor Air	BI: 26	Economizer feedback is lost or Economizer is not following commanded position.	
High Supply Temp Cutoff Alarm	BI: 27	The Supply Air has risen above the Hi SAT Cutoff Setpoint. Heating stages begin to deactivate and the fan continues to run.	

BACnet® Properties for the AZ 3 Controller			
Parameter	Object	Description	Limits
Low Supply Temp Cutoff Alarm	BI: 28	The Supply Air has fallen below the Low SAT Cutoff Setpoint and cooling stages will begin to deactivate. If the unit is in Economizer, Vent, or Heating Mode the Supply Fan will shut off.	
High Control Mode Alarm	BI: 29	Occurs when the Controlling Sensor Temperature rises above the Cooling Mode Enable Setpoint plus the Control Mode High Alarm Offset. Applies only to Space or Return Air Temperature controlled units.	
Low Control Mode Alarm	BI: 30	Occurs when the Controlling Sensor Temperature falls below the Heating Mode Enable Setpoint minus the Control Mode Low Alarm Offset. Applies only to Space or Return Air Temperature controlled units.	
Digital Compressor Cutoff Alarm	BI: 31	Occurs if the digital compressor discharge line temperature rises above 268°F or the sensor is shorted. The compressor is disabled.	
Digital Compressor Lockout Alarm	BI: 32	Occurs if five Digital Compressor Cutoffs occur within four hours. The compressor will be locked out.	
Loop Water Proof of Flow Alarm	BI: 33	On a WSHP unit, occurs if water flow is not proven within a certain time limit. Compressors disabled or prevented from activating.	
Low Suction Pressure Alarm	BI: 34	On a WSHP unit, occurs if the Suction Pressure falls below the Low Suction Pressure Setpoint. Compressors disabled or prevented from activating.	
Unsafe Suction Pressure Alarm	BI: 35	On a WSHP unit, occurs if the Suction Pressure falls below the Unsafe Suction Pressure Setpoint. Compressors disabled or prevented from activating.	
Low Leaving Water Temperature Alarm	BI: 36	On a WSHP unit, occurs if the Leaving Water Temperature falls below the Low Leaving Water Temperature Setpoint while in the Heating Mode. Compressors disabled or prevented from activating.	

Appendix C

AZ 3 BACnet® Parameters

BACnet® Properties for the AZ 3 Controller

Parameter	Object	Description	Limits
On Board Relay 1 Main Fan	BI: 37	Current status of Relay 1 on AZ 3 Main Board.	
On Board Relay 2	BI: 38	Current status of Relay 2 on AZ 3 Main Board.	
On Board Relay 3	BI: 39	Current status of Relay 3 on AZ 3 Main Board.	
On Board Relay 4	BI: 40	Current status of Relay 4 on AZ 3 Main Board.	
On Board Relay 5	BI: 41	Current status of Relay 5 on AZ 3 Main Board.	
On Board Relay 6	BI: 42	Current status of Relay 6 on AZ 3 Main Board.	
Expansion Module Relay 1	BI: 43	Current status of Relay 1 on the EM1 Expansion Module.	
Expansion Module Relay 2	BI: 44	Current status of Relay 2 on the EM1 Expansion Module.	
Expansion Module Relay 3	BI: 45	Current status of Relay 3 on the EM1 Expansion Module.	
Expansion Module Relay 4	BI: 46	Current status of Relay 4 on the EM1 Expansion Module.	
Expansion Module Relay 5	BI: 47	Current status of Relay 5 on the EM1 Expansion Module.	
12 Relay Expansion Module Relay 1	BI: 48	Current status of Relay 1 on the E-BUS 12 Relay Expansion Module.	
12 Relay Expansion Module Relay 2	BI: 49	Current status of Relay 2 on the E-BUS 12 Relay Expansion Module.	
12 Relay Expansion Module Relay 3	BI: 50	Current status of Relay 3 on the E-BUS 12 Relay Expansion Module.	
12 Relay Expansion Module Relay 4	BI: 51	Current status of Relay 4 on the E-BUS 12 Relay Expansion Module.	
12 Relay Expansion Module Relay 5	BI: 52	Current status of Relay 5 on the E-BUS 12 Relay Expansion Module.	
12 Relay Expansion Module Relay 6	BI: 53	Current status of Relay 6 on the E-BUS 12 Relay Expansion Module.	
12 Relay Expansion Module Relay 7	BI: 54	Current status of Relay 7 on the E-BUS 12 Relay Expansion Module.	

BACnet® Properties for the AZ 3 Controller

Parameter	Object	Description	Limits
12 Relay Expansion Module Relay 8	BI: 55	Current status of Relay 8 on the E-BUS 12 Relay Expansion Module.	
12 Relay Expansion Module Relay 9	BI: 56	Current status of Relay 9 on the E-BUS 12 Relay Expansion Module.	
12 Relay Expansion Module Relay 10	BI: 57	Current status of Relay 10 on the E-BUS 12 Relay Expansion Module.	
12 Relay Expansion Module Relay 11	BI: 58	Current status of Relay 11 on the E-BUS 12 Relay Expansion Module.	
12 Relay Expansion Module Relay 12	BI: 59	Current status of Relay 12 on the E-BUS 12 Relay Expansion Module.	

AZ 3 BACnet® Property Identifier:**BACNETPropertyIdentifier:****AZ3ControlModeBits ::= ENUMERATED {**

Constant Volume Mode	(1),
Supply Air Cooling Only	(2),
Outdoor Temperature Control	(3),
Single Zone VAV	(4),
Supply Air Tempering	(5),
}	

AZ3ControlStatusBits ::= ENUMERATED {

Unoccupied	(0)
Occupied	(1),
Override Mode	(2),
Holiday Unoccupied	(3),
Holiday Occupied	(4),
Forced Occupied	(5),
Forced Unoccupied	(6),
Remote Contact Occupied	(7),
}	

AZ3HVACModeStatusBits ::= ENUMERATED {

Off	(0),
Vent Mode	(1),
Cooling Mode	(2),
Heating Mode	(3),
Vent RH Mode	(4),
Cooling RH Mode	(5),
Heating RH Mode	(6),
Warm Up Mode	(7),
Defrost Mode	(8),
Purge Mode	(9),
Cool Down Mode	(10),
}	

AZ3AlarmStatusBits ::= BIT STRING {

Bad Supply Air Sensor	(0),
Bad Return Air Sensor	(1),
Bad Outdoor Air Sensor	(2),
Bad Space Sensor	(3),
Missing EM1 Module	(4),
Bad Coil Temp Sensor	(5),
Bad CO ₂ Sensor	(6),
Bad Discharge Sensor	(7),
Bad or Missing 12 Relay Expansion Module	(8)
Mechanical Cooling Failure	(9),
Mechanical Heating Failure	(10),
Fan Proving Alarm	(11),
Dirty Filter Alarm	(12),
Emergency Shutdown Alarm	(13)
High Supply Air Temp Cutoff	(14),
Low Supply Air Temp Cutoff	(15),
High Control Mode Signal Alarm	(16),
Low Control Mode Signal Alarm	(17),
Digital Compressor Cutoff Alarm	(18),
Digital Compressor Lockout Alarm	(19),
Loop Water Proof of Flow Alarm	(20)
Low Suction Pressure Alarm	(21)
Unsafe Suction Pressure Alarm	(22)
Low Leaving Water Temperature Alarm	(23)
}	

Appendix C

BACnet® PICS



BACnet® Protocol Implementation Conformance Statement

Vendor	Listing Status
AAON, Inc. 8500 NW River Park Drive, Suite 108A Parkville, MO 64152 USA	Listed Product
BACnet® Protocol Revision	
Revision 12 (ANSI/ASHRAE Standard 135-2010)	

Product Name	Model Number	Software Version
AZ 3 Controller	ASM02450	FW v1.23

BACnet® Standardized Device Profile (Annex L)
L.4 BACnet® Application Specific Controller (B-ASC)

BIBBs Supported		
Data Sharing	ReadProperty-B	DS-RP-B
	ReadPropertyMultiple-B	DS-RPM-B
	WriteProperty-B	DS-WP-B

Device and Network Management	Dynamic Device Binding-B	DM-DDB-B
	Dynamic Object Binding-B	DM-DOB-B
	DeviceCommunication Control-B	DM-DCC-B

Object Type Support		
Device	Analog Input	Analog Value
Binary Input	Binary Value	
Device does not support CreateObject, DeleteObject, and there are no Proprietary Properties.		

Data Link Layer Options	
Media	Options
MS/TP Master	9600, 19200, 38400, 57600, 76800

2-Conductor Wire.....21
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